

**THE ROLE OF DOCUMENTATION AND MEMORY IN INTERNAL  
CONTROL EVALUATION**

Lori S. Kopp  
I.H. Asper School of Business  
Department of Accounting and Finance  
University of Manitoba  
Winnipeg, MB, Canada  
R3T 5V4  
(204) 474-9886 (phone)  
(204) 474-7545 (fax)  
E-mail: [Lori\\_Kopp@UManitoba.ca](mailto:Lori_Kopp@UManitoba.ca)

November 2000

# **THE ROLE OF DOCUMENTATION AND MEMORY IN INTERNAL CONTROL EVALUATION**

## **ABSTRACT**

SAS No. 78 requires that auditors obtain “a sufficient understanding of internal control to plan the audit and to determine the nature, timing, and extent of tests to be performed” (AICPA 1995). It also requires auditors to document their understanding of an entity’s control activities. Given the importance of internal control evaluation to audit planning, it is important to understand how the auditor’s documentation process affects internal control evaluation. Consequently, this study examines how documentation procedure affects memory of internal control information and internal control risk assessments.

This study extends the decision-maker task involvement research by investigating the amount of auditor attention given to information during internal control documentation procedures, and the effect of this attention on internal control knowledge acquisition. Based on the levels-of-processing framework ( Craik and Lockhart 1972), I predict that the greater attention paid when preparing an internal control questionnaire after reviewing an internal control narrative should lead to the acquisition of more internal control knowledge than when a previously prepared internal control questionnaire and narrative are reviewed. The relationship between the number of internal control weaknesses and strengths learned and the level of control risk assessment also is examined.

Results suggest that the audit seniors who completed an internal control questionnaire retained significantly more internal control information than audit seniors

who reviewed an internal control questionnaire completed by another individual. This result held when separately examining the internal control strengths and weaknesses. In addition, a negative correlation between memory of internal control strengths and control risk assessment was found with the auditors who completed the internal control questionnaire.

## I. INTRODUCTION

In September of 1992, the Committee of Sponsoring Organizations of the Treadway Commission (COSO) released a report titled *Internal Control – Integrated Framework*. This report defined what constitutes internal controls and set a standard against which the effectiveness of a firm’s internal controls can be evaluated. Because the Auditing Standards Board believed that the COSO report provided an appropriate framework for developing effective internal controls, it amended SAS No. 55 to incorporate the COSO framework. This amendment, SAS No. 78, requires that auditors obtain “a sufficient understanding of internal control to plan the audit and to determine the nature, timing, and extent of tests to be performed” (AICPA 1995). It also requires auditors to document their understanding of an entity’s control activities, but does not dictate the form of auditors’ documentation.<sup>a</sup> Auditors may document internal control in the form of flowcharts, questionnaires, and/or narratives (AICPA 1988).

Given the importance of internal control evaluation to audit planning, it is important to understand how the auditor’s documentation process affects internal control evaluation. Consequently, this study examines how documentation procedure affects memory of internal control information and internal control risk assessments.<sup>b</sup>

The influence of decision-maker task involvement has received increased attention in accounting research. Prior research has examined how the act of choosing financial information influences decision performance. Specifically, accounting

---

<sup>a</sup> Control activities, one of the five components of an entity’s internal control system, are the policies and procedures that help ensure that necessary actions are taken to address risks in the achievement of the entity’s objectives (Messier 1997). The other four components of an entity’s internal control system are control environment, risk assessment, information and communication, and monitoring (Arens and Loebbecke 1997; Messier 1997).

researchers have examined the effects of user involvement in the development of decision aids used to predict corporate bond ratings (Whitecotton and Butler 1998), as well as the choice of financial ratios used to predict corporate bankruptcy (Simnett and Trotman 1989; Simnett 1996; Becker 1997) and municipal bond rating changes (Lewis et al. 1988).<sup>c</sup> However, this prior research demonstrates that the tools developed with user involvement are less effective than the optimal tools. In addition, psychological theory was not used as a basis for making predictions about the influence of user involvement on decisions. Decision-makers' use of sub-optimal tools and/or the lack of specific theory could help explain the insignificant task involvement-performance relationships in these studies. It is possible that this lack of specific theory could have caused the task involvement-performance predictions to be framed incorrectly.

This study extends decision-maker task involvement research by using psychological theory ( Craik and Lockhart 1972; Hastie and Park 1986) to examine the effects of decision-maker involvement on the development of an effective tool to be used in decision-making. Specifically, this study examines whether audit seniors from a Big 5 audit firm retain more internal control information when they prepare an internal control questionnaire than when they review an internal control questionnaire prepared by another individual. Based on the levels-of-processing framework (Craik and Lockhart

---

<sup>b</sup> In this study, memory is defined in terms of the amount and types (i.e., internal control strengths and weaknesses) of internal control knowledge (i.e., knowledge content).

<sup>c</sup> Results suggest that decision-makers allowed to choose information for a decision aid exhibit greater decision aid reliance than those not allowed to choose this information (Whitecotton and Butler 1998). However there were mixed results for the relationship between financial ratio choice and bankruptcy prediction (Simnett and Trotman 1989; Simnett 1996). Municipal financial analysts who self-selected information to assist in predicting municipal bond rating changes did not predict these changes any better than analysts that were provided with this information (Lewis et al. 1998). Becker (1997) found that auditor choice of information significantly increased self-determination (i.e., a greater feeling of control over the task), which significantly increased overall intrinsic motivation. Overall intrinsic motivation marginally increased correct prediction of corporate failure.

1972), I predict that the attention required to prepare an internal control questionnaire should result in the acquisition of more internal control information. Utilizing memory-based processing (Hastie and Park 1986) and prior research findings, I also predict that the more internal control weaknesses (strengths) retained, the higher (lower) the control risk assessment.

To test these predictions, 76 audit seniors evaluated internal control information using one of two documentation procedures. In one condition, participants reviewed a previously prepared internal control narrative and then prepared an internal control questionnaire. In the other condition, participants reviewed a previously prepared narrative and internal control questionnaire. Participants then completed a test to examine the amount and type of internal control knowledge acquired and provided an internal control risk assessment.

Ashton and Willingham (1989) and Messier (1995) describe the ultimate goal of audit judgment research as improving audit effectiveness and efficiency by providing a basis for improving audit decisions. The examination of the relationship between documentation procedure, memory, and internal control risk assessments is important because of its implications for audit effectiveness and efficiency.

Specifically, determining the documentation procedure that results in greater internal control information retention could improve audit effectiveness by causing auditors to consider all relevant internal control information when making internal control risk assessments. The results of the study suggest that audit seniors who prepared an internal control questionnaire retained significantly more internal control information than seniors who reviewed an internal control questionnaire prepared by another

individual. Better memory of internal control information is likely to result in accurate control risk assessments because all attributes of the control system will be considered when the assessment is made. These results imply that internal control evaluation could be performed more effectively when auditors prepare instead of review an internal control questionnaire. These results could be considered when staff assignments are made during audit planning.

Audit efficiency (i.e., taking less time to attain a given level of effectiveness) also would be improved if having the same person prepare the internal control questionnaire and assess control risk takes less time than having two different individuals perform these activities.<sup>d</sup>

Partial support was found for the prediction examining the internal control strengths/control risk relationship. The results showed a negative correlation between memory of internal control strengths and control risk assessment for the auditors who prepared the internal control questionnaire. Support for this prediction demonstrates another potential advantage of preparing (rather than reviewing) an internal control questionnaire during internal control evaluation.

No support was found for the prediction examining the internal control weaknesses/control risk relationship. In this study, the memory accuracy of internal control weaknesses was lower than that of the internal control strengths. It is possible that this lower memory accuracy made it more difficult to obtain a significant internal control weakness/control risk assessment relationship.

---

<sup>d</sup> I did not test the amount of time it took for each auditor to perform each documentation procedure. I am merely speculating that it will take less time when the same person prepares the ICQ and assesses control risk.

This study also contributes to psychology research. There is a trend in cognitive psychology toward applying basic concepts and theoretical models of cognitive psychology to real world situations (Matlin 1994).<sup>e</sup> Applying the levels-of-processing framework and memory-based processing to the performance of an internal control evaluation task contributes towards this line of research.

The remainder of this study is organized as follows: Section II discusses theory and develops the hypotheses; Section III discusses the methodology to be used. Section IV presents the results. The limitations and contributions are described in Section V.

## II. THEORY AND HYPOTHESES DEVELOPMENT

### **Documentation and Evaluation of Internal Control Information**

Auditors evaluate a client's internal control system to determine the extent to which it is capable of preventing or detecting material misstatements, whether caused by error or fraud. Based on their evaluation of internal controls, auditors assess the risk that the control system will not prevent or detect material misstatements (i.e., control risk). Control risk assessments are directly associated with audit investment through their effect on the nature, timing, and extent of substantive testing.<sup>f</sup>

Auditors can use narratives and/or internal control questionnaires (ICQ) to fulfill the requirement that they document their understanding of internal control systems (AICPA 1988).<sup>g</sup> The format used to document internal controls may influence auditors'

---

<sup>e</sup> Examples of other accounting research that follow this trend are Bonner and Walker (1994), Plumlee et al. (1998), and Herz and Schultz (1999).

