3-2012

Do External Financial Statement Auditors Sufficiently Adjust Their Audit Plans for Automated-Control Deficiencies?

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Recommended Citation
Selby, Daniel. "Do External Financial Statement Auditors Sufficiently Adjust Their Audit Plans for Automated-Control Deficiencies?" *Academy of Accounting and Financial Studies Journal* 16, no. 2 (March 2012): 1-24.

DO EXTERNAL FINANCIAL STATEMENT AUDITORS SUFFICIENTLY ADJUST THEIR AUDIT PLANS FOR AUTOMATED-CONTROL DEFICIENCIES?

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ABSTRACT

Shelton (1999) found that experience, based on rank, mitigates the influence of less-than-diagnostic evidence in going concern assessments. But, numerous studies (e.g., Abdolmohammadi and Wright 1987) question the external validity of studies that use rank to determine experience. I suspect that specialized domain experience is a better measure because all auditor ranks do not have procedural knowledge in going concern decisions but many auditors may have procedural knowledge in audit planning (AICPA 2008) and automated controls (Hunton et al. 2004). I investigate whether external financial statement auditors (henceforth auditors) sufficiently adjust their audit plans for material-automated-control-weaknesses. I determine the sufficiency of auditors' audit plan adjustments by comparing their adjustments for material-automated-control-weaknesses to professionals with specialized domain experience in automated-controls, IT audit specialists. Auditors' audit plan adjustments are significantly lower than IT audit specialist when less-than-diagnostic evidence is present. Thus, specialized domain experience mitigates the influence of less-than-diagnostic evidence. Meanwhile, experience based on rank, does not mitigate the influence of less-than-diagnostic evidence. The implication of my study is that consulting with IT audit specialists while revising plans for material-automated-control-weaknesses may improve the likelihood that adequate resources will be allocated to address automated-control weaknesses and reduce the likelihood of audit failure.

KEYWORDS: Specialized domain experience, diagnostic evidence, audit planning, IT audit specialists, internal controls, automated controls, IT controls

INTRODUCTION

Automated-control-deficiencies in computerized hardware or applications have a reasonable possibility of producing material misstatements in the financial statements (AICPA 2008). One example of an automated-control-deficiency is when financial data is transferred between computer applications without automated verification that all data that was intended to be sent is received. When auditors become aware of an automated-control-deficiency they are encouraged to adjust their audit plans so that they can better assess the effectiveness of the internal controls and better assess the effects of the weakness on the financial statements (AICPA 2008; PCAOB 2010; IAASB 2010a; IAASB 2010b; ITGI 2007).

In this paper, I investigate whether external financial statement auditors (henceforth, auditors) sufficiently adjust their audit plans for automated-control-deficiencies. I also investigate whether auditors' audit plan adjustments are influenced by less-than-diagnostic evidence.[1] Auditors are allowed to adjust their audit plans for material-automated-control-weaknesses without the assistance of IT (information technology) audit specialists (AICPA 2008; PCAOB 2010; IAASB 2010a; IAASB 2010b). However, auditors perform fewer audit procedures for automated-controls than manual-processes (Brazel and Agolia 2007). Thus, auditors do not possess as much specialized domain experience[2] in automated-controls as IT audit specialists (Weber 1980) and may (1) discount the relevance of automated-controls in audits (Messier et al. 2004), (2) be overconfident about their ability to examine automated-controls (Hunton et al. 2004), (3) provide significance of deficiency ratings for IT control deficiencies that are influenced by management persuasion techniques, (4) not fully utilize their accounting information system expertise for the extent of audit planning (Brazel and Agolia 2007), and (5) find it more difficult to identify the effects of automated-control weaknesses on the financial statements (Vendryzk and Bagranoff 2003). Thus, auditors' lower specialized domain experience in automated-controls may influence them to provide insufficient audit plan adjustments for automated-control-deficiencies. Moreover, auditors' audit plan adjustments for automated-controls may be insufficient in audit settings where less-than-diagnostic evidence is present.[3] My study provides empirical evidence on this issue.

Auditors' audit plan adjustments for automated-control-deficiencies are important because auditors rely on their professional judgment as to whether or not they should seek the assistance of IT professionals when planning the audit. Insufficient audit plan adjustments may lead to too few audit tests or too few audit tested items (Joyce 1976; Kaplan 1985; Johnstone and Bedard 2001). If auditors fail to perform enough tests or fail to sample enough items, audit failure[4] may occur. The likelihood that auditors' would be able to thoroughly assess internal control effectiveness or determine the effects of the material-automated-control-weakness on the financial statements may decrease. Thus, auditors may under-audit and issue unqualified opinions on financial statements and internal controls when qualified or adverse opinions may be more appropriate. It is important to know whether auditors can adequately adjust their audit plans for audit engagements that involve automated controls. Insufficient audit plan adjustments for automated-control-deficiencies can have serious implications on the nature, timing, and extent of control testing and substantive testing.

I conduct a two-phase experiment in which I assess audit plan adjustments as the *adjustment to the audit hours necessary to test controls relative to the prior year* as the dependent variable (Dauber et al. 2005). I manipulate *specialized domain experience* by exposing auditors to automated-control evidence (or manual-process evidence initially, depending on order) in phase 1 and then I expose them to manual-process evidence[5] (automated-control evidence) in phase 2. I also manipulate the *influence of less-than-diagnostic evidence* by including less-than-diagnostic evidence cues in the audit planning context and then I ask the participants to make the same judgment without the less-than-diagnostic evidence cues (Hackenbrack 1992; Shaft and Vessey 1998; and LaBella and Koehler 2004). To determine whether auditors adjust their audit plans sufficiently for an automated-control-deficiency, where they lack specialized-domain-experience in automated-controls, I compare their adjustments to the audit plan adjustments of IT audit specialists. I also compare the auditors' audit plan adjustments for the automated-control-deficiency to their own adjustments for a manual-processes-deficiency.

