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Decision Framing and Efficiency/Effectiveness Trade-Offs in Auditors' Planning Materiality Judgments

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DECISION FRAMING AND EFFICIENCY/EFFECTIVENESS TRADE-OFFS IN AUDITORS' PLANNING MATERIALITY JUDGMENTS

DISSERTATION

Presented in Partial Fulfillment of the Requirements for

the Degree Doctor of Philosophy

in the Graduate School of The Ohio State University

By

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* * * * *

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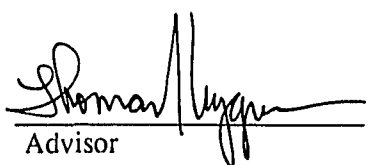

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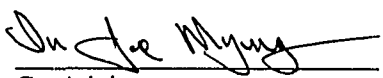

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For all those whose lives have touched and will touch mine...
especially to my incomparable Binu Bagga

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INTRODUCTION

0.1 Why Study Professional Judgment?

The exercise of judgment is not only essential to the practice of disciplines such as law, medicine and accounting, but is also what distinguishes these domains as professions (Boritz, Gaber & Lemon, 1987, cited in Gibbins & Mason, 1988). Recent advances in cognitive psychology research have given an impetus to research focusing on the nature of professional judgment, expert-novice cognition, heuristics and biases in decision making as well as decision strategies, the acquisition of knowledge and the effects of experience, and the development of expert/decision support systems (Ashton, 1982a; Smith & Kida, 1991; Chi, Glaser & Farr, 1988). The central importance of experience and the interaction of judgment with professional expertise and standards is evident from works devoted to explicating "professional judgment" in medicine (Dowie & Elstein, 1988) and accounting (Gibbins & Mason, 1988). Internally, exponential growth in knowledge and burgeoning technology have made it extremely difficult for "experts" to keep abreast of all new developments; externally, rising public expectations and lawsuits have significantly altered the institutional and legal contexts within which professional-client relations occur (Dowie & Elstein, 1988). In an environment calling for greater accountability for professional judgments, the basis for the exercise of professional judgment is increasingly coming under scrutiny: Experts are being compelled

to disclose how they reached their conclusions, what reasoning they employed, what evidence they relied upon (Simon, 1977).

It is imperative that professional judgment and decision making be actively studied, for we cannot proceed to improve a process unless we first understand it (Hogarth, 1991; Ashton, 1982b). With the appropriate strategy, methods, and techniques, theories from cognitive science can be usefully integrated with the applied theory of any practicing profession to the benefit of both disciplines (Skipper, Diers, & Leonard, 1967; Smith & Kida, 1991; Ashton, Kleinmuntz, Sullivan & Tomassini, 1988). Given the preponderance of professional judgment across domains, such research will likely enable us to understand the nature of expertise and thus provide the foundation for developing a general theory of expertise.

0.2 Professional Judgment in Auditing

The professional auditing environment is dynamic, uncertain and complex (Joyce & Libby, 1982). To cope with such a challenging environment, there exists a strong motivation to understand, evaluate and improve professional audit judgment performance (see Ashton, 1988; Ashton et al., 1988). The origins of the "auditing school" of behavioral accounting research date back to the 1970s (e.g., Ashton,1974a; Boatsman & Robertson,1974[1]), supplemented by Ashton's (1974b) exploration of the relevance of Brunswik's (1952) lens model and Libby's (1975) application of the lens model to

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[1] As one of the earliest published papers in audit judgment research, it is interesting to note that the topic of Boatsman & Robertson (1974) was "policy capturing" on selected materiality judgments of auditors.

investigate both the predictability and stability of loan officers' judgments. Within a few years, research interest in studying professional audit judgment surged, and Libby's (1981) book and Ashton's (1982a) monograph became influential reviews of human information processing research in accounting that carved out behavioral auditing research as an important area of interdisciplinary research in accounting (Birnberg & Shields, 1989). However, it should be pointed out that the systematic study of auditors' professional judgment requires careful consideration of several methodological issues. In general, research investigating professional judgment by auditors should seek to simulate the naturalistic settings in which auditors function, it should preferably make use of realistic tasks and use professional auditors as subjects, and most important, it should address questions whose answers have significant implications either from theoretical, applied, or both perspectives (e.g., Smith & Kida, 1991; Hogarth, 1981; Hogarth & Makridakis, 1981; Libby, 1989).

0.3 Goals of Study

The Commission on Auditors' Responsibilities (1978) observed that judgment pervades accounting and auditing, and especially so, in resolving questions of *materiality* and adequacy of disclosure. This dissertation study seeks to better understand how professional auditors make planning materiality judgments, a general planning decision that is typically made at the inception of an audit (for those unfamiliar with the auditing profession and the audit process, an outline is provided in Appendix A). This research has an interdisciplinary orientation and attempts to integrate research from the psychology

of judgment and decision making with the research and professional literature in auditing. In particular, the dissertation study uses experimental methods from psychology to examine the factors that influence auditors' judgments under varying conditions. It is hoped that the findings from this study will have implications both for advancing research in the psychology of decision making and judgment and in auditing, and, given the participation of professional auditors, yield insights that have direct relevance for the audit practice environment.

0.4 Organization of Dissertation

The dissertation is organized as follows. Chapter I provides an overview of the issues, conceptual and methodological, that make the study of auditors' planning materiality judgments both important and challenging. Chapter II proceeds to develop the theory, drawn from research in the psychology of judgment and decision making and from the professional and research literature on auditing, which undergirds the hypotheses to be tested in this study. Chapter III describes the method used for collecting data, including experimental materials and procedures employed. Chapter IV provides a summary of the data collected, the statistical methods employed to analyze the data, and the major results obtained. Chapter V is intended to be a discussion section: significant findings from Chapter IV and their implications are discussed. Finally, Chapter VI offers concluding comments, including an acknowledgment of the limitations of the study as well as suggestions for future research.

CHAPTER I

CONCEPTUAL AND METHODOLOGICAL ISSUES

1.0 Introduction

The purpose of this study is to investigate how auditors use professional judgment in making an important quantitative determination during the planning phase of an audit. The research motivation primarily arises from concerns about professional auditing practice (i.e., it is problem-centered) and the methodology is responsive to recommendations made by Gibbins & Jamal (1993), and Shanteau (1987, 1989) which are delineated in section 1.2. Part of the motivation for this dissertation topic also emerges from a similar, earlier study by the author, reported in Ramamoorti & Myung (1994). Although this dissertation study examines very different issues and has professional auditors rather than students as participants, the technique used for eliciting materiality judgments (i.e., programming in Microsoft's *Visual Basic* to create a computer-administered experimental task environment featuring a mouse-supported point-and-click interface) is very similar and draws upon the author's earlier experience.

In section 1.1, the early portion of this chapter, the motivation for the research topic is provided. Next, in section 1.2, focused literature reviews including state-of-the art overviews of behavioral auditing research, the psychology of judgment and decision making, and auditing theory and practice, are presented. This is followed by a discussion, in section 1.3, of a conceptual framework for auditors' planning materiality

judgments, a general "process" model that appears to underlie the making of materiality judgments and finally, the role played by decision framing and efficiency/effectiveness trade-offs in these judgments. Section 1.4 addresses some methodological issues in such research, including questions pertaining to external validity. Finally, section 1.5 summarizes anticipated contributions of the study.

1.1 Why Study Auditors' Planning Materiality Judgments?

Decisions made by an auditor at the planning stage are important because they set the stage for the design of all subsequent audit procedures--thus, poor planning judgments will likely lead to the undesirable outcome of conducting an inefficient and/or ineffective audit (Robertson & Davis, 1988). At the inception of an audit, an important general planning decision is making a preliminary judgment about the amount to be considered material to the financial statements taken as a whole (Statement on Auditing Standards (SAS) 47, AICPA, 1983). "Materiality" is an accounting concept that refers to the magnitude of an omission or misstatement of financial information that would influence a user's decision (FASB, 1980). Materiality helps auditors distinguish the important from the trivial[1] (Hicks, 1964; Carmichael & Willingham, 1989); it enables auditors to direct their efforts to those areas of an audit where the relative risk is greater (SAS 31, AICPA, 1980). Several uses for the "planning materiality" judgment may be

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[1] Selley (1984) cites with approval Hicks' (1964, p.158) short definition of materiality: "If it doesn't really matter, don't bother with it." Indeed, each Financial Accounting Standards Board's (FASB) Statement includes the following remark at its conclusion: "The provisions of this Statement need not be applied to immaterial items."

contemplated: identifying components of financial statements with greater relative risk and to which audit effort should be appropriately directed (SAS 31, AICPA, 1980); branches of a multinational company deemed important to visit; whether specific information about the client needs disclosure, and, of course, the magnitude of an error to be regarded as being material when planning the nature, timing, and extent of specific auditing procedures, including sample size (Carmichael & Willingham, 1989; Robertson & Davis, 1988; Stettler, 1974). Materiality judgments are complex and require considerable knowledge and experience. Stettler (1974, p.109) provides the following partial list of factors that would make a figure or difference *more material*: (a) the factor base can be precisely determined (cash) or is merely an approximation (depreciation); (b) the percentage of a difference is relative to a normal amount of net income, rather than an abnormally low net income; (c) the difference would cause an existing trend in the figures to be reversed rather than reinforced; (d) the difference would affect a relatively important total, such as current assets, rather than noncurrent assets; (e) there are other similar differences that affect a given figure, and the differences have a cumulative rather than a canceling effect. Stettler (1974) argues that the melding of "materiality, relative risk, and the reliability of the evidence being sampled" in the determination of sample size requires considerable professional skill, acquired through extensive experience.

Although materiality judgments are complex, they lie at the very heart of auditing and are critical in determining the scope of an audit (Krogstad, Ettenson & Shanteau, 1984). This study seeks to address, at least in part, a question posed by Ashton et al. (1988, p. 114) as being worthy of further research: "To what extent do audit decision

frames influence risk assessment, materiality judgments, and planning in the audit process?" Solomon & Krogstad (1988, pp. 5-6) also call for further research in this area of audit judgment by asserting that "...investigations of *how* and *how well* auditors perform this task [assessing materiality] would be very worthwhile" (emphases added).

Past research in auditing has noted significant variance in auditors' materiality judgments (see, for example, Pany & Wheeler, 1989; Mayper, 1982; Mayper, Doucet & Warren, 1989), presumably leading to differences in audit scope decisions. However, in the absence of quantitative guidelines from the profession this may be expected to happen to some extent.[2] Moreover, Bonner and Pennington (1991) have concluded that past research has shown auditors to make "poor" decisions with respect to planning materiality judgments (see also, Moriarity & Barron, 1979; Newton, 1977; and Ward, 1976). Low consensus among professional auditors with reference to materiality judgments is disturbing because of the attendant differences in audit scope decisions and the adverse implications for audit efficiency and effectiveness (Leslie, 1977; Elliott, 1977; Elliott, 1981). While previous studies have acknowledged the role of contextual factors and experience levels in explaining this low consensus, the influence of psychological (i.e., cognitive and motivational) variables has yet to be systematically explored with reference to the making of planning materiality judgments.

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[2] Further, Cushing & Loebbecke (1986) in their comparison of the methodologies of 12 public large accounting firms point out that generally, all participant firms comply with Generally Accepted Auditing Standards (GAAS) with the only possible exception being inadequate consideration of preliminary estimates of materiality during audit planning.

A substantial amount of research in psychology has focused on the cognitive and motivational factors that influence judgment and decision making behavior. Two behavioral decision theories are particularly relevant for this study, viz., Kahneman & Tversky's (1979) prospect theory, and Hogarth & Einhorn's (1990) venture theory. Further, investigation of the mediating effects of decision strategies (e.g., efficiency/effectiveness trade-offs) with respect to the manner in which a problem is represented is also planned.

By way of a literature review, we will now examine the extant research in the psychology of judgment and decision making and in auditing theory and practice which bear upon the research questions being addressed.

1.2 Literature Review

In this section, an overview of the types of past behavioral auditing research and recommended future directions from the viewpoint of a psychology researcher (Shanteau, 1987; 1989) as well as two accounting researchers (Gibbins & Jamal, 1993) is first presented and discussed. Next, relevant literature from the psychology of judgment and decision making, and from auditing research and professional literature, is reviewed. This review will help clarify the substantive content of the interdisciplinary research questions sought to be addressed.

1.2.1 Past Behavioral Auditing Research and Recommended Future Directions

Shanteau (1987) observes that, from his perspective, there have been three types of behavioral auditing studies: replication studies, adaptation studies, and finally, problem-driven studies. Replication studies totally import the methods and procedures used in psychology and check to see whether the original findings replicate with auditors as participants, e.g., behavioral auditing research on heuristics and biases (see Smith & Kida, 1991, for a review of this line of research). Clearly, replication studies lag developments in psychology research and offer little advance in theory, methodology or analysis as compared to the original psychological research. Adaptation studies examine research issues that have their roots in auditing but use the methods of behavioral research. While such studies constitute an advance over replication research, they may prove insufficient to investigate many complex issues in auditing, e.g., technical and policy issues in auditing. Finally, unlike the first two types of studies which are largely "spin-offs" from extant behavioral research, problem-driven studies are designed uniquely around the concerns of behavioral auditing and lead to their own methods and procedures. Shanteau (1989) asserts that future behavioral research should be such problem-driven research, a viewpoint endorsed by Gibbins & Jamal (1993).

Gibbins & Jamal (1993) discuss the importance of problem-centered research and knowledge-based theory in professional accounting settings to enhance the contributions of accounting judgment research to theory development and accounting practice. In particular, Gibbins & Jamal (1993, p. 451) emphasize that research effort could be greatly improved by a "mutually reinforcing combination of theory development and

field-oriented empiricism." Like Shanteau (1987) above, Gibbins & Jamal (1993) also decry the transference of simplified models from psychology which unfortunately lack the very richness of audit settings that makes them challenging. They believe that analogous to the medical profession, there is a need for social definitions of error[3], and taxonomies of accounting tasks and settings, lacking which, inappropriate criteria for performance evaluation are likely to be employed. Calling for a highly task-oriented theory development that emphasizes accounting tasks and their internal representations, Gibbins & Jamal (1993) point to the need for "exploratory and descriptive studies in ecologically rich settings," preferably by creating explicit computer simulations (cf. Hogarth, 1993).

Indeed, a serious attempt has been made in the design and implementation of this study to heed the recommendations made in Shanteau (1987, 1989) and in Gibbins & Jamal (1993). These will be highlighted and discussed in later sections.

1.2.2 Psychology Research: Judgment and Decision Making under Uncertainty

Solomon & Krogstad (1988, p. 5) have argued that "assessing materiality effectively amounts to a special case of formulating judgments under uncertainty." Consequently, it would be useful to trace the history of judgment and decision making under uncertainty, starting with Daniel Bernoulli, the 18th century mathematician.

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[3] In this connection, Gibbins & Jamal (1993, p. 454) observe that Bosk (1979) was able to report that physicians classified errors as "judgmental" (good decision under uncertainty, bad outcome), "technical" (mistakes made in learning the task but hopefully not repeated) and "normative" (disregard of accepted standards of conduct).

Because the language of probability can be used to capture the notion of uncertainty, Bernoulli (1738/1954) proposed a descriptive model of gambling decision behavior based on the definition of mathematical expectation with reference to a probability distribution. Bernoulli's (1738) framework assumes that people maximize expected utility in choosing among gambles. The expected utility E(U) of a gamble can be simply stated as follows:

$$E(U) = \sum_{i=1}^{n} p_i U(x_i) \qquad (1.1)$$

where $U(x_i)$ is the utility of the i-th outcome and p_i is the probability of that outcome. Christensen (1982) notes that Bernoulli's (1738) work influenced the subsequent important contribution of Laplace (1814/1952), although both assumed probability and utility to be objectively measurable; indeed, probability and utility were seriously treated as subjective quantities only after Ramsey (1925). Although some mathematicians and economists, notably Edgeworth (1881), Marshall (1890), Cournot (1897), de Finetti (1937) and Roy (1942) discussed the notion of utility in some detail, few attempts since Bernoulli (1738) were successful in describing functions relating utility to various objective magnitudes. Von Neumann & Morgenstern (1944/1947) were the first to axiomatize the notion of expected utility (EU) maximization: they demonstrated the feasibility of an empirical solution to this problem by proving that if a person's preferences possess certain elements of consistency, then it is possible to relate apparent utilities to the pattern of preferences of the person between every possible pair of gambles (Christensen, 1982). Indeed, the axiom system proposed by von Neumann &

Morgenstern (1947) was so reasonable and the chosen axioms so appealing that their EU model quickly became the major paradigm of rational decision making behavior, *normatively* in management science, *predictively* in economics and finance, and *descriptively* in psychology (Schoemaker, 1982; Hilton, 1985). Subsequently, in the 1950s, both Savage (1954) and Edwards (1954) proposed subjectively expected utility (SEU) models wherein a subjective probability function is used along with a utility function to represent risky preferences. Several variants of the EU model have since appeared in the literature, and an excellent summary of this line of research is provided by Schoemaker (1982).

Although the EU and SEU models of decision making behavior have dominated the literature for several decades, they do not offer a sufficiently rich descriptive theory of problem representation and therefore, it is no surprise that they do not readily predict new context effects (Schoemaker, 1982). Indeed, systematic violations of most of the basic axioms of EU theory have been found to occur (e.g., Davidson, Siegal & Suppes, 1957; Coombs, 1975; Tversky, 1969; Kunreuther, 1976), leading Schoemaker (1982, p.548) to conclude that the failure of the EU model, both descriptively and predictively, is directly attributable to its "inadequate recognition of various psychological principles of judgment and choice." Increasing dissatisfaction with the descriptive capacity of the EU model prompted Kahneman & Tversky (1979) to develop an alternative model called "prospect theory," which, at least one applied researcher enthusiastically hails as the "...most important advance in our understanding of behavioral decision-making processes in the last 20 years" (Bazerman, 1994, p.73).

The essential ingredients of Kahneman & Tversky's (1979) prospect theory are now described. Unlike EU models, prospect theory underscores the importance of *decision framing*[4] in understanding choice behavior. Prospect theory assumes that a decision maker initially "edits" a problem. Editing operations include determining what reference point to use ("coding"), deleting terms common to both options ("canceling") and ruling out dominated options ("eliminating"). Then, in the second phase, edited alternatives are evaluated using an expectation-type model of the following form:

$$V = \Sigma\ \pi(p_i)v(x_i) \tag{1.2}$$

where p_i represents the probability of outcome x_i occurring for $i = 1,\ldots,n$; $\pi(p_i)$ is a probability weighting function and $v(x_i)$ a value function. Because editing operations precede evaluation, the manner in which problem representations produce particular conceptualizations (or "decision framing") during editing exerts a powerful influence in determining how a problem is evaluated.

It should be noted that although the π function relates to decision weights applied to the given probabilities, $\Sigma\pi(p_i)$ need not sum to 1; consequently, decision weights are distinct from being merely subjective probability transformations. An interesting property of the shape of the π function is that it permits overweighting of small probabilities and underweighting of large probabilities. The value function, $v(x_i)$, is

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[4] Kahneman & Tversky (1984) defined framing as a cognitive perspective elicited by task characteristics; they have demonstrated that subjects respond differently to stimulus restatements that are logically equivalent, e.g., is the glass half full or half empty?

defined in terms of levels and changes in current, rather than terminal, wealth position (assessed relative to a fixed "reference point") for a utility function. The reference point, in turn, depends on framing of the decision (negative, if a loss, and positive, if a gain). The shape of the value function is such that it is concave for gains (implying risk averse behavior) and convex for losses (implying risk seeking behavior); this differs from traditional utility theory models which assume risk aversion throughout. Following Bazerman (1984), the major "tenets" of prospect theory can be summarized thus: (i) gains and losses are evaluated relative to a neutral reference point, (ii) potential outcomes are typically expressed as gains or losses relative to this fixed reference point, and (iii) the resulting change in the financial position is assessed by an S-shaped value function, with an added implication that decision makers respond to losses in a more extreme fashion than they respond to gains. In summary, prospect theory holds that among the crucial components of decision making behavior are factors such as the manner in which decision problems are coded and edited, and the location of the reference point (Kim, 1992).

Hogarth & Einhorn's (1990) "venture theory" attempts to offer some psychological support to the decision weight, or π function, in prospect theory. Using the prospect theory value function, Hogarth & Einhorn (1990) have developed venture theory which provides an account of how decision weights (which appear to replace probabilities when people evaluate risky outcomes) are influenced by variables that are both cognitive and motivational in origin. Venture theory assumes that people initially anchor on a stated probability and, depending on factors like the absolute size of payoffs,

the extent to which the anchor deviates from the extremes of 0 and 1, and the level of perceived ambiguity concerning the relevant probability, adjust the anchor by mentally simulating other possible values. The net effect of the adjustment, with reference to the anchor, reflects the relative weight given in imagination to values above as opposed to below the anchor. The relative weight is regarded as a function of both individual and situational variables, particularly the sign and size of payoffs. Specifically, to make Hogarth & Einhorn's (1990, p. 783) "venture theory" model operational, it is necessary to specify: "...(1) how the anchor, p_A, is established, (2) what affects the *amount* of mental simulation, and (3) what determines the *sign* or direction of the adjustment process." Because the present study will elicit planning materiality judgments from professional auditors in terms of actual dollar amounts rather than probabilities, it is only possible to use Hogarth & Einhorn's (1990) venture theory as a guiding metaphor for investigating auditors' planning materiality judgments. Indeed, there is sufficient parallelism in the concepts underlying venture theory with the present study's scenario (e.g., "payoffs" and "ambiguity" discussed more fully in Chapter II) that it may be possible to use it to derive predictions as well aid in the interpretation of results.[5]

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[5] Consider, in particular, the following remark of Hogarth & Einhorn (1990, p.800), made with respect to probabilities and decision weights: "The structure of venture theory allows explanations of contextual effects on decision making." This ability of venture theory in explaining contextual (or framing) effects can be profitably exploited in interpreting the results of this study.

1.2.3 Materiality in Professional Auditing Literature and Prior Research

Statement on Auditing Standards #47 (AICPA, 1983) distinguishes between the preliminary judgment made about materiality for audit planning (planning materiality) and the subsequent revision of this preliminary judgment owing to circumstances arising during the audit (evaluative materiality). Planning materiality establishes the precision of an auditor's verification procedures; it determines how much misstatement auditing procedures are (should be) designed to detect (Solomon & Krogstad, 1988). Although evaluative materiality pertains to the interpretation of audit results (i.e., reporting/disclosure issues), planning materiality and evaluative materiality are nevertheless linked because insufficient precision of an auditor's verification procedures may preclude identification of potential material misstatements (SAS 47, AICPA, 1983). Nevertheless, the planning materiality judgment must be made first, and this study primarily concerns itself with planning materiality judgments.

Previous auditing research has devoted considerable attention to an examination of the materiality construct and to factors influencing materiality judgments (see Holstrum & Messier (1982) and Ashton (1982a) for reviews of this extensive literature). Numerous studies have revealed that materiality judgments are complex and are influenced by a host of financial and non-financial factors being particularly sensitive to context effects as well as to the experience level of the materiality planner (Krogstad et al., 1984); also, it has been well-established that auditors' materiality judgments exhibit significant variance (Mayper, 1982; Pany & Wheeler, 1989; Mayper et al., 1989; Elliott, 1977, 1981; Leslie, 1985).

Further, Leslie (1985) notes that the most common bases for materiality computation (and hybrid computations thereof) are (pretax) net income, total revenues, total assets, equity and gross profit, although this finding comes from research in the context of industrial companies (see Holstrum & Messier, 1982; Warren & Elliott, 1986). Other findings and interpretations from past research encompass the following: internationally, 5% to 10% of net income is the most preferred factor base for materiality computation (Pattillo, 1976; Leslie, 1985); materiality intentions may differ from subsequent materiality adjustments (Coakley & Loebbecke, 1985; Icerman & Hillison, 1991); materiality judgments may be systematically influenced by audit firm structure (Morris & Nichols, 1988; Stone & Ingram, 1988; Cushing & Loebbecke, 1986); materiality judgments may be responsive not only to perceived internal control weaknesses (Leslie, 1977) but also to an entity's financial structure and the accounting choices made by management (Leslie, 1985).

However, despite substantial research on audit materiality judgments both of recent origin and in the past three decades (see Ashton et al., 1988; Holstrum & Messier, 1982; Ashton, 1982a), scant attention has been paid to the question of how "decision framing" (i.e., the manner in which a problem is represented) may influence an auditor's perception of the degree of risk associated with a client and the attendant impact on planning materiality judgments. The term "risk" in this context encompasses both audit risk and business risk. Audit risk is the risk that the auditor may unknowingly fail to appropriately modify her opinion on financial statements that are significantly misstated (SAS 47, AICPA, 1983). To decide what constitutes a "significant misstatement" we

need to rely upon the concept of materiality. Business risk represents the risk of loss or injury to an auditor's professional practice from litigation, adverse publicity, or other event arising in connection with financial statements examined or reported upon. Carmichael & Benis (1989) correctly interpret SAS 47 by observing that while increased likelihood of litigation or adverse publicity may increase audit scope, assessing business risk to be low does not provide the auditor with justification to perform less extensive procedures than would otherwise be appropriate under Generally Accepted Auditing Standards (GAAS).

One basic premise of this study is that because the materiality threshold and risk evaluation are inversely related (i.e., higher risk evaluation dictates more audit effort to collect "sufficient" evidence thus implying a lower materiality threshold; see Leslie, 1985; Arens & Loebbecke, 1991; and Carmichael & Benis, 1989), systematically manipulating auditors' perceptions of client risk by introducing "normal audit" and "suspected fraud" scenarios will reveal important insights into the making of the associated materiality judgments. In this connection, the expression "normal audit" corresponds to what Schultz (1982, p.159) labels an "ordinary audit[6]" (i.e., where there are no obvious red flags warranting the auditor's attention) while the "suspected fraud" scenario corresponds to a situation where Grinaker (1980) would suggest "auditing in a fraud mode" as indicated by appropriate warning signals. Another basic premise relies

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[6] Schultz (1982, p.159), somewhat facetiously, argues:"What is an 'ordinary' audit?...An ordinary audit involves an auditee who is not in financial distress, who is not an apparent merger target, who is not intent on spinning off subsidiaries, who is not registering securities, who is not blessed with management of doubtful integrity and who is not encumbered with a lousy internal control system."

on the causal relationship between good internal controls and the decrease in the probability of material error in the financial statements (SAS 1, AICPA, 1972; SAS 55, AICPA, 1988; NCFFR, 1987; COSO, 1992). Obtaining reasonable assurance that the financial statements are not materially misstated is a primary objective of an auditor; consequently, an evaluation of the effectiveness of internal controls automatically enters into materiality judgments because the auditor must inevitably rely on the strength of internal controls to prevent or detect material error (Leslie, 1985). Accordingly, it is reasonable to relate the extent of compliance testing to the planning materiality threshold. In fact, the construction of the experimental task takes into account the implication that perceived weaknesses in internal control would lower planning materiality thresholds, thus increasing audit scope. However, it must be mentioned that the perpetration of management fraud frequently involves the overriding of internal controls; therefore, in such cases one must not look to internal controls that are not designed to prevent or detect this type of fraud (Sullivan, 1988; Wallace, 1991; COSO, 1992).

1.3 Task Conceptualization and Components

This section describes a general "process" model that attempts to portray the planning materiality judgment task as a two-stage process involving an "anchor" that is suitably "adjusted" as more information is received. The later part of the section discusses the role played by decision framing and the importance of decision strategies such as efficiency/effectiveness trade-offs in arriving at these judgments.

1.3.1 General "Process" Model: Anchoring and Adjustment Paradigm

A major aspect of uncertainty is ambiguity, that is, the prevalence of situations where outcomes cannot be precisely, or even probabilistically, specified. Einhorn & Hogarth (1985) have suggested that one means of coping with ambiguity is the use of an anchoring and adjustment strategy: decision makers modify probability judgments through a mental simulation process that takes into account the level of anchor (initial probability), the amount of ambiguity involved, and the decision maker's attitude towards ambiguity. Based on the extensive literature in auditing that suggests professional auditors' use of an "anchoring and adjustment" strategy in arriving at various types of judgments (e.g., Joyce & Biddle, 1981; Kinney & Uecker, 1982; Biggs & Wild, 1985) a model that attempts to broadly characterize the materiality judgment process is now proposed. Typically, an auditor starts out with an initial baseline number (a preliminary calculation that may be based on a rule of thumb, e.g., 5% of pretax income) that is (conservatively) modified in light of new information becoming available (Steele, 1992). To understand the underlying cognitive mechanisms that might be operating, we draw heavily upon Kahneman & Tversky's (1979) "prospect theory" and Hogarth & Einhorn's (1990) more recent "venture theory" outlined earlier. To make this description explicit, consider the following simple mathematical model:

$$J_{PMAT} = J_0 + \Delta_{C/C} \tag{1.3}$$

where J_{PMAT} = the resulting, modified planning-materiality (PMAT) judgment; J_0 = the initial anchor chosen, possibly making use of a materiality rule-of-thumb computation

(i.e., percentage of a computation base chosen); and $\Delta_{C/C}$= the change or adjustment necessitated by the influence of relevant and significant cognitive and/or contextual factors (Figure 1.1 referenced in section 1.4.1 presents a conceptual framework that depicts the cognitive and contextual factors that possibly influence planning-materiality judgments).

The form of equation (1.3) above suggests that planning materiality judgments are subject to continual revision as the audit proceeds and more information is gathered, i.e., a kind of Bayesian updating of the auditor's beliefs occurs (Steele, 1992; Corless, 1972; Felix, 1976; Abdolmohammadi, 1985; Ashton & Ashton, 1988). Consequently, such judgments are best described as dynamic decision tasks that must reflect the time dimension. Unlike static decision tasks which involve only a single stage and a single outcome, dynamic decision tasks are sequential thus allowing for choices and outcomes at later stages to depend on choices and outcomes occurring at earlier stages, giving rise to order effects (Busemeyer & Townsend, 1993; Hogarth & Einhorn, 1992). A host of factors may influence choices in dynamic decision tasks; however, in the audit setting, two important factors seem to be the accumulation of evidence and the provision of feedback as part of the "review process," required by standards of fieldwork with respect to supervision of audit work. This issue is discussed more fully later in section 1.4.2.

