

**AUDITORS & DECISION AIDS:  
THE EFFECT OF LITIGATION RISK AND INTERNAL CONTROL RISK  
ON RELIANCE**

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[VERY PRELIMINARY DRAFT]

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**Abstract**

The purpose of the current study is to examine how litigation risk and internal control risk affect auditors' reliance on decision aid recommendations. Based on an experiment involving 118 audit practitioners, we find that auditors rely more on decision aid recommendations when either litigation risk or internal control risk is high relative to low. The research evidence suggests that high litigation risk triggers greater cognition of the consistency, objectivity and defensibility benefits of decision aid reliance. The findings further indicate that high internal control risk stimulates greater awareness of the unbiased, objectivity and defensibility benefits of decision aid reliance. When litigation risk and internal control risk are simultaneously high, the objectivity and defensibility benefits are amplified, thereby resulting in an interactive effect on decision aid reliance. Unexpectedly, the main and interaction effect patterns for decision confidence were the opposite from decision aid reliance. Post-experimental analyses reveal explanations for fairly low reliance on decision aids in practice and suggest possible strategies for increasing the use of reliable decision aids when appropriate.

**Key Words:** litigation risk, internal control risk, decision aid reliance, prospective rationality.

## I. INTRODUCTION

Recent audit failures and associated lawsuits against international audit firms highlight the magnitude and significance of litigation risk to the audit profession (Lowe et al. 2002). Audit failures also reinforce the importance of internal controls in establishing sound corporate governance policies and conducting effective audits, as recently promulgated and regulated by the Sarbanes-Oxley Act, SEC Rule 13A-14(a) and Auditing Standard No. 2 (Sarbanes and Oxley 2002; U.S. SEC 2003; PCAOB 2004). Litigation risk and internal control risk present major challenges and concerns to audit firms, as these risks influence the scope, cost and complexity of financial statement audits. One means by which auditors can reduce the threats of litigation risk and internal control risk is to use decision aids where appropriate.

Decision aids provide accuracy, consistency and defensibility advantages that can protect auditors in high litigation risk engagements (see e.g., Ashton and Willingham 1988; Benbasat and Nault 1990; Messier 1995). Decision aids also offer objective and unbiased advice (Blattberg and Hoch 1990; Kleinmuntz 1990), which is particularly beneficial when internal control risk is high and auditors attempt to corroborate or contradict the reasonableness of management-provided estimates and accruals. Despite the potential value of using decision aids in high litigation and internal control risk environments, to our knowledge, no existing research has investigated decision aid reliance under these prevalent and potent risk conditions.

Prior research has demonstrated that experienced professionals typically choose to ignore the advice of reliable decisions aids, mainly because they are more confident in their own judgments than decision aid recommendations (Messier 1995; Sutton et al. 1995; Lowe et al. 2002); hence, the potential benefits of decision aids frequently go unrealized (Rose 2002). The current research proposes that the substantial threats posed by litigation risk and internal control

risk will overcome auditors' self-confidence bias for two primary reasons: (1) The escalating litigious environment in which the audit profession operates coupled with recent judgments against CPA firms will tip the benefit-detriment scale of decision aid use toward the benefit side, as decision aid reliance can be used to signal compliance with the standard of due care should future legal action arise; (2) Section 404 of the Sarbanes-Oxley Act (Sarbanes and Oxley 2002) demands more intense scrutiny of internal controls, and decision aids hold the potential to provide auditors with unbiased and objective corroborating evidence, particularly in subjective areas such as accounting estimates and accruals.

The results of an experiment involving 118 Big-4 auditors indicate that decision aid reliance increases significantly when either litigation or internal control risk elevates. Increased reliance in the high litigation risk condition is attributed to the consistency, objectivity and defensibility advantages ascribed to decision aids; heightened reliance in the high internal control risk condition is attributed to the unbiased, objectivity and defensibility benefits associated with decision aids. Research evidence also reveals an interactive effect of litigation risk and internal control risk on reliance, such that the differential effect of low versus high litigation risk is greater when internal control risk is high relative to low. The interaction is driven chiefly by amplified awareness of the objectivity and defensibility advantages of decision aid use when both risks are simultaneously high. Although decision confidence was expected to follow the same pattern as decision aid reliance, surprisingly, the opposite result is observed. The reliance, attribution and confidence findings reported in the current study complement and extend existing decision aid theory. Additionally, post-experimental analyses indicate that auditors in practice are not aware of the accuracy rates of available decisions aids, and suggest opportunities to improve audit practice through initial and refresher decision aid training.

## II. BACKGROUND AND HYPOTHESES

The use of decision aids by decision makers has been the topic of much research in accounting and psychology literature. The proper use of reliable decision aids generally yields more accurate, consistent, unbiased and objective results than unaided judgments (e.g., Benbasat and Nault 1990; Kleinmuntz 1990; Messier 1995; Brown and Eining 1997; Rose 2002). Competitive pressures as well as the continual quest for high quality audits have motivated CPA firms to develop and deploy decision aids, with the aim of improving the efficiency and effectiveness of audit processes (Messier 1995). Despite the potential benefits of using decision aids, extant research shows that auditors are generally reluctant to use reliable decision aids (Ashton 1990; Arkes et al. 1986; Boatsman et al. 1997; Pincus 1989; Sutton et al. 1995). These studies suggest that one of the primary reasons for non-reliance is rooted in auditors having more confidence in their personal judgments than the recommendations offered by decision aids (Boatsman et al. 1997; Rose 2002). Herein, we examine two prevalent factors – litigation risk and internal control risk – that could potentially overcome auditors’ tendency not to rely on decision aids.

### **Litigation Risk and Decision Aid Use**

Litigation risk is one of the leading challenges facing the audit profession (Lowe et al. 2002).<sup>1</sup> Litigation risk is a function of the likelihood of material misstatement going undetected in the post-audit financial statements, the likelihood of litigation arising should the financial statements be materially misstated, the likelihood of losing litigation attempts, and the expected financial and reputation losses associated with litigation (Simunic 1980; Palmrose 1988; Stice

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<sup>1</sup> Consistent with existing research, we use the term ‘litigation risk’ to describe an auditor’s expected litigation losses.

1991). As the likelihood of these factors and the expected losses increase, litigation risk increases.

Auditors are usually among the first to be blamed when investors and creditors suffer financial losses (Stice 1991). The effects of litigation include financial damages, reputation losses and even bankruptcy (Palmrose 1988; Dalton et al. 1997). In response, when faced with relatively high levels of litigation risk, auditors typically increase audit fees, planned hours and evidence requirements (Simunic 1980; Pratt and Stice 1994; Houston et al. 1999), particularly in areas involving a great deal of subjective judgment such as accounting estimates and accruals (Lys and Watts 1994). In addition, litigation risk can influence auditors' decision-making processes during the audit engagement (Palmrose 1988).

Litigation risk focuses auditors' attention on making accurate decisions (Palmrose 1988; Stice 1991) and auditors are less willing to accept errors in financial statements as litigation risk increases (Chang and Hwang 2003; Farmer et al. 1987). Auditors are particularly attuned to potential overstatements of financial performance when litigation risk is high (Barron et al. 2001; Hirst 1994). Decision aids generally increase decision accuracy relative to unaided decision making (see e.g., Benbasat and Nault 1990; Kleinmuntz 1990; Messier 1995; Brown and Eining 1997); thus, as auditors become more concerned about decision accuracy, decision aid use should be more attractive.

Kelly and Michela (1980) further suggest that when retrospective evaluators attribute responsibility for failed performance, they consider consistency information. The current legal system is based upon hindsight judgments, where jurors' attributions of responsibility for audit failure are based upon what they believe other prudent auditors would have done in the same situation (Kelly and Michela 1980; Jennings et al. 1993; Lowe and Reckers 2000). High

consistency across decisions decreases the likelihood that a given judgment will be viewed as irregular or idiosyncratic by objective third-parties. Decision aids increase decision consistency (Ashton and Willingham 1988; Ashton 1992; Messier 1995); hence, as litigation risk heightens, auditors should be more inclined to rely on the advice of decision aids.

Given the litigious audit environment in which the audit profession operates, auditors are acutely aware that they must be prepared to defend their decisions to jurors should the need arise (Lowe and Reckers 2000). Staw (1980) refers to this phenomenon as prospective rationality, where decisions are made with foresight knowledge that decisions may need to be defended in the future. In light of prospective rationality, prudent auditors will attempt to identify the most defensible course of action (Tetlock 1985; Messier et al. 1992). Research on juror decision making supports the potential value of decision aids in reducing auditors' liability. When decision aids are reliable, jurors attribute more responsibility for audit failure to auditors who disregard the recommendations of a decision aid than auditors who incorporate the decision aid's advice into their final judgments; thus, the use of available reliable decision aids supports and defends audit judgments in the eyes of jurors (Lowe et al. 2002).