I find that less-than-diagnostic evidence and specialized domain experience affect auditors' audit plan adjustments for automated-control-deficiencies. My results are consistent with, and strengthen the results found in Shelton (1999). Shelton (1999) used audit firm rank to classify auditors as more-experienced or less-experienced and investigated whether experience could mitigate the influence of less-than-diagnostic evidence. Shelton found that experience did mitigate the influence of less-than-diagnostic evidence during going concern judgments. However, several studies question the external validity of studies that ignore the merits of procedural knowledge[6] and use ranks within the firm as the measure of experience for unstructured tasks (Abdolmohammadi and Wright 1987; Bonner and Lewis 1990; and Bedard and Biggs 1991). It is likely that the less-experienced auditors in Shelton's study did not have specialized-domain-experience in making going concern judgments while the more-experienced auditors in her study did have specialized-domain-experience in making going concern judgments. So, for this reason, I investigate. My results suggest that auditors insufficiently adjust their audit plans for automated-control-deficiencies. This finding is robust when I compare auditors' audit plan adjustments for automated-control evidence to (1) their adjustments for manual-process evidence and (2) IT audit specialists' audit plan adjustments for automated-control evidence.

My inferences are based on an experiment that captures three important aspects of the internal control environment that prior studies have not captured. First, auditors encounter automated-controls and manual-processes when they examine internal controls (Borthick et al. 2006). Second, IT audit specialists are not included on every audit engagement so auditors make judgments that pertain to automated-controls without the assistance of IT audit specialists (Vendryzk and Bagranoff 2003). Third, less-than-diagnostic evidence tends to be present in audit settings (Hackenbrack 1992). Fourth, auditors may lack the specialized domain experience that is needed to examine the automated portions of internal control structures.

The remainder of the paper is organized as follows. Section II discusses the previous literature and develops my hypotheses. Section III describes the experiment. Section IV presents the results. Section V summarizes the findings and comments on the study's implications.

HYPOTHESIS DEVELOPMENT

Audit planning

Audit planning affects the nature and extent of audit evidence (Joyce 1976). Joyce found that as auditors gain experience, their audit planning judgments move towards the consensus of their peers. Tabor (1983) examined auditor adjustments for internal control reliability and sample size as a means to analyze audit plan adjustments in a within-subjects designed study. Tabor results suggest that audit firm differences influence audit plan adjustments. Guamnitz et al. (1982) asked auditors to estimate the number of hours necessary to assess the propriety and collectability of accounts receivable. Their results suggest that different offices within the same firm could provide significantly different estimates of the hours to complete the same audit task. However, they did not find that years of experience influenced auditors' audit planning hour estimates.

Kaplan (1985) investigated the effects of environmental factors on the audit planning judgments of auditors. Kaplan operationalized environmental factors by using three different industry contexts. A hypothetical client that manufactured picture frames was viewed as the stable client environment manipulation. A hypothetical client in the tire replacement industry was viewed as the slightly dynamic client environment manipulation. Finally, a hypothetical client that manufactured semiconductors was viewed as the dynamic client environment manipulation. Kaplan's results suggest that environmental factors did not affect audit planning judgments. However, Kaplan results do suggest that perceived deterioration of the internal control structure may influence auditors to increase the number of hours in their audit plans. The frequency of information in an audit setting has also been found to also influence the way that auditors allocate hours of audit effort across transaction cycles (Nelson et al. 1995).

Recent studies on audit plans have specifically investigated the effects of various types of risks on external auditor audit plans. Zimbelman (1997) and Johnstone and Bedard (2001) found that fraud risk assessments had no effect on the magnitude of planned audit effort. These results indicate that auditors may maintain a consistent audit strategy that can limit their ability to detect fraud. Contrary to these results, a few studies have identified the impact of other types of risk on auditors' audit plans. Houston et al. (1999) found that the interaction between business risk and intentional misstatements influence audit plan adjustments. Additionally, Bedard and Johnstone (2004) correlate earnings management risk with the amount of planned audit hours.

In my study, I expect that auditors will provide insufficient audit plan adjustments for material-automated-control-weaknesses. The effect of technological innovation, such as automated-controls, in concert with audit planning judgments has received only a little attention in the literature. Bedard et al. (2005) found that control activities risk affect the number of automated-control procedures that auditors perform. Brazel and Agolia (2007) examined the interaction of auditors' knowledge of accounting information systems with their perception of the competence of the IT audit specialists on a hypothetical audit client that implemented a new ERP system. Brazel and Agolia found that the interaction significantly influenced the planned number of procedures and the planned number of hours that auditors would perform.

Less-than-diagnostic evidence

Audit plan adjustments are subjective and unstructured judgments that request cognitive effort (Davidson and Gist 1996). In order to adjust their audit plans, auditors consider many factors (e.g., competence of specialist on the engagement per Brazel and Agolia 2007). These factors compete for attention (Nelson 1993) but according to Kahneman and Tversky (1972), salient information about the target influences outcome predictions. For example, Choo and Trotman (1991) found that experienced auditors recalled more atypical items than typical items because the atypical items were more difficult to understand. In Choo and Trotman's study, the difficulty of the atypical items may have contributed to their increased salience over the typical items. Unfortunately, not all salient characteristics are diagnostic to the outcome prediction task (Tversky 1977). However, a material-control-weakness is diagnostic and salient in an audit plan adjustment task because material-control-weaknesses signal the need for more audit program resources (Kaplan 1985).

Individuals reduce their assessments of diagnostic[7] cues in prediction tasks when they are exposed to less-than-diagnostic information (Nisbett et al. 1981; Tetlock et al. 1989; Tetlock et al. 1996). Prior research posits that individuals predict future events of interest based on the perceived similarity of features between the target and the predicted outcome. Kemmelmeier (2004) describes the target as the observable object of interests and the predicted outcome as the prediction about the target. Judgment based on similarities between mental models and diagnostic features of available information is normative behavior (Tversky 1977). But, individuals have also been found to base their perceptions on features that are less-than-diagnostic to the event of interest (Nisbett et al. 1981; Tetlock et al. 1989; Tetlock et al. 1996).

The less-than-diagnostic evidence that I use in my experimental instrument provide salient characteristics about the client. However, the less-than-diagnostic evidence that I use in my study contribute little predictive value, if any, to my experimental audit plan adjustment task. People evaluate probabilities by representativeness and select outcomes that are most representative of the information that is available (Tversky and Kahneman 1974). So, auditors should also succumb to Tversky and Kahneman's (1974) *illusions of validity*. Thus, I suspect that less-than-diagnostic evidence will influence auditors to document smaller audit plan adjustments.

The influence of less-than-diagnostic evidence has been widely examined in the accounting literature (Hackenbrack 1992; Glover 1997; and Hoffman and Patton 1997; Shelton 1999). For example, the auditors in Hackenbrack's (1992) study evaluated diagnostic evidence initially in conjunction with less-than-diagnostic evidence and subsequently when the less-than-diagnostic evidence was removed. He found that auditors' fraud risk assessments were affected by less-than-diagnostic evidence when they evaluated diagnostic evidence simultaneously with less-than-diagnostic evidence versus evaluating the diagnostic evidence alone.