<sup>f</sup> Less effective internal controls result in higher control risk assessments, which typically cause auditors to increase the amount of substantive audit testing.

<sup>g</sup> Narratives, internal control questionnaires, and flowcharts have been used in practice and experimental research to document an understanding of internal control (e.g., Ashton 1974; Bierstaker 1997). Since the

information processing activities (Mock and Turner 1981), perhaps because of the manner in which auditors process internal control information into memory when preparing and reviewing narratives and ICQs. The next section uses the levels-of-processing approach ( Craik and Lockhart 1972) as a framework for explaining how performance of internal control evaluation is expected to differ based on documentation procedure.

### **Levels-of-Processing Approach**

Craik and Lockhart (1972) proposed the levels-of-processing framework, an approach that has been one of the most influential in the study of human memory (Matlin 1994). In the levels-of-processing approach, information to be learned (i.e., stimuli) receives some type of mental processing. The by-product of this processing is a memory trace. Deeper processing of stimuli result in longer lasting and stronger traces. More information will be remembered when the memory trace is stronger.

Craik and Lockhart (1972) propose two distinct methods of information processing, elaborative and maintenance rehearsal, which differ in terms of the depth of processing (deep vs. shallow). According to the theory, more information will be encoded into memory with deep, meaningful information processing than with shallow processing.<sup>h</sup> Deep processing involves analysis in terms of meaning (e.g., what is the meaning of the word in the context of the other words in the sentence) while shallow

---

use of flowcharts is declining (Bierstaker 1997), this study considers only a narrative and an internal control questionnaire to document an understanding of internal control in this experiment.

<sup>h</sup> Encoding is a process in which new information is stored into long-term memory. The more information stored, the better the encoding.

processing involves analysis in terms of physical or sensory characteristics (e.g., the sound of a word/number, the color of a letter) rather than meaning.<sup>i</sup>

Maintenance rehearsal (Type I information processing) is a low level, repetitive kind of information recycling (Ashcraft 1994) that involves shallow processing. It is the kind of rehearsal used, for example, when individuals repeat a phone number to themselves until they dial it. Once an individual stops rehearsing the information, it is difficult to retrieve from memory.

Elaborative rehearsal (Type II information processing) is based on deeper, more meaningful, analyses. Consequently, when material is rehearsed elaboratively (i.e., worked on, or presented in greater detail), there are longer-lasting and stronger memory traces, resulting in greater memory of the information.

In the levels-of-processing framework, the amount of attention devoted to a stimulus will also determine the depth to which information is processed. That is, more attention results in greater retention. In summary, the amount of information learned is a function of the depth of processing, where greater attention increases the depth in which this information is processed. The next section discusses how elaborations of textual information (i.e., deeper processing) and questions can be used to increase the amount of attention given to information.

### *Elaborations of Textual Information and Questioning Techniques*

Results of non-accounting research examining elaborations of textual information can be used as a basis for considering auditors' review of narrative information during

---

<sup>i</sup> Because of the emphasis on whether mental processing is deep or shallow, the approach is also called the depth-of-processing theory.

internal control evaluation. For example, when participants read paragraphs with a main-idea sentence and zero to four additional sentences providing examples of the main idea, their recall of the main idea improved with the number of additional sentences provided (Palmer et al. 1983). In addition, self-generated elaborations of textual information resulted in more information stored in memory than experimenter-provided elaborations (Bobrow and Bower 1969; Slamecka and Graf 1978; Stein and Bransford 1979). For example, participants remembered more information when they generated their own sentences than when the sentences were presented to them (Bobrow and Bower 1969).

In an audit setting, after reviewing a narrative describing the presence or absence of fraud indicators for a hypothetical audit client, auditors were asked to document this evidence using one of two documentation methods (Plumlee et al. 1998). The first method was a 12-item yes/no checklist of items that indicated a high or low risk of management fraud. In the second method, the auditors were instructed to take notes that they might use later to write a memorandum documenting evidence about the likelihood of fraud.<sup>j</sup> Auditors who used notes documented a higher proportion of fraud-related items than those who used checklists.<sup>k</sup> Although that study's predictions were not based on the levels-of-processing framework, results are consistent with elaborative processing. That is, the auditors taking written notes likely used deeper processing and devoted more attention to the information in the narrative than the auditors using a checklist.

The PQ4R method is a technique intended to improve memory for textual material (Thomas and Robinson 1972). It derives its name from the six phases of the method: preview, question, read, reflect, recite, review. One of the key stages of this

---

<sup>j</sup> Auditors in the notes condition were cued with questions that prompted them to address the same twelve items on the checklist.

technique, read, involves question-answering. During this stage, individuals answer the questions made up in the question stage. This question-answering feature encourages more elaborative processing of textual information (Anderson 1990), and has resulted in greater information retention. For example, either generating or answering questions while reading text resulted in retention of more information than just studying the textual material without having to generate or answer questions (Frase 1975; Frase and Schwartz 1975). In addition, focusing attention on text segments containing information related to the questions resulted in greater information retention (Reynolds and Anderson 1982).

Having to generate answers to questions in the ICQ is expected to cause auditors to focus more of their attention (i.e., elaborate more) on information in the narrative. This increased attention should result in deeper processing and greater attention to internal control information than reviewing an ICQ in which the answers are already provided. In summary, the question-answering required when preparing an ICQ should result in more attention to, and greater retention of information in an internal control narrative than reviewing an ICQ. This prediction leads to the following alternative form hypothesis:

H1: Auditors' memory for internal control information will be greater when they complete an internal control questionnaire rather than when they review an internal control questionnaire prepared by another individual.

### **Memory Effects on Judgment**

Efficiency concerns can cause auditors to rely on long-term memory, rather than performing a thorough re-reading of the workpapers (Libby and Trotman 1993). Less time spent re-reading workpapers and greater reliance on long-term memory would mean

---

<sup>k</sup> Three of the items on the 12-item checklist were indicators of fraud.

less total time spent on audit procedures, and greater audit efficiency. Because prior research suggests that auditors rely confidently on items in memory, even incorrect ones (Moeckel and Plumlee 1989), an increase in the number of accurate items in memory would improve audit effectiveness.

### *Memory-based Processing*

The relationship between memory and judgment can be explained using memory-based processing. In memory-based processing, the nature of information recalled from long-term memory has a direct relationship with judgments relying on these memories (Hastie and Park 1986).<sup>1</sup> An example of a memory-based judgment in auditing would be an auditor being asked to make a judgment in the review process, long after the original collection and evaluation of evidence.

### **Memory Studies in Accounting**

Prior research demonstrates a relationship between the nature of information in memory and related judgments. Choo and Trotman (1991) asked auditors to recall items included in the description of a hypothetical company. These items were classified as typical or atypical, where typical (atypical) items are procedures and occurrences that increase (decrease) an auditor's substantial doubts about a client's ability to continue as a going-concern. For experienced auditors, the greater the ratio of atypical items to typical

---

<sup>1</sup> Memory-based processing is based on the availability information processing model, which assumes that memory availability influences judgment. The most common example of this model is the "availability heuristic" (Tversky and Kahneman 1973), a judgmental heuristic in which a person evaluates the frequency or probability of events by the ease with which relevant instances come to mind. The greater the ease with which one can recall instances, the higher will be the judged probability of occurrence of the event.

items recalled, the lower the probability judgment.<sup>m</sup> Selfridge et al. (1992) and Choo (1996) provided support for Choo and Trotman's findings. Selfridge et al. (1992) found a positive relationship between auditors' increasing consideration for management's atypical plan to mitigate a liquidity problem and their going-concern judgments. Choo (1996) found the more atypical items listed, the greater the likelihood the company would be classified as a going-concern.<sup>n</sup> Similarly, Plumlee et al. (1998) found that higher recognition of items indicating fraud resulted in higher fraud risk assessments.

During internal control evaluation, internal control attributes are classified as strengths or weaknesses (Arens and Loebbecke 1997), with the relative number of strengths and weaknesses likely to influence internal control risk assessments.<sup>o</sup> Based on the findings of memory-based processing and prior research, I expect that the more internal control weaknesses (strengths) identified, the higher (lower) the control risk assessment. This prediction leads to the following alternative form hypotheses:

H2a: The greater the number of internal control weaknesses in memory, the higher the internal control risk assessment.

H2b: The greater the number of internal control strengths in memory, the lower the internal control risk assessment.

Prior research suggests that greater attention is devoted to items of higher importance (Anderson 1982). Under the levels-of-processing framework this greater attention should result in greater retention of more important items. However, previous

---

<sup>m</sup> The experienced auditors were at the senior/supervisor level and had at least three years of auditing experience, with average experience of 4.4 years. The inexperienced auditors had less than six months auditing experience, with average experience of 3.3 months. There was not a significant memory-judgment relationship for the inexperienced auditors in this study.

<sup>n</sup> In the Selfridge et al (1992) study auditors were at the partner or manager level. In the Choo (1996) study auditors had an average of 4.8 years of auditing experience.

<sup>o</sup> Presence/absence often corresponds to an internal control strength/weakness classification.

research in psychology has found mixed support for this relationship (Anderson 1982). In a study of audit working paper review, memory accuracy of accounts receivable and inventory items were positively related to their degree of importance (Sprinkle and Tubbs 1998).