Accordingly, we expect that auditors who are faced with relatively high, as compared to low, levels of litigation risk will increase decision aid reliance and attribute greater reliance to the accuracy, consistency and defensibility benefits offered by decision aids.

Hypothesis 1a: Auditors will increase their reliance on decision aid recommendations when litigation risk is high, as compared to low.

Hypothesis 1b: Auditors will increase their cognition of the accuracy, consistency and defensibility benefits of decision aids when litigation risk is high, as compared to low.

As mentioned earlier, prior research findings suggest that auditors are typically more confident in their own judgments than decision aid recommendations (Boatsman et al. 1997;

Rose 2002). However, because litigation risk has been so widespread and potent in recent years, we posit that the auditors' confidence in their decisions will increase commensurate with decision aid reliance due to the expected awareness of the decision aid benefits posited in H1b.

Hypothesis 1c: Auditors will increase their decision confidence when litigation risk is high, as compared to low.

### **Internal Control Risk and Decision Aid Use**

Recent law and regulations signal an increased emphasis on internal controls in corporate accounting and auditing. For instance, Section 404 of the Sarbanes-Oxley Act of 2002 increases the responsibilities of management and auditors to maintain adequate internal controls and evaluate the effectiveness of such controls (Sarbanes and Oxley 2002). Further, the Public Company Accounting Oversight Board (PCAOB) has promulgated and continues to develop new auditing standards that include expanded evaluations of internal control risk (PCAOB 2004, AS2).

Internal control risk is defined as the risk that material misstatements will not be prevented, detected or corrected by internal controls (AICPA 1996, AU 312). When internal control risk is relatively high, Auditing Standard No. 2 requires auditors to adjust "the nature, timing, and extent of substantive procedures to be performed to reduce the risk of material misstatement of the financial statements to an appropriately low level" (PCAOB 2004, AS2). According to Statement on Auditing Standards No. 99, weak internal controls signal potential opportunities for managers to misrepresent the true underlying financial position of the company (AICPA 2003); thus, auditors need to be particularly attuned to the possibility of material misstatement when internal controls are relatively weak and adjust substantive tests accordingly.

Management can paint an inaccurate picture of the company's financial position by biasing the value of estimates and accruals. A typical motivation for managers to engage in behaviour of

this nature is to align the entity's reported earnings with self-rewarding contractual incentives (Nelson et al. 2002). Thus, when internal controls are relatively weak, and accruals and estimates are not well-corroborated by objective evidence, auditors should independently substantiate the values provided by management (Glover et al. 2000; Nelson et al. 2005). One means by which auditors can obtain objective and unbiased evidence in this regard is to seek the advice of decision aids (Anderson et al. 2003).

Prior research indicates that auditors assess the same explanations for unusual account fluctuations as more credible when generated by a decision aid than when proffered by the client, as auditors believe that decision aids are more objective less biased than management representations (Anderson et al. 2003). Hence, decision aids can be used as one source of supporting evidence when auditors attempt to assess and corroborate or contradict the dollar amount of management-provided estimates and accruals. Accordingly, we propose that auditors will increase decision aid reliance under conditions of high, relative to low, internal control risk, and attribute higher reliance to the objective and unbiased benefits associated with decision aids.

Hypothesis 2a: Auditors will increase their reliance on decision aid recommendations when internal control risk is high, as compared to low.

Hypothesis 2b: Auditors will increase their cognition of the objective and unbiased benefits of decision aids when internal control risk is high, as compared to low.

Additionally, similar to H1c, due to enormous changes in internal control law and regulation of late, we expect that auditors will become more confident as decision aid reliance increases, particularly due to increased cognition of the objective and unbiased nature of decision aid recommendations.

Hypothesis 2c: Auditors will increase their decision confidence when internal control risk is high, as compared to low.

## **Interaction of Litigation Risk and Internal control risk**

The prospective rationality (Staw 1980) strategy adopted by auditors suggests a potential interactive effect of litigation risk and internal control risk on decision aid reliance. Auditors often make decisions with the awareness that their decisions may need to be defended in a court of law (Lowe and Reckers 2000). As a result, auditors will seek methods for improving the defensibility of their decisions (Messier et al. 1992). We expect an interaction between litigation and internal control risk on decision aid reliance based on the following chain of reasoning: Audits with high levels of litigation risk will trigger prospective rationality related to relying on decision aids should legal action arise in the future; in turn, the defensibility advantage activated by litigation risk will make auditors more aware of how decision aid reliance can beget a similar defensibility benefit when internal control risk is also high. Accordingly, we propose the following hypothesis.

Hypothesis 3a: The differential effect of high versus low litigation risk on decision aid reliance will be greater when internal control risk is high as compared to low.

Hypothesis 3b: The differential effect of high versus low litigation risk on decision aid defensibility will be greater when internal control risk is high as compared to low.

Finally, consistent with H1c and H2c, we anticipate that the auditors' confidence will display the same pattern as decision aid reliance, most notably due to heightened awareness of prospective rationality brought about by high, relative to low, litigation risk.

Hypothesis 3c: The differential effect of high versus low litigation risk on decision confidence will be greater when internal control risk is high as compared to low.

### III. METHOD

#### Design

The experiment involved a 2 x 2 between-participants design. The independent variables were litigation risk (low and high) and internal control risk (low and high). Participation in the study was voluntary. Participants were informed that a donation of \$50 would be made to the charity of their choice; additionally, a senior partner from each of the participating CPA firms sent a memo to audit seniors and managers encouraging their involvement in the study.

#### Procedure

The experiment was fully computerized using active server pages (ASP) with embedded JavaScript. The experimental software was installed on password-controlled intranet and extranet servers of the participating public accounting firms for a period of one week (Monday through Friday). Participants could take part in the study on any day, at any time and from any location (e.g., work or home) during the week.<sup>2</sup>

The software randomly assigned each participant to one of the four treatment conditions at the beginning of the experiment. The software incorporated various internal controls, such as validating input, ensuring completeness on one screen before moving to the next screen, disallowing participants from returning to prior screens to change earlier responses and randomizing response items where possible. Participant responses were automatically recorded into a database during the experiment.

The experiment provided participants with an informed consent, general instructions, case materials and a post-experiment questionnaire. After agreeing to informed consent, the general instructions emphasized the importance and confidentiality of participation, and explained the

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<sup>2</sup> For a discussion of the advantages and disadvantages of web-based experiments, see Bryant, Hunton and Stone (2004).

financial incentive. Afterward, the participants began reading case materials and completing the task.

### **Case Materials and Task**

The case materials described a large manufacturing corporation where accounts receivables represented a significant percentage of current assets. Participants read management's estimate of the allowance for uncollectible accounts (i.e., \$600,000) and analyzed the accounts receivable aging schedules for the previous five years. They were informed that management and the audit committee of the board of directors believed that management's estimate fairly represented the amount of uncollectible accounts at the end of the year. Participants further read that both management and the audit committee were reluctant to change the allowance amount. The five-year history of accounts receivable incorporated into the case materials was designed such that a relatively basic linear extrapolation of write-off activity would suggest an allowance amount of approximately \$700,000.

Following the review of case materials, participants provided an initial estimate of the dollar amount of uncollectible accounts at the end of the year. In addition, participants provided the dollar amount of the adjustment to the financial statements (i.e., year-end adjusting journal entry) they would require of management. After indicating their initial estimate and adjustment amounts, all participants were next informed about a decision aid, provided by their CPA firm, designed to assist in evaluating allowances for uncollectible accounts. Participants read about the decision aid's estimate of the allowance for uncollectible accounts (i.e., \$1,000,000), and were given an option to re-examine the client's financial information and provide a second assessment of uncollectible accounts and year-end adjustment. Participants were made fully aware that they

did not have to change their initial responses, but they could change the initial amounts in any direction or magnitude they desired.

### **Independent Variables**

*Litigation Risk.* Litigation risk was manipulated at two levels – low and high. In each of the conditions, participants were given information about the likelihood of being sued should the financial statements be materially misstated, as well as possible legal consequences. In the low [high] litigation risk condition, participants read the following:

Your legal department has indicated to you that the risk of your CPA firm being sued as a result of this engagement is very low [high] should the financial statements be materially misstated. Specifically, your legal department has evaluated the likelihood of being sued at 5% [95%]. If your firm is sued, the likelihood of the plaintiffs winning the suit is 10% [90%]. If the suit is successful, the fine and penalties imposed on your firm would be extremely low [high].

*Internal control risk.* Internal control risk was also manipulated at two levels. Specifically, participants read the following in the low [high] treatments:

In conjunction with the financial statement audit, your audit team is also performing an audit of internal control over financial reporting in accordance with Section 404 of the Sarbanes-Oxley Act (2002), and, Auditing Standard No. 2 of the Public Company Accounting Oversight Board (2004) entitled “An Audit of Internal Control Over Financial Reporting in Conjunction with an Audit of Financial Statements.” Although your audit team has yet to issue an opinion on internal control over financial reporting, preliminary tests indicate you will likely issue an unqualified [a qualified] report, as your audit team has found no [several] material weaknesses in internal control design and operation.