The auditors in Glover's (1997) study were allowed to update their fraud risk judgment after reviewing each of his eight diagnostic evidence cues. Then he assigned the auditors to one long case that embedded one of the diagnostic evidence cues with (1) less-than-diagnostic client information, (2) less-than-diagnostic workpapers, and (3) the less-than-diagnostic results of other audit procedures. Glover found that less-than-diagnostic evidence had more of an effect on auditors' fraud risk assessment in the long case than in the eight short cases.

Hoffman and Patton (1997) also used a within-participant experimental design to examine the influence of less-than-diagnostic evidence. The auditor judgments in Hoffman and Patton's (1997) study were made after participants read two diagnostic cues alone and then again after reading the same two diagnostic cues mixed with four less-than-diagnostic cues. Consistent with the aforementioned accounting studies, Hoffman and Patton also concluded that auditors' fraud risk assessments were affected by the less-than-diagnostic evidence cues.

Shelton (1999) used a between-subject design. The auditors in her study were either provided with diagnostic evidence only or diagnostic evidence plus less-than-diagnostic evidence. She observed that the going concern assessments of less-experienced auditors were affected by the presence of less-than-diagnostic evidence. She also found that the going concern assessments of the more-experienced participants in her study did not vary significantly based on the presence of less-than-diagnostic evidence cues. Shelton concluded that experience mitigates the effects of dilution.

Shelton's findings are contradicted by the evidence presented in Bhattacharjee and Moreno (2002). Similar to Shelton (1999), Bhattacharjee and Moreno (2002) examined the effects of experience and the influence of less-than-diagnostic evidence by partitioning their participants into an experienced or a less-experienced group. The major difference is that Bhattacharjee and Moreno's less experienced group includes staff-level auditors with senior-level auditors. Whereas Shelton's less-experienced group consisted of only senior auditors. Another major difference between these two studies is that the auditors in Bhattacharjee and Moreno's study analyzed the risk that inventory was obsolete while the auditors in Shelton's study assessed the likelihood that the hypothetical client in the experiment would continue as a going concern. Bhattacharjee and Moreno results suggest that experience does not mitigate the effects of less-than-diagnostic evidence. The differences in the results between Shelton (1999) and Bhattacharjee and Moreno (2002) could be driven by the fact that the less-experienced auditors in Bhattacharjee and Moreno's study had procedural knowledge from their practice experience in assessing inventory obsolescence. The less-experienced auditors in Shelton's study may lack procedural knowledge because assessing going concern is not a routine task that less-experienced auditors perform in practice. The going concern assessment is most likely determined by the external "auditor-in-charge" of the audit (AICPA 2008). The external "auditor-in-charge" will tend have procedural knowledge and higher rank within the firm than less-experienced auditors. My study provides empirical evidence on this issue.

The existing accounting literature (Hackenbrack 1992; Glover 1997; Hoffman and Patton 1997; and Shelton 1999) did find that auditors' judgments were affected by less-than-diagnostic evidence. I investigate the influence of less-than-diagnostic evidence to be consistent with this literature and because this literature describes that less-than-diagnostic evidence is common in internal control environments. Like Hackenbrack, I use a within-subject design and asked auditors to make an initial audit plan adjustment based on a combination of diagnostic and less-than-diagnostic evidence. Then I asked auditors to make their subsequent audit plan adjustment based on the diagnostic evidence alone. Unlike Hackenbrack, I do not use experimental cues that induce increased judgments so that I can focus on the audit failure problem. Specifically, I focus on how less-than-diagnostic evidence may reduce the extent and degree of control audit tests. I predict that auditors will have smaller audit plan adjustments for material control weaknesses when less-than-diagnostic evidence is present. The hypotheses, stated in the alternative form, are:

H1a *Less-than-diagnostic evidence will influence auditors to reduce their audit plan adjustments for material manual-process weaknesses.*

H1b *Less-than-diagnostic evidence will influence auditors to reduce their audit plan adjustments for material-automated-control-weaknesses.*

Specialized domain experience

Audit firms facilitate the acquisition of specialized domain experience for business purposes by assigning auditors to areas of specialization (e.g., industry specialization in Owhoso et al. 2002). Hunton et al. (2004) and Brazel and Agoglia (2007) describe how Big Four professional service firms attempt to reduce their business risks by using IT audit specialists when the client implements a new ERP. As auditors acquire specialized domain experience, they improve their ability to transfer knowledge from previously solved problems to new, unstructured problems that are related to their area of specialization (Frederick and Libby 1986; Vera-Munoz et al. 2001).

Vera-Munoz et al. (2001) found that management accountants outperformed financial auditors when both groups were asked to identify opportunity costs. Management accountants and financial auditors both have declarative knowledge in identifying opportunity costs. However, Vera-Munoz et al. (2001) attribute their results to the fact that management accountants have procedural knowledge in measuring opportunity costs because they routinely consider opportunity costs. Financial auditors, on the other hand, do not consider opportunity costs on a routine basis.

Borthick et al. (2006) describe knowledge structure as the organized information that individuals have stored in their memory. When individuals solve problems, they rely on their knowledge structure to comprehend problems, process information, and generate subsequent solutions (Zwaan and Radvansky 1998). Knowledge structure can be built from the procedural knowledge that one gains inside a specific domain (Vera-Munoz 1998; Vera-Munoz et al. 2001). Specialized domain experience is expected lead to superior performance when knowledge structures are compatible with tasks (Zwaan and Radvansky 1998).

When knowledge structures are aligned with tasks, those tasks are easier to solve than tasks that are not aligned with knowledge structures (Alba and Hutchinson 1987; Sun 2007; Hambrick et al. 2007). However, it is not clear whether knowledge structure compatibility will improve audit planning judgments (Nelson et al. 1995). Pre-existing knowledge structures can also bias individuals' interpretation of evidence (Greeno 1998). Thus, knowledge structure compatibility can be a benefit or a hindrance. Auditors' knowledge structures, in comparison with IT audit specialists knowledge structures, will tend to be incompatible with automated-control evidence (Weber 1980). If so, auditors may place more weight than necessary on less-than-diagnostic automated-control evidence. But, knowledge structure incompatibility may also be helpful in a judgment prediction context because pre-existing biases towards evidence may be absent (Kintsch 1988).