I also examined the relative importance (weighting) given to each internal control relative to the other internal controls. This examination is important because an internal control weakness given a high weighting may influence the risk assessment to a greater extent than a strength with a low weighting. While prior research has examined the weighting of internal controls in the payroll cycle, it has not examined whether the weighting of internal controls is related to its classification as a weakness or a strength, or the likelihood that the control is remembered (Ashton 1974; Ashton and Brown 1980; Ashton and Kramer 1980).<sup>p</sup> To the extent that auditors remember more important controls, control risk assessments will be more accurate. Inaccurate control risk assessments can result in reliance on absent internal controls or an unnecessary increase in the amount of substantive testing because the presence of an internal control was not identified. I explore the relationship between auditors' memory of internal controls and the weightings placed on each of these controls. Internal controls that are weighted higher should be tested more extensively and relied upon more if they are working as intended.

The three relationships examined in this study are depicted in Figure 1. In summary, I examine the relationships between documentation procedure and internal

---

<sup>p</sup> In a study examining six internal controls in the payroll cycle, internal controls dealing with separation of duties were perceived to be most important to the auditors (Ashton 1974). Other controls examined included the work of internal auditors and the results of the internal control examination of the previous year.

controls weightings on memory of internal control information (strengths and weaknesses). I also examine the relationship between memory of internal control information and the internal control risk assessment.

[Insert Figure 1 about here]

### **III. METHOD**

#### **Participants**

To test the hypotheses, 76 audit seniors from one Big 5 accounting firm completed an internal control evaluation case. Even though audit staff people often document and test internal controls early in their careers, they do not make control risk assessments until they are promoted to audit senior. Audit seniors recommend a level of control risk, which ultimately is reviewed and finalized by the manager and partner.<sup>9</sup>

Table 1 summarizes demographic attributes about the participants. The participants averaged 2.6 years (standard deviation = 1.1 years) of experience in public accounting, and 2.0 years (standard deviation = 0.7 years) with their current firm. Their average age was 26.1 years (standard deviation = 3.5 years), fifty-three percent were CPAs, and fifty-three percent were male.

[Insert Table 1 about here]

#### **Manipulated and Measured Variables**

The ICQ documentation procedure was manipulated at two levels. In the first condition, participants reviewed a narrative and prepared an ICQ (PREPARE). In the second condition participants reviewed both a narrative and a completed ICQ (REVIEW).

The ICQ appears in Table 2. It includes 21 internal controls for the purchasing cycle. The ICQ includes the 20 internal controls examined by Borthick et al. (1997) as well as an additional internal control (vouchers are pre-numbered) that consistently appears in the auditing literature (e.g., Yost 1997).<sup>†</sup> The internal controls for the purchasing cycle found in my review of auditing textbooks is consistent with the 21 internal controls used in this study.<sup>§</sup>

[Insert Table 2 about here]

Two measured variables were used to test the hypotheses: (1) memory of internal control strengths and weaknesses, and (2) internal control risk assessments. A recognition test was used to measure memory of internal control strengths and weaknesses. Recognition and recall tests are two methods used to measure memory. A recognition test was used because memory is facilitated when the encoding context (e.g., the list of internal controls in the ICQ) is similar to the retrieval context (e.g., the list of internal controls in a recognition test).<sup>‡</sup>

In recognition tests, individuals are shown two types of items: target items and distractor items (Ashcraft 1994). The target (old) items are items originally reviewed or studied whereas distractor (new) items are those not originally reviewed or studied. In this study, the target items were the 21 internal controls listed in the ICQ. The distractor items were ten internal controls for the sales cycle. Yes/no questions are commonly used

---

<sup>§</sup> This information is based on interviews with nine auditors representing all Big 5 accounting firms.

<sup>†</sup> The list developed by Borthick et al. (1997) was adapted from Frederick's (1991) list of 33 internal controls.

<sup>§</sup> Thirteen of the internal controls serve as internal control strengths, while eight serve as weaknesses. This combination of strengths and weaknesses should allow for the variability in control risk assessments necessary to examine the second hypothesis. The proportion of internal control strengths and weaknesses is similar to the proportion of positive (six) and negative (12) indicators of fraud used in a study of fraud risk assessment (Plumlee et al. 1998).

<sup>‡</sup> This is known as the encoding specificity principle (Tulving and Thomson 1973)

to measure memory on a recognition test. Table 3 shows the four possible outcomes in a recognition test. These outcomes are defined as follows: a hit is a “yes” response to an old item, a false alarm is a “yes” response to a new item, a correct rejection is a “no” response to a new item, and a miss is a “no” response to an old item. The number of hits for the internal control strengths and weaknesses was used to measure memory.<sup>u</sup>

[Insert Table 3 about here]

While internal control risk assessments can be made by using qualitative (e.g., words) or quantitative scales (e.g., probabilities from 0 to 100), three-point qualitative scales commonly are used in practice (Janell and Wright 1991; Martinov and Roebuck 1998). Previous research typically uses quantitative scales with qualitative descriptors (e.g., Choo and Trotman 1991; Asare 1992; Houston et al. 1999). Accordingly, in this study, an 11-point scale (0 = “Minimum”; 5 = “Moderate”; 10 = “Maximum”) was used.

Additional analyses examined the relationship between weightings of internal controls and memory of internal control information. The participants were asked to evaluate the importance of the 21 internal controls listed in the ICQ. An 11-point scale with linguistic descriptors of (10 = “Extremely important”; 6 = “Somewhat important”; 0 = “Not at all important”) was used. The average rating of each of these controls across participants was computed to see which controls were evaluated as being more important and how these ratings related to memory of internal control information.

---

<sup>u</sup> Participants’ ability to discriminate between old and new items also was examined. Indices suggested by signal detection theory were used to measure the discriminative ability and response bias of the participants. The hit and false alarm rates were used to calculate these indices.

## **Experimental Procedures**

Prior to formal experimentation, steps were taken to ensure that the experimental materials were externally valid. The research instrument was developed with assistance from ten auditors representing all Big 5 accounting firms, who provided insights about their firms' internal control evaluation process and reviewed preliminary versions of the materials. The case also was pilot tested with 54 graduate accounting students.

The experiment was conducted with two classes attending a Big 5 firm's national training program. The experimental sessions were conducted one day apart. Participants in the first class session were asked not to discuss the experiment with any other individuals participating in the training program. Participants in the second class session communicated that they did not have any prior knowledge of the experiment. There were 44/32 participants in the first/second class session. Both documentation manipulations were presented during each of the experimental sessions.

Table 4 summarizes the experimental procedures. The researcher was present during the administration of the experiment and the experiment took place during a 45-minute session. A complete set of the case materials is reproduced in the Appendix.

[Insert Table 4 about here]

The case materials consisted of three parts. Part 1 included the documentation procedures. Participants were given a narrative to review and an ICQ to either review or prepare. At this point, the participants were not told that they would later perform a recognition test on these materials. Because of time constraints, I chose to examine internal controls only for the purchasing cycle. An evaluation at the cycle level is appropriate because SAS No. 47 states that control risk can be assessed at the account

balance or class-of-transactions level (AICPA 1983). The purchasing cycle was chosen because there is a higher likelihood of finding both internal control strengths and weakness during internal control evaluation for this cycle (Reckers and Taylor 1979). The narrative used in the experiment was organized in the order in which documents flow through the accounting system. Based on my interviews with Big 5 auditors, this organization is consistent with practice.

In Part 2 of the case, presented after completing the documentation procedure, an assessment of cognitive ability and demographic questions were used as distractor tasks to clear short-term memory before the auditors were asked to make the control risk assessment and perform the recognition test. The Wonderlic Personnel Test was used to measure cognitive ability (Wonderlic 1998).<sup>v</sup>

Part 3 of the case materials consisted of the control risk assessment, recognition test, and internal control ratings. To ensure that the auditors relied on memory, and not documentation, the narrative and ICQ were not made available when the risk assessments were made.<sup>w</sup> To prevent the list of internal controls from acting as cues during the risk assessment process, the participants took the recognition test after the risk assessment. The participants were not allowed to adjust their control risk assessments after they completed the recognition test. After the recognition test, the participants were asked to evaluate the importance of each of the 21 internal controls listed the in the ICQ.

---

<sup>v</sup> The Wonderlic Personnel Test is a 12-minute short-form test of cognitive ability. It has been administered to more than 100 million individuals. It is correlated highly with longer tests of cognitive ability such as the Wechler Adult Intelligence Scale - Revised and the Otis-Lennon Ability test. Reliabilities range between .88 and .94 when measured for internal consistency (Wonderlic Personnel Test 1998).

<sup>w</sup> In practice, it is not always feasible for auditors to take the time to refer back to the working papers. Therefore, they often must rely on memory for evidence encountered during the review process (Tan 1995).

## IV. RESULTS

### Preliminary Analyses

To ensure that the participants had experience documenting internal controls and assessing control risk, I asked two questions, both of which were measured on 11-point scales (0 = “Never”; 10 = “Very often”). The questions were as follows: “In the course of conducting audits, how often do you document internal controls”; and “In the course of conducting audits, how often do you assess control risk?” Participant responses for the documentation (mean = 8.04; standard deviation = 2.10) and control risk assessment (mean = 7.89; standard deviation = 2.46) questions indicate that the participants had considerable experience documenting internal controls and assessing control risk.