1.3.2 Role of Decision Framing and Efficiency/Effectiveness Trade-offs

The manner in which the information about a problem is presented invokes particular "decision frames" (Tversky & Kahneman, 1981) which are simplified mental

structures of the world. This study will use the term decision framing to cover context effects as defined by Helson (1964), including the influence of *stimulus factors, background factors* and *personality factors.* In particular, if the presentation mode evokes negative images for the decision maker, the decision frame induced is "negative," and, similarly, positive images evoke "positive" frames. In an audit setting, a "normal audit" assignment may be viewed as a "neutral" if not a "positive" frame, and thus possesses some plausibility as a reference point; however, a scenario wherein fraud is suspected is most definitely one that induces a "negative" frame. Clearly, the perception of a problem resulting from a positive or negative decision frame can have dramatic effects on the judgment of decision makers; indeed, this is a robust finding from prior research in psychology (Kahneman & Tversky, 1981; Plous, 1993; Bazerman, 1994).

This study, by featuring both "normal audit" as well as "suspected fraud" scenarios, seeks to induce both neutral and negative frames and systematically investigate the magnitude, direction and relative extent of changes in auditors' planning materiality judgments. It can be argued that a client with very low audit risk would certainly evoke a positive frame, hence the remaining part of the study refers to the normal audit scenario as evoking a "positive frame" in order to be consistent with the literature.

Pragmatic, goal-specific considerations such as effectiveness and efficiency have to be taken into account in the conduct of an audit. In this regard, Stevens (1991, p. 22) echoes the Treadway Commission's report (NCFFR, 1987) as follows: "Intense competition among accounting firms contributes to significant pressure on audit fees, often with corresponding pressure to reduce staff, time budgets, and partner involvement

in audit engagements...Such pressures may not be conducive to the thorough investigation of red flags indicating the potential for fraudulent financial reporting, or to the thorough exercise of professional judgment and skepticism." Despite these very real pressures, professional auditors do strive to strike a balance between conflicting goals of effectiveness and efficiency. This is reflected in their focus on careful planning and budgeting of time, cost and audit effort (efficiency criteria) while not compromising on the quality of the audit (effectiveness criteria may encompass, e.g., opinion correctness, defensibility of decisions, audit quality control through peer review). More technically, with reference to the Statements on Auditing Standards, Kinney (1988, p.55) defines *audit effectiveness* as the "...achieving [of] appropriately low audit risk that error might exceed material limits." Similarly, he defines *audit efficiency* as "...the achievement of a given level of audit risk at minimum cost." Given resource constraints, the adoption of decision strategies such as efficiency/effectiveness trade-offs appears to be a rational response on the part of professional auditors. Also, effectiveness or goal-accomplishment is typically far more important than efficiency. This study will look at the magnitude (level) of planning materiality thresholds to assess the impact of decision framing and how it is mediated by decision strategies such as decision making efficiency/effectiveness trade-offs.

1.4 Methodology

In this section a conceptual framework for auditors' planning materiality judgments is first described (see Figure 1.1). Next, the computer-administered nature

of the experimental task in the context of dynamic decision making and the participation of professional auditors (in a task that was designed with input from practitioners) is highlighted. The implications for the external validity of the experimental findings are emphasized.

1.4.1 Conceptual Framework for Auditors' Planning Materiality Judgments

Figure 1.1 depicts a conceptual framework for auditors' planning materiality judgments; it features the cognitive and contextual factors that impinge on the making of such judgments, embedded within a complex professional and institutional environment. Judgment, whether in a professional or other context, should be understood within a framework in which person, actions and environment all influence and are influenced by one other (see for instance, Hogarth, 1987, based on Bandura, 1978). Gibbins & Jamal (1993) emphasize that professional accounting settings consist of the problem or task and the person within a larger professional context; this professional context shapes task perception and the person's approach to it. The person brings to bear on the problem several cognitive, motivational and judgment processes (e.g., perception, memory, values, preferences and goals). Finally, all these interact to produce a judgment, choice or other behavior that the person exhibits.

Figure 1.1 shows that planning materiality judgments are a function of the audit engagement objectives, a broadly construed task environment and the (cognitive) characteristics of the materiality planner. The audit engagement objectives, very generally, are to perform an effective, high quality audit, within pre-specified time and

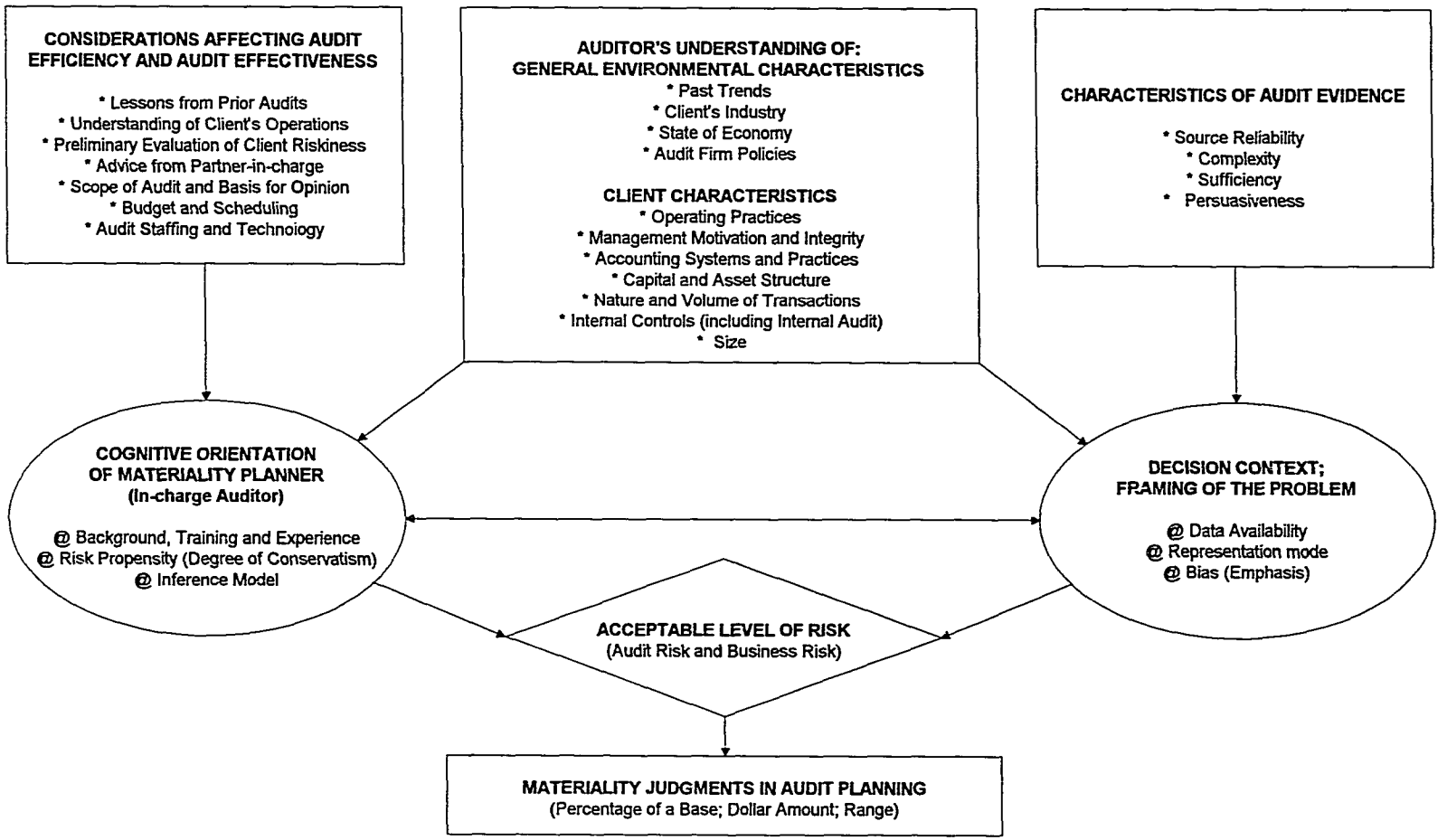

Figure 1.1

Materiality Judgments in Audit Planning: A Conceptual Framework

budget constraints. The general audit task environment is characterized by the auditor's understanding of the general business and client's environment, and the requirements imposed by the professional standards about collection of evidence (cf. SAS 31, AICPA, 1980), as well as decision strategies such as efficiency/effectiveness trade-offs to recognize constraints of time and budgets. In this environment, the cognitive characteristics of the materiality planner and the particular problem context have a complicated reciprocal relationship and involves considerable interpretive subjectivity (cf. Berliner, 1983). The goal of developing such a conceptual framework is to lay the foundation for a meaningful discussion of the "inevitable" professional judgment that is associated with the making of materiality judgments. Such a framework can support the development of decision aids for use in audit practice[7]. The conceptual framework will permit a more careful examination of the theoretical underpinnings of SAS 47.

1.4.2 Computer-Administered Experimental Task

In real world audit settings we frequently encounter situations where later information is contingent on the consequences of earlier decisions and decisions made have long-term ramifications. Further, rather than assume independence, it appears reasonable to build dependencies into experimental situations and study them systematically (Rapoport & Wallsten, 1972). To adequately study continuous and interactive audit decision settings (e.g., the audit "review" process) that permit feedback-

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[7] In this regard, Elliott (1982, cited in Selley, 1984) remarked, "It seems reasonable to conclude that if decision aids and models can reduce uncertainty in the audit process, it is sensible to develop them even if they *reduce* auditor judgment"(emphasis in original).

driven responses, a computer-administered experimental task environment that resembles the naturalistic audit environment is used. As Brehmer (1990, p.264) observes,"...one cannot study dynamic tasks using the ordinary paper-and-pencil approach of psychological research...interactive computer simulations of dynamic tasks are required." Further, Brehmer (1990) points out that, conceptually, normative models are unable to capture real-time, dynamic decision making behavior. Proposing computer simulations as constituting the appropriate methodology to study complex and dynamic decision settings, Kleinmuntz & Kleinmuntz (1981) used simulated task environments resembling medical decision problems to study decision strategies. Further, Kleinmuntz (1985) incorporated outcome feedback in dynamic medical decision settings to investigate performance of heuristics and concluded that they are a rich source of additional information.

The present study, based upon the author's training and background as a professional auditor, attempts to introduce these methodological advances (i.e., computer simulated task environments and incorporation of feedback) to research that seeks to understand the cognitive processes underlying professional audit judgments (cf. Gibbins & Jamal, 1993).[8] In addition, by systematically manipulating the scenario ("normal

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[8] Skipper et al. (1967, p.137) make a strong case for the integration of behavioral science theory with the practicing professions. However, they are quick to point out that such integration is difficult to achieve without a general working knowledge of both behavioral science and the practicing professions on the part of the researcher. Further, they also suggest that it is crucial that the researcher have a very "...specific knowledge of the particular practicing profession in question." Interestingly, Libby (1989) emphasizes the same viewpoint and goes on to suggest that academic accountants engaged in behavioral research may have a "comparative advantage" in conducting such research by virtue of their extensive background, training and domain-specific knowledge.

audit" then "suspected fraud" from screen to screen), the study attempts to investigate the impact of altering the problem representation and context for the same set of financial statements ("decision framing"). The balancing of audit efficiency and effectiveness considerations by professional auditors, as reflected in their planning-materiality judgments, is also examined.

The computer simulation of the experimental task environment has at least two important implications. First, it constitutes an excellent basis to develop decision support systems for audit practice that highlights critical decision parameters in establishing planning materiality while possessing enough flexibility to accommodate subjective assessments by individual auditors (cf. Steinbart, 1987). Second, it is a useful tool for use in professional audit training programs as well as auditing pedagogy that enables inexperienced auditors to learn from outcome feedback in a laboratory environment. Most complex audit judgment tasks occur in environments that Einhorn (1980) has characterized as "outcome irrelevant learning structures" (OILS) where it may not be possible to unambiguously establish correspondences between previously made judgments and their consequences. This creates a serious problem because not only is systematic learning inhibited but the making of less than optimal decisions may get perpetuated and become "conventional wisdom." Further, Bédard & Chi (1993) point out that with lack of outcome feedback, a critical condition for learning may be missing. One way to circumvent this problem is through laboratory simulations of actual auditing tasks and the"review process" with the computer serving as the reviewer (with stored expert input being the surrogate "answers" to difficult problems).

1.4.3 Professional Auditors' Participation in a Realistic Task

The study uses a realistic auditing task and a large number of professional auditors as participants. Several justifications exist to support the involvement of professional auditors as opposed to auditing students or novices in studying complex judgment tasks: task realism, comprehension of complex phenomena, immediate relevance, and the interpretableness of findings and their implications for both theoretical and applied work. Taking seriously Gibbins & Jamal's (1993) recommendation that accounting researchers attempt to generate more task realism by better capturing information rich environments, practitioner input was actively solicited as the study was designed and developed. Johnson (1983) has argued for inclusion of "veridical tasks" which are sampled from the environment and reflect the constraints and goals as well as the demands of individual tasks in the domain of practice. Efficiency/effectiveness trade-offs are necessitated by one such set of constraints faced in audit practice. The difficulty with tasks other than veridical ones is that performance on non-veridical tasks yield little information about the expertise of interest being studied (Johnson & Jamal, 1988). Further, Libby (1981) has argued that removing participants from a familiar decision context severely hampers interpretableness of the data. Similarly, Smith & Kida (1991) note the importance of drawing conclusions and ascribing interpretations to aspects of professional audit judgment only from those studies that are clearly founded upon investigations that use tasks and participants representative of the naturalistic environments in which auditors function. Finally, the decision to use professional auditors as subjects was based upon results from Krogstad, Ettenson & Shanteau (1984)

which questioned the appropriateness of students as surrogates for professional auditors, consideration of the useful suggestions about "subject's knowledge of the environment" made in Berg, Coursey & Dickhaut (1990, p. 837), and from personal experience in a previous study in which student subjects were used, and were found not to comprehend the planning materiality judgment task adequately (Ramamoorti & Myung, 1994).

1.5 Anticipated Contributions and Implications

This line of interdisciplinary research will likely be relevant for behavioral researchers studying judgment and decision making, auditing researchers and audit practitioners. Shanteau (1989) has remarked that the "heuristics and biases" literature spawned by Tversky & Kahneman (1974) has largely focused on examples of "poor" decision behavior. However, participants who are professionals, such as medical doctors (Schwartz & Griffin, 1986) and auditors (Shields, Solomon & Waller, 1987) have shown less proneness to biases and have generally exhibited "good" decision behavior. Accordingly, behavioral decision research will benefit from studies focusing on the performance of professionals and assist in better understanding the nature and determinants of expert judgment. In this respect, audit judgment researchers enjoy a unique advantage in being able to explore, in professional settings, the demands placed on cognition and its effects (see Gibbins & Jamal, 1993; Hogarth, 1991; Hogarth, 1993). Such research has broad relevance for the study of professional judgment in other domains such as medicine and law and thus helps lay the foundations for the development of a general theory of professional judgment and expertise. In addition, decision framing

effects appear to be mediated by decision strategies responding to goal-specific constraints. The current study seeks to advance extant psychological research by systematically investigating the mediating influence of one such decision strategy, viz., efficiency/effectiveness trade-offs.

This study will make several contributions for the study of auditors' professional judgment. More specifically, these contributions range from advancing the theory of auditing to enhancing professional training programs and the development of expert systems by integrating research from the psychology of decision making and judgment. In the paragraphs that follow, the nature and impact of some of these contributions are discussed.

First, a conceptual framework (see Figure 1.1) that reflects the characteristics of the materiality planner, the problem context, and the client's operating environment as well as the general audit environment, has been developed. This conceptual framework lays the foundation for a coherent discussion of the myriad cognitive and contextual factors that (could potentially) influence planning-materiality judgments and provide the basis to explain the variance observed in materiality judgments of professional auditors, noted in past research (e.g., Pany & Wheeler, 1989; Mayper, 1982; Mayper et al., 1989). The conceptual framework, in conjunction with the empirical data collected, will enable an examination of the conceptual underpinnings of SAS 47. The study is timely and significant not only because SAS 47 is over a decade old now and is in need of revision, but also because the auditing environment has considerably changed after a

series of multi-million dollar lawsuits against public accounting firms (see Public Oversight Board (POB), 1993; Albrecht & Willingham, 1993).

The implementation of a computer-administered experimental task environment with a mouse-supported, user-friendly interface, that allows for dynamic decision making and incorporation of feedback is a methodological contribution for future research on professional audit judgment. The computer-administered experiment is designed to produce a rich database of professional auditors' preliminary judgments of materiality for audit planning under different conditions. The findings from this study will likely enhance our understanding of the sensitivity of auditors' materiality judgments to incoming information (cf. Steele, 1992; Haskins & Sack, 1994). Such understanding will in turn enable us to implement more effective professional training programs, bring enhancements to auditing pedagogy, and assist in the development of appropriate decision aids geared to improve audit performance.

The design of the study also has implications for some important behavioral decision theories. Although a *direct* test of Kahneman & Tversky's (1979) prospect theory or of Hogarth & Einhorn's (1990) venture theory is not feasible given the manner in which the study has been operationalized, results from the study will definitely provide indirect evidence for the ideas such as *framing, decision strategies, decision weights, ambiguity,* and *payoffs*, that underlie these theories. Both prospect theory and venture theory were developed in the context of static, "one-shot" experiments, and therefore it would be illuminating to learn whether a dynamic decision task affords further insights and points to areas for further research with reference to these theories.

The participation of different kinds of professional auditors, viz., external auditors and internal auditors, opens another avenue for comparison of performance on the experimental task. Because of the limited number of studies examining the cognitive abilities and judgments of internal auditors (see, for instance, Church & Schneider, 1995), such comparisons have been rare and will no doubt provide additional perspectives on how professional training and background interact with the environment of auditing. These comparisons are likely to yield useful insights that can help advance the state-of-the-art in external and internal audit practice and will eventually benefit professionals possessing either background.

CHAPTER II

THEORY AND HYPOTHESES

2.0 Theoretical Foundations

In this chapter the theory and rationale that ground this study are laid out in more detail. Testable hypotheses for the experimental study emerge from the application of theories from behavioral decision research to the concern about explaining the sources of variance in auditors' planning materiality judgments.

In the early portion of this chapter, in section 2.1, the concept of materiality is further elaborated upon and some theoretical justification provided for it by comparing it to efficient "search processes" adopted by scientists in other disciplines. Section 2.2 highlights the fact that auditors engage in sequential processing of evidence (Asare, 1992) and this inevitably makes their resulting judgments subject to framing and order effects (Einhorn & Hogarth, 1985; Hogarth & Einhorn, 1992). Next, in section 2.3, Kahneman & Tversky's (1979) notion of decision framing of outcomes (redefined for the purpose of this study in terms of Helson's (1964) "context effects") is discussed with reference to the planning stage of an audit. Hogarth & Einhorn's (1990) venture theory is also discussed to identify key components of auditors' planning materiality judgments that rely upon constructs such as "payoffs" and "ambiguity." In section 2.4, the professional literature in auditing is cited to emphasize goal-specific criteria such as audit efficiency

and audit effectiveness that every auditor must necessarily contend with in professional practice. The theory developed in sections 2.1, 2.2, 2.3 and 2.4 forms the basis, for the theoretical framework depicted in Figure 2.1. In section 2.5, some of the causes for the adjustment to the anchor J_0, are ascertained and discussed with reference to a rule of thumb computation. Based on the implications derived from section 2.5, section 2.6 develops testable ordinal hypotheses. The approach adopted to the testing of these hypotheses, in turn, drives the experimental design and procedures discussed in chapter III.

2.1 The Concept of Materiality in Auditing

Every profession finds it necessary to adapt the legal doctrine called *de minimis non curat lex* (Latin for "the court will not consider trivial matters") and thus define the scope of enquiry. Thus, medical doctors are apt to ignore negligible "side effects"; and accountants refrain from recording events so insignificant ("immaterial") that the work of recording them would not be justified by the usefulness of the results (Anthony & Reece, 1983). Auditors make use of the "materiality" construct to define the overall scope of contemplated audit procedures.

To better appreciate the necessity for a concept such as materiality, it may be useful to consider the "bandwidth-fidelity" dilemma that arises in radio technology. Fay & Wallace (1987, p.69) illustrate the bandwidth-fidelity dilemma thus:"...Both [astronomer and microbiologist] begin their study using low-power lenses. The astronomer searches the sky until he finds the general area within which he wants to

study specific bodies more carefully. Similarly, the microbiologist scans the slide under her scope until she finds a general area of the tissue she wants to study more closely...At this point, [they] are trading fidelity (freedom from error or resolution) for bandwidth. They are scanning the object of their study with very broad-band devices in order to maximize the chance of capturing the general object they wish to study. Once they have located the general area, they lock in the scope and switch to extremely high-powered lenses to obtain far more resolution and error-free observation. At this second step, they trade bandwidth for fidelity." Materiality judgments appear to be auditors' lenses to cope with the bandwidth-fidelity dilemma.

Leslie (1985) has argued that there is only one materiality level, although the context of its uses may differ; similarly, Carmichael (1969) has noted that "...the auditor uses materiality in essentially two ways: (1) evaluating the fairness of presentation and reporting (materiality in accounting) and (2) in deciding questions involving the development and execution of the audit program (materiality in auditing). However, materiality in auditing is dependent upon materiality in accounting." In light of the bandwidth-fidelity dilemma referred to above, it would appear that materiality in accounting corresponds to "bandwidth-materiality" while materiality in auditing corresponds to "fidelity-materiality."

An important pragmatic goal of every auditor is to take into account the limited time and resources available and the need for keeping within planned time schedules. Constraints imposed by the need to minimize audit effort (while nevertheless meeting professional standards) in order to limit audit fees and meet deadlines make a concept

such as materiality crucial to performing an efficient and effective audit. Moreover, the auditor exercises professional judgment circumscribed by a sophisticated network of statutes, accounting principles and standards and professional ethics. In such a complex setting, it is argued that a psychological variable, viz., "decision framing" (or the manner in which a problem is represented) can potentially have a drastic impact on the making of materiality judgments.

2.2 Sequential Processing of Audit Evidence

Audit judgment is responsive to sequential processing of evidence (Gibbins, 1984; Ashton & Ashton, 1988). Typically, an external audit of a client involves at least two stages, an interim audit stage and a financial year-end audit stage (Anderson, 1984). Such "phasing" of the fieldwork results in a phase-by-phase sequential processing of audit evidence that continually accumulates and unfolds over this period. Planning meetings constitute the means by which the early portion of the audit engagement is formally discussed with the staff assigned to the audit to delegate responsibilities and assure effective communication. With reference to the contemplated computer-administered experiment, it is important that it should reflect and facilitate such piecemeal evidence processing in order to preserve the characteristics of the naturalistic environment in which auditors normally function.

Asare (1992, citing Einhorn & Hogarth, 1985) acknowledges the "cognitive economy" afforded by sequential processing of evidence, but warns that such an incremental approach is frequently subject to *framing* and *order* effects. While the

present study investigates decision framing effects in audit judgment in precisely such a setting, order effects are not examined. The decision framing construct is taken up in the following section.

2.3 Decision Framing of Outcomes

Tversky and Kahneman (1981, p. 453) define the term decision frame to refer to "...the decision maker's conception of the acts, outcomes, and contingencies associated with a particular choice. The frame that a decision maker adopts is controlled partly by the formulation of the problem and partly by the norms, habits, and personal characteristics of the decision maker." This study uses the term "decision framing" in experimental settings in two senses: *decision framing by the decision maker* and *decision framing implied by task formulation.* Decision framing by the decision maker refers to his/her subjective interpretation or conceptualization of a problem and its outcomes as being positive or negative, posing a threat or affording an opportunity and, with reference to this study, the conduct of a "normal audit" or "auditing in a fraud mode." Decision framing implied by task formulation signifies the construction of a problem designed to encourage the adoption of a particular decision frame by the decision maker[1];

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[1] Note that the experimental participant may yet adopt a decision frame that is different from the one implied by the task formulation. In real world settings, where "gaming" is common (i.e., a reactive, thinking opponent is present), an audit client may deliberately present information in a way that would encourage an auditor to adopt a particular decision frame (which would lead to a particular conclusion). Recognizing this possibility (called "information risk," cf. Arens & Loebbecke, 1991), the professional auditing literature exhorts auditors to exercise professional skepticism. Decision framing implied by (deliberate) problem formulation (by the client) could potentially constitute an important research issue for "behavioral game theory" especially with reference to the construction of agency contracts (see, for instance, Camerer, 1990).

Johnson, Grazioli and Jamal (1993, p. 469) have described this as "...the manipulation of information in the environment for purposes of creating a representation in the mind of an agent." The "framing" construct as used in this study closely mirrors what Helson (1964) calls "context effects." Context effects, according to Helson (1964), depend on stimulus factors, background factors, and personality factors; consequently, careful manipulation of one or more of these factors should produce framing effects.

The framing construct has been used in other studies of audit judgment, viz., in the context of overall financial statement evaluations (Johnson et al., 1991), in situations involving going concern judgments (Asare, 1992; Trotman & Sng, 1989), and with reference to internal control judgments and substantive testing decisions (Emby, 1994). This study investigates framing effects with reference to auditors' planning materiality judgments. In particular, with a view to better understand the psychological sources of variance in auditors' planning materiality judgments, incorporating framing effects represents an important advance in this line of research. Therefore, section 2.3.1 discusses the psychological theory that lies behind why such framing effects occur. Further, to explain the rationale behind how such framing effects may be induced by systematically varying background factors, section 2.3.2 makes use of signal detection theory and uses implications from Kahneman & Tversky's (1979) prospect theory and Hogarth & Einhorn's (1990) venture theory. Subsequently, in section 2.4, the issue of how these framing effects might be mediated by the use of specific decision strategies, e.g., efficiency/effectiveness trade-offs, is taken up.

2.3.1 Decision Framing by the Decision Maker

Typically, the process of judgment precedes a choice or decision; it may be thought of as pre-decisional behavior (Joyce & Libby, 1982). Conceptually, the judgment process encompasses initial perception and identification of issues, collection of relevant information and its evaluation (including weighing of information and of prior knowledge), and finally, consideration of the value or utility of potential outcomes, culminating in the decision (Gibbins & Mason, 1988). As noted before, selective perception of information (or "editing operations") precedes information evaluation (Kahneman & Tversky, 1979); consequently, differences in editing a problem will likely lead to differences in evaluating it. In other words, the invoked decision frame influences a decision maker's choice or decision.

Busemeyer & Townsend (1993) point out that Coombs & Avrunin (1988) have provided a detailed analysis of "framing effects" according to Lewin's (1935) approach-avoidance conceptual framework. In particular, they refer to Miller's (1944) discussion of approach-avoidance theory wherein approachable versus avoidable consequences correspond to rewards versus punishments. Such notions clearly seem to anticipate the distinction between positively and negatively framed outcomes proposed by Tversky & Kahneman (1981). Similarly, Goffman (1969), a sociologist, refers to "framing" information in his analysis of strategic face-to-face interaction as deriving from paralinguistic cues having an *expressive* rather than *semantic* character e.g., facial gestures, intonation etc. In particular, Goffman (1969, p.12) explains that the term "control move" in "expression games" concern the "intentional effort of an informant

to produce expressions that he thinks will improve his situation if they are gleaned by the observer." Such ideas relating to "impression management" are further developed in Goffman (1974) and clearly parallel the earlier description of "decision framing implied by task formulation."

Adopting a broader psychological perspective, Hogarth (1993) observes that the key notion of reference points that gives rise to framing effects is another manifestation of figure-ground phenomena. To cope with limited human information processing capabilities in the face of cognitive complexity, people tend to pay more attention to the more prominent features of their perceptual fields. Unfortunately, this adaptive mechanism to make cognitive operations more "manageable," comes at a cost, i.e., it has the effect of treating all non-prominent features as background. The implication of this psychological phenomenon is that the prominent features attended to (i.e., the figure) remain relative to the background and are highly sensitive to changes or shifts in that background.[2] First noted by gestalt psychologists (see Wertheimer, 1912; Koffka, 1922), Hogarth (1993) notes that the figure-ground phenomenon is captured well in phrases such as "losses loom larger than gains" (Kahneman & Tversky, 1979) and "goods satiate and bads escalate" (Coombs & Avrunin, 1977), and has motivated research issues in choice (Thaler, 1980) and inference (Einhorn & Hogarth, 1986).

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[2] A similar line of reasoning seems to have led Helson (1964) to explicitly mention background factors as being responsible for context effects.

2.2.2 Explaining Framing Effects: Signal Detection and Behavioral Decision Theories

Using Helson's (1964) scheme, this study manipulates background factors to produce framing effects. It is possible to explain these framing effects using insights from signal detection as well as behavioral decision theories.

Signal detection theory applies whenever there are only two discrete states of the world ("signal" and "noise") and a human agent is required to perform the classification of response categories (Wickens, 1992; Green & Swets, 1988). Combining the two states of the world with the two response categories produces Table 2.1, as shown below.