I predict that auditors will make smaller adjustments to their audit plan for material-automated-control-weaknesses than material-manual-process-weaknesses. Auditors find it more difficult to identify the effects of automated-controls than manual-processes (Vendryzk and Bagranoff 2003). The difficulty that auditors face with automated-controls may stem from the fact that that they work more frequently with manual-process evidence and less frequently with automated-control evidence (Tarantino 2006). Thus, auditors have more procedural knowledge of manual-process evidence than automated-control evidence (Weber 1980). Given the procedural knowledge advantage that auditors have with manual-process evidence, their knowledge structures may be best suited for manual-processes and less suited for automated-controls (Cash et al. 1977; Weber 1980). The hypothesis, stated in the alternative form, is:

H2 Auditors will make smaller adjustments to their audit plans for material-automated-control-weaknesses than material manual-process weaknesses.

IT auditors and auditors assess the strengths of the control points within an internal control system. The control points involve two internal control evidence domains: manual-processes and automated-controls (AICPA 2008). Manual-process evidence is created by humans within the internal control system. Automated-control evidence, on the other hand, is created by the IT infrastructure. Auditors are exposed to automated-controls but auditors do not have the same magnitude of specialized domain experience in automated-controls as IT audit specialists (Vendryzk and Bagranoff 2003; Hall and Singleton 2007). While auditors may have some broad, general knowledge of automated-controls, auditors do not tend to be specialists in automated-controls. Many studies identify the differences between auditors and IT audit specialist and acknowledge the IT audit specialists' specialized domain experience in automated controls. For example, Vendryzk and Bagranoff (2003) documented that IT audit specialists and auditors are separated within the accounting firm because of their specialized domain experience in automated-controls. However, they align as a team when approaching the client.

Other studies point out that IT audit specialists tend to test automated-controls by "auditing through the computer" while auditors tend to test manual-processes by "auditing around the computer" (Davis and Weber 1986; Biggs et al. 1987; and Messier et al. 2004). Auditors focus their investigations on examining the fairness of the financial statements while IT audit specialists go beyond the fairness of the financial statements and examine with additional automated-control issues such as system reliability, security, application development, system acquisition, and the system development life cycle (Vanacek et al. 1983; Vendryzk and Bagranoff 2003; Hunton et al. 2004; and Brazel and Agolia 2007). These additional technological areas of emphasis by IT audit specialists make their duties more complex than the duties of auditors (Bell et al. 1998; Messier et al. 2004). For example, materiality is much harder to determine during the evaluation of automated-controls than it is for a financial statement audit (Nord et al. 2005; Krishnan et al. 2005).

IT audit specialists are likely to have computer information systems degrees in addition to undergraduate degrees in accounting (Curtis and Viator 2000). The formal training in IT is intended to improve IT audit specialists' ability to address automated-control issues (Curtis and Viator 2000). Auditors, on the other hand, are more likely to hold undergraduate accounting degrees (Curtis and Viator 2000). Finally, IT audit specialists use CobIT[8] as additional guidance to supplement the lack of guidance for auditing automated-controls in Generally Accepted Auditing Standards and International Standards on Auditing (Biggs et al. 1987; Moeller 2004; Tarantino 2006). Auditors are not restricted from using CobIT and are highly encouraged to do so but auditors tend to know very little about CobIT (Moeller 2004).

Task performance is thought to enhance procedural knowledge and improve performance (Herz and Schultz 1999). Auditors tend to perform task in more manual-process evidence contexts than in automated-control evidence contexts (Vendryzk and Bagranoff 2003; Tarantino 2006; Singleton 2007). Procedural knowledge should allow individuals to integrate their preexisting knowledge with unstructured[9] problem contexts (Kole and Healy 2007) and to process patterns of internal control features (Brown and Solomon 1991).

Vera-Munoz et al. (2001) compared the broad domain experience of auditors to the specialized domain experience of management accountants. One assumption in Vera-Munoz et al.'s study is that the auditors and management accountants in the study have similar training and education. But, the managerial accountants in their study also have procedural knowledge in identifying opportunity costs. Their results suggest that individuals with specialized domain experience have the knowledge structure to solve problems even when the problems are presented in an unfamiliar format. Individuals with broad domain experience, on the other hand, perform better at solving problems when the problem is presented in a familiar format. In practice, IT audit specialists possess specialized domain experience in automated-controls and auditors do not (Weber 1980). So, I compare the audit plan adjustments of auditors to IT audit specialists.

There is evidence that suggests that specialized domain experience may not result in audit plan adjustment differences. For example, Shaft and Vessey (1998) examined the specialized domain experience of twenty-four IT professionals who had procedural knowledge in accounting application programs. Shaft and Vessey determined specialized domain knowledge based on the number of accounting credit hours and the number of years of experience in programming accounting applications. Shaft and Vessey used a within-subjects experimental design where the subjects reviewed lines of computer program code for a payroll accounting application. The participants also reviewed lines of computer program code for a hydrology application where they did not have specialized domain experience. Similar to Shaft and Vessey (1998), I use a within-subjects experimental design but the participants in my study are auditors in an audit planning context. Shaft and Vessey's results suggest that specialized domain experience does not affect the percentage of questions that programmers answered correctly.

Solomon et al. (1999) also provide conflicting evidence on the effects of domain specialization. They analyzed the plausibility of the explanations that auditors provided for two dissimilar client contexts, healthcare and financial institution industries. The auditors in their study had specialized domain experience in one of the two industries. They present mixed results. The auditors who specialized in the healthcare industry were able to take full advantage of their specialized domain knowledge and provide more plausible explanations for financial statement errors and nonerrors in the healthcare context. The auditors who specialized in the financial institution industry, on the other hand, were not able to fully utilize their specialized domain experience. On average, the financial institution specialists provided fewer plausible explanations in their own domain than the healthcare specialists.

I suspect that IT audit specialists have specialized domain experience in automated-controls. I also suspect that IT audit specialists' specialized domain experience in automated-controls derives from their procedural knowledge. Ultimately, procedural knowledge empowers IT audit specialists to possess a deeper structure[10] in automated-controls than auditors. Deep structure is necessary for categorizing and solving problems (Blessings and Ross 1996). Thus, IT audit specialists are experts in automated-controls and their judgments can be used as the criteria to determine the sufficiency of external auditor planning judgments of material-automated-control-weaknesses. I hypothesize that auditors will insufficiently adjust their audit plans for material-automated-control-weaknesses. The hypotheses, stated in the alternative form, are:

H3 Auditors will make smaller adjustments to the audit plan for diagnostic automated-control weaknesses than IT audit specialists.