### **Decision Aid**

Prior decision aid research has shown that providing participants with a decision aid with very low reliability (e.g. 50%) or very high reliability (e.g. 95% to 100%) can have unintended effects on the participants’ reliance behavior due mainly to the unusually low or high face validity (e.g., Ashton and Willingham 1988; Ashton 1990). On one hand, setting the decision

aid's reliability too low can lead to non-reliance, as participants feel that they can out-perform the decision aid; on the other hand, setting the decision aid's reliability too high can lead to over-reliance, as participants feel that they could not possibly outperform the aid. Therefore, consistent with prior research, a reliability of 80% was used in the current study to measure the effects of the decision aid on reliance decisions (e.g., Whitecotton 1996; Boatsman et al. 1997).

The decision aid manipulation, which was constant across conditions, read as follows:

Your firm has provided you with a computerized decision aid to assist you during the audit of AMI. The output of the decision aid is intended to be advisory only, as the ultimate decision regarding the estimate of the allowance for uncollectible accounts is your judgment call. In addition to analyzing AMI's historical financial records, the decision aid incorporates current economic conditions into its estimate of uncollectible accounts. The decision aid has been used many times to estimate allowance for uncollectible accounts for various clients. Experience indicates that it yields an acceptably accurate estimate every 8 out of 10 times; thus, the decision aid is considered to be 80% reliable. The decision aid has just estimated AMI's allowance for uncollectible accountants as of December 31<sup>st</sup>, 2004 at \$1,000,000.

### **Dependent Variables**

One of the dependent variables reflects the level of reliance on the decision aid.

Consistent with Hayes (2002), the reliance measure examines the extent to which participants change their initial prediction to agree with the decision aid's advice. The reliance metric is calculated as follows (range from 0.00 to 1.00):

*Decision Aid Reliance =*

$$\frac{\text{Final Proposed Adjustment} - \text{Initial Proposed Adjustment}}{(\text{Decision Aid's Recommendation} - \text{Management's Estimate}) - \text{Initial Proposed Adjustment}}$$

The decision aid can affect both the participants' final estimates of the allowance for uncollectible accounts and their final recommended year-end adjustments to uncollectible accounts. To take into account the total effect the decision aid had on their ultimate audit

judgments, the participants' final recommended year-end adjustment to the financial statements was used in the reliance function.<sup>3</sup>

The following items were used to assess participant beliefs concerning the accuracy, consistency, objectivity and unbiased benefits of decision aids (1 = Strongly Disagree, 4 = Not Sure, 9 = Strongly Agree): 1) Decision aids provide accurate results, 2) Decision aids provide consistent results, 3) Decision aids provide objective results and 4) Decision aids provide unbiased results. Defensibility was assessed using the following two response items:

When you arrived at your final estimate of AMI's allowance for uncollectible accounts, to what extent were you thinking about how the decision aid would help you, in the case of a lawsuit, defend your final judgment in a court of law? (1 = No Extent, 4 = Moderate Extent, 9 = Large Extent).

Should your CPA firm be sued on the AMI engagement, how certain are you that you could defend your procedure for estimating the allowance for uncollectible accounts in a court of law (1 = Very Uncertain, 4 = Moderately Certain, 9 = Very Certain).

Finally, each time after participants recorded their initial and final estimates, they responded to the following confidence item, thus providing pre- and post-decision-aid measures of confidence:

How much confidence do you have in your estimate of the allowance for uncollectible accounts? (1 = Very Low Confidence, 9 = Very High Confidence)

## IV. RESULTS

### Pilot Tests

Pilot testing was conducted at one of the Big-4 CPA firms during firm training sessions over a period of three days. The CPA firm used in pilot testing did not participate in the experiment. The first pilot test included seven audit seniors and three audit managers. The purpose was to evaluate the sufficiency and readability of the case, including the decision aid and

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<sup>3</sup> Decision aid reliance differences among treatment conditions were statistically and directionally consistent whether the reliance metric reflected the change from the participants' initial to final allowance estimates or metric reflected the recommended adjustment to the financial statements.

litigation risk manipulations as well as wording of the dependent variable response items. Participants assessed the case materials as realistic and sufficiently complete, the decision aid manipulation as understandable and plausible, and the response items as appropriate and clear. They also indicated that the litigation risk manipulation was believable and that the extremes were reasonable, yet sufficiently strong.<sup>4</sup>

A second pilot test was conducted, using a different sample of participants, to further assess the case materials and decision aid manipulation, to determine the efficacy of the internal control risk manipulation, and to evaluate wording of the dependent variable items. Thirteen seniors and six managers took part in the second pilot test. Consistent with the first pilot test, participants felt that the case and decision aid manipulation were understandable, realistic and sufficiently comprehensive, and that the dependent variable items were comprehensible, reasonable and concise. Participants further indicated that relating the internal control risk assessment to section 404 of the Sarbanes-Oxley act was relevant and convincing, and that the extremes were realistic.

A third pilot test, in which ten audit seniors and four managers participated, checked the experimental software, evaluated manipulation check responses and determined if decision aid reliance responses were directionally consistent with the treatment conditions. Several minor computer problems arose and were corrected. The manipulation check items and decision aid reliance responses were directionally consistent with expectations.

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<sup>4</sup> The case materials (including the decision aid manipulation) were adapted from Gomaa (2005), and were subjected to several pilot tests and resulting refinements in his dissertation study. The pilot test participants in the current study remarked that they believed the inclusion of the 1) likelihood of being sued, 2) likelihood of losing, 3) possible penalty magnitude and 4) focus on “should the financial statements be materially misstated” were key ingredients to an effective and realistic manipulation of litigation risk.

## **Participants**

A total of 118 auditors comprising 103 seniors and 15 managers from two of the Big-4 public accounting firms participated in the study. Participants worked in various offices spread across five large cities in the United States. The median age range of the participants was 31 to 35 years, with a mean (standard deviation) 5.15 (0.92) years of auditing experience. The participants included 79 male and 39 female auditors.<sup>5</sup>

## **Manipulation Checks**

The manipulation check items and results of statistical analyses are shown in Appendix A. Results of the first three questions indicate that the participants understood the task and the manipulations into which they were randomized. Items four through eight suggest that the participants understood the decision aid's stated reliability, believed that the decision aid was quite reliable, and could recall management's estimate of uncollectible accounts, the decision aid's estimate of uncollectible accounts, and the difference between the two estimates.

Items nine and ten assessed the participants' materiality thresholds. If they believed that the difference between the decision aid's estimate and management's estimate, the difference between their final estimate and management's estimate, or their recommended year-end adjustment to the financial statements was material, they would most likely gravitate toward the decision aid's recommendation on the basis of materiality alone. If, however, they felt that the amount in question was not material, then one could rule out this possible alternative hypothesis. All participants indicated that the \$400,000 difference between management's estimate and the decision aids' recommendation was not material (item nine). As shown in item ten, the overall

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<sup>5</sup> Chi-square analyses indicated that position level, CPA firm, office location, age bracket, and gender were not significantly different ( $p > .10$ ) across treatments. An ANOVA model indicated that years auditing experience was not significantly different across conditions ( $p > .40$ ). Therefore, the randomization procedure was deemed successful.

mean assessment of materiality was \$587,872. The participants' stated materiality threshold exceeds (in all cases) the differential estimate between the decision aid's and management's estimate, the participant's final estimate and management's estimate, and the participant's final recommended dollar amount of adjustment to the financial statements; thus, materiality is likely not creating a demand effect on the decision aid reliance metric.

Finally, the last four items assessed the extent to which participants believed it was possible for a client to have the various combinations of litigation risk and internal control risk manipulated in the current study. These items were asked as a 'reality check' on the combinations of independent variable manipulations present in the experiment. If, for instance, one or more combinations of litigation risk and internal control risk were deemed not possible, then drawing inferences from the upcoming decision aid reliance results could be confounded with perceptions regarding the believability of one or more treatment conditions. As indicated, although the results varied somewhat by degree, the participants believed that the four treatment conditions were possible. Based on the outcomes of the manipulation check items, the treatments were considered successfully manipulated.

### **Preliminary Testing**

Table 1 presents descriptive statistics for the participants' final allowance estimates and their recommended adjustments to the financial statements. Table 2 shows descriptive statistics for the decision aid reliance scores across treatment conditions.

[Insert Tables 1 and 2 about here]

*Covariates.* A preliminary ANCOVA model examined the covariance of demographic factors (i.e., gender, age, auditing experience, position level, CPA firm, and office location) to decision aid reliance. The model also included as covariates the 'day of week' and 'time of day'

during which the participants took part in the experiment. The independent variables reflected the main effects of litigation risk and internal control risk, as well an interaction term. While the main effect and interaction term variables were all significant ( $p < .01$ ), none of the covariates were significant ( $p > .10$ ). Accordingly, these factors were not included in hypotheses testing.