Table 2.1

Signal Detection Theory

	STATE OF THE WORLD	
RESPONSE	**Signal**	**Noise**
Yes	Hit	False Alarm
No	Miss	Correct Rejection

There exists considerable professional literature describing "red flags," that is, variables that are correlated or associated with the perpetration of fraud and serve as indicators of circumstances that warrant the attention of an auditor (e.g., Albrecht & Romney, 1986; Albrecht, Romney, Cherrington, Payne, & Roe, 1982). If we regard the presence of red flags as *signals* arousing suspicion of fraud and the absence of any red flags as situations justifying a normal audit, we can easily construct Table 2.2

analogous to Table 2.1 above. SAS 53 (AICPA, 1988) delineates the auditor's responsibility to detect and report errors and irregularities; it also recommends audit procedures in response to possible irregularities. Thus, it is extremely important for an auditor to determine whether to conduct a normal audit or audit in fraud mode ("audit in fraud mode" must be distinguished from a "fraud audit"; the latter expression presupposes that the existence of fraud has been already established). As shown in Table 2.2 below, should the auditor reach an erroneous conclusion, she will end up either overauditing (an inefficient outcome) or underauditing (maybe an ineffective outcome). The latter, of course, is the more serious lapse and, if discovered, could prove damaging to the auditor's reputation as well as expose her to possible litigation. In this connection, it must be noted that although business fraud is widely seen as a burgeoning white-collar crime problem (KPMG Survey, 1994; NCFFR, 1987) with several millions of dollars in losses, the occurrence of fraud is still a relatively rare occurrence. It is the publicity that surrounds fraud and the astronomical losses involved that compensate for the negligibly low probability of occurrence and make an external auditor conservative in this regard.

Table 2.2

Doing a *normal audit* or *audit in fraud mode*?

	STATE OF THE WORLD	
AUDITOR'S RESPONSE	**Red Flags Present**	**No Red Flags Present**
Audit in Fraud Mode	Appropriate	Overauditing
Normal Audit	Underauditing	Appropriate

It is clear then, that the partner's comments in the experimental setting suggesting the possibility of fraud completely alters the participant's decision frame by changing background factors and shifting the reference point. What was up till then perceived to be a low-risk audit suddenly appears fraught with disturbing possibilities. In other words, the decision framing implied by task formulation is expected to so change the experimental participant's conception that its impact will be observed in considerably lower planning materiality thresholds. In this connection, Haskins & Sack (1994, p.3) have remarked: "Information may not be provable, but it provides perspective, and it may point out the need for more evidence, or it may even cast doubt on the evidence gathered." This is a clear case of additional information (to be regarded as a background factor in Helson's (1964) scheme), increasing an auditor's professional skepticism with respect to the financial statements.

With respect to the suspected fraud settings featured in the experiment, viz., inventory theft and illegitimate income smoothing (see Appendix D for the text of the details furnished to participants), it may be useful to enumerate some of the red flags that could potentially be noted by the participants. Referring to some of the situational pressures mentioned in Albrecht et al. (1983), the following red flags can be identified: (a) urgent need for favorable earnings (to buttress stock price or achieve forecasted earnings); (b) dependence on only one or two products (i.e., only UPS systems); (c) extremely rapid expansion and growth; and (d) sizeable inventory increase accompanied by a less than proportionate increase in sales. Moreover, with respect to internal controls, the KPMG Survey (1994) concludes that poor or overridden internal controls

constitute the major reason for the occurrence of fraud: hence the choice of these particular suspected fraud scenarios.

Outcomes are frequently perceived as positive or negative in relation to a "neutral" reference outcome; in Kahneman & Tversky's (1979) "prospect theory" dealing with risky prospects, a value function is proposed that is concave for gains, convex for losses, and steeper for losses than for gains. In the audit scenario, a very low-risk audit engagement can be considered as a positive frame so that it is by invoking a "suspected fraud" scenario that a negative frame is induced into the experimental subject's conception. Further, based on SAS 53 (AICPA, 1988), the severity of the negative frame presumably differs for a scenario that suggests *defalcation* (i.e., misappropriation of assets, in this case, inventory theft, usually indicative of a breakdown in internal controls) as opposed to another scenario that suggests *management fraud* (material distortion of financial statements, in this case, illegitimate income smoothing[3], suggesting possible management override of internal controls). In the situation contemplated in this study, invoking the suspicion of irregularities (fraudulent acts) would encourage subjects to frame the outcome as being negative, by altering their perception of client riskiness. Further, as noted before, materiality thresholds vary inversely with risk assessment and

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[3] Several managements of companies engage routinely in "legitimate income smoothing," a practice that is not inherently in violation of any fundamental accounting principles (see, for instance, Smith, Lipin & Naj's (1994) article in the *Wall Street Journal* on November 3, 1994). Hence, it was important that the income smoothing described in the study be described as being somehow "illegitimate."

hence, with an increase in perceived client riskiness it is reasonable to expect subjects to make lower planning materiality estimates.

In addition, one should note the loss functions associated with non-discovery of either type of irregularity--certainly, this fact impacts the auditor's typically conservative behavior (e.g., Smith & Kida, 1991) and will likely produce asymmetry in planning materiality thresholds (e.g., Srivastava & Ward, 1992). For instance, management fraud is likely to be recurrent in nature and involve large dollar amounts; therefore, it has more serious implications than inventory theft which might well be an isolated occurrence and may not necessarily be of the same magnitude. Similarly, effectiveness is a more important criterion for external auditors than efficiency, despite their effort to keep their clients satisfied. Clearly, the exposure from an ineffective audit is associated with a more severe loss function and constitutes the rationale for the purported "asymmetry" in materiality thresholds (e.g., Srivastava & Ward, 1992)[4]. The significance of investigating the nature and extent of efficiency/effectiveness trade-offs made by professional auditors under differing conditions cannot be overemphasized.

Hogarth and Einhorn's (1990) venture theory seeks to provide a descriptive model of how people assess decision weights. The theory assumes that after having decided upon an anchor, people engage in a "mental simulation" while seeking to adjust the

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[4] Srivastava & Ward (1992) discuss the notion of asymmetric materiality thresholds with reference to the tolerable error of overstatements and understatements and the risk of incorrect acceptance and the risk of incorrect rejection. In other words, they consider a scenario involving the planning of substantive audit sampling applications (tests-of-detail). The situation described here is with reference to the planning of compliance testing (tests-of-control) but is completely analogous.

anchor. This mental simulation is affected by psychological factors, cognitive and motivational, and is considerably influenced by constructs such as "payoffs," deviation of the anchor from extremes, and "perceived ambiguity." Each of these influences is now explained. Payoffs (or loss functions) represent the value of outcomes, positive or negative, that is associated with a particular choice or decision. Clearly, the absolute size and sign of payoffs exercise a significant influence over the decision maker's mental simulation or deliberation. The deviation of the anchor from the extremes is relevant when considering the extent of adjustment required to the initial anchor. This is because of the psychological interpretation of greater uncertainty being associated with a "single shot" gamble as opposed to multiple plays despite the applicable probabilities being the same. As for "perceived ambiguity," this expression merely reflects the vagueness about probabilities. Although venture theory deals with decision weights and not final dollar amounts (as the present study does), the mental simulation referred to above as well as the factors influencing it remain pertinent in the context of auditors' planning materiality (PMAT) judgments. Some essential operational definitions required by their theory pertain to how the anchor is established, what affects the amount of mental simulation and what determines the sign or direction of the adjustment process. In the scenario described in this study, the factor base chosen in light of financial statement and background information and the percentage applied to it form a heuristic approach that can be used to show how the anchor PMAT is established. Decision framing, suitably modified by decision strategies and goals, determines the amount of mental simulation that goes on. Further, depending on whether the setting induces a positive frame (e.g.,

low-risk, normal audit) or a negative frame (e.g., suspected fraud) and whether efficiency or effectiveness is the goal-specific criteria sought to be optimized, dictates the sign of the adjustment to the established anchor. Thus, suspected fraud settings imply a lowering of the PMAT threshold, as do effectiveness considerations; normal, low-risk audit settings or efficiency considerations should lead to a raising of PMAT thresholds.

2.4 Efficiency/Effectiveness Trade-Offs

Simon's (1955) notion of bounded rationality emphasizes the limitations of human information processing capabilities (e.g., memory capacity) relative to the complexity encountered in the real world. Accepting that audit decision tasks are complicated, it seems reasonable to argue that professionals would attempt to develop decision strategies that adapt to the task in order to optimize their efforts in pursuit of domain-specific goals (cf. Hogarth, 1993; Brunswik, 1952). Audit engagements are frequently subject to time pressures and deadlines and, despite auditors' strong desire to meet major audit objectives, there nevertheless exist upper bounds on the audit resources that can be committed to a specific client. In other words, decision strategies[5] such as efficiency/effectiveness trade-offs appear to emerge naturally from the auditor's need to adapt to the environment she finds herself in. Efficiency is typically characterized by the

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[5] The bounded rationality argument implies that cognitive effort is expensive (Hogarth, 1993); also, decisions take time and time is a valuable resource (Busemeyer & Townsend, 1993). These considerations should help explain why people choose specific decision strategies from a host of available decision strategies. From a review of a large number of experiments to investigate this question, Payne, Bettman and Johnson (1992) conclude that decision makers do trade-off accuracy (e.g., average payoff) for effort (e.g., decision time). This is known as the "error-effort trade-off."

dimensions of time, cost and effort, while effectiveness is characterized by the dimensions of goal-attainment, opinion accuracy, user-satisfaction, peer review etc. Thus, while efficiency has a common connotation in different professions (i.e., professionals would like to minimize cost, time and effort as long as effectiveness, or goal-attainment, is not compromised), effectiveness is variously defined in different professions. Accordingly, while the conclusions from this study featuring efficiency/effectiveness trade-offs may generalize with reference to the efficiency criterion, any patterns of behavior influenced by the effectiveness criterion will need to be cautiously interpreted. The efficiency/effectiveness trade-off characterization has a parallel in studies of "speed-accuracy" trade-offs that has engaged the attention of psychologists over a long time (e.g., Woodworth, 1899; Garrett, 1922). In reaction time tasks, and in speeded performance in general, subjects often make errors: the reciprocity between latency and errors is referred to as the speed/accuracy trade-off (Wickens, 1984; Wickelgren, 1977). One can readily replace "speed" with "efficiency" and "accuracy" with "effectiveness" and meaningfully discuss efficiency-effectiveness trade-offs[6].

Planning materiality assessment is a crucial determinant of the nature, extent and timing of the audit procedures to be employed (Solomon & Krogstad, 1988). In particular, planning materiality lays the basis for audit scope decisions (i.e., determining the extent of testing) because of the basic inverse relationship between audit testing and

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[6] But the analogy is somewhat tenuous in that reaction time and error rate represent two dimensions of the *efficiency* of processing information; moreover, speed-accuracy trade-offs have primarily been observed in the realm of low-level perceptual tasks or recognition-memory tasks (Wickelgren, 1977). Nevertheless, it is helpful to motivate the discussion of efficiency-effectiveness trade-offs in this manner.

materiality: the higher (lower) the materiality threshold, the lesser (greater) the required testing (Arens & Loebbecke, 1991). The auditor needs to exercise judgment in resolving conflicts between the need to obtain sufficient competent evidential matter (audit effectiveness) and the time and the cost of obtaining it (audit efficiency). This efficiency/effectiveness trade-off is clearly set out in SAS #31 (AICPA, 1980): "An auditor typically works within economic limits; his opinion, to be economically useful, must be formed within a reasonable length of time and at reasonable cost." Planning-materiality judgments constitute a quantitative tool that enable auditors to fine-tune considerations of audit efficiency and audit effectiveness (Robertson & Davis, 1988). In other words, a poor judgment relating to planning-materiality could have serious consequences with reference to "over-auditing" (compromising the efficiency criterion) or "under-auditing" (compromising the effectiveness criterion).

The COSO (1992) report has defined internal control as a process, effected by an entity's board of directors, management and other personnel, designed to provide reasonable assurance regarding the achievement of objectives encompassing efficiency and effectiveness of operations, reliability of financial reporting and compliance with applicable laws and regulations. This definition applies broadly and seeks to integrate various components of internal control such as process, people, reasonable assurance and objectives into a comprehensive framework which nevertheless facilitates consideration of specific objectives. Indeed, the recently concluded KPMG Survey (1994) emphasizes strong internal controls in deterring fraud and the EAT Study (1980) recommended that standards/guidelines be developed to clarify the relationship that subsists between

materiality and internal controls. In the context of internal control evaluations and audit sampling, materiality judgments of internal control weaknesses would necessarily be responsive to the *risk of under-reliance* and *risk of over-reliance* used in SAS #39[7] (AICPA, 1981). In other words, the fundamental problem in designing audit procedures seems to lie in being able to strike a judicious balance between assessing control risk to be too high (under-reliance) or assessing control risk to be too low (over-reliance). Because goal accomplishment (effectiveness) is the paramount consideration, it appears that efficiency gains in importance once a threshold level of effectiveness has been achieved. In an audit context, this means efficiency considerations would be more significant for low-risk clients because audit effectiveness can be achieved with minimal audit effort. However, for risky clients, audit effectiveness cannot be compromised owing to the extreme exposure associated with failure to issue the "correct opinion" and in such cases, audit efficiency may only be peripherally relevant.

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[7] Wallace (1991) indicates this equivalence of terminology from different sources (risk-oriented terminology is the most recent; IAC = internal accounting controls):

SAS 39	*Statistics*	*Risk-Oriented*
Risk of overreliance on IAC for compliance testing	Risk of Type II error or Beta risk	Assessing control risk too low
Risk of underreliance on IAC for compliance testing	Risk of Type I error or Alpha risk	Assessing control risk too high

A theoretical framework exhibited in Figure 2.1 relates findings and research from psychology to the extant resarch and professional literature on professional judgments in auditing. This framework attempts to integrate findings from two disparate fields of enquiry to the mutual benefit of both (cf., Skipper et al., 1967 and Smith & Kida, 1991) and lays the foundations for this research study.

2.5 Anchor and Adjust Process Model: Adjustment to Anchor

The general anchor and adjust process model is now discussed in greater detail. As before, from Equation 1.3, we have:

$$J_{PMAT} = J_0 + \Delta_{C/C} \qquad (2.1)$$

It was pointed out that J_0, the anchor, is established by selecting an appropriate rule of thumb computation (e.g., 5% of pretax net income)[8]. The risk evaluation of the client and the client size (Carmichael & Benis, 1989), among others, may indicate that the initial anchor needs some adjustment. Past research in the psychology of judgment and decision making has revealed that decision makers have a tendency to either over-adjust or under-adjust the initial anchor (e.g., Kahneman & Tversky, 1974). In this section we look at the $\Delta_{C/C}$ term more closely. It is possible to recast it as follows:

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[8] Holstrum (1982) has remarked that materiality judgment research has been limited to public industrial companies and has questioned whether the impact on net income would have the same predominance for a nonpublic company as it does for a public company. Because the experimental task features a public company (described elsewhere in this dissertation), for the purposes of this study, basing J_0 on pretax net income is presumably justified.

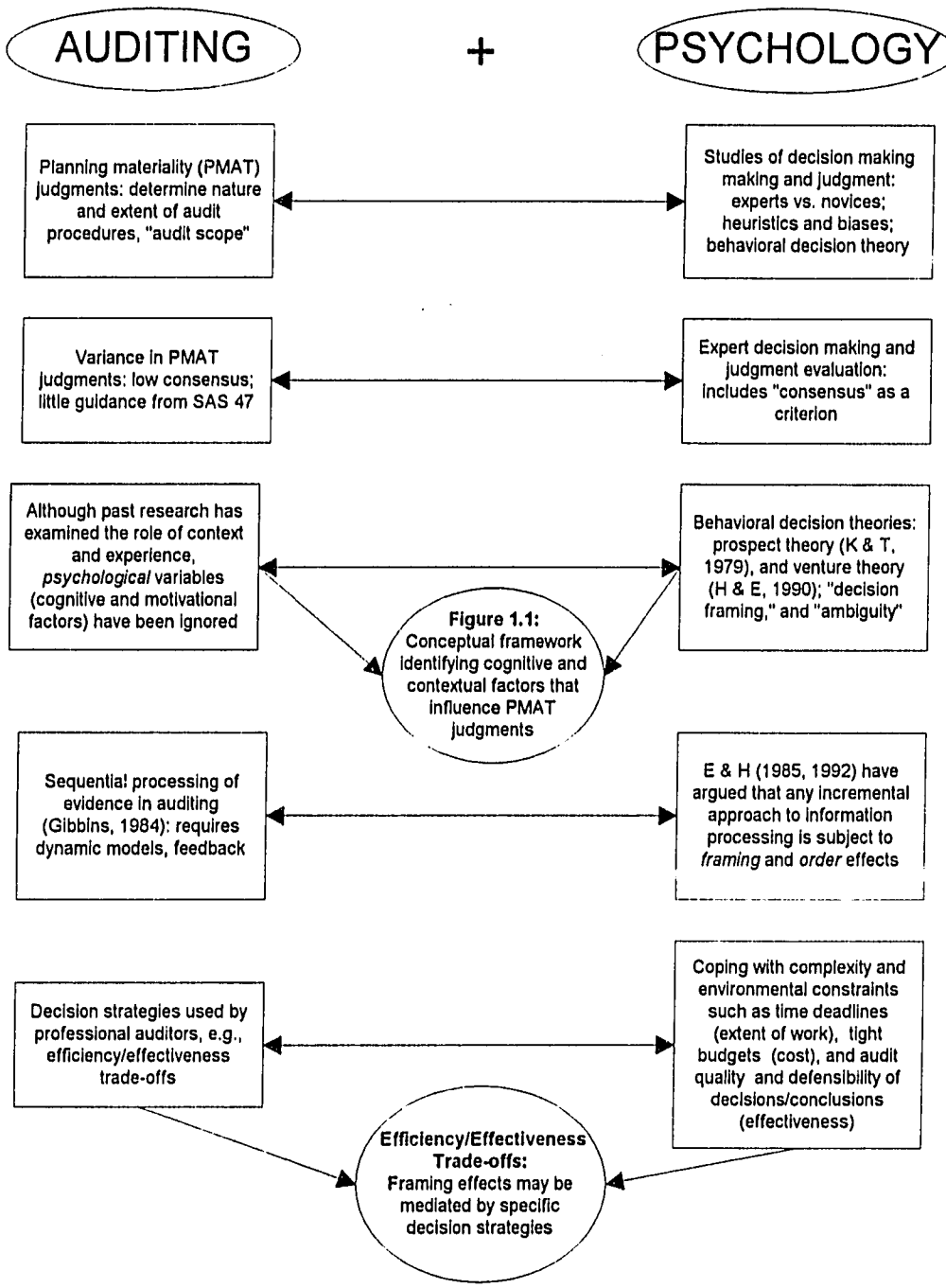

Figure 2.1

Theoretical Framework

$$\Delta_{CIC} = s_1\Delta_1 + s_2\Delta_2 + K\ (other\ factors) \qquad (2.2)$$

with $s_1, s_2 \in \{-1, 1\}$ and $\Delta_1 > \Delta_2 > 0$.

In Equation (2.2) above, s_1 and s_2 represent the sign, and Δ_1 and Δ_2, the magnitude of change. Further, the subscript 1 refers to the nature of the setting (i.e., "normal audit" or "suspected fraud") while subscript 2 refers to goal-specific criteria (viz., audit efficiency or audit effectiveness). Thus, we hypothesize that s_1 will take on a positive value for an audit scenario (for a low-risk client, close to reference point) while it will assume a negative value for a suspected fraud scenario ("negative framing"). Again, because effectiveness (goal-accomplishment) is more important than efficiency (time and cost considerations), and greater audit effectiveness may require more work suggesting a lower materiality threshold (Arens & Loebbecke, 1991), we will assert that s_2 will take on a negative value for effectiveness while taking on a positive value for efficiency. Further, "normal audit" and "suspected fraud" are scenarios with a "global" impact (hence called "primary framing"), whereas efficiency and effectiveness are simply goal-specific criteria subsumed within a specific scenario, hence we have assumed that the inequality: $\Delta_1 > \Delta_2 > 0$ must hold. Note that K is merely a function that captures everything else, including, perhaps the interaction term, say, $s_3\Delta_1\Delta_2$. Of course, K could be negative or positive, depending on the dominant influence exerted by its component factors. This basic model is used to derive predictions and test hypotheses.

2.6 Hypotheses

Using the theoretical backdrop presented in the preceding sections, in section 2.6.1, the major hypotheses of this experimental study are first outlined. Next, in section 2.6.2, other minor hypotheses are also described, although these were not the main focus of the study when it was conceived.

2.6.1 Major Hypotheses

The effects of decision framing implied by task formulation are investigated by eliciting planning materiality judgments from subjects under two conditions, "normal audit" and "suspected fraud." The suspected fraud setting is invoked using partner comments (see Appendix B) and will trigger a negative decision frame, and not only make participants assess client riskiness higher than for the normal audit setting, but in turn, will also yield lower planning materiality estimates. Because two types of fraud, defalcation and management fraud, are featured, the relative magnitude of the planning materiality judgments can now be compared. Defalcation (inventory theft) could be an isolated incident, and therefore, is less serious than management fraud (illegitimate income smoothing). More specific information is usually available about inventory theft (less ambiguity) whereas knowing the source and manner of illegitimate smoothing income is quite difficult (high ambiguity). Because of the perceived higher ambiguity for the illegitimate income smoothing condition, it is predicted that mean planning materiality thresholds for this condition will be lower. Also, because higher ambiguity

implies greater uncertainty, PMAT estimates from participants in the illegitimate income smoothing condition will likely exhibit larger variance.

Partner comments directing audit staff to pay more attention to audit efficiency (competitive audit environment; risk of underreliance on controls) and audit effectiveness (litigious audit environment; overreliance on internal controls) are introduced to examine the mediation of framing effects by consideration of goal-specific criteria. With respect the goal-specific criteria of efficiency and effectiveness, it is clear that effectiveness, in general, is the paramount concern of the auditor. Consequently, the partner's comments with reference to audit effectiveness should, in general, elicit much lower planning materiality judgments under both normal audit and suspected fraud conditions. The partner's revelation about the suspicion of fraud combined with the emphasis on audit effectiveness will produce the lowest estimate of all planning materiality conditions.

In general, planning materiality thresholds will be lower for the suspected fraud scenario; they will also be lower for the effectiveness scenario. Because illegitimate income smoothing is a more severe occurrence than inventory theft, the auditor will make lower planning materiality estimates for the income smoothing condition. All of these ordinal predictions are conveniently summarized in Table 2.3 below.

Table 2.3

Ordinal Predictions Concerning Planning Materiality Thresholds

CONDITIONS	Normal Audit	Defalcation	Management Fraud
General	*Higher*	*Lower*	*Lowest*
Efficiency	*Higher*	*Lower*	*Lowest*
Effectiveness	*Lower*	*Even Lower*	*Lowest*

2.6.2 Minor Hypotheses

Participants will be professional auditors holding the Certified Public Accountant (CPA), Certified Internal Auditor (CIA) or both, designations. Accordingly, it would be of interest to compare these three groups of professional auditors (i.e., CPA vs. CIA vs. Both CPA/CIA) in terms of their materiality threshold assessments as well as decision strategies. External auditors are more concerned with the financial statements taken as a whole, while internal auditors are more concerned with segments of a company. The objectives of the internal auditor relate more to operational auditing and, unlike the external auditor, she is not exposed to litigation risk. Finally, not all internal auditors appear to understand the notion of planning materiality in the same way as external auditors do. Nevertheless, internal auditors may be expected to make lower materiality judgments as compared to external auditors primarily because they audit more than just the financial statements and therefore, need to perform more procedures than contemplated by external auditors. The nature and extent of their audit procedures would translate to lower planning materiality thresholds.

Past auditing studies as well as auditing textbooks (see, for instance, Leslie, 1985; Read, Mitchell & Akresh, 1987; Carmichael & Willingham, 1989; Ricchiute, 1989; Pany & Wheeler, 1989; Thompson, Hodge, & Worthington, 1990; and Wallace, 1991) have suggested that materiality is typically computed as a fixed percentage (within an acceptable percentage range) of a chosen factor base. Selecting a fixed percentage, e.g., 5% of pretax net income, for computation of planning materiality suggests that the planning materiality threshold increases in proportion to the increase in net income, i.e., it is linear function of the chosen base. However, other literature provides evidence that materiality computation is best captured by a non-linear function. For instance, the "materiality gauge" based on a table constructed by KPMG Peat Marwick (exhibited in Carmichael & Benis, 1989; cf. Elliott, 1983), appears to be a convex function with step increases at predetermined landmark values. Warren and Elliott (1986) fitted a power function, based on revenues, to estimate empirically the planning materiality judgments made for 691 audits conducted during 1981; it turned out to be:

$$PMAT = 0.038657\ (Revenues)^{0.867203} \tag{2.3}$$

With a view to ascertaining whether professional auditors viewed materiality computation to best described by a linear or a non-linear function, two questions were included in the debriefing questionnaire. These questions were designed to elicit whether the study participants considered planning materiality computation to increase exactly in proportion to the magnification of financial statement numbers (e.g., magnified by a factor of 10 or 100) or whether the computation should show a disproportional increase

or decrease. The latter response would signify that participants believe that the computation of materiality thresholds involves non-linearity. Given the spate of lawsuits against public accounting firms in recent years (POB, 1993; Albrecht & Willingham, 1993), a reasonable conjecture is that the specter of litigation risk has more than likely influenced auditors to conceive of the planning materiality function as being non-linear and convex in shape (i.e., the planning materiality threshold shows a disproportionate decrease relative to the increase in the size of the client, and hence the factor base chosen). In other words, external auditors routinely seek to provide more assurance and hence would prefer to perform more audit procedures than less.

CHAPTER III

METHOD

3.0 Introduction

This chapter will describe the experimental method to test the hypotheses laid out in the previous chapter. Input from several practicing auditors, including two retired partners from different Big Six accounting firms, was actively solicited to make the experimental task realistic. Such task realism is important because realistic scenarios attempt to reproduce naturalistic settings and therefore, provide a "fair" test of the complex relationships among concrete referents in the real world (Swieringa & Weick, 1982). Before experimental materials were distributed, permission was sought and obtained from the Human Subjects Review Committee, The Ohio State University. A pilot study was carried out in December 1994 to ascertain the feasibility of the study and the strength of the hypothesized manipulations.

The rest of this chapter is organized as follows. Section 3.1 describes the experimental design, including the factors manipulated and the dependent variables used in the study. Section 3.2 outlines the experimental procedures, including a brief description of the computer program that was developed. Section 3.3 mentions the results of a pilot study conducted in December 1994 with a small number of professional auditors as participants. Some minor changes made in the computer program based on

pilot study findings are also described. Section 3.4 mentions several accounting firms and other organizations located in Columbus, Cleveland, and Chicago, respectively, from which professional auditors were recruited to participate in the experiment. The sample of participants is drawn from a mix of organizations, although it would be difficult to claim that it is "representative" in a statistical sense. The number of responses received are also indicated, although detailed information about the data collected is deferred to Chapter IV.

3.1 Experimental Design

The experiment used a three-factor mixed design with two-within subjects factors and one between-subjects factor. The first within-subjects factor, primary framing, had two levels: the normal audit setting vs. the suspected fraud setting. The second within-subjects factor, secondary framing scenario, also had two levels: efficiency vs. effectiveness. The between-subjects factor, suspected fraud type, had two levels: the defalcation condition (i.e., inventory theft) and the management fraud condition (i.e., illegitimate income smoothing). Tables 3.1 and 3.2 below depict the design.

Table 3.1

Mixed ANOVA 2 X (2 X 4 X S) Design

	Between Subjects Factor: **Suspected Fraud Type (2)**	
Within Subjects Factor: **Primary Framing (2)**	**Defalcation (Inventory Theft)**	**Management Fraud (Income smoothing)**
NORMAL AUDIT SETTING (Secondary Framing Scenarios)	PMAT (aud_ini)	PMAT (aud_ini)
	PMAT (aud_effy)	PMAT (aud_effy)
	PMAT (aud_effs)	PMAT (aud_effs)
	PMAT (aud_fin)	PMAT (aud_fin)
SUSPECTED FRAUD SETTING (Secondary Framing Scenarios)	PMAT (frd_ini)	PMAT (frd_ini)
	PMAT (frd_effs)	PMAT (frd_effs)
	PMAT (frd_effy)	PMAT (frd_effy)
	PMAT (frd_fin)	PMAT (frd_fin)

Table 3.2

PMAT Elicitation Sequence depicted in Figures 3.1, 3.2 and 3.3

Figure 3.1 Sequence	**Figure 3.2 Sequence**	**Figure 3.3 Sequence**
Normal Audit (PMAT)	*Defalcation (PMAT)*	*Management Fraud (PMAT)*
A1: aud_ini	**F1**: frd_ini	**F1**: frd_ini
A2, A3: aud_effy	**F2, F3**: frd_effs	**F2, F3**: frd_effs
A4, A5: aud_effs	**F4, F5**: frd_effy	**F4, F5**: frd_effy
A6: aud_fin	**F6**: frd_fin	**F6**: frd_fin

Figures 3.1, 3.2 and 3.3 show the manner in which the experiment was designed and implemented by means of the computer program. In particular, note that figure 3.1 is identical under both conditions because the "normal audit" setting is the same across participants in both "suspected fraud" groups. All participants start out with textual materials describing an hypothetical client and based on whose financial statements they have to arrive at PMAT judgments (Figure 3.1, Table 3.2: A1). This constitutes the normal audit setting. In the secondary framing scenario, the partner for the audit first emphasizes the competitive auditing environment and the risk of underreliance on internal controls, by implication asking for more audit efficiency (Figure 3.1, Table 3.2: A2, A3). Next, in another similar scenario, the partner points to the litigious environment and the risk of overreliance on internal controls, by implication asking for more audit effectiveness (Figure 3.1, Table 3.2: A4, A5). Finally, in the last PMAT estimate for the audit setting, participants are required to take into account all of the preceding information and arrive at an overall judgment of planning materiality for the current year's audit (Figure 3.1, Table 3.2: A6). The text of the partner's comments are given in Appendix B.