H4 In the typical audit environment, auditors will make smaller adjustments to the audit plan than IT audit specialists.

RESEARCH METHOD

Participants

Fifty auditors and thirty-seven IT audit specialists from each of the Big 4 accounting firms volunteered and participated in this study. Descriptive data on the participants in the study are provided in Table 1. The auditors had an average of 47.10 months of audit engagement experience where they examined manual-processes. The auditors had worked on an average of 2.58 client engagements where they examined automated-controls. The auditors also had some formal training in IT. On average, auditors completed 1.14 IT courses while they worked professionally and 0.78 IT courses while pursuing their undergraduate degrees. The IT audit specialists had an average of 49.43 months of audit engagement where they examined automated-controls. The IT audit specialists worked on an average of 20.76 client engagements where they examined automated-controls. IT audit specialists completed an average of 7.92 IT courses while they worked professionally and average of 2.95 IT courses while pursuing their undergraduate degrees.

Table 1: Demographics of Experimental Participants Means (Std. Deviations)

	Auditor Type	
	External Auditors	IT Audit Specialists
n	50	37
Area of Specialized Domain Experience	Manual Processes	Automated Controls
Estimated Months of Experience in Specialized Domain Area	47.10	49.43
	(51.29)	(39.66)
Estimated Number of Engagements Where Participants Reviewed Automated Controls	2.58	20.76
	(3.86)	(26.82)
Estimated Number of IT Training Courses Taken as a Professional	1.14	7.92
	(2.22)	(8.14)
Estimated Number of IT Training Courses Taken While Pursuing Undergraduate Degree	0.78	2.95
	(1.11)	(3.64)

Pre-testing

Two rounds of pre-testing were used. The cues were pre-tested in the first round by two Big Four senior managers who were both licensed as Certified Public Accountants and Certified Information System Auditors. Both senior managers were employed with two different Big Four accounting firms. During round one of pre-testing, the two senior managers provided input on the contexts and wording of the diagnostic and less-than-diagnostic evidence cues. During the second round of pre-testing, the evidence cues were rated between 1 (least diagnostic) and 100 (most diagnostic) by four Big Four IT audit specialists and four Big Four auditors. Both rounds of pre-testing revealed which evidence cues were diagnostic cues and which cues were less-than-diagnostic cues. The average rating for the diagnostic material manual-process weakness is 90. The average rating for the diagnostic material-automated-control-weakness is 80. The average ratings for the four less-than-diagnostic manual-process cues ranged between 2.6 and 15.9. The average ratings for the four less-than-diagnostic automated-control cues ranged between 3.8 and 22.6.

CASE MATERIAL

Auditors and IT audit specialists read an overview that summarized the purpose for the study. The auditors and IT audit specialists then acknowledged that they were interested in the results of the study and volunteered to participate (the participant response rate was 91 percent). Then I provided each participant with a password and a personal identification number (PIN). Participants used their password to enter the program. After reading the general instructions, participants entered their PIN and provided their formal consent to participate in the study.

Participants initially rated the effectiveness of the prior year's controls after reading a brief narrative about a hypothetical financial institution and an excerpt from the hypothetical company's unqualified independent internal control opinion of the previous year. The 7-point scale was labeled from left to right as "extremely effective" (coded as 1), "effective" (coded as 2), "somewhat effective" (coded as 3), "neutral" (coded as 4), "somewhat ineffective" (coded as 5), "ineffective" (coded as 6), and "extremely ineffective" (coded as 7). The purpose of this step was to allow the participants to establish a baseline perception of the effectiveness of internal controls in the prior year. The average baseline rating was 2.15. So the participants felt that the internal controls were effective in the prior year.

Half of the participants were randomly assigned to the manual-process evidence domain first and then to the automated-control evidence domain. The remaining participants were assigned to the automated-control evidence domain first and then to the manual-process evidence domain second. The order that the participants encountered the evidence cues were not significant ($t = 0.64$, p-value = 0.190).

Participants' audit plan adjustments were collected via a computer program that was designed according to the Tailored Design Method (Dilman 2007). The program controlled for order effects by randomizing the presentation order of the setting evidence cues and the program also controlled the order in which the participants completed the tasks in the experiment (Favere-Marchesi 2006). The program mandated responses when necessary and prevented the changing of responses once participants had already answered a question and proceeded to the next webpage. Participants were not subject to any time pressure and spent an average of 38.15 minutes completing the experiment.

Similar to Nisbett et al. (1981) and Hoffman and Patton (1997), I gave participants four less-than-diagnostic cues and one diagnostic cue (for each internal control evidence domain). Participants were given the opportunity to adjust the audit plan after reading four less-than-diagnostic manual-process cues (or automated-control cues depending on initial order assignment) with the diagnostic material manual-process weakness cue (or diagnostic automated-control weakness cue depending on the order of the initial assignment). Participants were then given the opportunity to adjust the audit plan based only on the diagnostic manual-process weakness cue (or diagnostic automated-control weakness depending on the order of the initial assignment). Participants repeated these steps for the remaining internal control evidence domain.

Participants were asked to provide their audit plan adjustment. They rated the number of audit hours necessary to effectively complete the audit relative to the prior year on an 11-point scale. The scale contained three labels, “Significantly Decrease” (coded as 1), “Do Not Adjust” (Coded as 6), or “Significantly Decrease” (coded as 11). The remaining points on the scale were not labeled. The participants then responded to six multiple choice questions related to internal control evidence domain from Gleim and Hillison’s (2006) professional examination preparation guide. The multiple choice questions were intended to distract participants from the next internal control evidence domain case. Participants were then prompted to repeat these steps for the next internal control evidence domain case. After completing the second internal control evidence domain case, participants completed six multiple choice questions for the more recent internal control evidence domain case, a background questionnaire, six new multiple choice questions that dealt with Electronic Fund Transfers, and a manipulation check.