One more potential covariate, risk propensity, was considered, as the relationship between litigation risk and decision aid reliance could be moderated by individual differences in risk tolerance. Accordingly, risk propensity was measured using a standard two-outcome lottery scenario in the same manner as Young (1985) and Hunton et al. (2005). Specifically, participants were asked to respond to the following item (post-experiment):

Given the choice between receiving a guaranteed \$5 or a gamble of receiving \$10, there would have to be at least a \_\_\_\_\_% chance that I would win the gamble before I would accept the gamble.

The mean (standard deviation) response across all conditions was 66.19% (16.22%). A preliminary ANCOVA model, with decision aid reliance as the dependent variable, litigation risk, internal control risk and the interaction term as independent variables, and risk attitude as the covariate, indicated that the covariate was non-significant ( $p\text{-value} = .51$ ). Therefore, it was not included in the upcoming statistical analyses.

*Assumptions.* The Shapiro-Wilkes test for normality was significant ( $p < .01$ ), indicating that the dependent variable (decision aid reliance) was not normally distributed. Within-treatment tests found that the ‘low litigation risk x high internal control risk’ and ‘high litigation risk x low internal control risk’ conditions were normally distributed ( $p \geq .30$ ), whereas the other two conditions were not normally distributed ( $p < .01$ ). Follow up inspection of frequency distributions in the non-normal conditions (‘high litigation risk x low internal control risk’ and ‘low litigation risk by high internal control risk’) indicated no outliers (all responses were within

3 standard deviations) and suggested that the non-normal distributions were due to skewness. ANOVA is robust to violations of the normality assumption where skewness is the underlying cause (Hair et al. 1995); thus the data were not transformed.

Levene's test was also significant ( $F = 2.98, p = .04$ ), indicating unequal variance of the response variable (decision aid reliance) across treatment conditions. Further evaluation of box plots and variances within each condition indicated a significantly ( $p < .01$ ) smaller variance (.005) in 'low litigation risk x low internal control risk' condition relative to the 'low litigation risk x high internal control risk' (variance = .033), 'high litigation risk x low internal control risk' (variance = .025) and 'high litigation risk x high internal control risk' (variance = .029) conditions. Data transformation was not performed, as ANOVA is robust to moderate departures from homogeneity of variance if sample sizes within each condition are fairly equal (Hair et al. 1995), as in the current study.

As a result of assumption testing, ANOVA is used to test the hypotheses.<sup>6</sup> In addition, inferences are made based on relative, not absolute, differences among treatment conditions, thereby treating the data as ordinal rather than interval.

## **Hypothesis Testing**

*Hypothesis One.* H1a suggests that decision aid reliance will be greater in the high, as compared to low, litigation risk condition. Supporting H1a, the ANOVA model shown on Table 3 (panel A) indicates a significant main effect for litigation risk; thus, decision aid reliance of

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<sup>6</sup> All of the upcoming ANOVA analyses were also performed using ranked data, where dependent variable responses were ranked within each treatment; additionally, complementary Kruskal-Wallis tests were run to determine if one or more of the treatment means were significantly different from the others, and complementary Mann-Whitney tests were conducted to compare each pair of means. The significance and direction of all test results were comparable to the reported ANOVA results.

0.67 in the high litigation risk condition is significantly greater than 0.16 in the low litigation risk condition (see Table 2 for decision aid reliance main effects).

[Insert Table 3 about here]

H1b anticipates that participants will be more aware of decision aid accuracy, consistency and defensibility in the high, relative to low, litigation risk condition. Regarding accuracy, the overall mean (standard deviation) across all participants was 3.92 (0.65). An ANOVA model indicates no significant main or interaction effects across treatment conditions (overall model:  $F = 0.76, p = .713$ ). Thus, the decision aid accuracy results do not support H1b.

An ANOVA model examining decision aid consistency suggests a significant main effect for litigation risk ( $F = 242.31, p < .01$ ), and non-significance for internal control risk ( $F = 0.72, p = .400$ ) and the interaction term ( $F = 0.13, p = .716$ ). The main effect means (standard deviations) for consistency in the low and high litigation risk conditions are 5.26 (1.26) and 8.34 (1.01), respectively.<sup>7</sup> Hence, the decision aid consistency results do support H1b.

The results of statistical testing on defensibility are indicated on Table 4. Inter-correlation between the two items used to assess defensibility is relatively high ( $r = .88$ ); thus, the responses are averaged to form a 'defensibility' index. As presented on Table 4 (panel A), the ANOVA results indicate a significant ( $p < .01$ ) main effect for litigation risk. Main effect means (standard deviation) for defensibility in the low and high litigation risk condition are 2.81 (1.06) and 6.98 (1.92), respectively; accordingly, the defensibility results support H1b. Overall, the consistency and defensibility results support H1b, but the accuracy findings do not.

[Insert Table 4 about here]

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<sup>7</sup> The main effect means (standard deviations) for decision aid consistency in the low and high litigation risk conditions, respectively, are 6.80 (1.83) and 6.91 (1.94).

H1c suggests that decision confidence will be greater in the high, as compared to low, litigation risk condition. The overall mean (standard deviation) for initial confidence is 8.68 (0.47) and the means are not significantly different across treatment conditions ( $F = 0.35$ ,  $p = .79$ ). The relatively high initial confidence mean suggests that the auditors were very confident in their unaided decisions.

Results of an ANCOVA model testing confidence are shown on Table 5. As indicated on Table 5 (panel A), the main effect of litigation risk on confidence is significant ( $p < .01$ ). The main effect means (standard deviations) in the low and high litigation risk conditions are 7.98 (1.08) and 4.16 (2.03), respectively, which are directionally opposite from expected results. Based on the confidence results, H1c is not supported.

[Insert Table 5 about here]

*Hypothesis Two.* The second hypothesis posits that decision aid reliance will be greater in the high internal control risk condition relative to the low internal control risk condition. Consistent with the predictions of H2a, the main effect for decision aid reliance of 0.57 in the high internal control risk condition is significantly greater than 0.28 in the low risk condition (see Table 2 for decision aid reliance main effect means and Table 3, panel A for statistical results).

H2b suggests that auditors will be more aware of the objective and unbiased benefits of decision aids in the high, as compared to low, internal control risk condition. Regarding objectivity, as indicated on Table 6 (panel A), the main effect for internal control risk is significant ( $p < .01$ ). The main effect means (standard deviations) for objectivity in the low and high internal control risk conditions, respectively, are 3.90 (2.04) and 5.95 (2.70). Therefore, the results support H2b.

With respect to the unbiased nature of decision aid recommendations, an ANOVA model indicates a significant main effect for internal control risk ( $F = 149.13, p < .01$ ), and non-significant effects for litigation risk ( $F = 0.01, p = .924$ ) and the interaction term ( $F = 0.18, p = .672$ ). The main effect means (standard deviations) for the unbiased metric are 4.86 (1.42) in the low internal control risk condition and 7.72 (1.08) in the high condition.<sup>8</sup> Based on the results of objective and unbiased testing, H2b is fully supported.

[Insert Table 6 about here]

Although not posited, internal control risk also activated prospective rationality cognition, as indicated by the significant main effect for defensibility (see Table 4, panel A). The main effect means (standard deviations) for defensibility in the low and high internal control risk conditions, respectively, are 3.67 (1.80) and 6.26 (2.66). This unexpected result suggests that when faced with relatively high internal control risk, auditors are partially motivated to rely on decision aids based on the defensibility benefit associated with decision aid use.

H2c asserts that decision confidence will be greater in the high, as compared to low, internal control risk condition. Referring to Table 5 (panel A), the main effect of internal control risk on decision confidence is significant ( $p < .01$ ). The main effect means (standard deviations) in the low and high internal control risk conditions are 7.31 (1.61) and 4.71 (2.60), respectively, which are again directionally opposite from predicted results. Therefore, H2c is not supported.

*Hypothesis Three.* The final set of hypotheses assert an interaction, where the differential effect of high versus low litigation risk on the dependent variables will be greater when internal control risk is high as compared to low. Figure 1 (panel A) illustrates the nature of the interaction for decision aid reliance. The results presented on Figure 1 (panel A), suggested by

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<sup>8</sup> The main effect means (standard deviations) for the unbiased metric in the low and high litigation risk conditions, respectively, are 6.33 (1.85) and 6.26 (1.97).

the significance of the interaction term (Table 3, panel A), and supported by the results of Bonferroni testing (Table 3, panel B) and contrast testing (Table 3, panel C) all indicate that H3a is supported.

[Insert Figure One about here]

H3b posits a similar interactive effect for decision aid defensibility. As indicated on Table 4 (panels B and C), the defensibility means follow the same interaction pattern as the decision aid reliance means. Hence, H3b is supported. Also, while not hypothesized, the objectivity benefit of decision aids reflects the same interaction pattern as decision aid reliance (see Table 6, panels B and C). This finding suggests that participants believe that the objectivity benefit offered by decision aids would be positively received by jurors should a legal defense be necessary in the future.