In primary framing, the partner first calls for an emergency planning meeting, based on his meeting with the Finance Director of the client. One group of participants was framed by the partner's indicating the presence of defalcation (inventory theft, see Table 3.2, Figure 3.2: F1) while the other group was framed by the partner's suggestions about the presence of management fraud (illegitimate income smoothing, see Table 3.2,

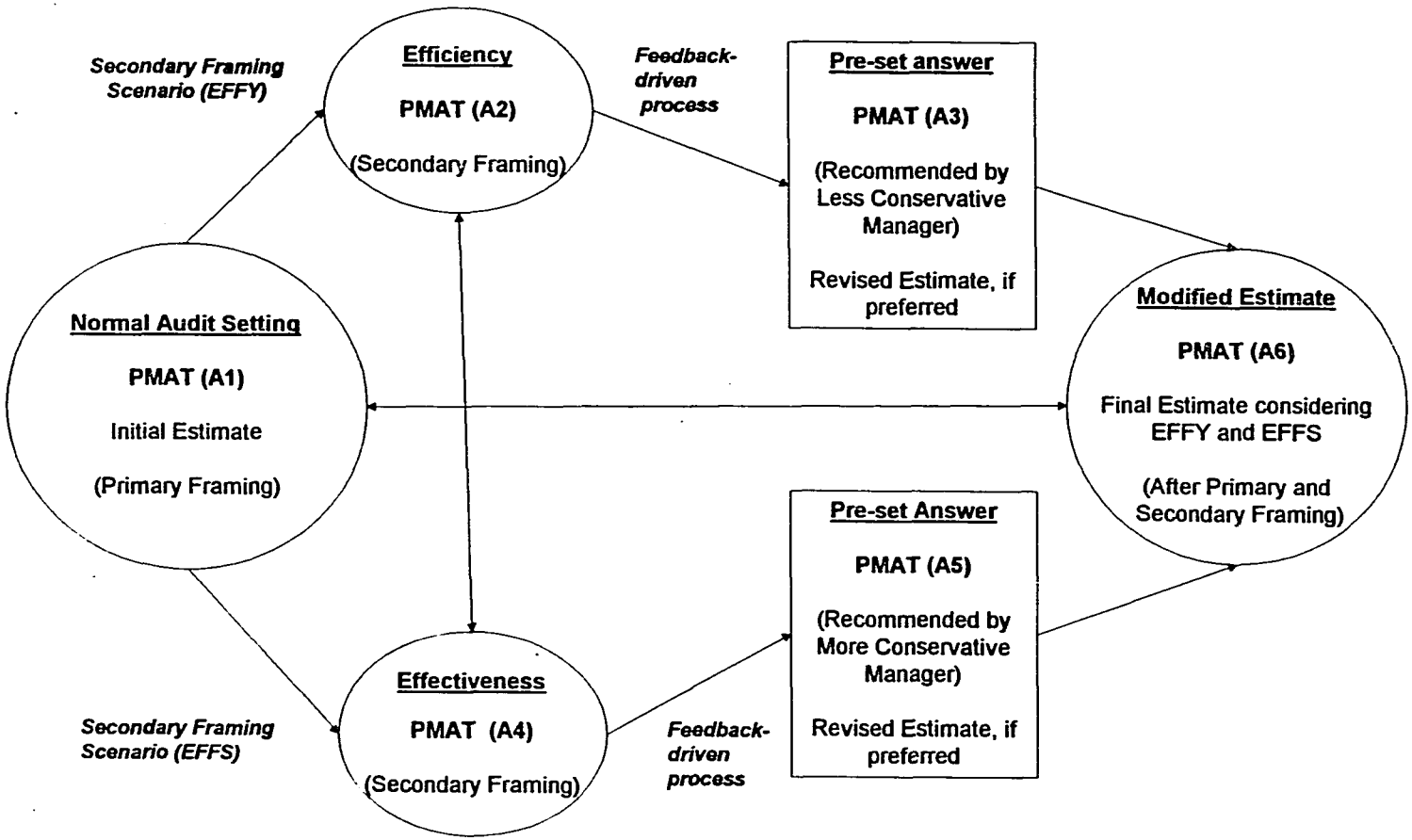

Figure 3.1

Experimental Design and Procedures (Normal Audit Setting)

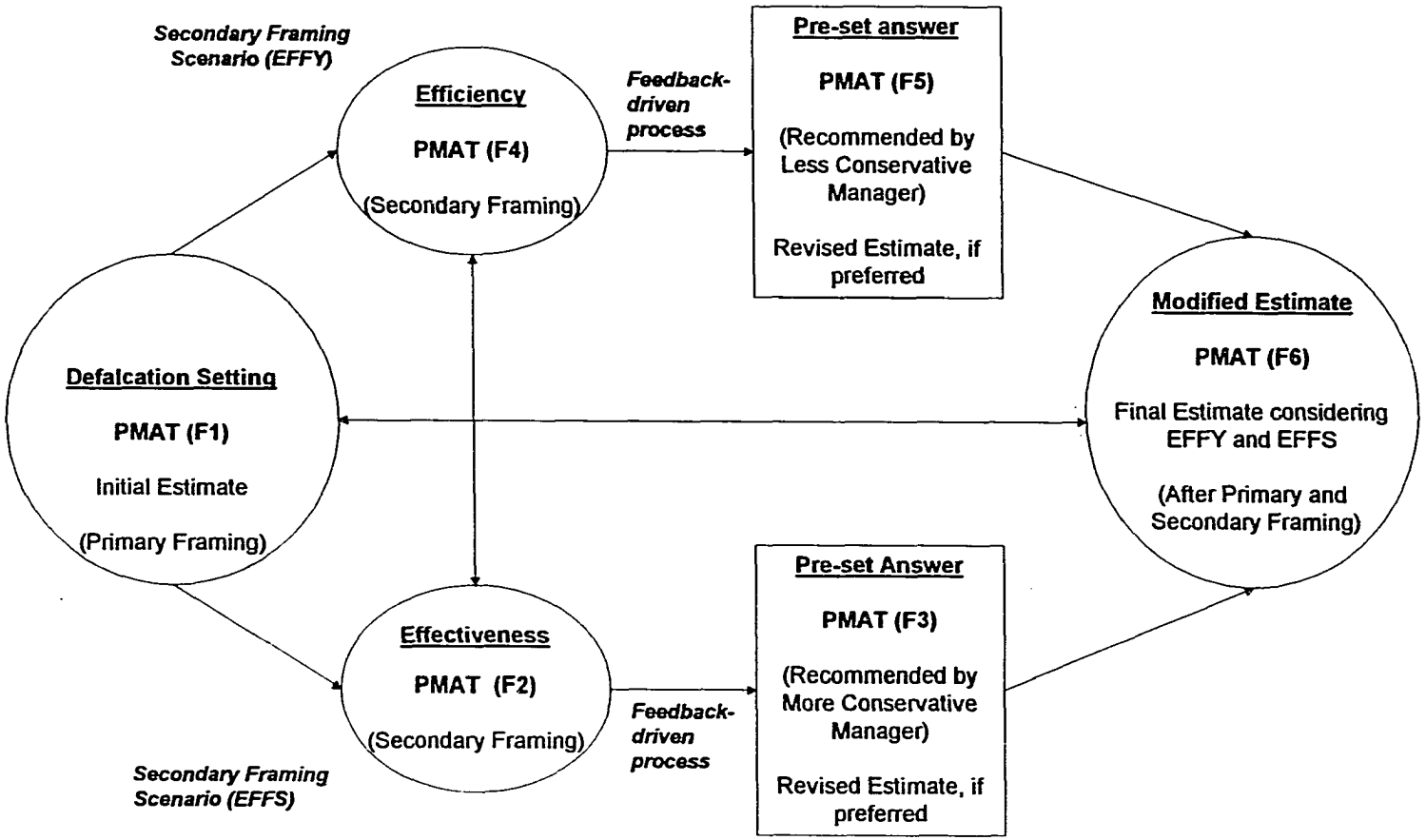

Figure 3.2

Experimental Design and Procedures (Suspected Fraud Setting--Defalcation)

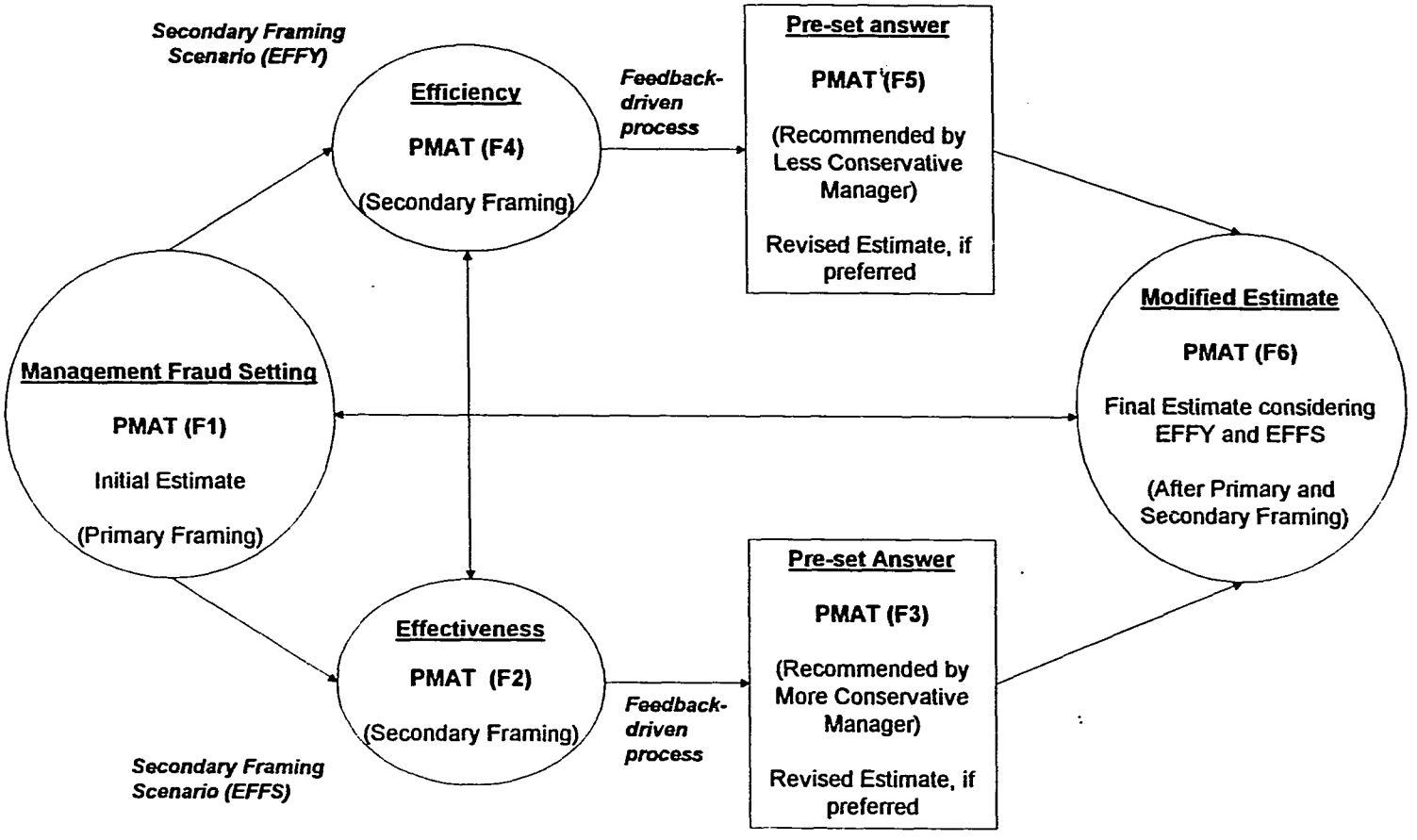

Figure 3.3

Experimental Design and Procedures (Suspected Fraud Setting--Management Fraud)

Figure 3.3: F1). The secondary framing scenarios following this emergency planning meeting are identical to those in the normal audit setting. In the secondary framing scenario, as before, the partner first emphasizes the litigious auditing environment and the risk of overreliance on internal controls, by implication asking for more effectiveness (Figures 3.2 & 3.3, Table 3.2: F2, F3). Next, in another similar scenario, the partner points to the competitive audit environment and the risk of underreliance on internal controls, by implication asking for more audit efficiency (Figures 3.2 & 3.3, Table 3.2: F4, F5). Finally, in the last PMAT estimate for the audit setting, participants are required to take into account all of the preceding information and arrive at an overall judgment of planning materiality for the current year's audit (Figures 3.2 & 3.3, Table 3.2: F6).

Secondary framing refers to the introduction of partner's comments emphasizing efficiency (abbreviated effy) or effectiveness (abbreviated effs), depending upon the scenario, as the goal-specific criterion.[1] The abbreviations for initial (ini) and final (fin) refer to scenarios prior to any outcome feedback in a particular setting (i.e., normal audit or suspected fraud) and the final scenario wherein participants come up with an overall planning materiality estimate that takes into account both goal-specific criteria of efficiency and effectiveness.

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[1] A final computer screen at the end of each of the normal audit and suspected fraud sessions displayed the participant's planning materiality (PMAT) estimates from earlier stages in the experiment. Thus, faced with both their estimates for audit efficiency and audit effectiveness, participants traded off one estimate against the other, to strike a balance between these conflicting goal-specific criteria, e.g., in the normal audit setting, if participants indicated $ 1,350,000 as their audit efficiency PMAT estimate and $ 750,000 as their audit effectiveness PMAT estimate, they may potentially select any number in this range, say $1,000,000, as their final PMAT estimate.

3.2 Procedure

The entire experiment was administered using computer diskettes distributed to participants. The programming of the experimental procedures used Microsoft's Visual Basic, as was done earlier for another study (see Ramamoorti & Myung, 1994). The program requires a Windows environment and features a mouse-supported point-and-click interface that is user friendly and easy to learn. All materiality estimates elicited were automatically recorded on these computer diskettes (the total time taken to complete the experiment is automatically measured and recorded). Because structured audit methodologies in some accounting firms (cf. Cushing & Loebbecke, 1986; Morris & Nichols, 1988) may include materiality computation tables, participants were requested not to refer to any audit manuals or other reference sources when doing the experiment.

Please refer to Figures 3.1, 3.2, and 3.3 in conjunction with Table 3.2 while reading each of the subsections below. Section 3.2.1 discusses procedures pertaining to the primary framing manipulations, while section 3.2.2 discusses those pertaining to the secondary framing manipulations. Section 3.2.3 explains the context in which efficiency/effectiveness trade-off behavior is investigated; section 3.2.4 deals with the suspected fraud types in the two between subject conditions; and finally, section 3.2.5 discusses other information relevant to the experiment. The text of all framing manipulations that appeared on the computer screen at selected points in time is exhibited in Appendix B.

3.2.1 Primary Framing

For the "normal audit" setting as well as the "suspected fraud" setting, participants first evaluated client riskiness (on a 5-point scale), assessed client size relative to the industry information provided (also on a 5-point scale), and indicated the factor base used for materiality computation (from the categories: gross margin %, pretax income %, total assets %, total revenue % and other, to be specified). Carmichael and Benis (1989) identify client riskiness and client size as two important considerations which might affect PMAT judgments. The choices of factor base for materiality computation conform to those found most popular among professional auditors in the professional literature (see, for instance, Leslie, 1985; Pany & Wheeler, 1989; Wallace, 1991). After making these qualitative assessments and indicating their preferences, participants are then asked to make an estimate of planning materiality and provide justification (usually this was done by providing a percentage measure of the factor base chosen). Qualitative data is collected in order to learn more about each subject's initial perceptions.

3.2.2 Secondary Framing

After having made their initial planning materiality (PMAT) estimate, participants were then asked to make PMAT estimates with only audit efficiency and later, only audit effectiveness, emphasized by the partner-in-charge as the paramount criterion for conduct of the current year's audit. From the experimental instructions, participants were aware that they would receive feedback on their PMAT estimates. However, the audit

manager who provided these estimates was described as being "new" so that participants would rely less on the manager's input and exercise more autonomy in arriving at their own independent judgments. Having recorded their PMAT judgments, participants received computer feedback from two types of managers, a less conservative[2] audit manager assigned to give feedback in the audit efficiency (effy) condition, and a more conservative audit manager assigned to give feedback in the audit effectiveness (effs) condition. Participants, in the presence of binary outcome feedback (i.e., "go higher," "go lower") and using an iterative process eventually reach each extreme, but pre-set materiality ranges. The inclusion of these two types of managers is purely a procedural issue with respect to the experiment; of course, the provision of feedback (not necessarily a good choice because the manager is described as being "new") is supposed to be informative to the participants. Note that a more conservative manager is likely to prefer driving down the planning materiality threshold to a very low level just as a less conservative manager is likely to raise the planning materiality threshold to a relatively high level. In other words, the preset ranges of materiality allow the participants to access the "extremes" of the materiality ranges.[3] Recognizing that a subject's risk

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[2] Smith and Kida (1991, p. 477) define auditor conservatism as "...a tendency to give more attention to, and to be more influenced by, negative information or outcomes." Such behavior seems a rational response to the potentially serious consequences of audit judgments, e.g., litigation against auditors by third parties (i.e., lenders or investors) for (unreported) misstatements in financial reports, especially when such reports overstate the profitability or economic viability of a company.

[3] These materiality ranges were determined after extensive consultation with audit practitioners including two former partners of different Big Six accounting firms.

preferences may not be compatible with the type of manager giving feedback and the pre-set range available to them, subjects are permitted to modify their responses to be different from these pre-set ranges, if they wish.

3.2.3 Efficiency-Effectiveness Trade-Offs

As mentioned before, participants are informed at different points in time by the partner to emphasize efficiency (effy) or effectiveness (effy) as the case may be. Toward the end of each setting (i.e., normal audit and suspected fraud) participants are asked to provide an overall judgment of their planning materiality threshold amount taking into account all prior information (e.g., client riskiness, client size, factor base chosen, and PMAT estimates under the effy and effs scenarios, denoted effy*effs).

For the normal audit setting, because the hypothetical company is a low-risk client and efficiency is quite important, the order of framing is (effy → effs → effy*effs); whereas for the suspected fraud setting, because effectiveness is more important, the order of framing is (effs → effy → effs*effy). Maintaining the same order as in the normal audit setting would not be justified because efficiency considerations are not as relevant when auditing in a fraud mode; similarly, for a low-risk audit engagement, efficiency is typically a more important goal, although audit procedures should not fall below the requirements set out by generally accepted auditing standards (GAAS).[4]

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[4] Counterbalancing these order effects was considered but eschewed in favor of the arguments summarized here. Based on the pilot study experience with a few practitioners, I concluded that little additional insight would be gained from such counterbalancing.

Participants are then asked, using all the qualitative and quantitative information they have provided themselves (i.e., client riskiness, client size, PMAT (effy), and PMAT (effs)) and now displayed on the screen, to arrive at the planning materiality estimate that gives consideration to all information simultaneously. Clearly, because audit efficiency is related to higher PMAT thresholds while audit effectiveness calls for lower PMAT thresholds, participants need to trade off one goal-specific criterion against the other. The nature and extent of the trade-offs made can be analyzed from their final PMAT thresholds. Note that these secondary framing effects moderate the effects of primary framing. In other words, motivational factors, such as (sub)goal attainment may influence the nature and extent of framing effects.

3.2.4 Type of Suspected Fraud

The "suspected fraud" setting is invoked by having the partner-in-charge call for an emergency meeting to discuss his meeting with the Finance Director and member of the client's Audit Committee (see Appendix B for text of framing conditions). The suspicion of defalcation is suggested by the partner's mentioning the Finance Director's account of the discovery, by a junior employee, of inventory pilferage and subsequent over-valuation of other inventory parts to compensate for the shortage. Subjects are further informed that client management is currently taking steps to assess the extent of the exposure by having the internal audit team investigate the situation.

The National Commission on Fraudulent Financial Reporting (1987; also called the Treadway Commission) laid considerable emphasis on management integrity and the

setting of the "proper tone at the top." This issue is highlighted in the current study by featuring a management fraud setting. The suspicion of management fraud is suggested by the partner's mentioning the Finance Director's allegation that the Chief Financial Officer was under considerable pressure from the management to maintain the stable trend in net income (i.e., possibility of "illegitimate income smoothing"). In the terminology used in Hogarth & Einhorn's (1990) venture theory the content of these scenarios can be described as containing a "high perceived level of ambiguity" (illegitimate income smoothing) and a "low perceived level of ambiguity" (inventory theft), respectively. That is, the inventory theft scenario is quite specific and the risk can be assessed, while the income smoothing scenario is nebulous and remains uncertain.

3.2.5 Other Information

While participants' anonymity is preserved when reporting the results, a detailed debriefing questionnaire explained the purpose of the study, and requested information relating to the background and training of participants (e.g., certification held i.e., CPA, CIA or both certifications) and their prior experience in auditing, particularly with the making of materiality judgments (and whether in a primarily external or internal auditing context). Participants who are primarily internal auditors are asked whether the external audit focus of the problem scenario adversely affected their ability to perform the experimental task. Some technical information is also requested from participants: this largely has to do with ascertaining if participants' typically think of materiality computation as being linear when the size of a client increases. Participants are also

asked if they evaluated the initial client riskiness as "high" and/or whether they never changed their initial PMAT estimates at all. The answers to these questions provide diagnostic information about a participant's performance on the task. Finally, a couple of questions enquire about the participant's assessment of whether the task was realistic and/or the scenarios plausible. At the very end, an open-ended question asking participants to comment on anything specific is included; such open-ended questions frequently reveal useful information about the participant's understanding of the experiment (cf. Berg et al., 1990).

Participants were also requested to complete a "self-description inventory" that was developed in Professor Herbert Mirels' laboratory in the Department of Psychology at The Ohio State University. This inventory helps measure the degree of self-confidence that a respondent has in his or her own judgments. It would be useful to examine the level of self-confidence participating auditors had in their own judgments while making these PMAT judgments under different scenarios (cf. Pincus, 1991).

3.3 Pilot Study Results

A pilot study was conducted to establish the feasibility of the main study. The results from the pilot study confirmed almost all the major hypotheses delineated in chapter II. Minor hypotheses discussed in that chapter were not tested because of the small sample size, viz., only 24 participants. These pilot study participants, most of whom were CPAs, were personal acquaintances of the author. However, the majority of the pilot study participants were unaware of the hypotheses that were being tested in

the experiment. Pilot participants were randomly assigned to conditions, i.e., they had an equal chance of being in the defalcation or management fraud condition.

Two findings from the pilot study specifically helped in fine-tuning the experimental design and procedures. First, as mentioned in footnote 4, experience with a few practitioners revealed that counterbalancing the secondary framing conditions of audit efficiency and audit effectiveness would not affect their judgments. Some went to the extent of pointing out that it is inappropriate to consider efficiency when there is a suspicion of fraud: this is tantamount to audit negligence! Consequently, efficiency was only featured as the latter secondary framing condition in the suspected fraud setting.

Second, some pilot study participants did not change their PMAT thresholds in response to the primary and framing manipulations. Their argument (as articulated by two highly experienced pilot subjects) seemed to be that "materiality" is a dollar amount in the mind of the average prudent investor (see FASB, 1980; Hicks, 1964; Stettler, 1974; EAT Study, 1980, for similar views), and ought not to change in response to considerations such as those featured in the task context. However, they did concede that upon becoming aware of the partner's comments and/or the suspicion of fraud, in reality they would have altered the level of audit effort (i.e., increased or decreased it depending upon the circumstances). This finding prompted the incorporation of a section in the experiment where participants are requested to indicate, after each planning materiality estimate, the change in the audit procedures contemplated. The information provided would reveal that even those participants who appeared insensitive to the experimental manipulations (on the basis of unchanged PMAT estimates) nevertheless

changed their level of audit effort.[5] The information requested encompasses both the nature (i.e., add, drop, or no change) and extent (i.e., more, less, or no change) of change(s) in audit procedures.

3.4 Recruitment of Participants

Partners and managers of public accounting firms and directors of internal audit departments of several companies were contacted in early Fall 1994 for the purposes of recruiting their audit staff for participation in the study. The response from them was very positive, and about 230 professional accountants with experience in auditing from 20 accounting firms and other organizations tentatively agreed to participate in the experiment (see Appendix C for a list of accounting firms and the indicated number of tentative participants). Experimental packets containing the materials exhibited in Appendix D and a computer diskette containing the computer program were distributed in late December 1994. Each organization located in Columbus, Cleveland, and Chicago, was provided with an appropriate number of diskettes to match their "qualified" staff (i.e., those who held CPA, CIA, or both certifications). Assignment of experimental packets could be regarded as being "double-blind" because every organization received odd and even-numbered packets and there was no systematic way of providing participants with an even or odd-numbered packet; in particular, the author

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[5] Note that a change in the level of audit effort does translate into an adjustment of materiality thresholds according to several authorities in the professional auditing literature (see, for instance, Arens & Loebbecke, 1991; Leslie, 1985; Carmichael & Benis, 1989). Therefore, such changes effectively amount to a lowering or raising of materiality thresholds for the purposes of this experimental study.

and experimenter had no control at all over the manner in which the packets (including diskette) were distributed.

By early April 1995, 145 completed experimental packets from 16 accounting firms and organizations were received: a response rate of 145/230 = 63%. Participants were informed that an executive summary of the major findings from the completed study would be made available to them.

CHAPTER IV

DATA COLLECTION, ANALYSES, AND RESULTS

4.0 Introduction

This chapter discusses issues related to the collection of data, including the final sample used in the study, presents a menu of statistical methods that are used to analyze the data from different angles, and reports the results from these different types of data analyses employed. Because the study is experimental as well as exploratory in nature, the wealth of information gathered from the participants is amenable to analysis in different ways. However, emphasis was given to those techniques that appeared capable of yielding the most important insights for the research questions of interest.

The rest of this chapter is organized as follows. In section 4.1, the nature of the data collected is explained in detail. A large part of the data collected could not be used, and the consequent shrinkage in the "usable" data is discussed in this section. In section 4.2, a summary of the techniques contemplated for analyzing the data is discussed. Section 4.3 provides descriptive statistics on the final sample selected for analysis, reports the results of some diagnostic tests, and suggests possible avenues of proceeding with the analysis. Section 4.4, the data analysis section, consists of numerous subsections dealing with different types of analyses carried out and the results obtained. Finally, section 4.5 concludes this chapter by offering a summary of the main

results of the study. A summary of the major findings including linkages between the results obtained, their implications for this study and for future research, are subsequently reported and discussed more fully in chapter V.

4.1 Data Collection

By the first week of April 1995, as noted before, 145 completed experimental packets from 16 organizations had been received. Of these, 96 (or 66%) participants were professional auditors holding the certified public accountant (CPA) certificate, 21 (or 19%) held the certified internal auditor (CIA) certificate, and the remaining 28 (or 15%) held neither CPA nor CIA certificate.[1] A majority of the CIAs (i.e., 11/21= 52%) indicated in the debriefing questionnaire that they were not very familiar with the notion of materiality or had limited experience with its determination from the perspective of external auditors. Moreover, given the external audit focus of the study, even in terms of the hypothetical scenario presented, it was thought appropriate to test the major hypotheses using only the 96 CPA participants. The small number of CIAs were, however, included in separate analyses so as to facilitate comparison. Thus, data from a total of 117 participants were (i.e., 96 CPAs + 21 CIAs) utilized in the statistical analyses.

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[1] The latter category of 28 participants included those holding the certified information systems auditor (CISA), certified bank auditor (CBA), and certified fraud examiner (CFE) designations, as well as those who did not hold any certifications. Three participants received "bad" diskettes in this category and were unable to work on the experiment, although they did complete the debriefing questionnaire.

The following information could be gleaned from the completed experimental packets. Among the 96 CPAs and 21 CIAs, the average number of years of experience was approximately 6.5 years and 8.35 years respectively. Participating CPAs/CIAs took about 25/29 minutes to complete the computer portion of the experiment; subsequently filling out the debriefing questionnaire and providing other information, may have required an additional 10 minutes. The average total time for completing the experiment was probably less than 45 minutes (this was also true of the pilot study participants).

It was clear that participants "adapted" well to the experimental design and procedures (cf. Hogarth, 1993; Gibbins & Jamal, 1993) from observing the steady decrease in the number of trials subjects took to arrive at the pre-specified dollar range of PMAT that was stored into the computer. Each participant received feedback at four different times during the experiment: during computation of aud_effy, aud_effs, frd_effs and frd_effy, respectively[2] (see Figures 3.1, 3.2 and 3.3). The progressive decrease in the number of trials-to-criterion, i.e., "task learning behavior" can be observed by looking at Table 4.1 below. Note that PMAT (aud_effy) is the first estimate about which outcome feedback is received, PMAT (aud_effs) is next, PMAT (frd_effs) is the third such estimate receiving outcome feedback, while PMAT (frd_effy) is the last such estimatefor which participants receive outcome feedback. At the end of the feedback-

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[2] The abbreviations "aud" and "frd" denote the normal audit and suspected fraud conditions; "ini," "effy," "effs," and "fin" refer to PMAT estimates made at the initial (ini) stage, after the "efficiency" (effy) secondary framing, after the "effectiveness" (effs) secondary framing, and at the final (fin) stage respectively.

driven process, participants input their own PMAT estimate for that particular scenario which may or may not correspond to the pre-stored ranges for those scenarios determined by the experimenter.

Table 4.1

Mean Number of Trials-to-Criterion (CPA, CIA)

Condition 1: Defalcation		*Condition 2: Management Fraud*	
Trials For:	Mean Trials	Trials For:	Mean Trials
Aud_Effy	(6.49, 9.20)	Aud_Effy	(11.31, 7.27)
Aud_Effs	(2.74, 3.60)	Aud_Effs	(2.84, 3.36)
Frd_Effs	(3.04, 2.10)	Frd_Effs	(2.65, 1.27)
Frd_Effy	(1.62, 1.60)	Frd_Effy	(1.67, 1.00)

As shown in Table 4.1, for condition 1, (CPA, CIA) participants required a mean number of (6.49, 9.20) trials to reach the pre-stored PMAT solution range for the audit efficiency condition, but only a mean of (1.62, 1.60) trials to reach the pre-recorded PMAT estimate for efficiency in the suspected fraud (defalcation) condition. Similarly, for condition 2, (CPA, CIA) participants took a mean number of (11.31, 7.27) trials to reach the solution range for the audit efficiency condition, but they took only a mean of (1.67, 1.00) trials to reach the pre-recorded PMAT estimate for efficiency in the suspected fraud (management fraud) condition. It certainly appears that despite the large

number of trials at the beginning, participants were able to get used to the task environment quite quickly.