ANALYSIS AND RESULTS

Table 2 provides the means and standard deviations of the auditors’ audit plan adjustments. The mean response and standard deviation of the auditors’ judgments for the diagnostic material-automated-control-weakness was 8.02 and 1.62, respectively. The mean response and standard deviation of the auditors’ audit plan adjustments for the same diagnostic material-automated-control weakness when combined with less-than-diagnostic automated-control evidence was 7.20 and 1.92, respectively. The mean response and standard deviation of the auditors’ judgments for the diagnostic material manual-process weakness was 9.04 and 1.67, respectively. The mean response and standard deviation of the auditors’ planning adjustments for the same diagnostic material-manual-process weakness when combined with less-than-diagnostic manual-process evidence was 7.78 and 1.46, respectively.

The mean response and standard deviation of the IT audit specialists’ audit plan adjustments for the diagnostic material-automated-control-weakness was 8.46 and 1.41, respectively. This information is also provided in Table 2. The mean response and standard deviation of the IT auditor specialists’ planning adjustments for the same diagnostic material-automated-control-weakness when combined with less-than-diagnostic automated-control evidence was 7.86 and 1.32, respectively.

Table 2: Means (Std. Deviations) of Audit Plan Adjustments			
	External Auditors	IT Audit	
	Specialized Doman Experience	Specialists	
	NO	YES	
Influence of less-than-diagnostic evidence	Automated Control Domain	Manual Process Domain	Automated Control Domain
Diagnostic Only (material weakness alone)	8.02	9.04	8.46
	(1.62)	(1.67)	(1.41)
Diagnostic with Less-than- diagnostic evidence	7.20	7.78	7.86
	(1.92)	(1.46)	(1.32)

Please observe in Figure 3 that the auditors' lowest mean audit plan adjustment is for the material-automated-control-weakness with less-than-diagnostic evidence. Meanwhile, the auditors' highest mean audit plan adjustment is for the diagnostic material-manual-process weakness. Moreover, auditors' adjustments, in general, are higher for the manual process domain than the automated control domain. This graph of the means of auditors' audit plan adjustments depicts insufficient audit plan adjustments for automated-control weaknesses by auditors.

The results to the test of my hypotheses are provided in Table 3, Table 4, and Table 5. H1a predicts that auditors' audit plan adjustments for manual-process evidence would be lower when less-than-diagnostic evidence is present than when less-than-diagnostic evidence is not present. This would mean that the less-than-diagnostic manual-process evidence influence auditors to reduce their audit plan adjustments for material manual-process weaknesses. As predicted, H1a is significant ($t = 5.07$, $p = <.0001$). When less-than-diagnostic manual-process evidence is mixed with diagnostic material-manual-process evidence, the average auditor adjustment is only 7.78 (1.46 standard deviations). When diagnostic material-manual-process evidence is the only evidence is present, the average auditor adjustment is 9.04 (1.67 standard deviations).

H1b predicts that auditors' audit plan adjustments for automated-controls will be lower when less-than-diagnostic evidence is present than when less-than-diagnostic evidence is not present. This would mean that less-than-diagnostic automated-control evidence influence auditors to reduce audit plan adjustments for material-automated-control-weaknesses. As predicted, H1b is significant ($t = 2.90$, $p = .0028$). When less-than-diagnostic automated-control evidence is mixed with diagnostic material-automated-control evidence, the average auditor adjustment is only 7.20 (1.92 standard deviations). When diagnostic material-automated-control evidence is the only evidence is present, the average auditor adjustment is 8.02 (1.62 standard deviations).

Table 3: External Auditors' Audit Plan Adjustments Influence of Less-Than-Diagnostic Evidence							
Paired Samples Tests, One-Tail							
	Within-Subjects						
	Less-than-Diagnostic With Diagnostic		Diagnostic Only Material Weakness Only				
Hypothesis	Mean	Std Dev.	Mean	Std. Dev.	df	t-Statistic	p-value
1a: Manual Process							
Domain	7.78	1.46	9.04	1.67	49	5.07	<0.0001
1b: Automated Control							
Domain	7.20	1.92	8.02	1.62	49	2.90	0.0028
n=50 Response Scale 1-11 (Significantly Decrease – Significantly Increase)							

H2 predicts that auditors' audit plan adjustments of diagnostic material-automated-control-weaknesses will be lower than their audit plan adjustments for diagnostic material-manual-control-weaknesses. This would mean that financial statement auditors do not anticipate that the material-automated-control-weakness used in this study warrants the same magnitude of audit plan adjustment as the material manual-process weakness used in this study. As predicted, H2 is significant ($t = 3.73$, $p = .0002$). The mean (standard deviation) adjustment by auditors for the material-automated-control-weakness is 8.02 (1.62). The mean (standard deviation) adjustment by auditors for the material-manual-process-weakness is 9.04 (1.67).

Table 4: External Auditors' Audit Plan Adjustments Evidence Domain Comparison							
Paired Samples Tests, One-Tail							
	Within-Subjects						
	Material Automated Control Weakness		Material Manual Process Weakness				
Hypothesis	Mean	Std Dev	Mean	Std. Dev.	df	t-Statistic	p-value
2. Evidence	8.02	1.62	9.04	1.67	49	3.73	0.0002
n=50 Response Scale 1-11 (Significantly Decrease – Significantly Increase)							

H3 predicts that auditors will make smaller adjustments to the audit plan for diagnostic automated-control weaknesses than IT audit specialists. The statistical results are displayed in Table 5. For auditors, the mean audit plan adjustments for the material-automated-control-weakness and the standard deviation are 8.02 and 1.62, respectively. For IT audit specialists, the mean audit plan adjustments for the material-automated-control-weakness and the standard deviation is 8.46 and 1.41, respectively. H3 cannot be rejected ($t = 1.32$, $p = <.095$).

Table 5: Audit Plan Adjustments Automated Control Domain Evidence							
Independent Samples, One-Tail							
	Between-Subjects						
	n=50		n=37				
	External Auditors		IT Audit Specialists				
Hypothesis	Mean	Std Dev.	Mean	Std. Dev.	df	t-Statistic	p-value
3: Diagnostic Only	8.02	1.62	8.46	1.41	85	1.32	0.0950
4: Typical Audit Environment, Less-Than-Diagnostic With Diagnostic	7.20	1.92	7.86	1.321	84.6	1.92	0.0291
Response Scale 1-11 (Significantly Decrease – Significantly Increase)							

The results in table 5 suggest that IT audit specialists and auditors make similar adjustments to the audit plan in the case of automated-control evidence. This result also suggests that IT audit specialists do not overreact to automated-control weaknesses. I say this because the IT audit specialists' adjustments to the audit plan are statistically similar to auditors' audit plan adjustments. This result is consistent with the survey results found in Haskins (1987) where auditors rated automated-controls and manual-process authorization as two of the most important attributes in a client's control system. The two diagnostic cues in my study are directly related to these attributes presented in Haskins 1987.