The final hypothesis, H3c, also expects a similar interaction pattern with decision confidence. Surprisingly, as depicted on Figure 1 (panel B) and supported by Table 5 (panels B and C), the pattern is the opposite of decision aid reliance, although the differential effect between low and high litigation risk remains greater when internal control risk is high relative to low. The confidence findings from the main and interaction effects suggest that auditors who rely less on the decision aid are more confident in their final estimates, which is consistent with prior studies (see Rose 2002). However, the results further indicate that perceived threats inherent with relatively high levels of litigation risk and/or internal control risk apparently swamp the auditors' self-confidence in their unaided judgments, leading them to rely on the more decision aid's recommendation even though they are less confident. Implications of this revealing finding will be further explicated in the upcoming discussion section.

## **Post-Experiment Debriefing**

To more fully understand how and why litigation risk affects auditors' propensity to rely or not rely on decision aids, the participants responded to several scenarios and an informative series of debriefing questions. Wording of the scenarios and items are shown in Appendix B.

Results of the first scenario suggest that participants would increase substantive testing and heighten decision aid reliance in light of increased litigation risk (as supported by the experimental results). Scenarios two and three probed further into why litigation risk might increase decision aid reliance. Findings from scenario two suggest that participants believed the auditor (Steve) made a good judgment in relying on an alternate sampling procedure rather than an available decision aid, deemed that either relying on the decision aid's advice or Steve's sampling selection procedure would be in accordance with GAAS, and were not sure whether they would have taken Steve's approach or relied on the decision aid. In the third scenario, participants indicated that a jury would be more accepting of Steve's defense had he followed the decision aid's advice, as compared to the stratified sampling procedure he used. Overall, the results from scenarios two and three indicate that auditors would be motivated to rely on a decision aid in a high litigation risk environment, mostly as a legal defense mechanism, even though an alternate sampling procedure was deemed appropriate under the circumstances and in accordance with GAAS. This line of reasoning is consistent with the mirror-image interaction patterns between decision aid reliance and decision confidence found in the current study.

Summarizing the results of debriefing items nine through eleven, it appears as though the participants believe that decision aids can improve audit efficiency and effectiveness; yet, they indicate little reliance on decision aids in the field ( $m = 2.84$ ). In items twelve and thirteen, the participating auditors agreed somewhat (mean = 6.34) with a statement

suggesting that litigation risk is a major consideration during audit planning, and agreed totally (mean = 9.0) that internal control risk is a major consideration. Next, the auditors indicated the percentage of their past and present clients that would be considered as low (40.77%), medium (42.84%) and high (16.39%) litigation risk (item fourteen). They also categorized their past and present clients that would be classified as low (24.40%), medium (54.92%) and high (18.69%) internal control risk (item fifteen). In responding to items sixteen and seventeen, the auditors agreed that during audits of either high litigation risk or high internal control risk clients, they had access to computerized decision aids. The final series of issues reflected in item eighteen focused on high litigation and/or high internal control risk clients.

All respondents agreed that they were trained on the proper use of available decision aids, but were not periodically refreshed on how to use the aids. They further indicated that there were alternate GAAS compliant procedures available that they could have used in lieu of the decision aids. They suggested that with high risk litigation (internal control) clients, they chose the decision aid only 6.05% (13.27%) of the time. Item eighteen (f) will be reviewed in the upcoming discussion section.

When considering the three scenarios and final response items, a ‘disconnect’ arises between participants’ beliefs and actions. On one hand, participant responses suggest that auditors should use decision aids because the aids would improve audit efficiency and effectiveness, offer consistent and unbiased results, and be especially helpful in legal defense proceedings. On the other hand, the participants indicate that they do not use decision aids very often in practice, even in high risk engagements. Reasons why and suggestions for improvement in theory and practice are offered in the discussion section.

## V. DISCUSSION

Prior research suggests that reliable decision aids offer accuracy, consistency, unbiased, objectivity advantages (e.g., Ashton and Willingham 1988; Benbasat and Nault 1990; Kleinmuntz 1990; Messier 1995); however, decision makers often choose not to rely on decision aids, mainly because they are more confident in their own judgments than decision aid recommendations (e.g., Kleinmuntz 1990; Rose 2002). In the current study, we examined the impact of litigation risk and internal control risk on decision aid reliance. Given recent immense pressure on auditors to minimize both risks, we posited that decision aid reliance would heighten as each of the risks increased, and anticipated an interactive effect when both risks increased simultaneously. The research findings complement and extend decision aid theory, as well as offer cogent insight into decision aid use in audit practice.

Based on the results of the current study, decision aid reliance followed the hypothesized patterns. Underlying reasons for reliance were also examined. We found that increased reliance under high, relative to low, litigation risk was attributed to the consistency, objectivity and defensibility benefits associated with decision aid use. With regard to internal control risk, we observed that decision aid reliance was attributed to the unbiased, objectivity and defensibility features related to decision aids. The interaction of high litigation and internal control risks resulted in the greatest level of reliance, as heightened cognition of the defensibility benefit activated by high litigation risk appeared to trigger concurrent awareness of such advantage for internal control risk.

Unexpectedly, the interaction pattern of treatment means for confidence tracked in the opposite direction of decision aid reliance. This suggests that the auditors who increased their reliance on the decision aid did so to gain the defensibility advantage, despite decreased

confidence in their ultimate decisions. This pattern of findings begs the question: Is this the result audit firms really want? Meaning, should auditors be so focused on legal defense strategies that they blindly rely on decision aids, especially when they are uneasy with their ultimate decisions? On one hand, if the decision aid is more accurate than human judgment, perhaps reliance will improve audit quality. However, if the decision aid's accuracy is highly variable, robotic reliance of this nature could deteriorate audit effectiveness; and, as suggested by Sutton et al. (1995), decision aid reliance in this circumstance could actually harm the auditors' defensibility argument in the eyes of a jury.

Given the research findings, a perplexing question remains—why have auditors in prior studies and in practice chosen not to take advantage of the benefits offered by decision aids? The post-experiment debriefing items offer key insight into why auditors tend not to rely on available decision aids and point to possible solutions. Recall, the auditors believe that decision aids hold the potential to make the audit more efficient and effective. However, the auditors are unsure of decision aid accuracy. Their accuracy concerns coupled with the lack of refresher training could be driving auditors to rely on alternate procedures rather than decision aids, even in high risk auditing environments.

The participants' answers to an open-ended question (see Appendix B, item 18-f), offer crucial insight. First, all of the participating auditors claim that they do not know or can not recall the accuracy of the decision aids available in practice. This suggests that the firms might be focusing too little attention on the critical issue of decision aid accuracy during training, the auditors' lack of refresher training results in memory recall problems regarding decision accuracy, or both. Second, most of the auditors (86%) indicate that they felt more comfortable with alternate procedures. Third, many auditors (45%) mention that they are too busy to refresh

themselves on how to use the aids, mostly because they do not use them very often. The auditors may feel more comfortable with alternate procedures because they defer to them most of the time; hence, they fall back on the (more comfortable) alternate procedures the next time they have a choice.

The underlying reasoning behind this decision strategy could be rooted in the ‘principle of least effort’ (Payne 1982; Johnson and Payne 1985). In this context, the principle of least effort can be viewed as follows: Auditors will tend to choose easily available decision strategies (e.g., alternate procedures versus decision aids), even though the quality of such strategies might be objectively inferior to more effortful strategies. Further, they will tend to be satisfied with whatever solution can be found more easily in preference to pursuing higher-quality sources whose use would require a greater expenditure of effort. Thus, given the immense pressure under which auditors typically work coupled with high risk clients, they likely struggle with a tradeoff between accuracy and effort. Under such circumstances, the auditors might end up satisficing (Simon 1956, 1978) when choosing whether to rely on alternate procedures or the advice of a decision aid. Tying the results of this study to the theoretical ‘principle of least effort’ suggests a practical solution.

CPA firms who make available and encourage the use of decision aids need to deploy decision aids that are at least as accurate as alternate procedures, educate auditors on how the aids work and the accuracy rates, make the decision aids relatively easy to use, and periodically refresh the auditors on the benefits and use of the aids. Else, the cycle of selecting alternate procedures over available decision aids, becoming more familiar with the alternate procedures as a result of this choice, and again relying on the alternate procedures the next time the same choice arises is unlikely to be broken.

The findings from our research must be considered in light of design limitations. Our decision aid recommendation did not require auditors to understand the decision aid or how to use the aid in practice. This reduces the external validity of our findings because decision aid use requires investments of time and cognitive effort by the auditor. Additional research should investigate the effects of litigation risk and internal control risk on aid reliability when auditors must use a decision aid in order to receive a recommendation. Research will also be necessary to determine how to design aids to be sufficiently easy to use so that auditors will choose them over alternate procedures.