The debriefing questionnaire contained questions asking participants to comment upon task realism and plausibility of the scenarios presented in the experimental task. A total of 61 out of 117 participants (i.e., 53 CPAs and 8 CIAs, or 52%) opined that the task was realistic and the scenarios plausible; 49 participants (or 42%) did not respond to this question. Only 7 out of 117 participants (or 6%), felt that the task was not realistic and/or the scenarios implausible.

4.2 Statistical Data Analysis Methods Used

Both quantitative and qualitative data were collected from each participant. The availability of several data inputs from each participant permits several statistical tests, in addition to descriptive statistical summaries. These descriptive summaries enable diagnostic tests to assess integrity of the data. The sign and size of adjustments made to the "anchor" PMAT estimate can also be determined by looking at movements in the PMAT estimates responsive to different secondary framing scenarios (see Appendix B). Such an analysis will confirm or challenge some of the predictions made in chapter II with reference to the "anchoring and adjustment" model that was posited for planning materiality judgments. Because each participant enters planning materiality (PMAT) estimates eight different times (i.e., 4 times in the normal audit setting and 4 times in the suspected fraud setting), and belongs to one of two suspected fraud settings (i.e.,

defalcation or management fraud), there are eight PMAT dollar estimates associated with each participant in a group. Accordingly, the experimental design can be described as a 2 X (2 X 4 X S) mixed ANOVA design.

Primary and secondary framing scenarios occurred sequentially, and therefore, each PMAT estimate serves as an input to the next PMAT estimate. Accordingly, the final audit scenario PMAT estimate could be used to predict the initial suspected fraud PMAT estimate. Another potential predictor variable could be the client riskiness evaluation after the primary framing with respect to the suggestion of suspected fraud (see Appendix B for details of the text of the decision framing implied by task formulation that was used). In other words, both simple and multiple linear regression can be used to make such predictions.

Because client riskiness assessment was operationalized as an ordinal scale variable and participants were asked to evaluate this before and after the "primary framing" (i.e., the suggestion of suspected fraud), a non-parametric test such as the Wilcoxon signed-rank test could be employed to test whether these risk assessments measured on a scale from 1 to 5 (i.e., very low, low, moderate, high, and very high) were significantly higher for the suspected fraud condition.

Other statistical methods can be used with reference to the minor hypotheses referred to in chapter II as well as for exploration of observed patterns in the data collected. Selected comparisons between participants with the CPA, CIA and/or both certifications, are possible through the use of correspondence analysis. Unlike the χ^2

test, which merely provides a test statistic to assess statistical significance, correspondence analysis produces a graphical display of cross tabular information (Greenacre, 1993). Such a visual display is readily comprehensible and can be useful in detecting patterns that might not be evident from simple cross-tabulations. Similarly, multidimensional scaling refers to a conglomeration of data analytic techniques that enable the portrayal of data structure in a spatial fashion that can be easily understood (Kruskal & Wish, 1978). Both of these graphical data analysis techniques are used to gain additional insights about experimental findings.

4.3 Descriptive Statistics and Diagnostic Tests

Section 4.3.1 provides the descriptive statistics which are then used as the basis to perform some diagnostic tests reported in sections 4.3.2 through 4.3.5 to gain an initial understanding of the data collected. It is helpful to obtain some familiarity with the data collected before full-blown statistical procedures are carried out.

4.3.1 Summary of Descriptive Statistics

Table 4.2 provides a summary of descriptive statistics, for CPAs (total N = 96), arranged by suspected fraud condition, i.e., defalcation (n_1=47) and management fraud (n_2=49) scenarios. Table 4.3 provides the same information for CIAs (total N = 21). All PMAT estimates are reported in thousands of dollars. Tables 4.2 and 4.3 reveal the following patterns with respect to both intra-group vs. inter-group comparisons for both

the CPA and CIA samples: (i) the initial PMAT estimate in the normal audit setting for both suspected fraud conditions shows the maximum amount of variance; (ii) the efficiency criterion produces higher PMAT thresholds than does the effectiveness criterion under both suspected fraud conditions; and finally, (iii) the PMAT estimates for aud_fin and frd_fin lie between the bounds (aud_effy, aud_effs) and (frd_effy, frd_effs) respectively. In general, the descriptive statistics reveal patterns that are consistent across CPAs and CIAs. This is somewhat surprising because these are professionals with quite distinct backgrounds and job responsibilities. However, the notion of materiality is familiar to both CPAs and CIAs, and may account for the similar patterns observed.

One of the major hypotheses states that the management fraud condition exhibits greater ambiguity and should therefore produce a larger variance in participants' PMAT estimates. Indeed, this hypothesis holds true for the CPAs in Table 4.2 but is not true for the small CIA sample (N =21) in Table 4.3. For the CPAs from Table 4.2, although the mean PMAT difference in thousands for the two suspected fraud conditions is only $15 (i.e., $578 - $563), the standard error of the mean shows a much greater spread, that is, $74 versus $46.

Table 4.2

PMAT Estimates under Primary and Secondary Framing (CPAs, N=96)

Normal Audit Setting *(Group 1, n_1 = 47)*		
Variable	Mean PMAT	Standard Error
aud_ini	$ 1,371.72	$ 303.84
aud_effy	$ 1,273.87	$ 116.68
aud_effs	$ 611.81	$ 35.76
aud_fin	$ 865.15	$ 42.88

Normal Audit Setting *(Group 2, n_2 = 49)*		
Variable	Mean PMAT	Standard Error
aud_ini	$ 972.18	$ 189.63
aud_effs	$ 1,281.29	$ 119.12
aud_effy	$ 720.12	$ 98.49
aud_fin	$ 947.33	$ 111.78

Defalcation Setting *(Group 1, n_1 = 47)*		
Variable	Mean PMAT	Standard Error
frd_ini	$ 563.51	$ 46.05
frd_effy	$ 322.98	$ 40.21
frd_effs	$ 558.83	$ 43.40
frd_fin	$ 477.55	$ 48.16

Management Fraud Setting *(Group 2, n_2= 49)*		
Variable	Mean PMAT	Standard Error
frd_ini	$ 578.24	$ 74.71
frd_effs	$ 330.63	$ 42.37
frd_effy	$ 526.29	$ 39.25
frd_fin	$ 434.39	$ 38.88

Table 4.3

PMAT Estimates under Primary and Secondary Framing (CIAs, N=21)

Normal Audit Setting *(Group 1, n_1 = 10)*		
Variable	Mean PMAT	Standard Error
aud_ini	$ 1,495.70	$ 654.50
aud_effy	$ 1,207.00	$ 151.34
aud_effs	$ 565.00	$ 55.80
aud_fin	$ 899.50	$ 101.34

Normal Audit Setting *(Group 2, n_2 = 11)*		
Variable	Mean PMAT	Standard Error
aud_ini	$ 2,106.45	$ 1170.46
aud_effs	$ 1,445.45	$ 373.22
aud_effy	$ 904.55	$ 186.41
aud_fin	$ 1,104.55	$ 222.23

Defalcation Setting *(Group 1, n_1 = 10)*		
Variable	Mean PMAT	Standard Error
frd_ini	$ 633.20	$ 201.56
frd_effy	$ 162.50	$ 24.51
frd_effs	$ 470.00	$ 76.45
frd_fin	$ 349.00	$ 52.71

Management Fraud Setting *(Group 2, n_2= 11)*		
Variable	Mean PMAT	Standard Error
frd_ini	$ 354.55	$ 54.96
frd_effs	$ 200.00	$ 42.10
frd_effy	$ 463.64	$ 33.77
frd_fin	$ 347.73	$ 38.21

4.3.2 Diagnostic Tests of Client Riskiness Perception: Wilcoxon Signed Rank Test

Participants were asked to provide a qualitative assessment of the client riskiness (on a scale of 1 to 5, with 1 = very low risk; 2 = low risk; 3 = moderate risk; 4 = high risk; and 5 = very high risk) for both the initial audit setting and later after the suspected fraud setting had been invoked. The Wilcoxon matched-pairs signed rank test is a suitable non-parametric alternative to the within-subjects t-test: the T statistics and its sampling distribution allow for testing the significance of an observed difference between two sets of scores obtained via a repeated measures design (Diekhoff, 1992). The Wilcoxon matched-pairs signed-rank test revealed that for both CPA participants as well as CIA participants significantly higher assessments of client riskiness were observed in the suspected fraud setting (after being exposed to the partner's comments at the emergency planning meeting) than in the normal audit setting. For CPAs the value of the observed test statistic for the difference (rsk_aud - rsk_frd) was $T = -7.72$ ($p < 0.001$) and for CIAs, the value of the same observed test statistic was $T = -3.24$ ($p < 0.002$). Accordingly, it is possible to conclude that the change in background factors (i.e., the shift from a "normal audit" setting to a "suspected fraud" setting) significantly impacted participants' perception of the riskiness associated with the hypothetical client in the two settings.

Because the client riskiness evaluation is a qualitative assessment, participants' assessments at this stage constitute "pre-decisional behavior," part of what Kahneman & Tversky (1979) call "editing operations." Consequently, this result provides evidence

that the primary framing manipulation was successful; it remains to be shown that the impact of such predecisional behavior can be linked to the making of subsequent decisions by auditors, i.e., PMAT judgments.

4.3.3 Diagnostic Tests of Framing Effects: Direction and Size of PMAT Adjustments

A cursory glance at the mean PMAT thresholds in Tables 4.2 and 4.3 confirms that participants were using a decision strategy that has been called "efficiency/effectiveness tradeoffs." Under both normal audit and suspected fraud settings, the PMAT threshold for the efficiency is the higher amount, the PMAT threshold for effectiveness is the lower amount, and the tradeoff can be indirectly surmised by noting that the mean final PMAT threshold lies between these two "extreme" assessments. It should be pointed out that this "high-low then middle" pattern is observed partially owing to the manner in which the feedback provided to the participants induced them to make judgments consistent with the pre-stored solution ranges. However, participants were permitted to arrive at their own independent PMAT judgments for every scenario.

With reference to the anchoring and adjustment model underlying the making of PMAT assessments, it was hypothesized that if PMAT (aud, frd; ini) is treated as a baseline, then PMAT (aud, frd; effy) would be a higher amount, while PMAT (aud, frd; effs) will likely be a lower amount. Again, because the primary framing settings are

global to the audit engagement they are expected to exhibit a greater magnitude of adjustment as compared to the secondary framing scenarios which will probably show a smaller adjustment. In terms of the magnitude of change in these adjustments, in general, effectiveness being a more important criterion than efficiency, PMAT (effs) should be associated with a sharper drop than the relative increase for PMAT (effy). Moreover, across the normal audit and suspected fraud settings one would expect PMAT (effs) to have a steeper slope than PMAT (effy). This prediction partially derives from Kahneman & Tversky's (1979) prospect theory wherein, in the domain of losses, a steeper function is posited. Finally, it was conjectured that participants in the suspected fraud scenarios would make more severe adjustments[3].

The large variance associated with PMAT (aud_ini) is cause for some concern because it lacks the stability to be treated as an "anchor." Moreover, the overall mean PMAT thresholds associated with PMAT (aud_ini) = $ 1,167.79 and PMAT (aud_effy) = $ 1,277.66 do not appear, at first glance to differ substantially (see Figure 4.1). To better understand the nature of the data producing such mean PMAT thresholds, a Wilcoxon matched-pair signed ranks test was performed for the 96 CPA participants. The results were statistically significant with $T=-3.73$ ($p<.001$) showing that the hypothesis that PMAT (aud_effy) > PMAT (aud_ini) was not implausible. In

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[3] Four subjects in the suspected fraud condition did not change their PMAT estimates at all, however, in line with the findings obtained in the pilot study, they did change the nature and extent of audit procedures in the direction implied by the audit partner's comments. As pointed out before, such a change in audit procedures effectively translates as a change in PMAT thresholds in the appropriate directions.

particular, 68 participants gave estimates agreeing with the directional prediction, 28 gave estimates counter to the prediction and there were 8 ties. Moreover, the median PMAT thresholds, namely that PMAT (aud_ini) = $ 500.00, and PMAT (aud_effy) = $ 1,250.00, are much more representative of the PMAT thresholds one would expect in light of theoretical considerations.

In particular, it is now possible to evaluate our predictions from the general process model presented in equation 1.3. The model was stated as follows:

$$\Delta_{C/C} = s_1\Delta_1 + s_2\Delta_2 + K\ (other\ factors) \qquad (4.1)$$

with $s_1, s_2 \in \{-1, 1\}$ and $\Delta_1 > \Delta_2 > 0$.

In Equation (4.1) above, s_1 and s_2 represent the sign, and Δ_1 and Δ_2, the magnitude of change. Further, the subscript 1 refers to the nature of the setting (i.e., "normal audit" or "suspected fraud") while subscript 2 refers to goal-specific criteria (viz., audit efficiency or audit effectiveness). It was hypothesized that s_1 will take on a positive value for an audit scenario (for a low-risk client) while it will assume a negative value for a suspected fraud scenario ("negative framing").

Table 4.4 below summarizes whether the observed PMAT estimates for CPAs conformed to predictions made from equation (4.1). Note that both s and Δ are generic in that they refer to both s_1 and s_2 as well as to Δ_1 and Δ_2. The notation "Y" indicates the prediction was confirmed, while "N" indicates it was disconfirmed. Table 4.4 shows

that most of the predictions related to the efficiency criterion turned out to be false. In other words, although it was hypothesized that PMAT (aud_effy) would be consistently higher than PMAT (aud_ini) in the two normal audit settings for each group as well as the two suspected fraud settings (viz., defalcation and management fraud), the observed PMAT (aud_effy) turned out to be slightly less than PMAT (aud_ini) in three out of the four cases. This might suggest that auditors prefer not to place too much emphasis on efficiency, or that the partner's comments were not convincing enough for participants to respond as expected. The latter explanation is not persuasive because the partner's comments with reference to effectiveness did elicit a response in the expected direction, and the pilot study results confirmed these predictions. The observed anomalous behavior is taken up again in the discussion related to efficiency/effectiveness trade-offs. Note that, at least with respect to the suspected fraud scenarios, it is unrealistic to expect any increase in PMAT (frd_effy) beyond PMAT (frd_ini) because the mere suspicion of fraud dictates that effectiveness be the paramount consideration with efficiency playing only a minor role.

Table 4.4

How Well Do Observed Mean PMAT Thresholds Conform To Predictions?
(CPAs only, N= 96)

Normal Audit Setting				*Defalcation Setting*			
Variable	Mean $ PMAT	s	Δ	Variable	Mean $ PMAT	s	Δ
aud_ini	1,371.72	Y	Y	frd_ini	563. 51	Y	Y
aud_effy	1,273.87	N	N	frd_effs	322.98	Y	Y
aud_effs	611.81	Y	Y	frd_effy	558. 83	N	N
aud_fin	865.15	Y	Y	frd_fin	477. 55	Y	Y
Normal Audit Setting				*Management Fraud Setting*			
Variable	Mean $ PMAT	s	Δ	Variable	Mean $ PMAT	s	Δ
aud_ini	972.18	Y	Y	frd_ini	578.24	Y	Y
aud_effy	1,281.29	Y	Y	frd_effs	330.63	Y	Y
aud_effs	720.12	Y	Y	frd_effy	526.29	N	N
aud_fin	947.33	Y	Y	frd_fin	434.39	Y	Y

4.3.4 Diagnostic Tests: Decision Weighting Strategies

It is clear that participants balanced considerations of efficiency and effectiveness while arriving at the final PMAT estimates in the normal audit and suspected fraud settings respectively. By assuming a decision weighting parameter, say κ, for the

normal audit setting, and another decision weighting parameter, say λ, for the suspected fraud setting, such that $0 \leq \kappa, \lambda \leq 1$, it is possible to ascertain whether a specific participant adopted an equal weighting strategy, an efficiency-prone strategy or an effectiveness-prone strategy. The calculation of κ and λ for the normal audit and suspected fraud settings proceeds as follows:

$$PMAT\ (aud\_fin) = \kappa\ PMAT\ (aud\_effy) + (1-\kappa)\ PMAT\ (aud\_effs) \qquad (4.2)$$

and similarly,

$$PMAT\ (frd\_fin) = \lambda\ PMAT\ (frd\_effy) + (1-\lambda)\ PMAT\ (frd\_effs) \qquad (4.3)$$

If a participant obtains a decision weight value of 0.5 for the corresponding κ and λ, then s/he is described as one who has adopted an "equal-weighting" strategy for that setting, if the decision weight value exceeds 0.5 then s/he is described as being "efficiency-prone" and finally, if the decision weight value is less than 0.5 then s/he is described as being "effectiveness-prone." Table 4.5 summarizes the number of participants who preferred specific decision strategies (in terms of the weights assigned to efficiency or effectiveness) according to the context in which these decisions were made.

Table 4.5

Decision Weighting Strategy Preferred by CPA, CIA and Both Participants

Certification	*CPA*		*CIA*		*Both*	
Strategy	***Audit***	***Fraud***	***Audit***	***Fraud***	***Audit***	***Fraud***
Equal Weighting	20	17	8	10	0	0
Efficiency-Prone	16	28	5	6	3	3
Effectiveness-Prone	42	23	8	3	3	2
TOTAL	78	68	21	19	6	5

Wherever the total does not correspond to the total number of CPAs (90), CIAs (21) or participants with both certifications, denoted Both (6), it is because not all participants could be so classified. For instance, some participants chose to input the same dollar amount for all PMAT estimates, some chose to go beyond the parameter bounds of 0 and 1 etc. Accordingly, Table 4.5 has already been adjusted for "degenerate" strategies (with reference to those defined) such as not changing PMAT thresholds at all, or changing it in such a way that the value of the decision weighting parameters exceeds 1 or falls below 0.

It appears that CPAs are generally effectiveness-prone in the normal audit setting but efficiency-prone in the suspected fraud setting; CIAs prefer to be equal-weighters in both the normal audit and in the suspected fraud setting; as for those holding both

certifications, the only statement we can safely make is that they do not tend to be equal-weighters at all. A slightly different version of Table 4.5 has been used to perform a correspondence analysis in section 4.4.3 (see Figure 4.8 wherein these patterns can be readily observed).

4.3.5 Diagnostic Tests: Plotting Confidence Intervals Around Means

Figures 4.1, 4.2 and 4.3 depict the 95% confidence intervals around the mean PMAT thresholds by utilizing error bars. Note that Figure 4.1 depicts the combined means for the normal audit setting across both groups of participants. Clearly, this kind of pictorial representation is visually quite appealing and tells at a glance, the amount of variation associated with mean PMAT thresholds reported (Loftus & Masson, 1994). Loftus and Masson (1994) strongly espouse the practice of plotting a set of sample means along with their confidence intervals. They believe that such plots can be illuminating because an intuitive assessment of the best estimate of the underlying pattern of population means as well as the degree of statistical power becomes possible. However, see the discussion pertaining to the results of the Wilcoxon matched pair signed ranks test reported in section 4.3.3 earlier in the case when t-test assumptions may have been violated.

From Figures 4.1 and 4.2, it is evident that mean PMAT estimates for the efficiency and effectiveness criteria differ considerably. Similarly, in Figure 4.3 again,

there appears to be no overlap in the confidence intervals between the efficiency and effectiveness criteria. Because of the small sample sizes, similar error bar graphs for CIAs are not presented. Nevertheless, information from Table 4.3 pertaining to CIAs does suggest that there was a significant difference in PMAT thresholds for the normal audit vs. suspected fraud settings. However, there did not appear to be a significant difference between mean PMAT thresholds elicited from subjects in the defalcation and management fraud conditions respectively. In sum, the CIA data reveal patterns and relationships that closely mirror the data obtained from the CPAs.

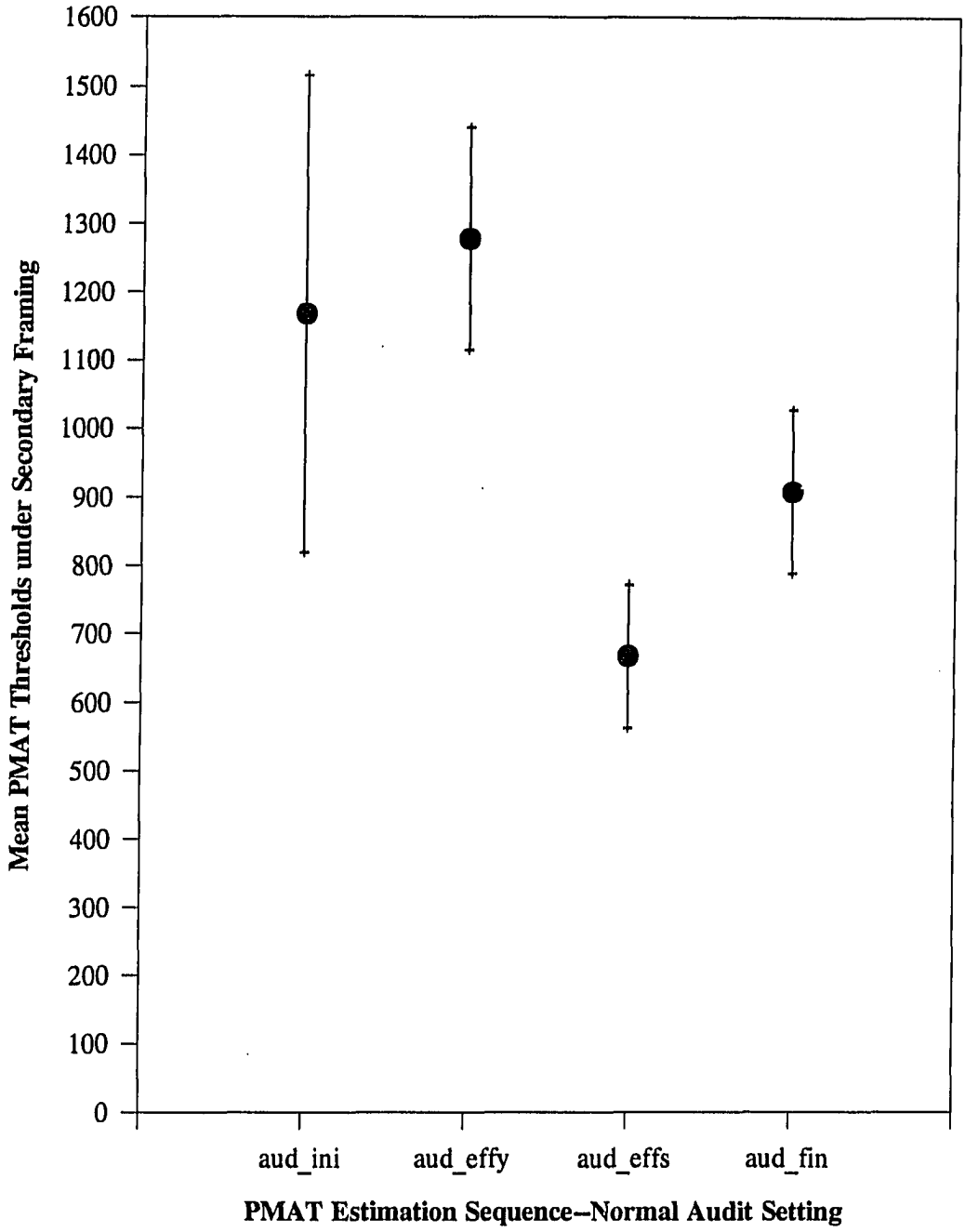

Figure 4.1

95% CI's Around Mean PMAT Thresholds (Combined Means)

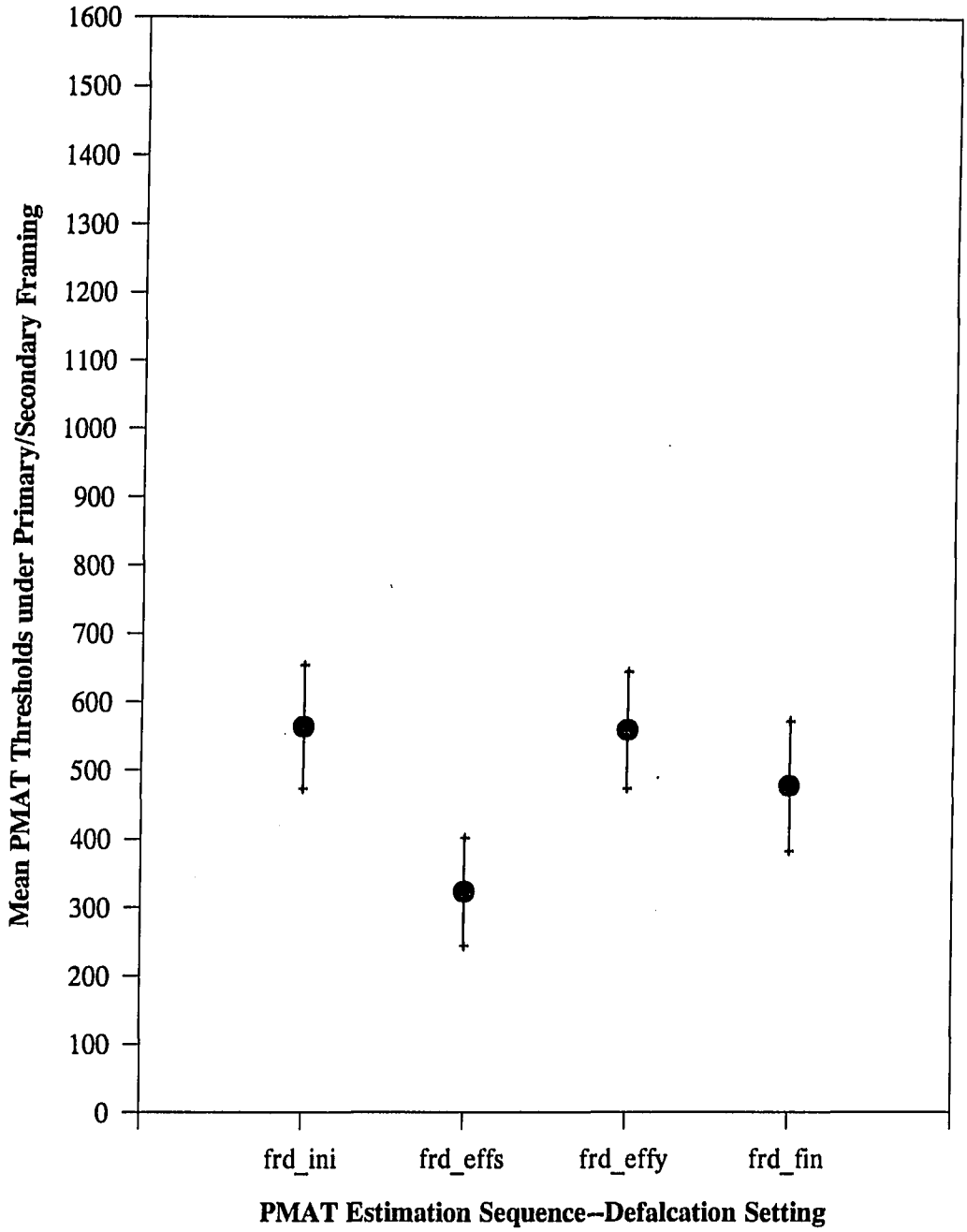

Figure 4.2

95% CI's Around Mean PMAT Thresholds (Defalcation)

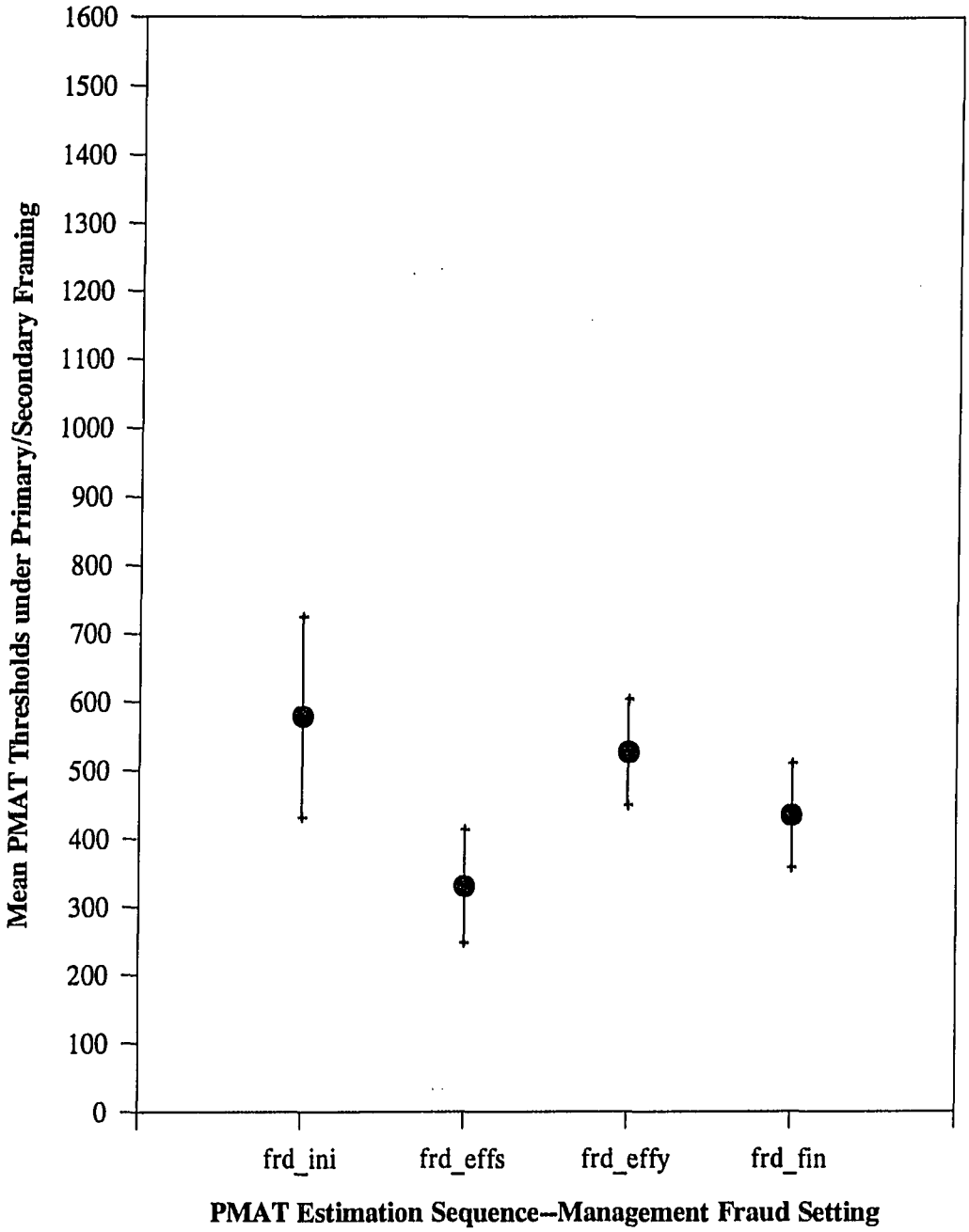

Figure 4.3

95% CI's Around Mean PMAT Thresholds (Management Fraud)

4.3.6 Non-Linearity in Materiality Computation Function

The question in the debriefing questionnaire asking subjects to "scale" materiality computation in response to magnification of the financial statements by a factor is now considered. Specific questions in the debriefing questionnaire (see Appendix D) were designed to elicit participants' opinions as to whether the planning materiality computation is non-linear. Participants were asked to respond whether magnifying the financial statements by 10 or by 100 would result in PMAT thresholds being also magnified by greater than 10, less than 10, or by exactly 10 or 100 as the case may be.