In an ideal audit setting, auditors may be able to examine only diagnostic pieces of evidence without the distraction of less-than-diagnostic evidence. But generally, auditors have to consider diagnostic evidence and less-than-diagnostic evidence simultaneously (Hackenbrack 1992). For auditors, the mean (standard deviation) audit plan adjustments for the material-automated-control-weakness with less-than-diagnostic automated-control evidence are 7.20 (1.92), respectively. For IT audit specialists, the mean (standard deviation) audit plan adjustments for the material-automated-control-weakness with less-than-diagnostic automated-control evidence are standard deviation is 7.86 (1.32), respectively. H4 predicts that auditors will make smaller adjustments to the audit plan than IT audit specialists. As predicted, H4 is significant, ($t = 1.92$, $p = .0291$). This result suggests that auditors insufficiently adjust their audit plans for material-automated-control-weaknesses when less-than-diagnostic evidence is also present.

In my study, I investigate whether auditors sufficiently adjust their audit plans for material-automated-control-weaknesses. I also investigate whether auditors' audit plan adjustments are influenced by less-than-diagnostic evidence. The results of my H4 suggest that auditors do not sufficiently adjust their audit plan for automated-control weaknesses. The implication of my results for practitioners is that auditors may want to seek the advice of IT audit specialists before revising the audit plan for automated-control weaknesses. Thus, specialized domain knowledge of automated-controls may mitigate the influence of less-than-diagnostic evidence.

I compared the auditors in my study based on the classifications provided in Shelton (1999). The result of my analysis is provided in Table 6. The mean audit plan adjustments of the more-experienced auditors (rank above senior-level auditors) and the standard deviations of their adjustments are 8.42 and 1.38, respectively.

Table 6: Additional Analysis Audit Plan Adjustments Automated Control Domain Evidence							
Independent Samples, One-Tail							
	Between-Subjects						
	n=50 External Auditors		n=37 IT Audit Specialists				
Hypothesis	Mean	Std Dev	Mean	Std. Dev.	df	t-Statistic	p-value
3: Diagnostic Only	8.02	1.62	8.46	1.41	85	1.32	0.0950
4: Typical Audit Environment Less-Than-Diagnostic With Diagnostic	7.20	1.92	7.86	1.321	84.6	1.92	0.0291
Response Scale 1-11 (Significantly Decrease – Significantly Increase)							

The mean audit plan adjustments of the less-experienced auditors (senior-level auditors) and the standard deviations of their adjustments are 7.43 and 1.91, respectively. The audit plan adjustments between the less-experienced auditors and the experienced auditors are not significantly different ($t = 1.49$, $p = 0.0746$). Shelton found that experience, based on external auditor ranks within the firm, mitigates the effect of less-than-diagnostic evidence in going concern judgments. However, numerous studies (e.g., Abdolmohammadi and Wright 1987) question the external validity of studies that use rank within the firm as the method of measuring experience. Less-experienced auditors may lack the procedural knowledge that is necessary to perform a going concern task. In my study, I use an internal control setting because, in practice, auditors are exposed to automated-controls when they conduct audits (Hunton et al. 2004). So, auditors have procedural knowledge in automated-controls but they tend to lack the specialized domain knowledge in automated-controls of IT audit specialists (Weber 1980).

During the exit interview, each of the fifty external auditor participants rated the diagnosticity of both diagnostic evidence cues (one material-automated-control-weakness and one material manual-process weakness) and each of the less-than-diagnostic evidence cues (four less-than-diagnostic automated evidence cues and four less-than-diagnostic manual-process cues). The response scale was -3 to 0 to +3 (significantly irrelevant, neutral, significantly relevant). In Table 7, panel A, the univariate ratings of the diagnosticity ratings are significant ($F = 12.89$, p-value < 0.0001). So, one-way analysis of variance is provided in panel B. As expected, the mean difference between the diagnostic and less-than-diagnostic cues for automated is insignificant (p-value = 0.424). Thus, auditors in my study felt that the less-than-diagnostic automated-control cues were diagnostic to the task when they were not. Although that automated-control means are not significantly different (p-value = 0.424), the diagnostic cue mean is higher, 1.70 (standard deviation 1.18) than the mean for the less-than-diagnostic cues, 1.35 (standard deviation 1.41). In contrast, the auditors did rate the diagnostic manual-process cue significantly higher (p-value < 0.0001) than the less-than-diagnostic cues. The mean for the diagnostic manual-process cue was

2.44 (standard deviation 1.26) and the mean for the less-than-diagnostic cues was 1.05 (standard deviation 1.64).

<table>
<tr><th colspan="8">Table 7: Manipulation Check External Auditors' Diagnosticity Ratings of the Experimental Cues</th></tr>
<tr><td colspan="8">Panel A: Univariate Test of Diagnosticity Ratings During Exit Interview</td></tr>
<tr><td></td><td>df</td><td>SS</td><td colspan="2"></td><td>MS</td><td>F</td><td>p-value</td></tr>
<tr><td>Diagnositicity Rating</td><td>3</td><td>83.94</td><td colspan="2"></td><td>27.98</td><td>12.89</td><td><0.0001</td></tr>
<tr><td>Error</td><td>496</td><td>1076.61</td><td colspan="2"></td><td>2.71</td><td></td><td></td></tr>
<tr><td colspan="8">Panel B: Tukey Analysis of Diagnosticity Ratings During Exit Interview</td></tr>
<tr><td></td><td colspan="2">Diagnostic</td><td colspan="3">Less-than-Diagnostic Mean</td><td></td><td></td></tr>
<tr><td></td><td>(N=50)</td><td>(N=200)</td><td></td><td colspan="2"></td><td></td><td></td></tr>
<tr><td>Internal Control Evidence Domain</td><td>Mean</td><td>Std. Dev.</td><td>Mean</td><td colspan="2">Std. Dev.</td><td>Difference</td><td>p-value</td></tr>
<tr><td>Automated</td><td>1.70</td><td>1.18</td><td>1.35</td><td colspan="2">1.41</td><td>0.35</td><td>0.4240</td></tr>
<tr><td>Manual Process</td><td>2.44</td><td>1.26</td><td>1.05</td><td colspan="2">1.64</td><td>1.39</td><td><0.0001</td></tr>
<tr><td colspan="8">Response Scale -3 to 0 to +3 (Significantly Irrelevant, Neutral, Significantly Relevant)</td></tr>
</table>

I performed a second manipulation check to determine if the subjects were able to identify the source of each domain cue. This information is provided in Table 8. The response scale for this task was 1-6-11 (automated, neutral, manual-process). The mean response for the automated-control domain is 2.86 (standard deviation 2.51). So, the auditors classified the automated-control cues appropriately. The mean response for the manual-process domain cues is above 8.30 (standard deviation 2.87). The auditors also classified the manual-process domain cues appropriately. The domain source ratings for the internal control domains are significantly different ($t = 21.83$, $p < 0.0001$).