The manipulation of decision aid reliability in this study may also limit the applicability of the findings to practice. The reliability of the aid was relatively high (80%), easy to interpret and readily available. Hence, we cannot determine the effects of litigation risk and internal control risk on decision aids with unknown or low reliability levels from this study nor can we infer how the results would change if the decision aid was relatively effortful to use. Additional studies will be necessary to understand how to convince auditors of the reliability of decision aids relative to alternative procedures, effectively impart the benefits of aid use to practitioners and make the aid relatively easy to access and use.

Our findings are further limited to high levels of litigation risk and internal control risk manipulated in this study. The risk manipulations were potent, indicating extreme versus little risk of litigation and strong versus weak internal controls worthy of a qualified report. While these manipulations are appropriate for testing the theoretical effects of internal control risk and litigation risk on reliance, we cannot determine the shape of the reliance function between very low and very high levels of risk. Understanding the nature of reliance between the extremes represents another avenue for future research.

Discussion among the authors and national partners of three of the Big-4 firms offers insight into the profession's thoughts and concerns about litigation, internal controls and decision aids. According to one partner, "If one more big firm loses a massive lawsuit or... is pursued by the SEC, we [audit partners from the Big Four firms] will all close our doors and enter a less risky profession, and we will hand the auditing profession to the federal government." Another partner said of internal controls: "An effectively designed and operated internal control system reflects the investor's strongest defense against potential management abuse and corporate fraud ...if the internal control system is not effective and management and the audit committee are resistant to change the existing controls, I will walk away from the client in a heart-beat." The third partner talked about decision aids: "The audit profession has to decide whether or not to make decision aids available to auditors...in my opinion, the consistency, objectivity and exculpatory advantages of using decision aids far outweigh the risks of abandoning the concept altogether."

## APPENDIX A

### Manipulation Check Items

- 1) *Did you understand the task? (Yes, No)*
  - a) All respondents answered 'Yes'
- 2) *Should the audit fail to detect a material misstatement of the financial statements, the risk of being sued on this engagement is: (1 = very low, 9 = very high)*
  - a) Mean (standard deviation) in the high litigation risk condition: 8.69 (0.50)
  - b) Mean (standard deviation) in the low litigation risk condition: 2.81 (1.06)
  - c) Litigation risk main effect: F-ratio (p-value): 1499.88 (<.01)
  - d) Internal control risk main effect: F-ratio (p-value): 0.03 (= .86)
  - e) Interaction term: F-ratio (p-value): 0.69 (= .41)
- 3) *For this client, how would you rate AMI's internal controls? (1 = very weak, 9 = very strong)*
  - a) Mean (standard deviation) in the high internal control risk condition: 8.22 (0.83)
  - b) Mean (standard deviation) in the low internal control risk condition: 2.69 (2.84)
  - c) Litigation risk main effect: F-ratio (p-value): 0.96 (= .33)
  - d) Internal control risk main effect: F-ratio (p-value): 202.76 (<.01)
  - e) Interaction term: F-ratio (p-value): 0.27 (= .60)
- 4) *What was the stated reliability of the decision aid?*
  - a) All participants correctly indicated a reliability of 80%
- 5) *In your opinion, how reliable was the decision aid? (1 = very unreliable, 4 = moderately reliable, 9 = very reliable)*
  - a) Mean (standard deviation): 7.46 (1.11)
  - b) Main effects and the interaction term were non-significant ( $p > .25$ )
- 6) *What was the dollar amount of the allowance for uncollectible accounts initially estimated by AMI's management?*
  - a) All participants correctly indicated \$600,000
- 7) *What was the dollar amount of the allowance for uncollectible accounts indicated by the decision aid?*
  - a) All participants correctly indicated \$1,000,000
- 8) *What was the difference between management's estimate of the allowance for uncollectible accounts and the amount indicated by the decision aid?*
  - a) All participants correctly indicated \$400,000
- 9) *Do you consider the difference (above) to be material to the financial statements taken as a whole?*
  - a) All participants indicated 'No'.

- 10) *Based on the information you have, what dollar amount would you consider to be material to the financial statements taken as a whole?*
- a) Mean (standard deviation): \$587,872.90 (\$84,495.74)
  - b) Litigation risk main effect: F-ratio (p-value): 0.01 (= .92)
  - c) Internal control risk main effect: F-ratio (p-value): 0.10 (= .75)
  - d) Interaction term: F-ratio (p-value): 0.33 (= .57)
- 11) *Is it possible for a client to have a very low litigation risk and very strong internal controls? (1 = not possible, 4 = somewhat possible, 9 = very possible)*
- a) Mean (standard deviation) = 8.56 (0.50)
  - b) Litigation risk main effect: F-ratio (p-value): 0.48 (= .49)
  - c) Internal control risk main effect: F-ratio (p-value): 0.15 (= .70)
  - d) Interaction term: F-ratio (p-value): 0.03 (= .86)
- 12) *Is it possible for a client to have a very low litigation risk and very weak internal controls? (1 = not possible, 4 = somewhat possible, 9 = very possible)*
- a) Mean (standard deviation) = 6.84 (0.69)
  - b) Litigation risk main effect: F-ratio (p-value): 0.56 (= .46)
  - c) Internal control risk main effect: F-ratio (p-value): 0.02 (= .89)
  - d) Interaction term: F-ratio (p-value): 0.01 (= .93)
- 13) *Is it possible for a client to have a very high litigation risk and very strong internal controls? (1 = not possible, 4 = somewhat possible, 9 = very possible)*
- a) Mean (standard deviation) = 7.31 (0.95)
  - b) Litigation risk main effect: F-ratio (p-value): 0.03 (= .86)
  - c) Internal control risk main effect: F-ratio (p-value): 0.42 (= .52)
  - d) Interaction term: F-ratio (p-value): 0.82 (= .37)
- 14) *Is it possible for a client to have a very high litigation risk and very weak internal controls? (1 = not possible, 4 = somewhat possible, 9 = very possible)*
- a) Mean (standard deviation) = 8.59 (0.49)
  - b) Litigation risk main effect: F-ratio (p-value): 0.47 (= .49)
  - c) Internal control risk main effect: F-ratio (p-value): 0.59 (= .44)
  - d) Interaction term: F-ratio (p-value): 0.30 (= .59)

## APPENDIX B

### Post-Experiment Debriefing<sup>9</sup>

#### Scenario One:

*Assume that you are planning an audit for a client. You have set inherent risk at 1.0 and internal control risk at 0.50. Since you want to maintain an overall audit risk of 0.05, you have set detection risk to 0.10 ( $1.0 \times 0.50 \times 0.10 = 0.05$ ). You have already planned your substantive tests; however, you have just learned that your legal department has assessed the risk of litigation for your client as very high should the financial statements be materially misstated.*

- 1) *How would the litigation risk information affect the extent of substantive testing you have already planned? (1 = considerably less substantive testing, 4 = no effect on substantive testing, 9 = considerably more substantive testing).*
  - a) Mean (standard deviation) = 8.69 (0.52)
- 2) *How would the litigation risk information affect the extent to which you would rely on the advice of available decision aids during the course of the audit? (1 = considerably less reliance, 4 = the same reliance, 9 = considerably more reliance).*
  - a) Mean (standard deviation) = 8.35 (0.71)

#### Scenario Two:

*Assume that a CPA firm has audited a client and offered an unqualified opinion on the financial statements. However, during the subsequent year the CPA firm learns that the client materially overstated net income in the audited year. The overstatement arose because the client recorded fictitious sales. The sales transactions that the CPA firm sampled and verified during the audit were valid, and the sample did not include any of the fictitious sales. The senior auditor, Steve, who conducted the audit of sales transactions, believes that he did so with due care and diligence.*

*When selecting the sample of sales transactions, Steve could have used a decision aid that would have automatically determined the sample size, in accordance with specified risk parameters, and randomly selected specific sales transactions to audit from the total population of sales transactions. Rather than relying on the decision aid, Steve decided to sort the population of sales transactions from largest to smallest, based on the dollar value of each transaction, and audit all sales transactions comprising 80% of the total dollar value of annual sales. The procedure was in accordance with the CPA firm's policy. The decision of whether to rely on the decision aid or audit 80% of the dollar value of sales transactions was Steve's judgment call.*

- 3) *I believe that Steve's decision not to rely on the decision aid was a good judgment call on his part (1 = strongly disagree, 4 = neither agree nor disagree, 9 = strongly agree).*
  - a) Mean (standard deviation) = 8.76 (0.47)

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<sup>9</sup> ANOVA tests for main effects of litigation risk and internal control risk as well as interactive effects were non-significant for all variables analyzed in Appendix B, as all p-values > .15.