Almost 82% of the 117 participants considered the computation of PMAT to be non-linear. Only 10% considered the computation to stay the same percentage of the factor base even though the size of the client increased. Most of the responses supporting non-linearity (i.e., 70%) indicate that PMAT levels would decrease with increasing client size. This convexity in the shape of the planning materiality estimation function presumably reflects contemporary auditors' concerns about litigation risk (see, for instance, POB, 1993). This finding is supported by Warren & Elliott's (1986) power function using "revenues" as the factor base, and will be discussed in chapter V.

4.4 Statistical Analyses

As mentioned earlier, several statistical analyses can be performed to investigate interesting hypotheses and conjectures. Some of the important techniques that have been

used in this study are: analysis of variance (ANOVA), simple and multiple linear regression, correspondence analysis, and multidimensional scaling. Each of these is taken up in turn in the sections below.

4.4.1 Analysis of Variance (ANOVA)

There were two groups consisting entirely of CPAs, exposed to two types of suspected fraud: the group exposed to defalcation (inventory theft) had 47 subjects, while the group exposed to management fraud (illegitimate income smoothing) had 49 subjects. All mean PMAT thresholds pertaining to CPA participants have been reported in Table 4.2 earlier. Comparable information for groups consisting entirely of CIAs is available in Table 4.3.

To recapitulate, PMAT threshold is the dependent variable; suspected fraud type (i.e., defalcation or management fraud condition) is a two-level between subjects factor (labeled *suspected fraud type*), normal audit or suspected fraud is a two-level within-subjects factor (labeled *primary framing*), and PMAT elicitations for the scenarios corresponding to audit efficiency or audit effectiveness (i.e., aud_ini ⇒ aud_effy ⇒ aud_effs ⇒ aud_fin as opposed to frd_ini ⇒ frd_effs ⇒ frd_effy ⇒ frd_fin) is a four-level within-subjects factor under secondary framing (labeled *scenario*).

Referring back to the major hypotheses outlined in chapter III, the following comparisons are of interest: (a) whether the within-subjects factor, *primary framing*, i.e.,

normal audit setting" vs. "suspected fraud setting" produces statistically significant differences in PMAT thresholds; (b) whether the between-subjects factor, *suspected fraud type* (i.e., defalcation vs. management fraud) produces statistically significant differences in PMAT thresholds; (c) whether the within-subjects factor, *scenario*, generates sufficiently large differences in the PMAT estimates within each of the normal audit and suspected fraud settings, respectively, which prove to be statistically significant; and (d) finally, whether there is any evidence of significant interactions among any of these factors enumerated above. Clearly, these questions can all be answered by performing an analysis of variance.

ANOVA results are reported in Table 4.6 below. Both sum of squares (SS) and mean sum of squares (MS) have been rounded to the nearest integer; only F-ratio's are reported to three decimal places. Table 4.5 shows that the ordinal predictions of the major hypotheses, with respect to the within-subjects factors *primary framing* and *scenario*, were correct. However, the main effect for the between-subjects factor, *suspected fraud type*, was not statistically significant. In other words, mean PMAT thresholds for the defalcation (low ambiguity) and illegitimate income smoothing (high ambiguity) conditions did not reveal a difference that was statistically significant. Some of the reasons for the result which is inconsistent with the hypotheses outlined earlier, will be discussed in chapter V. Figure 4.4 should be viewed in conjunction with Table 4.6 below.

Table 4.6

Source Table for Mixed ANOVA Design

Source	SS	*df*	MS	*F*	*p*
Fraud Type (A)	194923	1	194923	0.128	n.s
S/A	142537286	94	1516354		
Audit/Fraud (B)	54190701	1	54190701	53.919	<.001
AB	65692	1	65962	0.066	n.s
BS/A	94473675	94	1005039		
Scenario (C)	20920793	3	6973598	17.630	<.001
AC	1768352	3	589451	1.490	n.s
CS/A	111543262	282	395543		
BC	4311175	3	1437058	4.091	<.01
ABC	2321755	3	779318	2.203	n.s
BCS/A	99066932	282	351301		

Figure 4.4 shows that the mean PMAT threshold in thousands (the initial estimate) averaged across both suspected fraud conditions for the normal audit setting ($1,168) was far higher than for each individual suspected fraud setting, i.e., defalcation ($564) and management fraud ($578) respectively. However, the mean PMAT difference between the two groups identified by exposure to type of suspected fraud was quite small. Also contrary to predictions made earlier, the mean PMAT threshold for management fraud was higher than that for the defalcation setting. A comparison between the PMAT

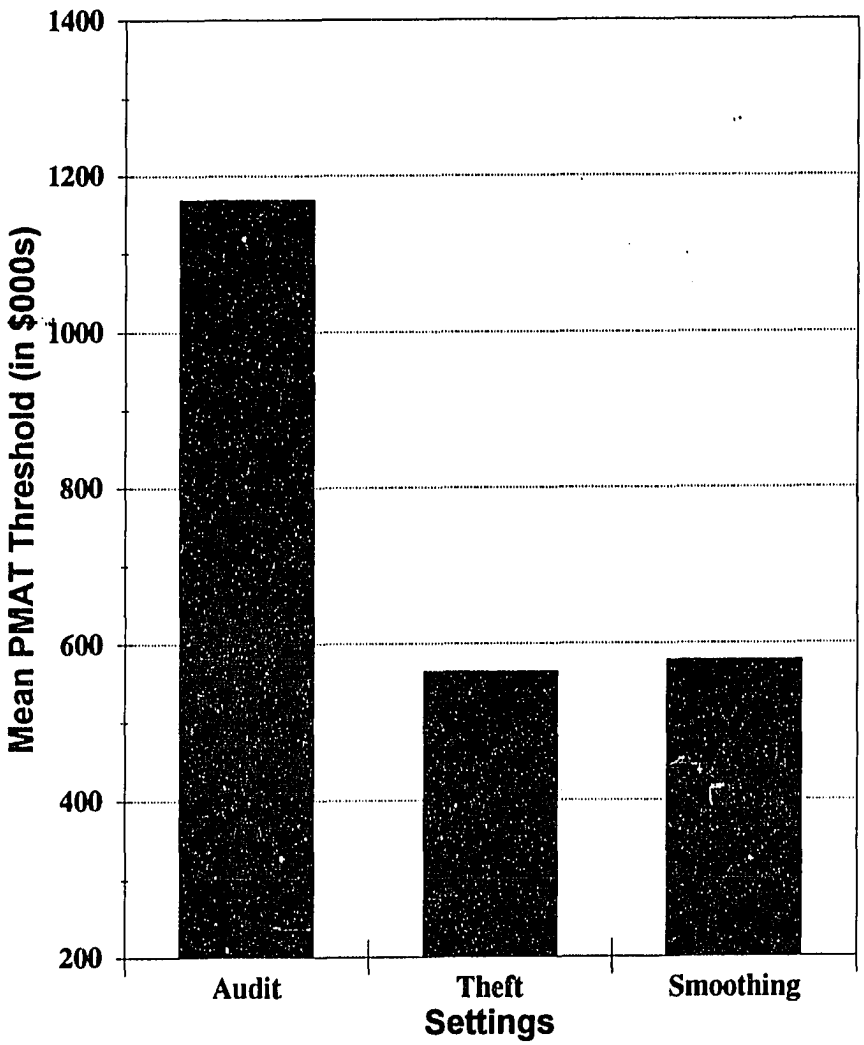

Figure 4.4
Primary Framing Effect

estimates in the normal audit and suspected fraud settings is provided in Figure 4.5. Figure 4.5 clearly displays that mean PMAT estimates in the normal audit setting were consistently higher than those for the suspected fraud setting. Again, the overlapping sequences pertaining to the two *suspected fraud* settings, the between-subjects condition, suggests that there is very little difference between these two groups; however, significant differences are observed with reference to the within-subjects factors, *primary framing* and *scenario*, respectively.

4.4.2 Simple and Multiple Linear Regression

Given the "anchoring and adjustment" nature of the audit judgment process and the design of the experimental task, the outcome from a prior decision frequently constitutes the input at the next decision phase, the very essence of dynamic decision making (see Wallsten & Rapoport, 1972; Busemeyer & Townsend, 1993). This feature of the PMAT estimates elicited sequentially under primary and secondary framing conditions raises the possibility of performing simple and multiple regressions. First, the final PMAT estimate in the normal audit setting (which reflects efficiency/effectiveness tradeoffs), must form the "anchor" for the initial PMAT estimate in each of the suspected fraud settings. Accordingly, a simple linear regression with frd_ini as the dependent variable and aud_fin as the independent variable, for both groups of subjects, was carried out.

A brief overview of the regression model is now presented. Suppose there are n observations on the dependent variable Y corresponding to the n sets of values for the independent variables, X_{i1}, X_{i2}, ..., X_{ip}, where i = 1,2,...,n. It is then possible to express this in matrix notation as:

$$Y = X\beta + e \tag{4.4}$$

where **Y** is the vector of dependent variable values, **X** is the (design) matrix containing the values of the independent variables, β is the vector of parameters, and e is the vector of error components assumed to be uncorrelated with mean zero and common variance σ^2. The parameter values β_i's can be estimated using the principle of least squares. In particular, once the data are available, we choose as the estimates of β_i those values that minimize $\Sigma\ e_i^2$ or the sum of squared deviations of the observed Y_i's from the corresponding values given by the regression function. Now, provided $(\mathbf{X'X})^{-1}$ exists, the solution can be represented in matrix form as follows:

$$\hat{\beta} = (X'X)^{-1}X'Y \tag{4.5}$$

This equation (4.5) above is important in regression analysis because it provides the means (on the right hand side) for obtaining the least squares values for any multiple regression model linear in parameters.

Table 4.7 reports the results of this regression; based on this Table, aud_fin turns out to be a good choice as a predictor variable. Subsequently, to improve the R^2, the inclusion of the level of client riskiness assessment, i.e., risk_frd variable, was examined (see multiple regression results in the next Table 4.8).

Table 4.7

Simple Linear Regression

Reg. Equation (Defalc.): frd_ini = 28.48 + 0.618 (aud_fin)					
Variable	B	S.E. of B	β	T	Sig. T
Aud_fin	0.618	0.131	0.575	4.725	.0000
Constant	28.48	119.46		0.238	.8126
Corr (aud_fin, frd_ini) = 0.58; R^2 = 0.33; Adjusted R^2 = 0.32					
Reg. Equation (Mgt. Fraud): frd_ini = 288.07 + 0.306 (aud_fin)					
Variable	B	S.E. of B	β	T	Sig. T
Aud_fin	0.306	0.087	0.458	3.535	.0009
Constant	288.07	106.03		2.717	.0092
Corr (aud_fin, frd_ini) = 0.46; R^2 = 0.21; Adjusted R^2 = 0.19					

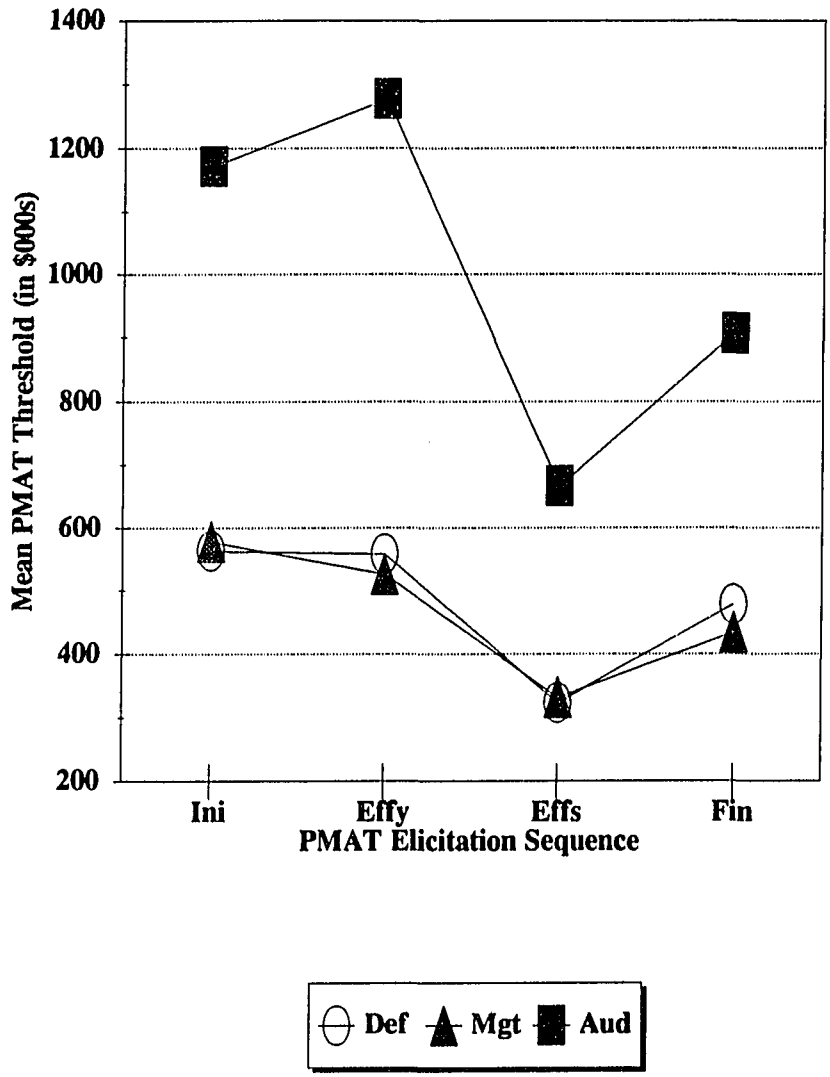

Figure 4.5
Normal Audit vs. Suspected Fraud

Table 4.8

Multiple Linear Regression

Reg. Equation (Defalc.): frd_ini = 665.73 + 0.711 (aud_fin) -192.72 (risk_frd)					
Variable	B	S.E. of B	β	T	Sig. T
Aud_fin	0.711	0.111	0.662	6.410	.0000
Risk_frd	-192.72	42.26	-0.471	-4.561	.0000
Constant	665.73	171.56		3.880	.0003
Multiple R = 0.73; R^2 = 0.55; Adjusted R^2 = 0.53					
Reg. Equation (Mgt. Frd): frd_ini = 915.06 + 0.294 (aud_fin) -158.77 (risk_frd)					
Variable	B	S.E. of B	β	T	Sig. T
Aud_fin	0.294	0.087	0.458	3.535	.0009
Risk_frd	-158.77	112.42	-0.182	-1.412	.1646
Constant	915.06	456.20		2.006	.0508
Multiple R = 0.49; R^2 = 0.24; Adjusted R^2 = 0.21					

The inclusion of risk_frd as an additional independent variable is appropriate for the defalcation condition (the increment to R^2 is over 0.20 and statistically significant) but it does poorly with reference to the management fraud condition (here the increment to R^2 is only about 0.03 and is not statistically significant). As noted earlier, the ANOVA showed that the two groups did not differ significantly with respect to the

between-subjects factor, viz., type of suspected fraud, yet the results of multiple regression suggest that there seem to exist some very stark differences between the two groups. This is also evident from a quick examination of the beta weights for risk_frd. More sophisticated analysis may be needed to tease out these differences. Client size, choice of materiality base, and work experience could potentially prove to be other good predictor variables, but for the data in this study, their inclusion as an additional independent variable did not account for much more variance and the associated regression weights proved not to be statistically significant. Further analysis was deemed unnecessary keeping in mind the primary intention of using multiple regression to test the validity of the "process model" assumed.

4.4.3 Correspondence Analyses

While correspondence analysis is available in major statistical software packages such as SAS, it has not yet gained sufficient popularity as an exploratory technique whenever cross tabular information needs to be analyzed. One of the aims of using the correspondence analysis technique in this study is to introduce it as a viable method that can be exploited in psychology and accounting research.

The ensuing discussion largely draws upon Greenacre (1993). Correspondence analysis is a technique that facilitates examination of the row-column associations in cross tabulated information. Such associations can be displayed in a one, two or three

dimensional display called a map. A fundamental notion in correspondence analysis is that of a *profile* which is obtained simply by dividing each element of a row by the row sum or alternatively, each element column of a column by the column sum. A correspondence map depicts row and column profiles on a map: such pictorial representation is amenable to interpretation in terms of their location and their proximity to or distance from the average profile. Another basic concept is that of *inertia*, a metric that captures the overall disparity among profiles. The dimensionality of cross tabular information subjected to correspondence analysis is defined as {min (number of rows, number of columns) - 1}, i.e., subtract one from the number of rows or columns, whichever is smaller. Inertia measures the similarity or dissimilarity among profiles and takes on a value of zero when all profiles are identical and are coincident with the average profile; it attains a maximum when its value reaches the dimensionality of the cross tabular information. Further, the χ^2 statistic with reference to a contingency table is obtained by multiplying the inertia by the total number of responses in the table (i.e., sample size). A significant χ^2 supports the conclusion that any differences between profiles can be attributed to more than merely chance occurrence. To adequately represent the similarities and dissimilarities in the profiles and to avoid loss of information, it is important that a large proportion of the inertia be reflected on the correspondence map. Consequently, when a map has as many dimensions as the dimensionality of the problem itself, a perfectly accurate representation is achieved.

Given a cross tabulation with non-negative entries, the problem to be solved by using correspondence analysis is finding a weighted least squares approximation to N (the data matrix). The following equation presents such an approximation:

$$N = nrc' + (D_r X)(nD_\mu)(D_c Y)' \qquad (4.6)$$

where

n = grand total of entries in N ($=\Sigma\Sigma\, n_{ij}$)

r = row masses; **c** = column masses

D_r = diagonal matrix of row masses

D_c = diagonal matrix of column masses

D_μ = diagonal matrix of square roots of principal inertias

X, Y = matrices whose column vectors contain standards coordinates (note that these can rescaled to obtain the principal coordinates)

Solutions of rank *k* are obtained from the above Equation (4.6) by using the first k columns of X, Y, and by choosing the (k x k) partition from the top left corner of D_μ.

In this study, the correspondence analysis technique is used to compare three groups of professional auditors: CPAs, CIAs, and persons holding both certifications. The comparisons make use of two distinct pieces of empirical data collected: choice of materiality factor base to arrive at an initial estimate of PMAT and the levels of PMAT

thresholds (on a 7-point scale from extremely low to extremely high). Table 4.9 below presents the cross tabular information that was used to carry out the correspondence analysis for choice of materiality factor base.

Table 4.9

Cross-Tabular Information for Correspondence Analysis (Factor Base)

Certification By Choice of Materiality Factor Base			
	CPA	CIA	CPA & CIA
Gross Margin	6	0	1
Pretax Net Income	24	6	2
Total Assets	24	6	1
Total Revenue	32	7	2
Other Base	4	2	0
TOTAL	90	21	6

The χ^2 test statistic for this cross tabulation with a value of 4.04 and 8 degrees of freedom was not significant at the .05 level. Therefore, all the interpretations from the correspondence map appearing as Figure 4.6 need to be made with caution. First, it must be noted that the map is of high quality because 100% (i.e., 94.28% + 5.72%) of the inertia is captured (the dimensionality of the problem is 2, and the map itself is represented in two dimensions). Although it appears that persons holding both certifications seem to prefer the choice of gross margin as a base for the initial

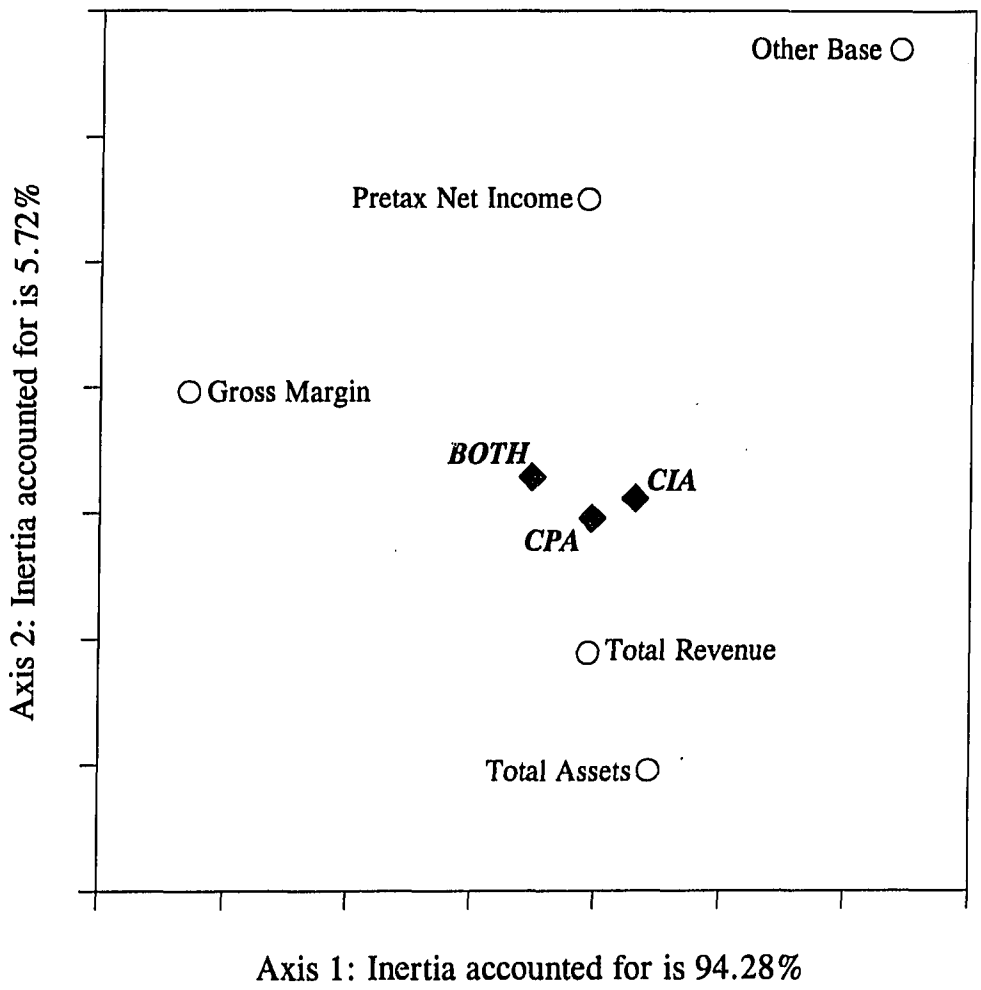

Figure 4.6

Correspondence Analysis Map:

Certification by Choice of Materiality Base

computation of materiality, a quick glance at Table 4.9 shows why such a claim may be unjustified. The total number of participants with both certifications is only 6, and only one of them chose gross margin as a materiality factor base. It appears the sample size is too small to arrive at any firm conclusions. In terms of the participants in this study, both CPAs and CIAs appeared to prefer "Total Revenue" and "Total Assets" as the factor base for materiality computation although the professional literature suggests that the most popular base is (pretax) net income (see Leslie, 1985; Wallace, 1991). One reason for this finding might be the relatively large proportion of participants in the study who were affiliated with banks and utility companies where total assets is an important item on the financial statements.

Table 4.10 shows the frequency with which CPAs, CIAs and Both (certifications) fell into one of arbitrarily chosen seven ordered categories of threshold PMAT levels from "extremely low" to "extremely high." The frequency information enables the use of correspondence analysis to detect any patterns or trends in the profiles that would merit further attention.

Table 4.10

Cross-Tabular Information for Correspondence Analysis (Anchor Levels)

Certification By "Anchor" (Initial Audit Materiality) Levels			
	CPA	CIA	CPA & CIA
Extremely Low (< $100)	22	4	1
Very Low ($101-$300)	14	7	0
Low ($301-$500)	10	1	2
Moderate ($501-$1000)	17	1	1
High ($1001-$1500)	10	2	0
Very High ($1501-$2000)	6	1	1
Extremely High (> $2001)	11	5	1
TOTAL	90	21	6

The χ^2 test statistic for the cross tabulation in Table 4.10, with a value of 13.25 and with 12 degrees of freedom, was again not significant at the .05 level. Therefore, all the interpretations from the correspondence map appearing as Figure 4.7 must be made with extreme caution. For the same reasons given to account for the excellent quality of the correspondence map, the map in Figure 4.7 also captures all the inertia, i.e., 73.79% + 26.21% = 100%.

Some general statements can be made about the map in Figure 4.7. First, it appears that there is a lot of scatter in the frequencies associated with each one of the PMAT level categories. While there is a preference among all types of auditors to

assess planning materiality across the entire range from extremely low to extremely high, CPAs in particular were observed to remain in the moderate to high range in their PMAT estimates, relative to the other two groups.

Finally, Figure 4.8 shows yet another correspondence analysis map based on Table 4.11. This time it displays the type of decision weighting scheme adopted by each participant: they are either equal weighters giving equal importance to criteria such as efficiency and effectiveness or whether they are likely to overweight efficiency or effectiveness considerations in different contexts. Because the dimensions in the solution are 2, the map in Figure 4.8 also captures all the inertia, i.e., 81.37% + 18.63% = 100% and thus, is an accurate representation.