<table>
<tr><th colspan="7">Table 8: Manipulation Check External Auditors' Identification of Evidence Domain Source
During Exit Interview</th></tr>
<tr><td colspan="7">Paired Samples Tests, Two-Tail</td></tr>
<tr><td colspan="4">Internal Control Domain</td><td colspan="3" rowspan="2"></td></tr>
<tr><td colspan="2">Automated</td><td colspan="2">Manual Process</td></tr>
<tr><td>Mean</td><td>Std. Dev.</td><td>Mean</td><td>Std. Dev.</td><td>df</td><td>t-Statistic</td><td>p-value</td></tr>
<tr><td>2.86</td><td>2.51</td><td>8.30</td><td>2.87</td><td>249</td><td>21.834</td><td><0.0001</td></tr>
<tr><td colspan="7">n=250
Response Scale 1-6-11 (Automated, Neutral, Manual Process)</td></tr>
</table>

CONCLUSIONS

In this study, I investigate whether auditors sufficiently adjust their audit plans for material-automated-control-weaknesses. I also investigate whether auditors' audit plan adjustments are influenced by less-than-diagnostic evidence. My results suggest that auditors do not sufficiently adjust their audit plan for automated-control weaknesses. My results also suggest that auditors are influenced by less-than-diagnostic evidence. The implication of my results is that auditors may want to seek the advice of IT audit specialists before adjusting their audit plans for automated-control weaknesses. IT audit specialists' specialized domain experience of automated-controls may mitigate the influence of less-than-diagnostic automated-control evidence.

I extend Shelton (1999). Shelton found that experience, based on external auditor rank within the firm, mitigates the effect of less-than-diagnostic evidence in going concern judgments. But, many question the external validity of studies that use rank within the firm as the method of measuring experience (e.g., Abdolmohammadi and Wright 1987). Less-experienced auditors may lack the procedural knowledge that is necessary to perform a going concern task. In my study, I use an internal control setting that emulates a common situation in practice where auditors are exposed to automated-controls during audits (Hunton et al. 2004). So, auditors have procedural knowledge in automated-controls but they tend to lack the specialized domain experience in automated-controls of IT audit specialists. I find that specialized domain experience mitigates the influence of less-than-diagnostic evidence but experience, based on rank within the firm, does not mitigate the influence of less-than-diagnostic evidence.

Accounting firms may be able to reduce their likelihood of audit failure if they involve professionals with specialized domain experience in the planning stages of the audit. Professionals with specialized domain experience may provide more optimal judgments than auditors without specialized domain experience. Most importantly, professionals with specialized domain experience may improve the effectiveness of audits. However, the auditor decides whether or not to consult with professionals with specialized domain experience. This paper is only a first step toward addressing this issue. In my study, I investigate one internal control evidence domain (automated-control or manual-process) at a time without blending evidence from the two different internal control domains. I intentionally separate the two internal control evidence domains so that procedural knowledge would not be confounded and to simplify the experimental task. I also use less-than-diagnostic evidence that would induce under-auditing because under-auditing contributes to the issue that is the utmost concern for accounting firms, audit failure (Louwers, et al. 2008). Additionally, it is also unclear how auditors would use input from IT audit specialists when they adjust their audit plans for automated-control-weaknesses. These issues await further empirical investigation.

ENDNOTES

1. I define less-than-diagnostic evidence as information that is of little value for a specific judgment outcome. Nisbett et al. (1981) used the term "nondiagnostic" in a similar manner. Hilton and Fein (1989), Macrae et al. (1992), and Waller and Zimbelman (2003) examined how nondiagnostic information reduced outcome predictions. I too restrict my examination to the reduction of outcome predictions (audit planning adjustments) in order to emphasize the potential for audit failure in the contemporary post Sarbanes-Oxley environment. Previous accounting studies used the term nondiagnostic and "seemingly irrelevant" interchangeably to investigate increases and reductions in outcome predictions (e.g., Hackenbrack 1992). In my experiment, over- adjustments to the audit plan by auditors may only signal over-auditing. I do not

examine over-auditing because over-auditing does not generally contribute to the audit failure problem, but under-auditing does contribute to audit failure (Louwers et al 2008).

2. Specialized domain experience means procedural knowledge that is gained through experience in a specialized domain (Vera-Munoz et al. 2001).

3. In the typical audit setting, auditors encounter diagnostic evidence comingled with less-than-diagnostic evidence (Hackenbrack 1992; Glover 1997; Hoffman and Patton 1997 Shelton 1999) and multiple internal control cues (per Brown and Solomon 1991) in the form of automated-control evidence and manual-process evidence (Duffy 2004; Borthick et al. 2006).

4. Audit failure occurs when financial statements include a material misstatement and users of the financial statement reply on those financial statements (Louwers, et al. 2008).

5. Per Duffy (2004), manual-processes are internal controls that are expedited by human personnel within the control system. Auditors do not need specialized domain skills in IT when they evaluate manual-process evidence.

6. Procedural knowledge: Stored information about if-then rules that provide situation-specific solutions to problems (Vera-Munoz et al. 2001).

7. Information that is useful for a specific judgment outcome (Nisbett et al. 1981; Hilton and Fein 1989; Macrae et al. 1992; and Young et al. 2001).

8. CobIT stands for Control Objectives for Information and related Technology and is used for information system audits.

9. I describe audit planning as unstructured because, per Abdolmohammadi and Wright (1987), it involves a judgment with infinite alternatives, also with few or no guidelines available.

10. Deep structure knowledge is defined as the set of principles or equations important for solving the problems (Blessings and Ross 1996).

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