- 4) *Relying on the decision aid would have been in accordance with GAAS.*
  - a) Mean (standard deviation) = 8.99 (0.09)
- 5) *The sample selection procedure used by Steve was in accordance with GAAS.*
  - a) Mean (standard deviation) = 8.97 (0.18)
- 6) *In this same situation, I would have relied on the decision aid.*
  - a) Mean (standard deviation) = 3.43 (1.05)

### **Scenario Three:**

*Steve now finds out that investors of the company have just filed a class action lawsuit and his audit firm is one of the defendants. Steve has been asked to explain and defend in court his sample selection procedure. His defense is that he selected the audit sample in accordance with firm policy, and audited the transactions with due care and diligence. Please answer the following two questions:*

- 7) *What is the likelihood that the jury will deem Steve's sampling procedure as acceptable? (1 = very low likelihood, 4 = moderate likelihood, 9 = very high likelihood)*
  - a) Mean (standard deviation) = 1.62 (0.77)
- 8) *Had Steve relied on the decision aid to select the sample, what is the likelihood that the jury would judge Steve's sampling procedure as acceptable? (1 = very low likelihood, 4 = moderate likelihood, 9 = very high likelihood)*
  - a) Mean (standard deviation) = 6.60 (0.85)

### **Decision Aids, Litigation Risk, Internal control risk and Reliance:**

- 9) *To what extent to you believe that decision aids hold the potential to make the audit more efficient? (1 = no extent, 4 = moderate extent, 9 = great extent)*
  - a) Mean (standard deviation) = 7.79 (1.24)
- 10) *To what extent to you believe that decision aids hold the potential to make the audit more effective? (1 = no extent, 4 = moderate extent, 9 = great extent)*
  - a) Mean (standard deviation) = 6.38 (1.15)
- 11) *In previous audits, to what extent have you relied on decision aids? (1 = never relied, somewhat relied, extensively relied)*
  - a) Mean (standard deviation) = 2.84 (0.98)
- 12) *The level of litigation risk is a major factor I consider when planning an audit. (1 = strongly disagree, 4 = neutral, 9 = strongly agree)*
  - a) Mean (standard deviation) = 6.34 (1.19)

- 13) *The level of internal control risk is a major factor I consider when planning an audit. (1 = strongly disagree, 4 = neutral, 9 = strongly agree)*
- a) Mean (standard deviation) = 9.00 (0.00)
- 14) *About what percentage of your past and present audit clients would be considered low, medium and high risk engagements due to potential litigation exposure?*
- a) Low: Mean (standard deviation) = 40.77 (21.47)
  - b) Medium: Mean (standard deviation) = 42.84 (23.36)
  - c) High: Mean (standard deviation) = 16.39 (10.10)
- 15) *About what percentage of your past and present audit clients would be considered low, medium and high risk engagements due to internal control risk?*
- a) Low: Mean (standard deviation) = 26.40 (17.86)
  - b) Medium: Mean (standard deviation) = 54.92 (20.78)
  - c) High: Mean (standard deviation) = 18.69 (10.80)
- 16) *When auditing a client that is considered high risk due to litigation exposure, did you have access to any computerized decision aids that would have been helpful during the audit process?*
- a) All respondents answered 'Yes' to this question.
- 17) *When auditing a client that is considered high risk due to internal control risk, did you have access to any computerized decision aids that would have been helpful during the audit process?*
- a) All respondents answered 'Yes' to this question.
- 18) *If you answered 'Yes' to the either of the last two questions:*
- a) *Were you trained on the proper use of such decision aids?*
    - i) All respondents answered 'Yes' to this question.
  - b) *Are you periodically re-trained on how to use the decision aids?*
    - i) All respondents answered 'No' to this question.
  - c) *Were there alternative GAAS compliant procedures you could have used in lieu of the decision aids?*
    - i) All respondents answered 'Yes' to the question.
  - d) *Think about the approximate number of instances where you had a choice to use a decision aids or rely on alternative procedures when you deemed the client to be high risk due to potential litigation exposure. Please estimate the percentage of times you chose the decision aid over the alternate procedures.*
    - i) Mean (standard deviation): 6.05% (4.10%)

- e) *Think about the approximate number of instances where you had a choice to use a decision aids or rely on alternative procedures when you deemed the client to be high risk due internal control risk. Please estimate the percentage of times you chose the decision aid over the alternate procedures.*
- i) Mean (standard deviation): 13.27% (6.81%)
- f) *If your answer to 'd' or 'e' above was less than 100%, what are the main reasons you chose the alternative procedure(s) over the decision aid(s)?*<sup>10</sup>
- i) Group #1: (118 of 118 [100%] participants responded): I did not know or could not recall the accuracy of the aid(s)
- ii) Group #2: (101 of 118 [86%] participants responded): I felt more comfortable with the alternate procedure(s)
- iii) Group #3: (53 of 118 [45%] participants responded): During an audit, I am too busy to refresh myself on how to use the aid(s), as I do not use it (them) very often

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<sup>10</sup> Two independent raters separately categorized the responses into common groupings. Initial inter-rater reliability was 92%. After reviewing disputed responses, the raters agreed. Four groupings emerged. The three listed groupings reflected coherent themes. The final grouping, comprised of 16 remarks, varied considerably with no obvious commonality.

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**Table 1:** Mean (standard deviation) Allowance for Uncollectible Accounts Estimates and Recommended Adjustment to the Financial Statements <sup>1,2</sup>

| Litigation Risk  | Internal control risk |                       |
|--|-----------------------|-----------------------|
|  | Low                   | High                  |
| Difference between participants' final estimate of uncollectible accounts and management's estimate of \$600,000 |                       |                       |
| Low  | \$159,179<br>(61,037) | \$202,483<br>(83,307) |
| High   | \$226,097<br>(73,837) | \$363,233<br>(58,965) |
| Participants' final recommended adjustment to the financial statements   |                       |                       |
| Low  | \$93,214<br>(41,683)  | \$138,448<br>(61,920) |
| High   | \$207,258<br>(68,603) | \$358,500<br>(60,602) |
| Final recommended adjustment as a percentage of final estimate   |                       |                       |
| Low  | 59%                   | 68%                   |
| High   | 92%                   | 99%                   |

<sup>1</sup> The decision aid's estimate of uncollectible accounts was \$1,000,000 and management's estimate of uncollectible accounts was \$600,000, thus yielding a difference of \$400,000.

<sup>2</sup> Mean (standard deviation) materiality level, as assessed by participants, was \$587,872.90 (\$84,495.74). Materiality assessments were not significantly different across treatment conditions (see Appendix A).

**Table 2:** Mean (Standard Deviation) [Sample Size] Statistics: Decision Aid Reliance <sup>1</sup>

| Litigation Risk                      | Internal control risk  |                        | <i>Main Effect:<br/>Litigation Risk</i> |
|--------------------------------------|------------------------|------------------------|---|
|                                      | Low                    | High                   |   |
| Low                                  | 0.09<br>(0.07)<br>[28] | 0.25<br>(0.16)<br>[29] | 0.16<br>(0.15)<br>[57]                  |
| High                                 | 0.45<br>(0.18)<br>[31] | 0.89<br>(0.17)<br>[30] | 0.67<br>(0.28)<br>[61]                  |
| <i>Main Effect: Internal Control</i> | 0.28<br>(0.23)<br>[59] | 0.57<br>(0.36)<br>[59] | 0.43<br>(0.34)<br>[118]                 |

<sup>1</sup> The decision aid reliance metric is calculated as follows:

$$\frac{\text{Final Recommended Adjustment} - \text{Initial Recommended Adjustment}}{(\text{Decision Aid's Recommendation} - \text{Management's Estimate}) - \text{Initial Recommended Adjustment}}$$

**Table 3:** Statistical Results of Hypothesis Testing

**Panel A:** Overall ANOVA Model: Dependent variable = Decision Aid Reliance

| Source                      | Sum of Squares | d.f. | Mean Square | F      | p    | Hypothesis |
|-----------------------------|----------------|------|-------------|--------|------|------------|
| Litigation Risk (LR)        | 7.42           | 1    | 7.42        | 316.60 | .000 | H1a        |
| Internal Control Risk (ICR) | 2.62           | 1    | 2.62        | 111.86 | .000 | H2a        |
| LR x ICR                    | 0.56           | 1    | 0.56        | 23.80  | .000 | H3a        |
| Error                       | 2.67           | 115  | 0.02        |        |      |            |

**Panel B:** Multiple Pairwise Comparisons (H3a)

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| Bonferroni Pairwise Comparisons<br>( $\alpha = .01$ ) | [1] | [2] | [3] |
|---|-----|-----|-----|
| [1] LR (Low) & ICR (Low) 0.09                         |     |     |     |
| [2] LR (Low) & ICR (High) 0.25                        | *   |     |     |
| [3] LR (High) & ICR (Low) 0.45                        | *   | *   |     |
| [4] LR (High) & ICR (High) 0.89                       | *   | *   | *   |

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\* Indicates that means are significantly different at  $\alpha = .01$