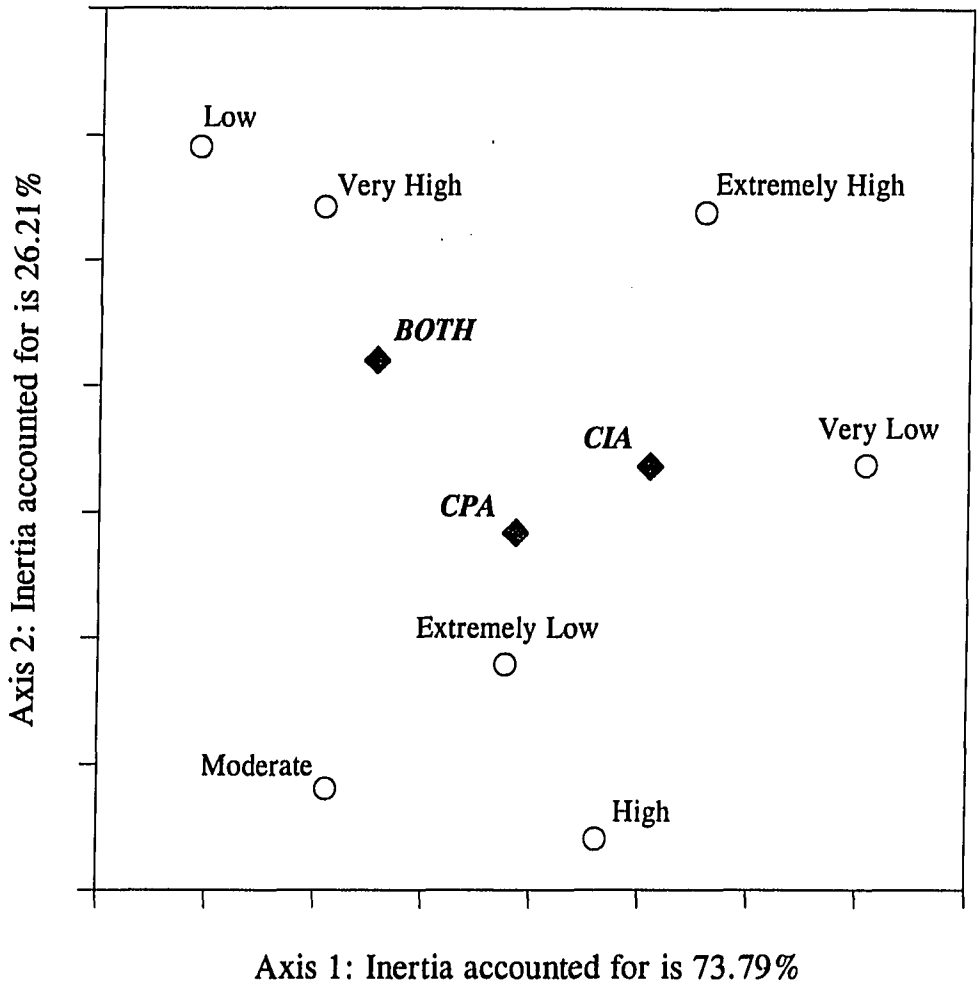

Figure 4.7

Correspondence Analysis Map:

Certification by Anchor (Aud_Ini) Materiality Level

Table 4.11

Cross-Tabular Information for Correspondence Analysis

(Decision Weights)

Certification by Decision Strategy in Different Contexts			
	CPA	**CIA**	**Both**
Audit_Equal	20	8	0
Audit_Efficiency	16	5	3
Audit_Effectiveness	42	8	3
Subtotal--Audit	**78**	**21**	**6**
Fraud_Equal	17	10	0
Fraud_Efficiency	28	6	3
Fraud_Effectiveness	23	3	2
Subtotal--Fraud	**68**	**19**	**5**

The correspondence map in Figure 4.8 is highly interpretable and enables us to draw distinctions among participants with specific certifications by looking at their choice of decision strategies. First, participants who hold both certifications appear to emphasize efficiency when in the suspected fraud setting relatively more than CPAs and CIAs (note that there are only 6 such participants and hence one must be careful not to draw any strong inferences from this observation). While CIAs prefer an equal weighting strategy in general, CPAs appear to emphasize the effectiveness criterion in

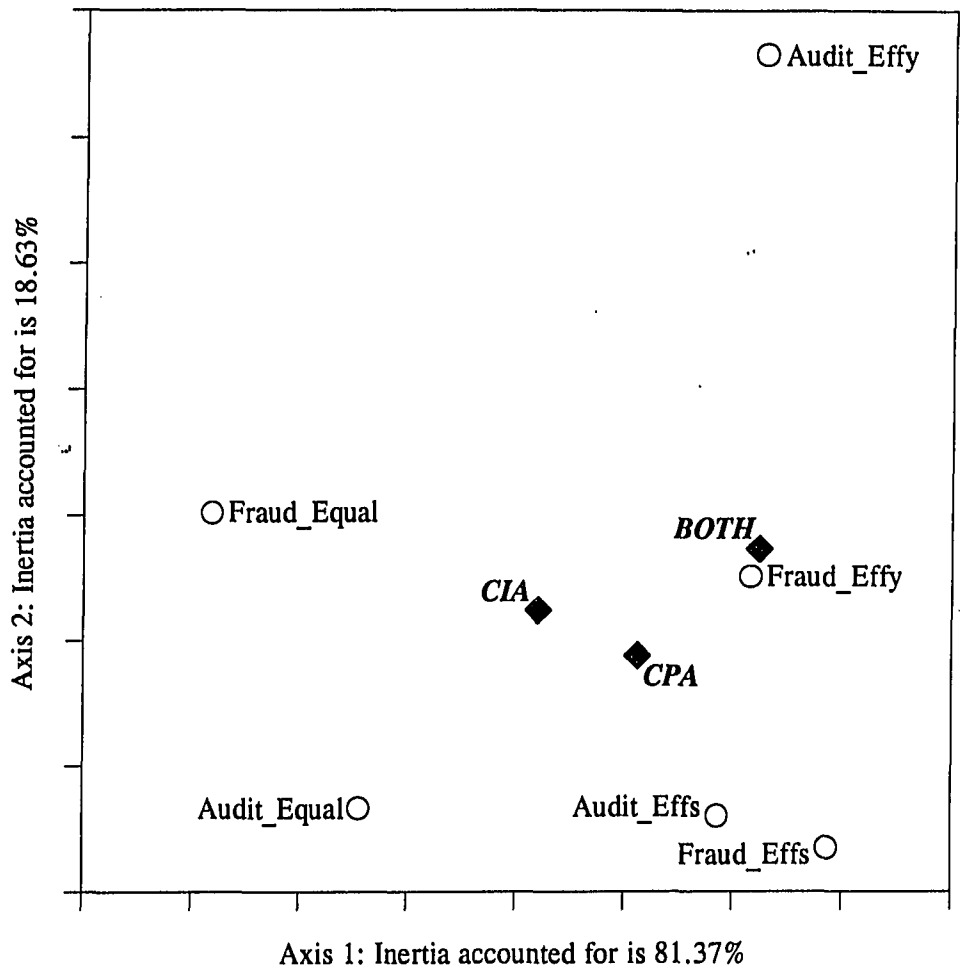

Figure 4.8

Correspondence Analysis Map:

Decision Weighting of Efficiency and Effectiveness in PMAT Judgments

both normal audit and suspected fraud settings. None of the participants appeared to gravitate towards the use of efficiency in decision weighting when in the normal audit setting. Although the χ^2 test statistic for the cross tabulation shown in Table 4.11, with a value of 13.73 and with 10 degrees of freedom, was not significant at the .05 level, the correspondence map brings out some relationships that cannot be readily be discerned otherwise. It is important to recognize the simplicity and power of the correspondence analysis technique and its ability to explore patterns that may not readily be evident from contingency tables. Correspondence maps should supplement the tabulated information available and not supplant it. Finally, it is important to ascertain whether the observed χ^2 is significant before making interpretations of correspondence maps. If the observed χ^2 statistic is statistically significant, this fact enables us to gain comfort that it is not merely chance occurrences that may be responsible for the patterns/trends observed.

4.4.4 Multidimensional Scaling

The goal of multidimensional scaling (MDS) is to uncover the dimensional structure of a set of elements by examining the "similarities" or proximities between those elements (Diekhoff, 1992). In other words, for a set of observed dissimilarities or distances between every pair of k elements, MDS seeks to find configurations in $q \leq (k - 1)$ dimensions such that the inter-element proximities "nearly match" the original similarities (or distances) as closely as possible (Johnson & Wichern, 1992). The

numerical measure of closeness, called "stress," measures the extent to which a geometrical representation falls short of a "perfect match" (Kruskal, 1964). For a set of k items or elements, it is possible to arrange them in a low-dimensional co-ordinate system using only rank orders of the k(k-1)/2 original similarities or distances, without recourse to their magnitudes. Shepard's (1962) path-breaking work introduced what is now called *non-metric multidimensional scaling* wherein a multidimensional map can be obtained from distance-like numbers defined only at the ordinal level (Young & Hamer, 1987). Previously, starting with Torgerson (1952) and Messick & Abelson (1956) who used the Euclidean distance model, and Attneave (1950) who discussed the City-Block model, actual magnitudes of the original similarities (or distances) were required to carry out what is known as *metric multidimensional scaling.*

The following discussion is based on Johnson & Wichern (1992). For N elements, there are T = N(N - 1)/2 similarities (distances) or rank orders thereof between pairs of different elements, which constitute the basic data set. It is possible to arrange these T similarities in a strictly ascending order, where the smallest similarity pair identifies the pair of elements that are least similar. The objective is to find a q-dimensional configuration of the N elements such that the distances, d^q_{ik} between pairs of items matches the ordering of similarities. If the distances are laid out in a descending order, analogous to the ascending ordering of the initial similarities, a perfect match occurs when:

$$d^{q}_{i1k1} > d^{q}_{i2k2} > \ldots > d^{q}_{iTkT} \tag{4.7}$$

For a given value of q, finding a configuration of points whose pairwise distances are monotonically related to the original similarities may prove infeasible. Accordingly, Kruskal (1964) proposed a measure of the extent to which a geometrical representation approximates a perfect match. This measure, called *stress*, is defined as follows:

$$Stress\ (q) = \left[\frac{\sum\sum_{i<k} (d^{q}_{ik} - (\hat{d}^{q}_{ik})^2}{\sum\sum_{i<k} (d^{q}_{ik})^2} \right]^{1/2} \tag{4.8}$$

Note that the $\hat{d}^{q}$'s in the stress formula above in Equation (4.8) are monotonically related to the similarities. However, they are not distances in the sense that they satisfy the usual distance properties but are merely numbers that are used in evaluating the nonmonotonicity of the observed d^{q} 's.

Libby (1981) briefly reviews three studies in accounting with a focus on studying accounting policy preferences that have employed MDS analyses, viz., Libby (1979), Rockness & Nikolai (1977), and Brown (1981). Because the intent here is to use MDS procedures for exploratory data analysis, the following stages are contemplated: first, generate proximity data for all possible pairs of elements being examined; next, use these proximities or similarities to map or scale the elements into one or more spatial

dimensions, and finally, interpret the resulting graphical display. There is a plethora of MDS techniques available and to assess the appropriateness and quality of the results obtained, it is important to know which type of MDS, what measure of similarity or distance and which computer program was used. It is also significant to understand how the number of dimensions in the solution was arrived at. Each of these concerns is discussed before the results of the analysis are presented.

The items sought to be "scaled" using MDS will be the eight PMAT estimates obtained from every participant, four estimates each under the normal audit and the suspected fraud conditions respectively. These PMAT estimates are dollar amounts expressed in thousands. The averaged z-score differences between pairs of variables are assumed to constitute the measure of dissimilarity that forms the input to the MDS procedure. The squared Euclidean distance is then used as a measure of proximity. It is computed as the sum of squared differences between those elements across a series of k descriptor variables, e.g.,

$$d^2_{AB} = \sum_{i=1}^{k} (A_i - B_i)^2 \qquad (4.9)$$

where,

d^2_{AB} = squared Euclidean distance between elements A and B

k = number of descriptor variables on which the elements are being compared

A = values on the k descriptor variables for elements A

B = values on the k descriptor variables for elements B

Although the squared Euclidean distance is sensitive to both profile differences as well as level differences, it remains fairly susceptible to distortion from magnitude differences that exist from one descriptor variable to the next. Accordingly, to eliminate this susceptibility to score magnitude, we standardize descriptor variables prior to computing d^2.

Two dimensions were selected for the solution space based on the rationale that two distinct experimental manipulations were used and the stimulus configuration map typically summarizes an immense quantity of information about how participants perceived the elements being examined. Finally, it must be pointed out that among the several competing software packages, this analysis was conducted using ALSCAL (Alternating Least-squares SCALing) which systematically minimizes SSTRESS, created by Takane, Young, and De Leeuw (1976).

Figures 4.9 and 4.11 are MDS derived stimulus configurations of the eight PMAT estimates for 96 CPAs and 21 CIAs respectively, using the squared Euclidean distance model. Figures 4.10 and 4.12 are scatterplots of the linear fit of distances against disparities (i.e., dissimilarities). Both graphical displays in Figures 4.9 and 4.11 are striking because the two dimensions represented are so clearly marked off. The first direction of interpretation, dimension 1, may be viewed as separating the positive and

negative framing settings (i.e., normal audit vs. suspected fraud). The second direction of interpretation, dimension 2, can then be viewed as distinguishing efficiency criteria from effectiveness criteria. While the pattern of PMAT estimates in the normal audit setting for CPAs and CIAs are quite comparable, the PMAT estimates for the suspected fraud setting are quite distinct for the two groups of auditors. In particular, while the suspected fraud PMAT estimates for CIAs are quite spread apart, the same estimates are clustered together for the CPAs, suggesting greater similarity among them. The cluster pattern observed with reference to the suspected fraud setting suggests that CIAs react the same way whether they are exposed to a normal audit or suspected fraud setting; CPAs however, show a tendency to respond to suspected fraud settings quite differently than they would to a normal audit setting. This observed pattern seems only to confirm what we have already noted from Figure 4.8 earlier with respect to the correspondence analysis involving adoption of specific decision strategies concerning efficiency and effectiveness considerations.

The scatterplot of linear fit for both CPAs and CIAs looks reasonably good. The Kruskal's stress value for both displays is 0.04 and the R-squared value is greater than 98% (here, R-squared values are the proportion of variance of the scaled data or disparities in the partition matrix accounted for by their corresponding distances. *Ceteris paribus*, a stress value of less than 0.15 coupled with an R-squared value exceeding 90% indicates quite a good fit (Diekhoff, 1992; Kruskal, 1964; Kruskal & Wish, 1978). The

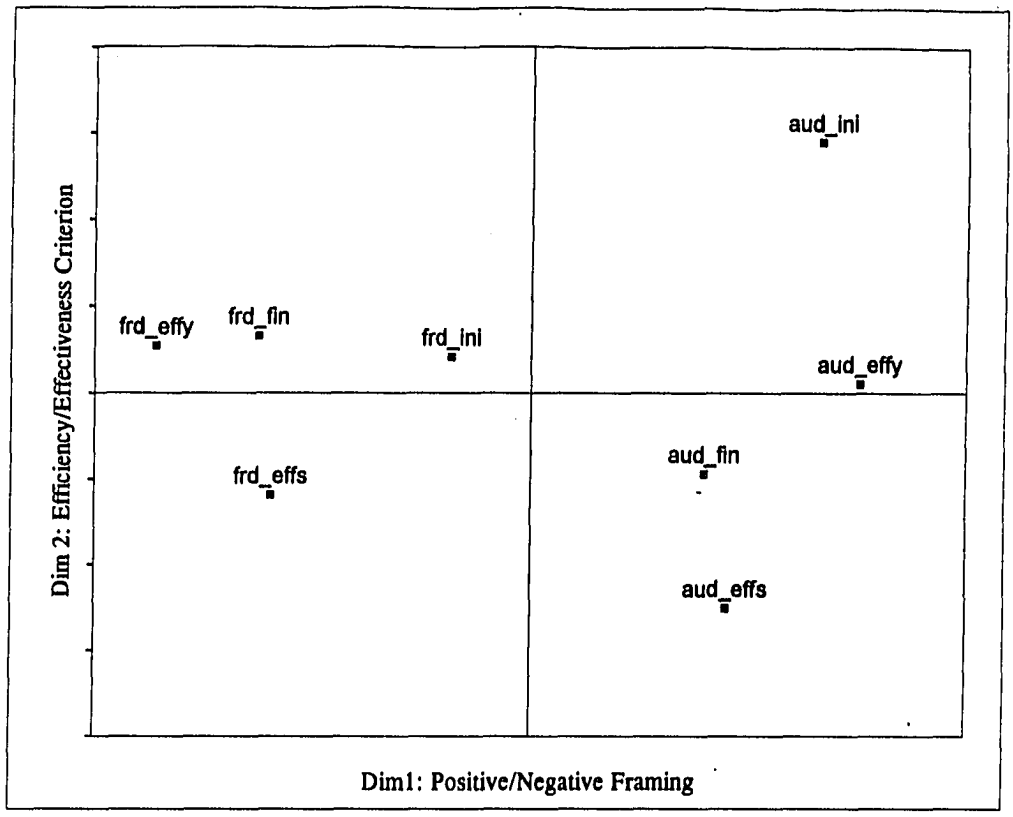

Figure 4.9

Derived Stimulus Configuration: CPAs (N=96)

Squared Euclidean distance model

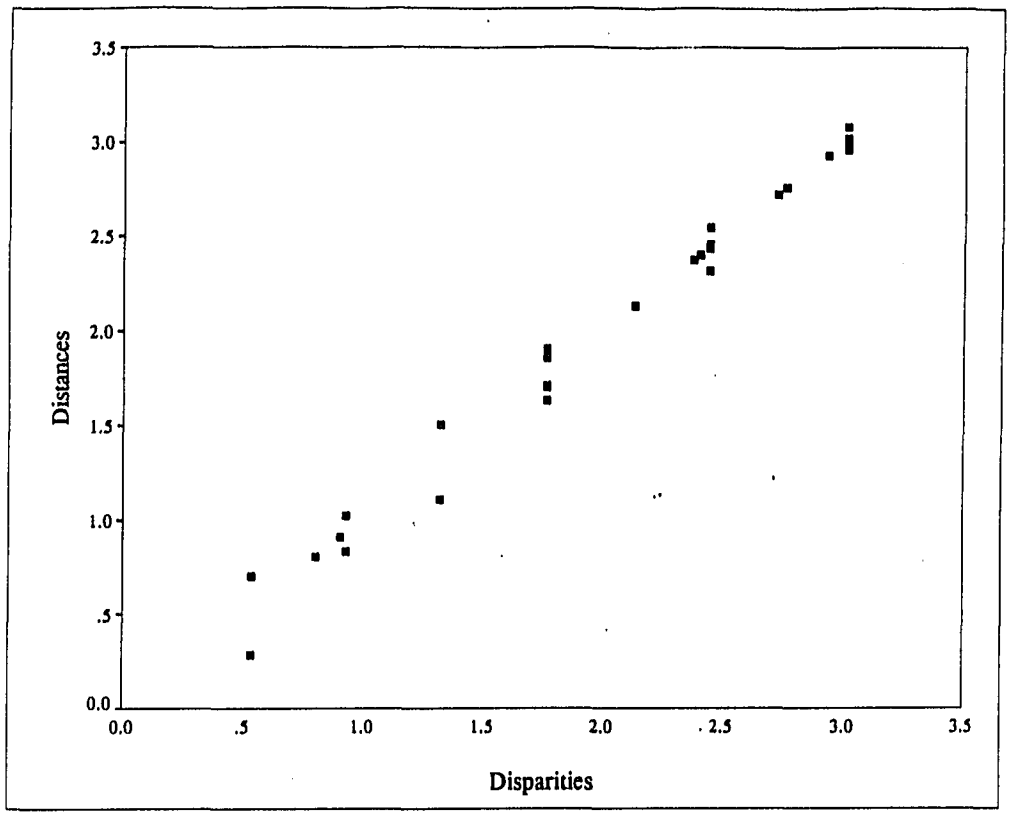

Figure 4.10

Scatterplot of Linear Fit: CPAs

Squared Euclidean distance model

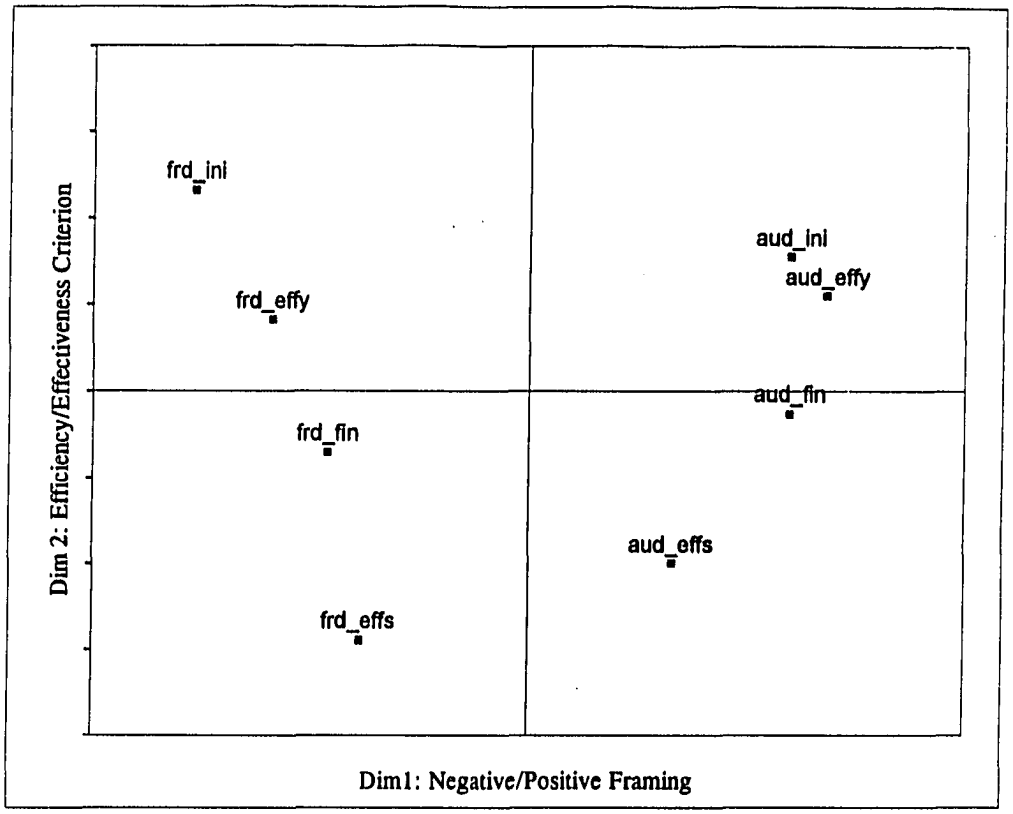

Figure 4.11

Derived Stimulus Configuration: CIAs (N=21)

Squared Euclidean distance model

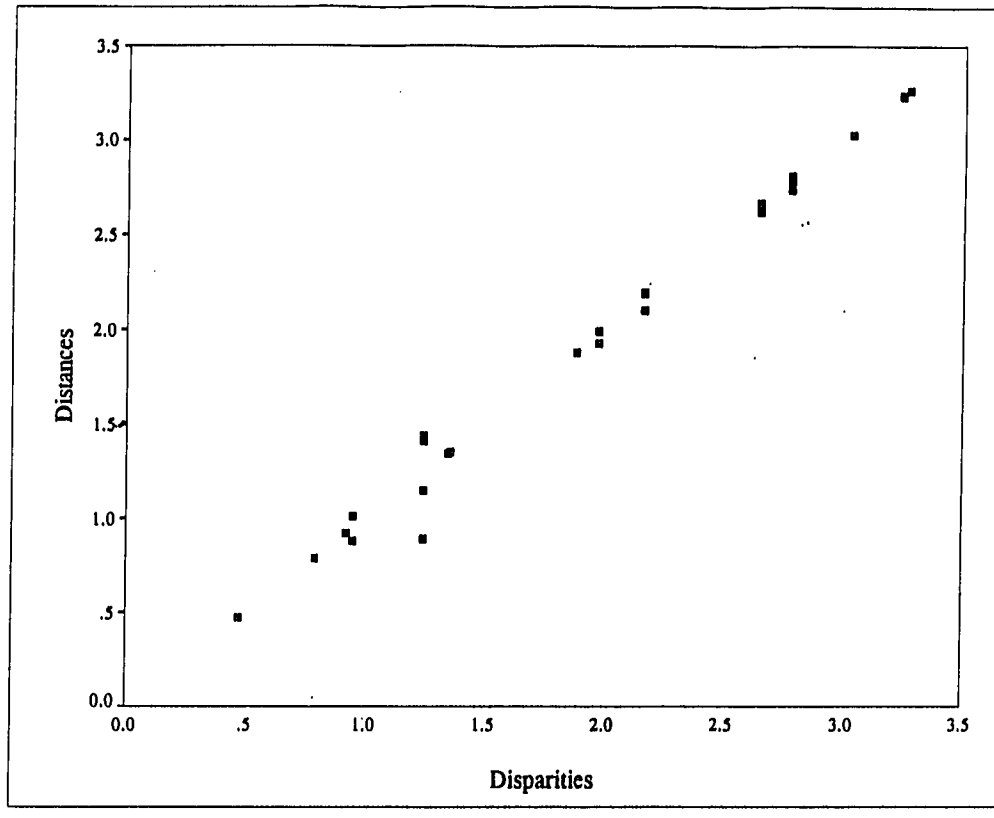

Figure 4.12

Scatterplot of Linear Fit: ClAs

Squared Euclidean distance model

interpretation of the stress measure depends on the number of elements, I, and the dimensionality, D. However, as a rule of thumb, the stress measure is not sensitive to I or D, provided $I>4D$, which is marginally satisfied in the current case where $I=8$ and $D=2$.

It should be pointed out that an MDS performed on the (8 X 8) correlation matrix of PMAT threshold dollar amounts (by obtaining measures of dissimilarity as follows: first, take the absolute values of all the correlations; then, subtract each absolute correlation value from a constant, say 1.00, to obtain measures of dissimilarity), yielded a comparable map as exhibited here. This is probably because it can be easily shown that the squared Euclidean distance for standardized scores is proportional to the dissimilarity measure computed above.

4.5 Summary

This chapter has reported the results of several data analyses: Wilcoxon signed-rank test, ANOVA, simple and multiple regression, correspondence analysis, multidimensional scaling, and conformity to predictions made in the general process model mentioned in section 1.3.1.

In this section the main results are now recapitulated: (a) the Wilcoxon signed rank test revealed that participants assessed client riskiness to be significantly higher for the suspected fraud setting than they did for the normal audit setting; (b) the ANOVA results showed a main effect for the within subjects factor (primary framing), viz., normal audit vs. suspected fraud, and also for the (secondary framing) scenario, viz., efficiency vs. effectiveness criterion, and also a significant interaction between the two; (c) the multiple regression enabled a significant proportion of the variance in PMAT (frd_ini) estimates to be explained by predictor variables PMAT (aud_fin) and risk_frd; (d) three correspondence analyses were carried out, however, only the last one showed that while CPAs emphasize the effectiveness criterion, CIAs prefer to balance considerations of efficiency and effectiveness; (e) the multidimensional scaling produced a stimulus configuration that, in a sense, recovered the experimental design: in a plot with two dimensions, one dimension could be interpreted as separating positive vs. negative framing while the other separated efficiency from effectiveness. While many of the ordinal hypotheses mentioned in chapter III were borne out, there were some

specific results that need explanation. Interpretations of these results and their implications have been deferred to chapter V.

CHAPTER V

DISCUSSION

5.0 Introduction

A menu of data analysis methods were employed in chapter IV to extract as much information from the data collected as possible. With reference to the results obtained from statistical analyses in the previous chapter, this chapter offers interpretations and highlights the implications of the findings.

Section 5.1 briefly discusses the role of primary, secondary framing, and trade-offs in auditors' PMAT judgments. Section 5.2 discusses the implications of the study's findings for two behavioral decision theories, Kahneman & Tversky's (1979) prospect theory and Hogarth & Einhorn's (1990) venture theory. Section 5.3 shows that the general process model assumed to operate in this experimental study is not an implausible assumption. Section 5.4 takes up the results of correspondence analyses and multidimensional scaling to compare the PMAT judgment behavior of internal and external auditors with reference to their decision strategies. In section 5.5, the preference indicated by participants for viewing planning materiality computation as being non-linear is reviewed and the implications discussed. Finally, in section 5.6, other findings are reported and discussed.

5.1 Role of Primary, Secondary Framing and Trade-Offs in PMAT Judgments

Although a substantial amount of variance was noted in participants' initial PMAT estimates in the normal audit setting, this is in line with findings from past research (e.g., Mayper, 1982; Pany & Wheeler, 1989; Mayper et al., 1989) and serves to re-emphasize the motivation for this study, viz., to investigate the sources of variance in auditors' planning materiality judgments, in particular, the influence of psychological variables such as decision framing and decision strategies. Studying the impact of psychological variables on professional judgment is important for understanding knowledge intensive behavior in complex domains (Hogarth, 1993).

This research study extends past research in at least two methodological ways, i.e., the experiment featured a realistic task and was computer-simulated so as to allow for the provision of feedback. Data from the participants preserves some ordinal relationships in PMAT judgments under different scenarios, implied by authoritative professional standards such as SAS 31 and SAS 39. It is thus seen that PMAT (aud, frd; effy) > PMAT (aud, frd; effs) as well as PMAT (aud, frd; effs) < PMAT (aud, frd; fin) < PMAT (aud, frd; effy) hold under both conditions. This indicates the participants' recognition that the effectiveness criterion requires a higher level of audit effort than the efficiency criterion. Tradeoffs between efficiency and effectiveness criteria are routinely made; for the normal audit setting, the tradeoff is nearer to PMAT (aud; effs), however, for the suspected fraud setting, the tradeoff is nearer PMAT (frd; effy). As noted before, the variance in the PMAT(frd_ini) estimate for the management

fraud condition is substantially greater than for the defalcation condition, possibly owing to more ambiguity perception.

The results of the Wilcoxon signed rank test were significant suggesting that the qualitative assessment of client riskiness for the suspected fraud setting was significantly greater than that for the normal audit setting. This finding provides further evidence that the experimental manipulations were strong enough to elicit a large effect size in PMAT thresholds. Also, from a sequential decision making perspective, it appears that auditors are extremely sensitive to incoming information. Following Haskins & Sack (1994), one must carefully distinguish between information and evidence, in this regard. Information does not constitute "evidence" until it has been processed and verified in different ways. Accordingly the primary framing manipulation seeks to introduce *additional* information rather than supply persuasive evidence. Note that both situations required evaluation of the same set of financial statements, with the only difference being this provision of additional information about the meeting of the Partner with the client's Finance Director. The strong impact of the primary framing manipulation suggests that mere provision of information can have a significant impact upon an auditor's judgment and therefore, this issue of "editing" and "evaluating" a problem continue to be given more emphasis in future research.