In this study, audit seniors were asked to document internal controls and then assess control risk. As an additional external validity check, participants were asked how often they documented internal controls before assessing control risk when conducting audits. An 11-point scale (0 = “Never”; 10 = “Very often”) was used to answer this question. A mean response of 7.22 (standard deviation = 2.49) showed that the participants had adequate experience performing this activity. Seven managers from the same Big 5 firm also were asked how often the same person completes the documentation and assesses control risk. A mean response of 6.86 (standard deviation = 2.04) on an 11-point scale (0 = “Never”; 10 = “Very often”) provides additional evidence that auditors frequently document internal controls before making control risk assessments.

In this study, audit seniors in the PREPARE documentation group prepared an ICQ (i.e., a tool) to be used in decision-making. The ICQ was prepared with a mean accuracy rate of 86 percent (standard deviation = 9 percent).

This study is based on the assumption that participants use the narrative and ICQ as a basis for assessing control risk. To check this assumption, I asked the following two questions: “How useful was the narrative in helping you assess control risk?”; and “How useful was the internal control questionnaire in helping you assess control risk?” Participants used an 11-point scale (0 = “Not at all useful”; 5 = “Somewhat useful”; 10 = “Extremely useful”) to answer these questions. Participant responses for narrative use (mean = 7.21; standard deviation 1.55) and ICQ use (mean = 6.67; standard deviation = 2.26) indicated that the materials were useful.

## **Hypothesis Tests**

### *Hypothesis 1 Testing*

H1 predicts that memory for internal control information will be greater when participants review a narrative and complete an ICQ (PREPARE) than when they review both a narrative and a completed ICQ (REVIEW). Memory of internal control information was measured in three ways: the percentage of the 13 internal control strengths recorded as hits (PER\_CS), the percentage of the eight internal control weaknesses recorded as hits (PER\_CW), and the percentage of the 21 internal control strengths and weaknesses recorded as hits (PER\_HITS). Levene’s tests suggest that the equal variance assumption is not met for the three memory variables. Consequently, robust rank-order tests, which do not rely on the equal variance assumption (Siegel and Castellan 1988), are used to test H1.<sup>x</sup>

---

<sup>x</sup> The robust rank-order test makes less stringent distributional assumptions about the sampled population than the Mann-Whitney U test and may be more appropriate where significant variation in sample variances are detected (Siegel and Castellan 1988).

The results reveal that the effect of documentation procedure on memory of internal control information is in the predicted direction. Specifically, participants in the PREPARE condition retained more internal control information than those in the REVIEW condition. Table 5 provides the medians, means, and standard deviations for the three memory variables for each documentation condition. Results of robust rank-order tests demonstrate that participants in the PREPARE condition had significantly better memory of internal control information than participants in the REVIEW condition using PER\_CS ( $\hat{U} = 2.29$ ;  $p = 0.011$ ), PER\_CW ( $\hat{U} = 2.14$ ;  $p = 0.016$ ), and PER\_HITS ( $\hat{U} = 2.15$ ,  $p = 0.016$ ).<sup>y</sup> Standard deviation measures for all three memory variables demonstrate that participants in the REVIEW condition had greater variability in their memory of internal control information than participants in the PREPARE condition.

[Insert Table 5 about here]

Additional testing was performed to determine whether participants in the PREPARE condition remembered more specific internal controls than participants in the REVIEW condition. Fisher's Exact tests were performed to see if significant differences existed in the proportion of participants in each documentation condition who had correct memory of each internal control.

The Fisher's Exact tests suggested that, for six internal controls, participants in the PREPARE condition had superior recognition compared to participants in the REVIEW condition. Table 6 provides the significance levels for the internal controls where significant differences were found. It also reports the mean PER\_HITS for each of the six internal controls for each documentation condition. The audit objective being

---

<sup>y</sup> Predictions are directional; therefore, p-values are one-tailed. Similar results are obtained if analyses are performed using the Mann-Whitney U tests or parametric t-tests. The Mann-Whitney U test is also referred

assessed with each of these controls and the accounting department in which the internal control is being performed also are provided.

[Insert Table 6 about here]

Additional analyses were performed to make sure results found for H1 were not attributable to other variables. The possible effects of personal characteristics (i.e., age, gender, public accounting experience, cognitive ability) on memory of internal control information was examined. Age or gender was not significantly related to any of the memory variables. The results of a t-test demonstrate that there was not a significant difference ( $t = 0.411$ ;  $p = 0.682$ ) in the cognitive ability of the audit seniors in the two documentation conditions. Spearman rank-order correlations found that months of public accounting experience was marginally significantly related to PER\_CS ( $r = .205$ ;  $p = 0.075$ ) and PER\_HITS ( $r = .202$ ;  $p = 0.080$ ), and cognitive ability was significantly related to PER\_CW ( $r = .232$ ;  $p = 0.044$ ) and PER\_HITS ( $r = .240$ ;  $p = 0.036$ ). However, including months of public accounting experience and cognitive ability as control variables did not significantly affect the results.

### *Signal Detection Theory*

Signal detection theory also can be utilized to measure recognition memory (Snodgrass and Corwin 1988; Neath 1998). Hit and false alarm rates are used to calculate these indices. Both parametric and nonparametric procedures can be used to calculate these indices. Because the equal variance and normality assumptions are not met for the hit and false alarm rates of the participants in this study, nonparametric analyses were performed to calculate A' and B".

---

to as the Wilcoxon test, the Wilcoxon rank-sum test, and the Wilcoxon-Mann-Whitney test.

A' measures the degree to which participants were able to discriminate between old and distractor (new) items.<sup>z</sup> It ranges from 0 to 1 with .5 reflecting chance performance. Numbers greater than .5 demonstrate the ability to better discriminate old items from the distractor items.

B" is an index that measures the response bias of individuals taking a recognition test. This measure ranges from -1 to 1. Zero represents no bias. A positive number represents conservative bias, defined as a tendency to respond "new" more often than "old" to distractor items. Negative numbers represent liberal bias, defined as a tendency to respond "old" more often to distractor items.

Table 7 provides the means, medians, and standard deviations for A' and B" for each documentation condition. Kolmogorow-Smirnov analysis suggests that the A' measure is not normally distributed. As a result, Mann-Whitney U tests are used to examine differences in A' for the two documentation groups. Mann-Whitney U/t-tests demonstrate that there was not a significant difference in the A'/B" measures of participants in the two documentation conditions.<sup>aa</sup> Consequently, discussion of A' and B" is limited to the overall group of participants.

A mean of .75 for A' indicates that the participants were able to discriminate old items from the distractor items relatively well. A mean B" measure of .02 suggests that the participants exhibited almost no response bias.

[Insert Table 7 about here]

---

<sup>z</sup> See Snodgrass and Corwin (1988) for descriptions of how to calculate the A' and B" indices.

<sup>aa</sup> Similar results are obtained if A' analyses are performed using parametric t-tests.

### *Hypothesis 2 Testing*

Hypothesis 2a predicts that the greater the number of internal control weaknesses in memory, the higher the internal control risk assessment. Hypotheses 2b predicts that the greater the number of internal control strengths in memory, the lower the internal control risk assessment. The descriptive statistics for RISK, PER\_CS, and PER\_CW are reported in Table 5.

As discussed in the previous section, Levene's tests suggest that the equal variance assumption is not met for PER\_CS and PER\_CW. Consequently, Spearman rank-order correlations were used to test H2a and H2b. The results of these correlations for the overall group of participants and for each documentation condition are found in Table 8. For the overall group of participants, neither PER\_CS or PER\_CW were significantly correlated with RISK. Separate analyses were performed for participants in each documentation condition. For participants in the PREPARE documentation group, RISK was negatively correlated with PER\_CS ( $r = -.299$ ;  $p = 0.034$ ). For participants in the REVIEW documentation group, no significant relationships were found. This provides partial support for H2b. There were no significant correlations between RISK and PER\_CW for individuals in either documentation condition.

[Insert Table 8 about here]

### **Additional Testing**

#### *Weightings of Internal Controls*

The participants were asked to evaluate the importance of the internal control strengths and weaknesses used in the study (0 = "Not at all important"; 5 = "Somewhat

important”; 10 = “Extremely important”). Table 9 provides a list of these internal control importance ratings in order of importance. Included in this table are the means, medians, and standard deviations for each internal control rating, the audit objective being assessed with each of these controls, and the accounting department in which the internal control is performed.<sup>bb</sup> The mean importance ratings range of 5.66 to 8.61 suggests that the auditors rated all internal controls as being somewhat to extremely important.

[Insert Table 9 about here]

Additional analyses examined auditors’ memory accuracy of each of the internal controls and the importance weightings placed on them. Table 10 shows the importance rating and memory ranking for each internal control. Kolmogorov-Smirnov tests suggest that all of these memory variables and most of the importance rating variables being evaluated are not normally distributed. Consequently, Spearman rank-order correlations were used to examine the relationship between the rating and memory of each internal control. A significant relationship was found for only four of the 21 internal controls examined in the study. A list of these four internal controls and their respective correlation coefficients and significance levels can be found in Table 11. Two of these internal controls were strengths, and two were weaknesses. In two cases, memory was positively correlated with the importance ratings. In the other two cases, memory was negatively correlated with the importance ratings. The results of these analyses do not provide substantial support for a memory/importance rating relationship.