**Panel C:** Contrast Test for Interaction (H3a)

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| Contrast   | t-statistic | p     |
|--|-------------|-------|
| [LR (High) & ICR (High) of .89] minus [LR (High) & ICR (Low) of .45] = .44 |             |       |
| Is greater than  | 4.88        | < .01 |
| [LR (Low) & ICR (High) of .25] minus [LR (Low) & ICR (Low) of .09] = .16   |             |       |

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**Table 4:** Statistical Results of Defensibility

**Panel A:** Overall ANOVA Model: Dependent variable = Defensibility Index <sup>a</sup>

| Source                      | Sum of Squares | d.f. | Mean Square | F        | p    | Hypothesis                 |
|-----------------------------|----------------|------|-------------|----------|------|----------------------------|
| Litigation Risk (LR)        | 524.77         | 1    | 524.77      | 1,250.57 | .000 | H1b                        |
| Internal Control Risk (ICR) | 204.20         | 1    | 204.20      | 486.62   | .000 | Discussed with H2b results |
| LR x ICR                    | 26.10          | 1    | 26.10       | 62.21    | .000 | H3b                        |
| Error                       | 47.84          | 115  | 0.42        |          |      |                            |

**Panel B:** Multiple Pairwise Comparisons (H3b)

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Bonferroni Pairwise Comparisons  
( $\alpha = .01$ )

|                                 | [1] | [2] | [3] |
|---------------------------------|-----|-----|-----|
| [1] LR (Low) & ICR (Low) 1.95   |     |     |     |
| [2] LR (Low) & ICR (High) 3.64  | *   |     |     |
| [3] LR (High) & ICR (Low) 5.23  | *   | *   |     |
| [4] LR (High) & ICR (High) 8.80 | *   | *   | *   |

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\* Indicates that means are significantly different at  $\alpha = .01$

**Panel C:** Contrast Test for Interaction (H3b)

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| Contrast   | t-statistic | p     |
|--|-------------|-------|
| [LR (High) & ICR (High) of 8.80] minus [LR (High) & ICR (Low) of 5.23] = 3.57<br>Is greater than | 7.89        | < .01 |
| [LR (Low) & ICR (High) of 3.64] minus [LR (Low) & ICR (Low) of 1.95] = 1.69                      |             |       |

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<sup>a</sup> The Defensibility Index is comprised of the following two response items:

1. When you arrived at your final estimate of AMI's allowance for uncollectible accounts, to what extent were you thinking about how the decision aid would help you, in the case of a lawsuit, defend your final judgment in a court of law? (1 = No Extent, 4 = Moderate Extent, 9 = Large Extent).

2. Should your CPA firm be sued on the AMI engagement, how certain are you that you could defend your procedure for estimating the allowance for uncollectible accounts in a court of law (1 = Very Uncertain, 4 = Moderately Certain, 9 = Very Certain).

Pearson Correlation (r) = .88

**Table 5:** Statistical Results of Confidence (H1c, H2c & H3c)

**Panel A:** Overall ANCOVA Model: Dependent variable = Final Confidence, Covariate = Initial Confidence

| Source                      | Sum of Squares | df  | Mean Square | F      | p    | Hypothesis |
|-----------------------------|----------------|-----|-------------|--------|------|------------|
| Initial Confidence          | 0.09           | 1   | 0.09        | 0.15   | .700 | H1c        |
| Litigation Risk (LR)        | 435.19         | 1   | 435.19      | 696.10 | .000 | H2c        |
| Internal Control Risk (ICR) | 202.78         | 1   | 202.78      | 324.35 | .000 | H3c        |
| LR x ICR                    | 32.20          | 1   | 32.20       | 51.50  | .000 |            |
| Error                       | 70.65          | 115 | 0.61        |        |      |            |

**Panel B:** Multiple Pairwise Comparisons (least square means) (H3c)

| Bonferroni Pairwise Comparisons<br>( $\alpha = .01$ ) |     |     |     |
|---|-----|-----|-----|
|   | [1] | [2] | [3] |
| [1] LR (Low) & ICR (Low) 8.78                         |     |     |     |
| [2] LR (Low) & ICR (High) 7.20                        | *   |     |     |
| [3] LR (High) & ICR (Low) 5.97                        | *   | *   |     |
| [4] LR (High) & ICR (High) 2.30                       | *   | *   | *   |

\* Indicates that means are significantly different at  $\alpha = .01$

**Panel C:** Contrast Test for Interaction (H3c)

| Contrast  | t-stat | p     |
|---|--------|-------|
| [LR (High) & ICR (High) of 2.30] minus [LR (High) & ICR (Low) of 5.97] = -3.67<br>Is greater than | 7.18   | < .01 |
| [LR (Low) & ICR (High) of 7.20] minus [LR (Low) & ICR (Low) of 8.78] = -1.58                      |        |       |

**Table 6:** Statistical Results of Hypothesis Testing (H2b)

**Panel A:** Overall ANOVA Model: Dependent variable = Decision Aid Objectivity

| Source                      | Sum of Squares | df  | Mean Square | F      | p    | Hypothesis                 |
|-----------------------------|----------------|-----|-------------|--------|------|----------------------------|
| Litigation Risk (LR)        | 527.44         | 1   | 527.44      | 531.22 | .000 |                            |
| Internal Control Risk (ICR) | 128.97         | 1   | 128.97      | 129.89 | .000 | H2b                        |
| LR x ICR                    | 23.36          | 1   | 23.36       | 23.52  | .000 | Discussed with H3c results |
| Error                       | 113.19         | 115 | 0.98        |        |      |                            |

**Panel B:** Multiple Pairwise Comparisons

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| Bonferroni Pairwise Comparisons<br>( $\alpha = .01$ ) | [1] | [2] | [3] |
|---|-----|-----|-----|
| [1] LR (Low) & ICR (Low) 2.14                         |     |     |     |
| [2] LR (Low) & ICR (High) 3.34                        | *   |     |     |
| [3] LR (High) & ICR (Low) 5.48                        | *   | *   |     |
| [4] LR (High) & ICR (High) 8.47                       | *   | *   | *   |

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\* Indicates that means are significantly different at  $\alpha = .01$

**Panel C:** Contrast Test for Interaction

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| Contrast   | t-stat | p     |
|--|--------|-------|
| [LR (High) & ICR (High) of 8.47] minus [LR (High) & ICR (Low) of 5.48] = 2.99<br>Is greater than | 4.84   | < .01 |
| [LR (Low) & ICR (High) of 3.34] minus [LR (Low) & ICR (Low) of 2.14] = 1.20                      |        |       |

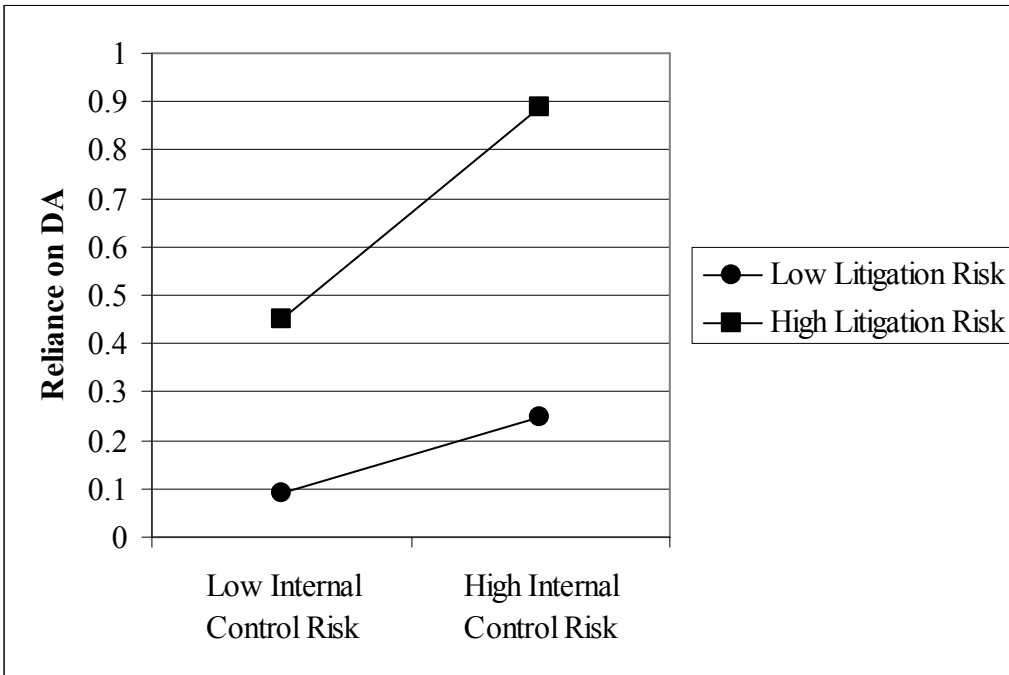
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**Figure 1:** Interaction Graphs of Litigation Risk and Internal Control Risk

**Panel A:** Decision Aid Reliance



**Panel B:** Final Confidence