[Insert Tables 10 and 11 about here]

---

<sup>bb</sup> Kolmogorov-Smirnov tests suggest that the weightings for some of the internal controls are not normally distributed. Because of this, both t-tests Mann-Whitney U tests were performed to see if there was a significant difference in the weightings of the participants in the two documentation conditions. No

Further analyses classified the internal controls into higher and lower importance weightings. The ten internal controls with the highest mean importance weighting were classified as internal controls with higher importance. Similarly, the ten internal controls with the lowest mean importance ratings were classified as internal controls with lower importance.<sup>cc</sup> Table 12 provides the memory accuracy for the internal controls with high and low mean importance ratings for the overall group of participants as well as for the participants in each documentation condition. The overall group of participants ( $t = 1.448$ ;  $p = 0.08$ ; one-tailed), as well as individuals in the PREPARE documentation group ( $t = 1.659$ ;  $p = 0.06$ ; one-tailed) had marginally significant better memory of internal controls rated as more important. There was no significant difference in the memory of the internal controls ranked with higher importance for participants in the REVIEW documentation condition ( $t = 1.162$ ;  $p = 0.13$ ; one-tailed). The results of these tests provide some support that the audit seniors had better memory for controls with higher importance ratings.

[Insert Table 12 about here]

### *Senior Manager Comparisons*

Testing was performed to compare audit seniors' control risk assessments and importance ratings with responses of audit managers in the same Big 5 firm. Seven audit managers made a control risk assessment and rated the importance of the internal controls after reviewing the narrative and completed ICQ. Audit managers had significantly

---

significant differences were found. Based on these findings descriptive information on the internal control weightings is only provided for the overall group of participants.

<sup>cc</sup> These are similar to the procedures used by Sprinkle and Tubbs (1998) to categorize importance classifications.

higher ( $t = 2.375$ ;  $p = 0.02$ ) mean risk assessments (mean = 6.71; standard deviation = 2.43) than the audit seniors (mean = 4.73; standard deviation = 2.10). Since Kolmogorov-Smirnov tests suggest that most of the importance ratings variables are not normally distributed, Mann-Whitney U tests were used to compare the importance ratings of the audit seniors and managers. Results found that there was a significant difference in the importance ratings of the audit seniors and managers for only one internal control ( $z = -3.120$ ;  $p = 0.002$ ). For this control, “cash disbursers are authorized by the board of directors or the president of the company,” audit managers had a significantly lower importance rating (mean = 4.00; standard deviation = 2.89) than the audit seniors (mean = 7.76; standard deviation = 2.45).

## V. DISCUSSION

### **Summary and Implications of the Study**

This study extends prior decision-maker task involvement research by examining how documentation procedure affects memory of internal control information and internal control risk assessments. Prior task involvement research has examined the relationship between the act of choosing information and corporate bond ratings, corporate bankruptcy and municipal bond rating change predictions. Weaknesses of this research included the facts that psychological theory was not used to make the predictions about the influence on user involvement on decisions, and the information chosen resulted in the utilization of a sub-optimal tool to make decisions.

This study uses psychological theory to examine the relationship between task involvement and performance. While prior research has examined the relationship

between task involvement and predictions, this study examines a different performance relationship. It examines the relationship between task involvement and acquisition of audit knowledge. This study also demonstrates how user involvement can result in an effective tool. The audit seniors in the PREPARE documentation group prepared the ICQ (i.e., the tool) with a mean accuracy rate of 86 percent.

This study extends prior decision-maker task involvement research in accounting by using psychological theory to examine the effects of decision-maker involvement on the development of a good (vs. sub-optimal) tool to be used in decision-making. More specifically, the study predicts that decision-maker involvement in completing an ICQ increases the amount of auditor attention given to information examined during internal control documentation, with this attention improving memory of internal control information.

Results suggest that the audit seniors who completed an ICQ retained significantly more internal control information than audit seniors who reviewed an ICQ prepared by another individual. This result held when separately examining the internal control strengths and weaknesses. Differences in memory of specific internal controls were found for six of the 21 internal controls examined in this study. Two of these six internal controls were ranked by the audit seniors as the second and third most important in assessing control risk. These same two internal controls are also performed in the same accounting department, cash disbursements.

Results also suggest that participants in the REVIEW condition had greater variability in their memory of internal control information. One of the goals of the audit profession is to have consistency across engagements (Bell and Wright 1995). The

greater variability of the memory of auditors in the REVIEW documentation condition could lead to more inconsistencies during internal control evaluation. The user involvement in internal control documentation performed by auditors in the PREPARE condition could increase the level of consistency.

These results have implications for improving audit effectiveness and efficiency. Audit effectiveness would be improved when audit seniors have knowledge of more internal control information when making control risk assessments. Not only did auditors in the PREPARE group have better overall memory of controls, they had better memory of internal controls ranked as being second and third most important in assessing control risk. Better memory of the more important internal controls will lead to more accurate control risk assessments.

Audit efficiency could possibly be improved if having the same person complete an ICQ and assess control risk takes less time than having two different individuals perform these activities. Responses from the audit seniors and managers in this study showed that having the same person document internal controls and assess control risk is frequently done in practice.

Audit efficiency/cost tradeoffs would have to be considered when possible staff assignment decisions involving internal control documentation and risk assessment are made during audit planning. In this study, the audit seniors who documented internal controls (i.e., the PREPARE documentation group) had better memory of internal control information. While it might be more efficient to have an audit senior complete an ICQ and make the control risk assessment, it could possibly be more costly than having a staff auditor complete an ICQ and having an audit senior making the control risk assessment.

Predictions about memory of internal control strengths and weaknesses and control risk assessments also were examined. A negative correlation between memory of internal control strengths and control risk assessment was only found with the auditors who completed the ICQ. This result could demonstrate an additional advantage that individuals in the PREPARE documentation group could have during internal control evaluation. That is, their better memory of internal control information for individuals in this group could have helped influence the supported internal control strength/control risk assessment relationship.

There was no support for the internal control weakness/control risk assessment relationship predicted in H2a. In this study memory of internal control strengths was higher than memory of internal control weaknesses. It is possible that this lower memory accuracy of internal control weaknesses made more it difficult to obtain a significant internal control weakness/control risk assessment relationship. Another possible reason for the lack of support for H2a is that the auditor experience level in the prior research used to develop H2 was much higher than that of the audit seniors used in this study.<sup>dd</sup> The auditors in this study had only an average of 2.6 years of auditing experience. Auditors with more experience are likely to have a higher memory accuracy of internal control weaknesses than the audit seniors in this study.

Additional analyses were performed to determine whether the audit seniors in this study had better memory of internal controls weighted as being more important. Results showed that participants in the PREPARE documentation group had marginally significantly better memory of internal controls rated as more important. This is

---

<sup>dd</sup> The Plumlee et al. (1998) study included 4 staff auditors, 56 seniors and 6 managers. The actual number of years of auditing experience was not provided.

comparable to the results in Sprinkle and Tubbs (1998), who found that memory accuracy was positively related to the degree of importance of a piece of evidence within either accounts receivable or inventory during working paper review. A possible reason as to why this relationship did not hold for participants in the REVIEW documentation condition is that the documentation procedures did not encourage them to devote extra attention to the more important internal controls. This lack of attention could have led to a lower level of memory accuracy of these more important items.

### **Limitations**

Participants in this study performed an internal control evaluation task in a controlled setting primarily to enhance the study's internal validity. Unfortunately, this setting gave rise to three potential limitations with respect to the study's external validity.

The first limitation is that the participants' motivations in performing the experimental task may have differed from those that would be present in their normal work environment. This limitation was probably mitigated by conducting the experiment as part of a firm-wide training session and having the verbal support of the coordinator of this session immediately before the administration of the experiment.

Second, the participants were given 45 minutes to complete the experiment. Even though this was adequate time to complete the experimental task, it is probably less than the actual time taken to document internal control and assess control risk in public accounting.

The final limitation was the type of experimental materials used in the study. The documentation about the client's internal control system was limited to written

information. Although prior or current contact with the client can influence auditors' evaluation of internal controls during audit planning, it was not part of the experimental design. Future research can manipulate or control for client involvement.

### **Suggestions for Future Research**

The ultimate goal of audit judgment research is improving the effectiveness and efficiency of audits by providing a basis for improving audit decisions (Ashton and Willingham 1989; Messier 1995). Future research can continue to examine other procedures or techniques that could improve audit effectiveness. The results of this study demonstrate that audit effectiveness could be improved if more internal information is retained during internal control evaluation. In this study, individual task involvement led to better retention of internal control information. Future research can examine whether auditor involvement in documentation during going-concern and fraud risk assessment tasks provides similar results. It also can examine what additional procedures besides user involvement in documentation cause auditors to devote more attention to internal control or other audit information. The influence of group task involvement on memory or decision-making also could be examined.

This is one of the few accounting studies that examined the relationship between information importance and memory. This study provides some evidence that auditors had better memory of internal controls rated as being more important. Future research can examine whether auditors devote more time assessing whether or not the more important internal control procedures are in place. Future research can also examine the importance rankings of items evaluated during or performed as part of other audit

procedures. This is the second audit study that has found a relationship between information importance and memory. Previous research in psychology has found mixed support for this relationship. Future research could examine why audit and psychology research findings differ.

## References

- American Institute of Certified Public Accountants. 1983. *Statement on Auditing Standards No. 47: Audit Risk and Materiality in Conducting an Audit*. New York: American Institute of Certified Public Accountants, Inc.
- American Institute of Certified Public Accountants. 1988. *Statement on Auditing Standards No. 55: Consideration of the Internal Control Structure in a Financial Statement Audit*. New York: American Institute of Certified Public Accountants, Inc.
- American Institute of Certified Public Accountants. 1995. *Statement on Auditing Standards No. 78: Consideration of Internal Control in a Financial Statement Audit: An Amendment to SAS No. 55*. New York: American Institute of Certified Public Accountants, Inc.
- Anderson, J.R. 1990. *Cognitive Psychology and Its Implications*. 3rd edition. New York: W.H. Freeman and Company.
- Anderson, R. 1982. Allocation of attention during reading. *Discourse Processing*. New York, N.Y.: North-Holland.
- Arens, A.A. and J.K. Loebbecke. 1997. *Auditing: An Integrated Approach*. Upper Saddles River, N.J.: Prentice Hall
- Asare, S.K. 1992. The auditor's going-concern decision: Interaction of task variables and the sequential processing of evidence. *The Accounting Review* 67 (April): 379-383.
- Ashcraft, J.H. 1994. *Human Memory and Cognition*. 2nd edition. New York: HarperCollins College Publishers.
- Ashton, R.H. 1974. An experimental study of internal control judgments. *Journal of Accounting Research* 12 (Spring): 143-157.
- \_\_\_\_\_, and P.R. Brown. 1980. Descriptive modeling of auditors' internal control judgments: Replication and extension. *Journal of Accounting Research* 18 (Spring): 268-277.
- \_\_\_\_\_, and S.S. Kramer. 1980. Students as surrogates in behavioral research: Some evidence. *Journal of Accounting Research* 18 (1 Spring): 1-15.
- \_\_\_\_\_, and J.J. Willingham. 1989. Using and evaluating decision aids. In R.P. Srivastava and J.E. Rebele (Eds) *Auditing Symposium IX – Proceedings of the 1988 Ross/University of Kansas Symposium on Auditing Problems*. Lawrence: University Kansas.

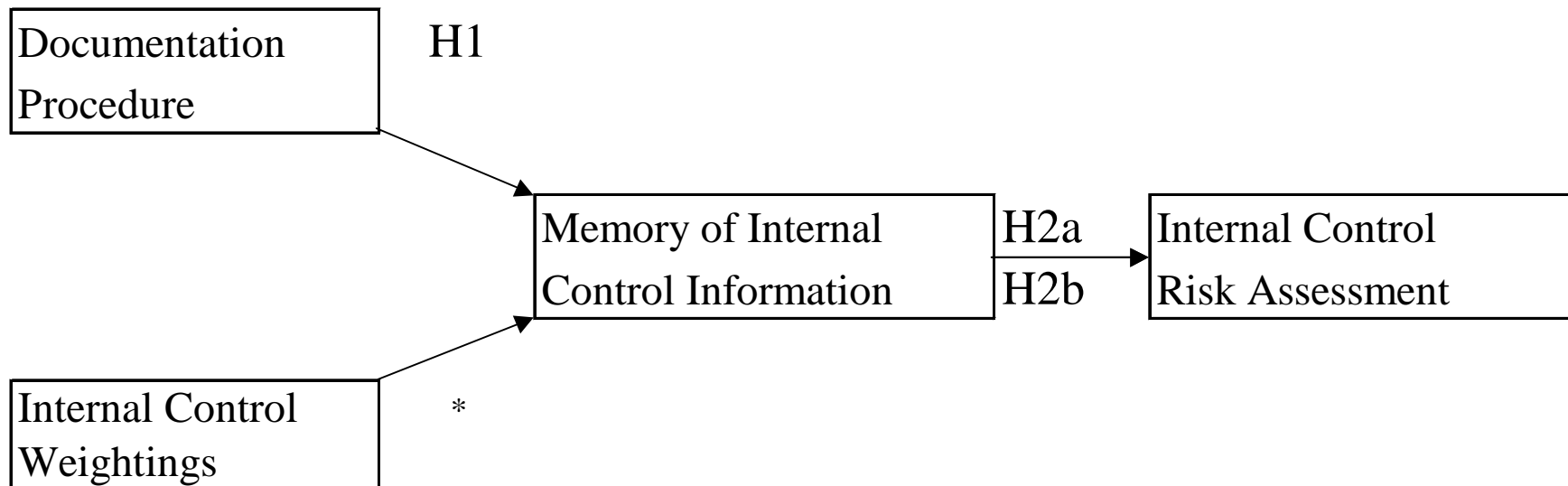
- Becker, D.A. 1997. The effects of choice on auditors' intrinsic motivation and performance. *Behavioral Research in Accounting* 9: 1-19.
- Bell, T.B. and A.M. Wright. 1995. *Auditing Practice, Research, and Education: A Productive Collaboration*. New York: American Institute of Certified Public Accountants.
- Bierstaker, J.L. 1997. Performance in internal control evaluation: The importance of documentation format and task-specific knowledge. Working paper. University of Massachusetts-Boston.
- Bobrow, S.A. and G.H. Bower. 1969. Comprehension and recall of sentences. *Journal of Experimental Psychology* 80 (3): 455-461.
- Bonner, S.E. and P.L. Walker. 1994. The effects of instruction and experience on the acquisition of auditing knowledge. *The Accounting Review* 69 (January): 157-168.
- Borthick, A. F., M.B. Curtis and R.S. Siram. 1997. Accelerating the acquisition of knowledge structure to improve performance in internal control evaluation. Working paper. Georgia State University.
- Choo, F. 1996. Auditor's knowledge content and judgment performance: A cognitive script approach. *Accounting, Organizations and Society* 21 (May): 339-359.
- \_\_\_\_\_, and K.T. Trotman. 1991. The relationship between knowledge structure and judgments for experienced and inexperienced auditors. *The Accounting Review* 66 (July): 464-485.
- Committee of Sponsoring Organizations of the Treadway Commission. 1992. *Internal Control – Integrated Framework*. Jersey City: AICPA
- Craik, F.I.M. and R.S. Lockhart. 1972. Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior* 11 (December): 671-684
- Frase, L.T. 1975. Prose processing. In G.H. Bower (Ed) *Psychology of Learning and Motivation* (Vol. 9). New York: Academic Press.
- \_\_\_\_\_, and B.J. Schwartz. 1975. Effect of question production and answering on prose recall. *Journal of Educational Psychology* 67 (October): 628-635.
- Frederick, D.M. 1991. Auditors' representation and retrieval of internal control knowledge. *The Accounting Review* 66 (April): 240-258.

- Hastie, R. and B. Park. 1986. The relationship between memory and judgment depends on whether the judgment task is memory-based or on-line. *Psychological Review* 93 (July): 258-268
- Herz, P.J. and J.J. Schultz. 1999. The role of declarative and procedural knowledge in performing accounting tasks. *Behavioral Research in Accounting* 11: 1-26.
- Houston, R.W., M.F. Peters and J.H. Pratt. 1999. The audit risk model, business risk and audit-planning decisions. *The Accounting Review* 74 (July): 281-298.
- Janell, P.A. and A. Wright. 1991. Inherent risk and control environment. Assessment practices of major audit firms: Implications for practice and future research. Working paper. Northeastern University.
- Lewis, B.L, J.M. Patton and S.L. Green. 1988. The effects of information choice and information use on analysts' predictions of municipal bond rating changes. *The Accounting Review* 63 (April): 270-282.
- Libby, R. and K.T. Trotman. 1993. The review process as a control for differential recall of evidence in auditor judgments. *Accounting, Organizations and Society* 18 (August): 559-574.
- Martinov, N. and P. Roebuck. 1998. The assessment of integration of materiality and inherent risk: An Analysis of major firms' audit practices. *International Journal of Auditing* (July): 103-126.
- Matlin, M.W. 1994. *Cognition*. 3rd edition. Forth Worth: Harcourt Brace Publishers.
- Messier, W.F. 1995. Research in and development of audit decision aids. In R.H. Ashton and A.H. Ashton (Eds) *Judgment and Decision-Making in Accounting and Auditing*. Cambridge: Cambridge University Press.
- \_\_\_\_\_, 1997. *Auditing: A Systematic Approach*. New York: The McGraw-Hill Companies, Inc.
- Mock, T.J. and J.L. Turner. 1981. *Internal Accounting Control Evaluation and Auditor Judgment*. New York: AICPA.
- Moeckel, C. and R.D. Plumlee. 1989. Auditors confidence on recognition of audit evidence. *The Accounting Review* 64 (October): 653-666.
- Neath, I. 1998. *Human Memory: An Introduction to Research, Data, and Theory*. Pacific, Grove, CA: Brooks/Cole.

- Palmere, M., S.L. Benton, J.A. Glover and R.R. Ronning. 1983. Elaboration and recall of main ideas in prose. *Journal of Educational Psychology* 76 (December): 898-907.
- Plumlee, R.D, B. Tuttle and C.L. Moeckel. 1998. Auditors' evidence documentation and judgment: The mediating role of memory. Working paper. University of Utah.
- Reckers, P.M. and M.E. Taylor. 1979. Consistency in auditors' evaluations of internal accounting controls. *Journal of Accounting and Finance* 3 (Fall): 42-55.
- Reynolds, R.E. and R.C. Anderson. 1982. Influence of questions on the allocation of attention during reading. *Journal of Experimental Psychology* 74 (October): 623-632.
- Selfridge, M., S.F. Biggs, and G.R. Krupka. 1992. A cognitive model of the auditor's going-concern judgment. *International Journal of Intelligent Systems* 7: 393-417.
- Siegel, S. and N.J. Castellan. 1988. *Nonparametric Statistics for the Behavioral Sciences*. New York: McGraw-Hill Book Company.
- Simnett, R. 1996. The effect of information selection, information processing and task complexity on predictive accuracy of auditors. *Accounting, Organizations and Society* 21 (October/November): 699-719.
- \_\_\_\_\_, and K. Trotman. 1989. Auditor versus model: Information Choice and information processing. *The Accounting Review* 64 (July): 514-528.
- Slamecka, N.J. and P. Graf. 1978. The generation effect: Delineation of a phenomenon. *Journal of Experimental Psychology: Human Learning and Memory* 4 (Nov ): 592-604.
- Snodgrass, J.G. and J. Corwin. 1988. Pragmatics of measuring recognition memory: Applications to dementia amnesia. *Journal of Experimental Psychology: General* 117 (March): 34-50.
- Sprinkle, G.B. and R.M. Tubbs. 1998. The effects of audit risk and information importance on auditor memory during working paper review. *The Accounting Review* 73 (October): 475-502.
- Stein, B.S. and J.D. Bransford. 1979. Constraints on effective elaboration: Effects of precision and subject generation. *Journal of Verbal Learning and Verbal Behavior* 18 (December): 769-777.
- Tan, H. 1995. Effects of expectations, prior involvement, and review awareness on memory for audit evidence and judgment. *Journal of Accounting Research* 33 (Spring): 113-135.

- Thomas, E.L. and H.A. Robinson. 1972. *Improving Reading In Everyday Class: A Sourcebook For Teachers*. Boston: Allyn and Bacon.
- Tulving, E. and D.M. Thomson. 1973. Encoding specificity an retrieval processes in episodic memory. *Psychological Review* 80 (September): 352-373.
- Tversky, A. and D. Kahneman. 1973. Availability: A heuristic for judging frequency and probability. *Cognitive Psychology* 5 (July): 207-232.
- Whitecotton, S.M. and S.A. Butler. 1998. Influencing decision aid reliance through involvement and information choice. *Behavioral Research in Accounting* 10 (Supplement): 182-200.
- Wonderlic, C.F. 1988. *Wonderlic Personnel Test – Form IV*. Libertyville: IL: Wonderlic Personnel Test, Inc.
- Wonderlic Personnel Test, Inc. 1998. *Wonderlic Personnel Test and Scholastic Level Exam – User’s Manual*. Libertyville: IL: Wonderlic Personnel Test, Inc.
- Yost, G.C. 1997. *The Audit Its Environment and Application: An Experiential Approach*. Upper Saddle River, NJ: Prentice Hall, Inc.

Figure 1: Hypotheses Examined



\* This link does not represent a stated hypothesis. This relationship is examined to see if participants had better memory for internal controls evaluated as being more important in assessing control risk.

**TABLE 1**  
**Demographic Information for Participants**

---

	<b>Male</b>	<b>Female</b>	
Gender	40	36	
	<b>Yes</b>	<b>No</b>	
CPA status	40	36	
	<b>Mean</b>	<b>Median</b>	<b>Std. Dev.</b>
Age	26.1	25.0	3.5
Time in Public Accounting (years)	2.6	2.2	2.1
Time with the Firm (years)	2.0	2.1	0.7

**TABLE 2**  
**Internal Control Questionnaire**

**Please review/complete the following internal control questionnaire.**

<b>Internal Controls</b>	<b>Yes/No/NA</b>	<b>Comments</b>
1. Purchase orders are authorized.	Y	
2. There are written authorization procedures and limits of buying power.	Y	
3. There is an approved list of suppliers.	N	
4. Certain limits or ranges are put into place so only correct information can be entered into the purchase order.	N	
5. Purchase orders are pre-numbered.	Y	
6. Access to receiving areas is authorized and controlled.	Y	
7. Access to recording goods received is restricted to those authorized.	Y	
8. Goods received are physically verified.	Y	
9. Receiving reports are pre-numbered.	N	
10. Invoices are matched to receiving reports.	Y	
11. Invoices are checked for prices, quantities, and mathematical accuracy.	Y	
12. Batch totals of invoices entered are compared to totals of invoices recorded.	N	
13. Receiving reports are matched to purchase orders.	Y	
14. Invoices are matched to purchase orders.	Y	
15. Vouchers are pre-numbered.	N	
16. Fund disbursers are authorized by the board of directors or the president of the company.	Y	
17. Fund disbursers review supporting evidence before releasing payments.	Y	
18. Payments are pre-numbered.	Y	
19. Aborted payments are marked to prevent their being treated as valid payments.	N	
20. Paid invoices are effectively cancelled.	N	
21. Cash disbursement records are reconciled to monthly bank statements.	N	

**TABLE 3**  
**Possible Outcomes in a Recognition Test**

		<u>Participant's Response</u>	
		<i>Old</i>	<i>New</i>
<i>Test Item</i>	<i>Old<sup>a</sup></i>	Hit	Miss
	<i>New<sup>b</sup></i>	False Alarm	Correct Rejection

<sup>a</sup> Internal control strengths and weaknesses originally reviewed.

<sup>b</sup> Internal controls from the sales cycle not originally reviewed.

**TABLE 4**  
**Summary of Experimental Procedures**

1. Perform documentation procedure. Review a narrative and either complete or review an internal control questionnaire.
2. Distractor task (ability assessment and demographic questions).
3. Control risk assessment.
4. Recognition test.
5. Internal control ratings.

**TABLE 5**  
**Memory of Internal Control Information and Risk Assessment by Documentation Condition**  
**Medians [Means] (Standard Deviations)**

<b>Memory Variables</b>				
<i>Documentation Condition</i>	PER_CS <sup>a</sup>	PER_CW <sup>b</sup>	PER_HITS <sup>c</sup>	RISK <sup>d</sup>
PREPARE N = 38	92.31% [87.65%] (12.84%)	75.00% [74.67%] (19.81%)	85.71% [82.71%] (12.50%)	5.00 [5.00] (2.43)
REVIEW N = 38	84.62% [81.17%] (16.26%)	62.65% [61.84%] (25.82%)	76.19% [73.81%] (17.91%)	4.50 [4.45] (1.69)
OVERALL N = 76	84.62% [84.41%] (14.91%)	75.00% [68.26%] (23.76%)	80.95% [78.26%] (15.98%)	5.00 [4.73] (2.10)

<sup>a</sup> Percentage of the 13 internal control strengths recorded as hits.

<sup>b</sup> Percentage of the eight internal control weaknesses recorded as hits.

<sup>c</sup> Percentage of the 21 internal control strengths and weakness recorded as hits.

<sup>d</sup> Control risk assessed on an 11 point scale (0 = “Minimum”; 5 = “Moderate”; 11 = “Maximum”).

**TABLE 6**  
**Memory of Internal Controls by Documentation Condition**

<i>Internal Control</i>	<i>Internal Control</i>		<i>P-value</i> <i>(one-tailed)</i>	<i>Percentage of Hits</i>		
	<i>Strength (S) or Weakness(W)</i>	<i>Audit Objective</i>		<i>Accounting Department</i>	<b>PREPARE</b>	<b>REVIEW</b>
There is an approved list of suppliers.	W	Authori- zation	Purchasing	0.0142	97.37%	78.95%
Access to receiving areas is authorized and controlled.	W	Authori- zation	Receiving	0.0485	86.84%	68.42%
Invoices are matched to purchase orders.	S	Complete- ness	Accounts Payable	0.0954	92.11%	78.95%
Payments are pre-numbered.	S	Complete- ness	Cash Disburse- ments	0.0243	86.84%	64.86%
Aborted payments are marked to prevent their being treated as valid payments.	S	Validity	Cash Disburse- ments	0.0389	94.74%	78.38%
Cash disbursement records are reconciled to monthly bank statements.	W	Accuracy	Cash Disburse- ments	0.0010	94.74%	63.89%

TABLE 7

**Memory of Internal Control Information by Documentation Condition  
Utilizing Signal Detection Theory Indices  
Means [Medians] (Standard Deviations)**

<i>Documentation Condition</i>	<i>Signal Detection Theory Indices</i>	
	<i>A<sup>a</sup></i>	<i>B<sup>b</sup></i>
PREPARE N = 38	.78 [.89] (1.67)	.06 [-.05] (.49)
REVIEW N = 38	.72 [.81] (.25)	-.01 [-1.1] (.53)
OVERALL N = 76	.75 [.81] (.23)	.02 [-.09] (.51)

<sup>a</sup> An index that measures of how participants were able to discriminate between old and distractor (new) items in a recognition test.

<sup>b</sup> An index that measures the response bias of individuals taking a recognition test.

TABLE 8

**Spearman Rank-Order Correlations<sup>a</sup> of Control Risk Assessment (RISK) with  
Memory of Internal Control Strengths and Weaknesses**

<i>Documentation Condition</i>	<i>PER_CS<sup>b</sup></i>		<i>PER_CW<sup>c</sup></i>	
	<i>Correlation</i>	<i>P-Value</i>	<i>Correlation</i>	<i>P-Value</i>
PREPARE N = 38	-.299	0.034	.097	0.281
REVIEW N = 38	-.051	0.381	-.213	0.100
OVERALL N = 76	-.107	0.178	-.014	0.452

<sup>a</sup> Reported probabilities are one-tailed.

<sup>b</sup> Percentage of the 13 internal control strengths recorded as hits.

<sup>c</sup> Percentage of the eight internal control weaknesses recorded as hits.

**Table 9**  
**Internal Control Ratings in Order of Importance<sup>a</sup>**

<i>Internal Control</i>	<i>Audit Objective</i>	<i>Accounting Department</i>	<b>Descriptive Statistics</b>
			<i>Means [Medians]</i> <i>(Standard Deviations)</i>
1. Supporting documentation is reviewed before authorizing payments.	Validity	Cash disbursements	8.61 [9.00] (1.33)
2. Aborted payments are marked to prevent their being treated as valid payments.	Validity	Cash disbursements	8.54 [9.00] (1.81)
3. Cash disbursement records are reconciled to monthly bank statements.	Accuracy	Cash disbursements	8.54 [9.00] (1.81)
4. Goods received are physically verified.	Validity	Receiving	8.47 [9.00] (1.33)
5. Invoices are checked for prices, quantities, and mathematical accuracy.	Accuracy	Accounts Payable	8.36 [9.00] (1.49)
6. Payments are pre-numbered.	Completeness	Cash disbursements	8.17 [8.00] (2.04)
7. Ability to record goods received in the inventory records is restricted to those authorized.	Authorization	Receiving	8.15 [8.00] (1.42)
8. Purchase orders are authorized.	Authorization	Purchasing	8.08 [8.00] (1.79)
9. Invoices are matched to receiving reports.	Validity	Accounts Payable	7.99 [8.00] (1.98)
10. Receiving reports are matched to purchase orders.	Completeness	Accounts Payable	7.96 [8.00] (1.42)
11. Invoices are matched to purchase orders.	Completeness	Accounts Payable	7.96 [8.00] (1.64)

<sup>a</sup> 11-point scale (0 = "Not at all important"; 5 = "Somewhat important"; 10 = "Extremely important").

**Table 9 (continued)**  
**Internal Control Ratings in Order of Importance <sup>a</sup>**

<i>Internal Control</i>	<i>Audit Objective</i>	<i>Accounting Department</i>	<b>Descriptive Statistics</b>
			<i>Means [Medians] (Standard Deviations)</i>
12. There are authorization procedures and limits on buying power.	Authorization	Purchasing	7.83 [8.00] (1.89)
13. Access to receiving areas is authorized and controlled.	Authorization	Receiving	7.78 [8.00] 1.58
14. Cash disbursers are authorized by the board of directors or the president of the company.	Authorization	Cash disbursements	7.76 [8.00] (2.45)
15. Purchase orders are pre-numbered.	Completeness	Purchasing	7.72 [8.00] (1.58)
16. Paid invoices are effectively cancelled.	Validity	Cash disbursements	7.54 [8.00] (2.05)
17. Vouchers are pre-numbered.	Completeness	Accounts Payable	7.11 [8.00] (2.25)
18. Batch totals of invoices entered are compared to totals of invoices recorded.	Accuracy	Accounts Payable	6.93 [7.00] (1.82)
19. Certain limits or ranges are put into place so only correct information can be entered into the purchase order.	Accuracy	Purchasing	6.75 [7.00] (1.88)
20. Receiving reports are pre-numbered.	Completeness	Receiving	5.87 [6.00] (2.45)
21. There is an approved list of suppliers.	Authorization	Purchasing	5.66 [5.00] (2.38)

<sup>a</sup> 11-point scale (0 = "Not at all important"; 5 = "Somewhat important"; 10 = "Extremely important").

**Table 10**  
**Internal Control Importance Ratings<sup>a</sup> and Memory Rankings**

<i>Internal Control</i>	<i>Rating Ranking</i>	<i>Memory Accuracy<sup>b</sup> Ranking</i>	<b>Descriptive Statistics</b>
			<b>Memory Accuracy</b> <i>Means [Medians]</i> <i>(Standard Deviations)</i>
1. Supporting documentation is reviewed before authorizing payments.	1	7	86.67% [100%] (34.22%)
2. Aborted payments are marked to prevent their being treated as valid payments.	2	12	79.73% [100%] (40.48%)
3. Cash disbursement records are reconciled to monthly bank statements.	3	4	91.89% [100%] (27.48%)
4. Goods received are physically verified.	4	14	76.00% [100%] (43.00%)
5. Invoices are checked for prices, quantities, and mathematical accuracy.	5	5	89.33% [100%] (31.08%)
6. Payments are pre-numbered.	6	18	64.00% [100%] (48.32%)
7. Ability to record goods received in the inventory records is restricted to those authorized.	7	13	77.63% [100%] (41.95%)
8. Purchase orders are authorized.	8	1	97.37% [100%] (16.22%)
9. Invoices are matched to receiving reports.	9	10	82.67% [100%] (38.11%)
10. Receiving reports are matched to purchase orders.	10	2	96.05% [100%] (19.60%)
11. Invoices are matched to purchase orders.	11	8	85.53% [100%] (35.42%)

<sup>a</sup> 11-point scale (0 = “Not at all important”; 5 = “Somewhat important”; 10 = “Extremely important”).

<sup>b</sup> Mean memory accuracy of each internal control examined.

**Table 10 (continued)**  
**Internal Control Importance Ratings<sup>a</sup> and Memory Rankings**

<i>Internal Control</i>	<i>Rating Ranking</i>	<i>Memory Accuracy<sup>b</sup> Ranking</i>	<b>Descriptive Statistics</b>
			<b>Memory Accuracy</b> <i>Means [Medians] (Standard Deviations)</i>
12. There are authorization procedures and limits on buying power.	12	11	80.26% [100%] (40.07%)
13. Access to receiving areas is authorized and controlled.	13	9	84.21% [100%] (36.71%)
14. Cash disbursers are authorized by the board of directors or the president of the company.	14	3 <sup>c</sup>	94.74% [100%] (22.48)
15. Purchase orders are pre-numbered.	15	3 <sup>d</sup>	94.74% [100%] (22.48%)
16. Paid invoices are effectively cancelled.	16	17	64.86% [100%] (48.07%)
17. Vouchers are pre-numbered.	17	15	69.33% [100%] (46.42%)
18. Batch totals of invoices entered are compared to totals of invoices recorded.	18	16	65.33% [100%] (47.91%)
19. Certain limits or ranges are put into place so only correct information can be entered into the purchase order.	19	20	42.11% [00.00%] (49.70%)
20. Receiving reports are pre-numbered.	20	19	48.68% [00.00%] (50.31%)
21. There is an approved list of suppliers.	21	6	88.16% [100%] (32.53%)

<sup>a</sup> 11-point scale (0 = "Not at all important"; 5 = "Somewhat important"; 10 = "Extremely important").

<sup>b</sup> Mean memory accuracy of each internal control examined.

<sup>c</sup> Tied with internal control number 15.

<sup>d</sup> Tied with internal control number 14.

**TABLE 11**  
**Spearman Rank-Order Correlations of Internal Control Importance Ratings<sup>a</sup> with**  
**Memory Accuracy<sup>b</sup>**

<i>Internal Control</i>	<b>Internal Control</b>	<i>Correlation</i>	<i>P-Value</i>
	<i>Strength (S)</i> <i>or Weakness (W)</i>		
1. Access to receiving areas is authorized and controlled.	W	-.250	0.029
2. Receiving reports are pre-numbered.	W	-.202	0.089
3. Payments are pre-numbered.	S	.419	0.000
4. Vouchers are pre-numbered.	S	.223	0.057

<sup>a</sup> 11-point scale (0 = "Not at all important"; 5 = "Somewhat important"; 10 = "Extremely important").

<sup>b</sup> Percentage of auditors who had correct memory of this internal control.

**TABLE 12**  
**Memory of Internal Control Information with High and Low Importance Ratings**  
**by Documentation Condition**  
**Means [Medians] (Standard Deviations)**

<i>Documentation Condition</i>	<i>Importance Rating</i>	
	LOW <sup>a</sup>	HIGH <sup>b</sup>
PREPARE N = 38	76.71% [80.27%] (15.37%)	87.57% [90.50%] (13.87%)
REVIEW N = 38	70.29% [69.35%] (12.97%)	79.06% [85.14%] (20.02%)
OVERALL N = 76	73.72% [73.48%] (13.78%)	83.93% [88.00%] (16.02%)

<sup>a</sup> The ten internal controls with the lowest mean importance weightings.

<sup>b</sup> The ten internal controls with the highest mean importance weightings.