The results from the mixed ANOVA design are now interpreted. Both within-subjects factors, viz., normal audit vs. suspected fraud and PMAT elicitation scenario, produced significantly different estimates. Figures 5.1 and 5.2 constitute plots of the results from secondary framing manipulations against the normal audit and suspected

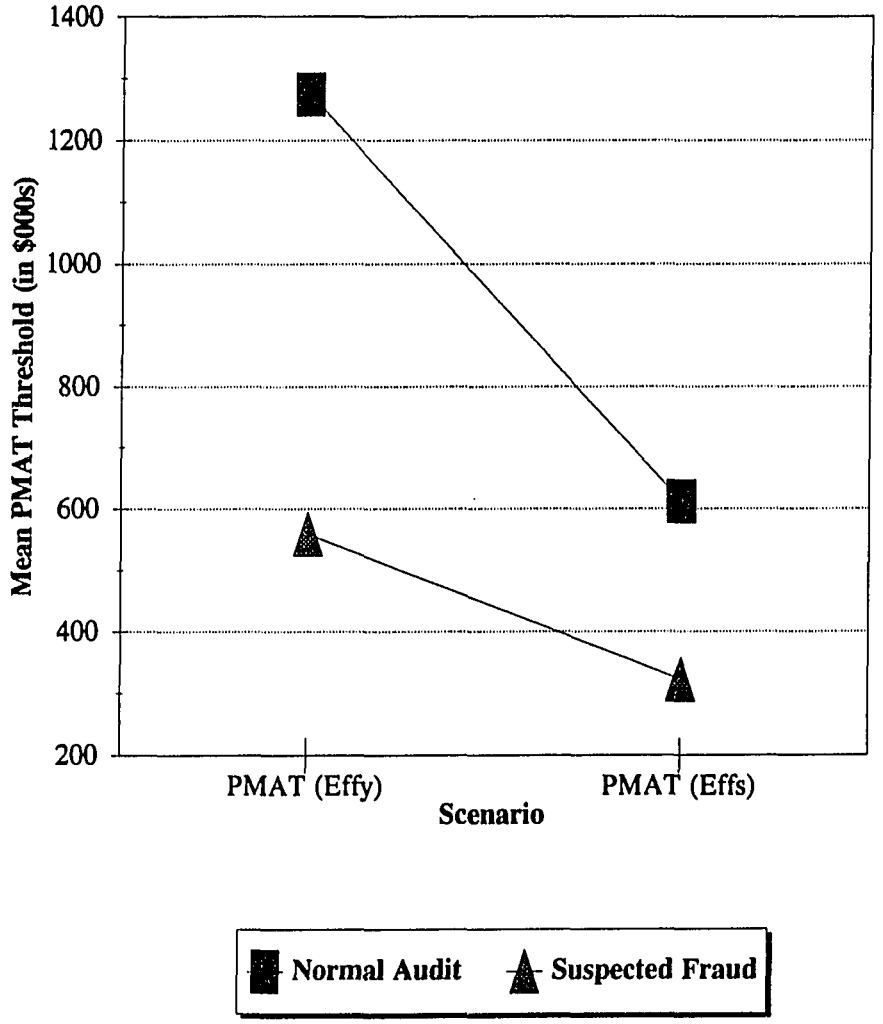

Figure 5.1
Secondary Framing: Defalcation

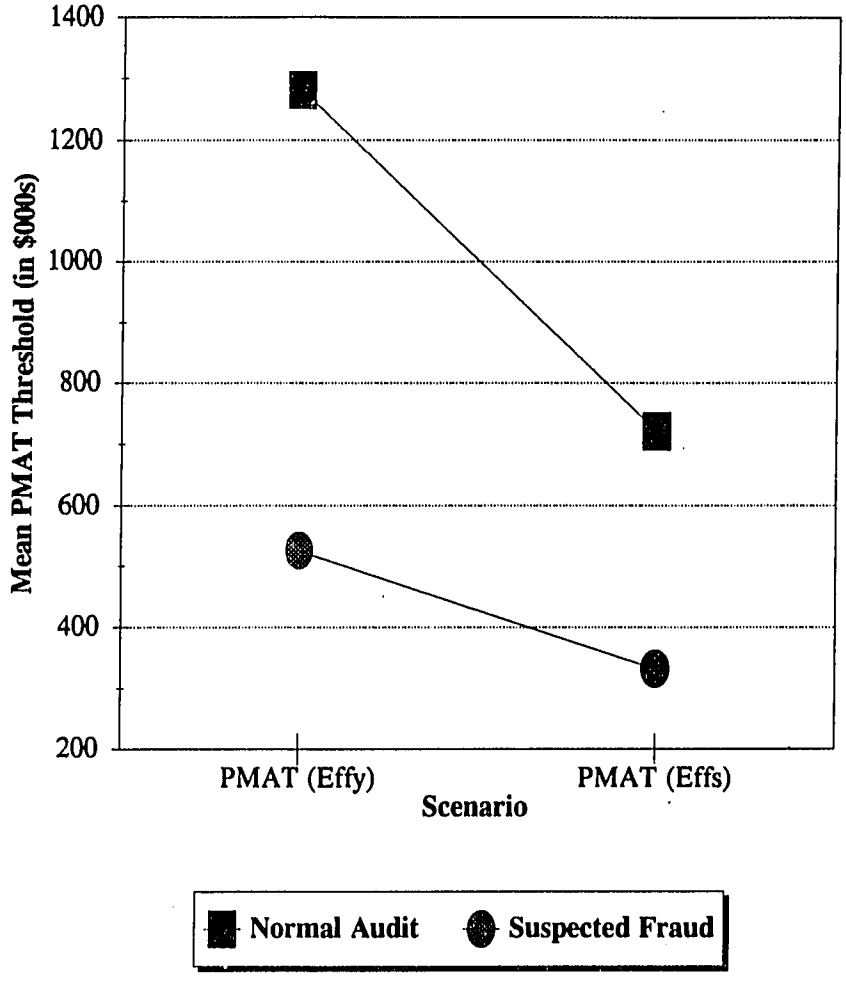

Figure 5.2
Secondary Framing: Management Fraud

fraud scenarios. These figures highlight that the difference in PMAT estimates between the defalcation and management fraud scenarios was not significant. Several explanations could be advanced to describe why no significant difference between these PMAT thresholds was observed. One general observation is that at the planning stage, the PMAT judgment is still a "fluid" threshold that might undergo several changes as auditors receive more and more information and or evidence (Ashton & Ashton, 1988; Asare, 1992; Gibbins, 1984). Accordingly, a "data sufficiency" explanation could be provided as follows: while it is important for auditors to invoke a global "decision frame" for the problem, and alter PMAT judgments at the planning stage, further fine-tuning and adjustments could be deferred until such time that more information and/or evidence is gathered. Thus, recognizing red flags is important, but the development of an appropriate audit response must be dictated by further information that may need to be collected, basically a "wait and watch" strategy (Albrecht & Willingham, 1993; Carnall, 1989).

Alternative explanations might be that auditors are desensitized to the presence of some "income smoothing" in every financial audit (e.g., Smith et al., 1994), hence they did not make a sharp distinction between the two scenarios. Bonner & Pennington (1991) have suggested that sound materiality judgments may require as many as 8.5 years of experience--but the mean experience level of participants was only about 6.5 years. This inadequate level of experience for the task at hand may also have impacted their judgments. Other factors might be insufficiency of "framing" information, lack of

exposure of participating auditors to the industry to which the hypothetical client belonged, etc.

Consideration of auditors' decision strategy, i.e., efficiency/effectiveness tradeoffs, reveals interesting patterns. In the normal audit scenario, the PMAT (aud_fin) reflecting the trade-off, is closer to the PMAT (aud_effs) because of auditor conservatism demanding a downward adjustment (or a stronger impact of the effectiveness criterion). However, for the suspected fraud settings, this finding is reversed. One explanation appears to be that participants made a really steep downward adjustment to their PMAT (aud_fin) and in the process of balancing efficiency and effectiveness attempted to compensate for their "overreaction." Past research has primarily focused on risk propensity of auditors' but this picture may be incomplete without consideration being given to the strategies of expert auditors (see, for instance, Shanteau, 1992; Kleinmuntz, 1985). The number of CIAs was quite small, i.e., only 21, so these results must necessarily remain tentative and await more research.

5.2 Implications of Study's Findings for Behavioral Decision Theories

Several results obtained from the study have a bearing upon the predictions made by Kahneman & Tversky's (1979) prospect theory as well as Hogarth & Einhorn's (1990) venture theory. The findings are first related to the predictions of prospect theory and subsequently to venture theory.

The basic ideas behind prospect theory, i.e, the relevance of reference points, values, and frames, and the importance of pre-decisional behavior, viz., editing

operations, appear to hold substantial promise in the context of this experimental study. In particular, a low-risk audit scenario can be viewed as evoking a positive frame, thereby producing higher PMAT thresholds, while a suspected fraud setting evokes a negative frame and elicits lower PMAT thresholds from participants. However, two other findings are pertinent to prospect theory. First, Figures 5.1 and 5.2 clearly show that the slope of PMAT (aud, frd; effs) is less steep than that of PMAT (aud, frd; effy). This is contrary to the assertion in prospect theory that, in the loss domain, the prospect theory value function is steeper. One reason this prediction is not confirmed may be because of "floor" effects. Maybe participants had already lowered PMAT (frd; ini) so drastically that little further decline could really be expected. Indeed, it would be naive to expect CPAs to fall below 0.5% of the pretax net income to arrive at the initial anchor PMAT threshold. Another interesting finding is that in addition to the framing effects predicted by prospect theory, the results provide evidence that framing effects are further subject to mediation by goal-specific considerations such as efficiency and effectiveness. In other words, decision strategies such as efficiency/effectiveness trade-offs further accentuate or mitigate framing effects depending on the situation. This finding constitutes a valuable addition to the existing research on applications of prospect theory, by refining the notion of framing effects.

Venture theory predicts that in the face of high perceived ambiguity, auditors would tend to exhibit more conservative behavior and lower PMAT thresholds even further. Thus, for the more serious type of suspected fraud, viz., illegitimate income smoothing by management, which has higher ambiguity, lower PMAT thresholds are

expected to be observed. As discussed before, this prediction did not get confirmed. No significant difference was observed in the mean PMAT thresholds between the two suspected fraud scenarios. It is interesting to note, however, that participants appeared to evaluate the management fraud setting as one containing more ambiguity as evidenced by the larger variance associated with the PMAT (frd; ini) for that group. Again, several reasons may be advanced for this particular finding. First, it is possible that the framing manipulation was not strong enough--this is unlikely because a significant difference was found for these scenarios in the pilot study. The pilot study participants did appear to have more work experience (> 10 years, on average) than the participants in the main study did (approximately 6.5 years). If this difference in experience levels is the reason for this anomaly, it would be interesting to investigate at what stage in their professional careers do auditors start making these fine distinctions between a breakdown in internal controls involving employee fraud vs. an override of internal controls involving management fraud, both of which have been indicated as precursor conditions to the perpetration of fraud (KPMG Survey, 1994). Second, it is possible that management fraud typically concerns very large dollar amounts--after all, why would management go to the trouble of "tinkering" with the financial statements if these involve only modest amounts? This line of reasoning suggests that the directionality of the original hypothesis is somewhat suspect and needs to be reconsidered. In any case, the lack of a significant difference between the two groups distinguished by their exposure to defalcation and management fraud respectively is an intriguing finding and merits further research, especially in a climate where fraud is on the rise (KPMG Survey, 1994;

Albrecht & Willingham, 1993). Indeed, in an environment where white-collar crime is becoming more common such suspicions of different types of fraud are assuming more importance than they ever did before. Moreover, it appears quite likely that planning materiality judgments should be responsive to such real-life scenarios so as to support the conduct of an audit that is close to being "optimal."

5.3 Validity of Process Model

In simple linear regression, it was discovered that the correlation between the variables PMAT (aud_fin) and PMAT (frd_ini) was 0.58 in the defalcation condition and 0.46 in the management fraud condition. This is a high enough correlation that PMAT (aud_fin) may be usefully viewed as the basis for arriving at modified estimates--the general process model appears to have some plausibility. For both conditions, the beta weights proved to be statistically significant. In order to improve the R^2, the variable risk_frd was next included in the regression model. For the resulting multiple linear regression, the R^2 went up from 0.33 to 0.55 for the defalcation condition, but remained relatively unchanged from 0.21 to 0.24 for the management fraud condition. The inclusion of risk_frd in the management fraud condition was not statistically significant. Inclusion of an additional variable, client size, also did not yield statistical significance.

Given that the mean difference in PMAT (frd_ini) thresholds between the two conditions, defalcation and management fraud, were not statistically significant, it is somewhat surprising that the multiple regression models are so distinct. Even the R^2 for the defalcation vs. management fraud conditions differs by over 30%. From Table

4.2, it can be seen that one reason for this inconsistency between the two models is that both PMAT (aud_fin) and PMAT (frd_ini) for the defalcation condition has much tighter confidence intervals as compared to the relatively wide confidence intervals for the management fraud condition. In other words, for the management fraud condition, the variance associated with these estimates is extremely large and therefore, the fit of the multiple regression model is poor.

5.4 Comparing External Auditors (CPAs) and Internal Auditors (CIAs)

While the ANOVA and multiple regression tapped into mean and variance information, some of the more interesting explorations involving the data occurred with the use of graphical display techniques such as correspondence analysis and multidimensional scaling. These methods delve into the dimensional and thus, correlational, structure of data to produce an easily digestible visual display. These methods were employed to ascertain whether CPAs, CIAs and/or Both (i.e., persons with both certifications) exhibited judgment and decision behavior that looked remarkably different on important dimensions. Figure 4.8, is a correspondence analysis that seeks to examine the relationship between the type of decision strategy with the kind of professional certification (i.e., CPA, CIA, or Both). In particular, CPA are observed to emphasize effectiveness criteria in both normal audit and suspected fraud settings, whereas CIAs are more balanced and equally weight effectiveness and efficiency criteria under both settings. Once we factor in litigation risk, the behavior of CPAs and CIAs seems perfectly reasonable. Because CPAs face the possibility of lawsuits, they have

to treat effectiveness as the most important criterion as it justifies their performance; the CIA, on the other hand, works within an organization and is not concerned with litigation risk, therefore she is able to grant equal importance to both criteria. Although the map shows that "Both" prefer to look at efficiency in the presence of suspected fraud, there were only six such individuals out of 117, and so must not be over-interpreted. Internal auditors (i.e., CIAs) are more concerned with the "process" which produces financial statements, among other things, while external auditors are more interested about the "product," i.e., the big picture afforded by the financial statements taken as a whole. It appears that these differences in perspectives are usefully captured in the correspondence analysis map and deserve more attention.

Multidimensional scaling displays available as Figures 4.9 and 4.11 are also extremely informative. Both displays, one relating to CPAs and another to CIAs, are clear-cut in their stimulus configurations by distinguishing along the lines of positive/negative framing and effectiveness/efficiency considerations. Further, the spread in PMAT estimates in the normal audit setting (i.e.,aud_ini, aud_effy, aud_effs, and aud_fin) on the displays is quite comparable. The difference arises when one looks at the suspected fraud PMAt estimates (i.e., frd_ini, frd_effy, frd_effs, and frd_fin). For the CIAs, these PMAT estimates are evenly dispersed whereas for CPAs these PMAt estimates are all clustered quite close together. Again, the litigation risk interpretation is a powerful way to explain this phenomenon. Once in an environment where fraud is suspected, CPAs appear to become very "watchful and vigilant" and possess very little flexibility in their decision strategies except to design procedures that would increase the

likelihood of detecting fraud. CIAs, on the other hand, appear not be affected and are able to act in a manner that remains consistent with the goals of balancing efficiency and effectiveness.

The similarity in interpretations of correspondence analysis maps and multidimensional scaling displays stems from the fact that both techniques exploit correlational information contained in data structures. The aspect of visual display further adds to their verisimilitude.

5.5 Non-Linearity in Materiality Computation

Almost 80% of the participants opined that the estimation of planning materiality across client size is non-linear. It can be argued that the current litigious environment has made several public accounting firms more conservative than before in their planning materiality estimates. The shape of the planning materiality estimation function is likely to be convex such that increases in the planning materiality thresholds are less than proportionate to increases in client size. This is certainly an issue warranting more attention in future research.

5.6 Other Findings

As mentioned in the previous chapter, the χ^2 statistic associated with both the correspondence analyses conducted proved to be statistically insignificant. Consequently, only very general statements can be hazarded with respect to these contingency tables (see Tables 4.9 and 4.10). With respect to choice of materiality base

(see Table 4.9), it appeared that the most common choices were pretax net income, total assets, and total revenues.[1] The choices picked most rarely were gross margin and "other category" (this included factor bases such as "equity" and "net income").

As for the contingency table ordering PMAT anchor levels into seven pre-determined classes (see Table 4.10), CPAs showed a tendency to assess planning materiality thresholds at the "moderate" level. However, it must be mentioned that there was a wide scatter in this data and the PMAT levels appeared to be distributed across all classes and across all certifications.

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[1] Past research on auditors' materiality judgments has revealed that the most popular choice of materiality factor base is the pretax net income (e.g., Libby, 1981; Ashton, 1982a; Holstrum & Messier, 1982). However, Warren & Elliott (1986) use a materiality power function that incorporates total revenues as the factor base. It would appear that because a large number of the participants come from the banking, insurance, and utility sectors, total assets is a popular choice of factor base for materiality computation.

CHAPTER VI

SUMMARY AND CONCLUSION

6.0 Summary of Study

In order to understand the nature of expertise in problem solving and decision making and driven by a concern for ecological validity, behavioral decision researchers are increasingly turning their attention to the study of decision making and judgment by "experts" (see Chi, Glaser & Farr, 1991; Bazerman, 1994; Smith & Kida, 1991). This experimental study investigated the effects of decision framing and the use of decision strategies on auditors' planning materiality judgments. Several contributions of the study can be highlighted: research focus on an important unresolved problem for audit practitioners--planning materiality judgments; the development of a conceptual framework that depicts the cognitive and contextual factors that impinge on auditors' planning materiality judgments; the use of a realistic experimental task simulated on computers by using a state-of-the art, object-oriented programming language, viz., Visual Basic 3.0; the participation of a large number of professional auditors (96 CPAs and 21 CIAs); and the use of statistical methods such as correspondence analysis and multidimensional scaling which yield graphical displays that aid interpretableness of results. Each of these is briefly recounted below.

In the current competitive as well as litigious environment in auditing, making sound planning materiality judgments is critical for proper audit "scoping" and establishment of the nature, timing and extent of audit procedures. Three decades of behavioral auditing research on issues pertaining to materiality attest to the importance of this topic to the auditing profession; it is hoped that the present study is seen as continuing this rich tradition of bringing together theory and practice.

Past research has indicated that auditors' planning materiality judgments exhibit low consensus, leading some researchers to characterize audit judgment performance in this area as being "poor" (e.g., Bonner & Pennington, 1991). If different auditors come up with drastically different assessments for planning materiality under the same circumstances, this can only imply that "auditors are delivering variable precision in the financial statements." (Elliott, 1981). Although previous research has noted the effects of context and experience in attempting to explain these variances, little research has focused upon *psychological variables* such as "decision framing" to account for this variance. Further, the practicalities of the auditing environment make it necessary for auditors to adopt decision strategies (e.g., efficiency/effectiveness trade-offs) which must be emphasized in judgment studies.

The primary goal of this experimental study (with professional auditors as participants) was to manipulate decision framing (primary framing) and examine the use of decision strategies (secondary framing) to assess the influence of goal-specific criteria on framing effects. A computer-administered experimental task that permitted sequential revision of planning materiality judgments by auditors for differing scenarios and in the

presence of feedback was the prime source of experimental control and data collection. This methodology falls between being a tightly controlled experimental study and a straightforward paper-and-pencil survey. Such research contributes to the psychology of decision making and judgment by investigating psychological notions like decision framing in professional environments. More specifically, the mediation of framing effects by consideration of goal-specific criteria represents an advance in this line of research in psychology. The external validity of the study was greatly increased by the participation of a large number of CPAs from a mix of organizations including public accounting firms, and companies in the banking and insurance, food service, and utility sectors.

Given the wealth of data collected, a menu of statistical techniques was employed to plumb the data and gain insights. While ANOVA, multiple regression and the Wilcoxon signed rank test helped answer research questions predicated on mean and variance information, other statistical methods became necessary to tap into correlational and dimensional structures of the data. For this purpose, techniques that yield a graphical display such as correspondence analysis and multidimensional scaling were employed. Use of these methods has provided insights into the data that may not have been gleaned otherwise. Moreover, hypotheses have been generated from these analyses that can be the basis for future research.

6.1 Major Findings, Contributions and Implications

First, the results from the study show that professional auditors are extremely sensitive to incoming information that has the potential to alter their entire conception of an audit engagement. This finding has significant implications for both practitioners as well as auditing faculty. Auditors are regarded as market agents who serve to reduce "information risk" (Arens & Loebbecke, 1991). Such information risk is arises from the notion of decision framing: every client knows that the same set of financial statements can be "window dressed" so as to make them appear better than they actually are. This type of behavior by a client could be described as "framing implied by task formulation." It is the auditor's responsibility to "see through" such a deception frame and act accordingly (Jamal et al., 1994). Johnson et al. (1991, 1993) have done some pioneering work in this area and have attempted to make it relevant to audit practice. Professional auditors and auditing students should be made familiar with the psychology of decision making so that they are better able to appreciate and benefit from this research literature.

Second, with reference to the use of decision strategies, labeled "secondary framing" for the purposes of describing the experimental task, these strategies seem to either accentuate or mitigate framing effects depending on the circumstances. This is an important result because it shows that framing effects can themselves be moderated in a sequential decision making process (see Asare, 1992). The lack of a statistically significant difference between the two groups exposed to different types of suspected fraud can be explained in many ways. One reasonable explanation appears to be that auditors go into a "wait and watch" mode when they receive "negative" information that

needs further clarification or processing. Of course, as mentioned previously, it is also possible that the manipulation in this respect was not powerful enough to produce a difference in PMAT judgment or that the participants were not sufficiently experienced to make these sharp distinctions. More research is needed to better understand the types of decision strategies used by auditors. In particular, because an external audit is conducted in phases, such as the "interim" and the "final" phase, it is quite conceivable that an auditor's testing strategy considers "short-term" as well as "long-term" possibilities. Thus, some tests may be executed at an earlier stage of the audit, depending on staffing availability and the client management preferences. Another strategy, which might flow from the first is the interface between compliance and substantive tests with a view to enhancing audit efficiency and effectiveness (e.g., Kinney, 1975; Bailey & Jensen, 1977; Anderson, 1976). It would be interesting to ascertain if there exists a hierarchy of some sort to conceptualize the nature and usefulness of specific decision strategies used in audit practice and assess the influence they may exert on specific audit judgments.

Third, SAS 47 (AICPA, 1983), the authoritative professional pronouncement concerning materiality and audit risk is now over a decade old and, in the author's opinion, needs to be updated. To help examine the conceptual underpinnings of SAS 47, studies such as the present one are needed. In this sense, this research is "pro-active" and attempts to address a set of problems about which the standard-setting bodies need information before commencing their deliberations. In particular, Figure 1.1 provides an overview of the myriad cognitive and contextual factors that bear upon the

materiality decision. Materiality decisions have direct relevance for audit sampling strategies and the determination of appropriate sample sizes and therefore, exert an influence that permeates the entire audit. Indeed, planning materiality decisions lie at the very heart of auditing and need to be understood better. Such understanding will permit the introduction of audit efficiencies while maximizing audit productivity.

Extensions to this study can be readily imagined. First, it would be of interest to conduct a similar study on a national or even international basis to inquire into the robustness of the "framing effect," its mediation by the use of decision strategies, and have these results validated for large sample sizes. Second, because materiality is a notion fundamental to the auditing profession in all countries with strong stock markets, it would be interesting to expand the reach of the study to these countries. Third, taking Holstrum's (1982) recommendations, similar studies should be taken up with reference to non-profit organizations where, in the absence of a net income factor base, it would be of interest to ascertain how the computation of materiality would proceed. Fourth, to secure a better handle on user-defined notions of materiality the experiment could also feature bankers, investors, analysts, the courts etc. to broaden our understanding of this important construct. Fifth, one of the factors that must go into the computation of materiality at a segment level is information about the underlying nature and number of transactions, i.e., the distribution of transactions, so that an optimal materiality threshold may be "engineered" to generate audit efficiencies. Also, it is extremely important that these results, whether conceptual or statistical, be communicated to practitioners and

means developed to "de-bias" these framing effects, e.g., accountability and evidence-focusing (cf. Emby & Finley, 1994, cited in Emby, 1994).

Framing, however, may not always be undesirable, especially when we think of it as an evolutionarily adaptive strategy that carries significant implications for survival. It is possible that the strategy could prove to be sub-optimal in a laboratory setting, but it does make a lot of sense in the real world. Thus, it could be argued that an auditor's extremely conservative response to the mere suspicion of fraud is an adaptive, precautionary strategy that may save her from a lot of grief later on. After all, the penalties of non-discovery of fraud or material error are so prohibitive that even small probabilities of occurrence are to be dreaded. This perspective suggests that it may be inappropriate to think of "framing" as a bias. In fact, it would be more realistic to accept it as being an integral part of the repertoire of the decision making environment and yielding a positive outcome on average, with adverse outcomes being relatively infrequent. In this sense, "de-biasing" is unnecessarily harsh terminology to make use of and perhaps needs to be eschewed altogether.

6.2 Limitations of the Study

In order to gain experimental control, this study necessarily needed to limit its scope of enquiry as well as the contemplated experimental procedures. For instance, although every attempt was made to incorporate as much task realism as was possible, the time to complete the task was carefully worked out so as not to exceed one hour. Similarly, a number of factors that influence materiality decisions were not considered

so as not to clutter up the hypothetical scenario. Thus, while the secondary framing manipulation referred to time and budget constraints, no exact numbers, e.g, audit fees or budgeted number of hours, was provided. Again, in order to study auditors' unaided professional judgments, it was important not to allow them use of their firm audit manuals or other information, such as past years' working papers, or materiality judgments from the previous year (cf. Steinbart, 1987).

One of the most important applications of materiality in audit settings is for audit sampling purposes. The idea of 'tolerable error' emerges from the determination of materiality and is necessary to arrive at a sample size. This study did not address issues in audit sampling because the research question of interest here pertains to a much earlier stage of the audit. Future studies should attempt to integrate the setting of materiality thresholds with the issue of sample selection and size (see Guy, Carmichael & Whittington, 1994). Materiality intentions may differ from materiality adjustments (Coakley & Loebbecke, 1986) and therefore, asking for justification for audit materiality judgments would leave a cognitive "audit trail" which could then be analyzed.

With reference to the topic of materiality, the Canadian Extent of Audit Testing (EAT) Study (1980) has made some excellent recommendations highlighting the need for the development of standards/guidelines for (a) definition of errors and the requirement to extrapolate them within a defined framework, (b) materiality in nonmanufacturing situations like governmental and nonprofit entities (cf., Holstrum, 1982), and (c) the relationship of materiality to other procedures such as analytical review. Although these issues are still hanging fire, the need to resolve them satisfactorily is urgent.

Dr. Herbert Mirels' Self-Description Inventory was distributed to and completed by all 117 participants. It was decided to wait to analyze this data until a scale is developed to evaluate each individual's scores. As soon as the instrument is validated, however, it would be useful to perform this analysis. In particular, it would be interesting to trace back the participants' scores to determine whether their self-reports about their confidence in judgments are consistent with their actual performance on the task. This line of research would extend Pincus' (1993) work on audit judgment confidence.

6.3 Suggestions for Further Research

Elliott (1981) has claimed that audit quality largely remains an "unobservable" and even client managements hiring auditors are at a loss to explain the audit fee variability they encounter in the market. Specifically, Elliott (1981) observes,"...[client management] cannot know whether [audit fee variances] result from precision differentials (one auditor striving for tighter financial statement precision than another), efficiency differentials (one firm using a better audit technique than another), profit differentials (one firm willing to work for a smaller profit than another) or something else." Clearly, "precision differentials" are directly a consequence of materiality thresholds and moreover, may have a direct or indirect impact on several issues in a n audit engagement. It is important to understand the reasons behind such stark differences and more work needs to be done in this area. This study is only a first step in the direction of understanding the basis for "precision differentials."

The study of professional judgment in similar vein must be extended to other domains such as medicine and law (see, for instance, Amsel et al., 1991). It is very likely that professionals in these domains face similar constraints and it would not come as a surprise if they also adopt decision strategies such as efficiency/effectiveness trade-offs. Of course, the goals of every profession are different and therefore, considerations of effectiveness criteria are bound to differ too. Similarly, both "red flags" (with implications for effectiveness) and "red herrings" (with implications for efficiency) deserve systematic study. Studying knowledge intensive behavior is likely to gain in importance in the future. Psychologists interested in studying the nature of expertise have immense potential in being able to contribute to the development of a general theory of expertise. Learning about commonalities across domains will yield rich rewards in terms of cross-training and enable the solution of difficult and complex problems that may have parallels in other domains.

The methodological paradigm employed for eliciting auditor judgments can be usefully adapted to future studies of audit judgment. Professional auditors are a difficult group of "experts" to have access to, and researchers must find ways and means of involving their participation with the least cost and effort. This study demonstrates that studying professional judgment in complex domains is a fertile ground for collaborative efforts between cognitive psychologists and professionals in different domains. Because of the theoretical as well as practical challenges inherent in such research coupled with advances in technology that make more innovative research designs possible, it is likely to hold considerable appeal to future generations of researchers.

APPENDIX A

A FEW WORDS ON AUDITING: THE RATIONALE AND PROCESS

(with specific emphasis on the notion of "materiality")

1. Financial Statement Credibility: Shareholders, creditors and regulators (called "market participants") need a basis for assessing a company's past and present operating results as well as its potential future performance. Financial statements, usually consisting of the balance sheet, income statement, statement of retained earnings and statement of cash flows, are prepared in accordance with Generally Accepted Accounting Principles (GAAP). In addition to conformity with GAAP, financial statements must have credibility if they are to be accepted by third parties. Independent auditors are engaged by the shareholders, board of directors (or its audit committee), or management of a company to "attest" to the financial statements. Auditing assists in reducing "information risk" by helping evaluate the quality of the accounting information conveyed to users of financial information.

2. Purpose of an Audit: Auditors are typically Certified Public Accountants (CPAs) who examine the financial statements of a company and express their professional opinion on them. The objective of an audit is to evaluate whether the financial statements fairly present the financial position (balance sheet), the results of operations (income statement), and changes in financial position (statements of cash flows, and retained earnings) in conformity with GAAP consistently applied.

3. The Audit Report: The audit report, containing the auditor's professional opinion, is the final product of a thorough examination of the data supporting the financial statements.

4. Audit Sampling: The volume of transactions taking place in business today makes it impossible for the auditor to examine all evidentiary documentation supporting the financial statements. To recognize time and budget constraints, the auditor has to resort to sampling. There is always the risk, however, that the conclusions drawn from any sample will be different from the conclusions that would have been reached had the entire population been examined. The auditor seeks to minimize this risk when projecting the results of testing samples on to the entire population and forming an audit opinion. The auditor needs a way to decide how to sample from the population of accounting records in such a way that the maximum results are obtained for a given amount of audit effort: a balance is sought between "overauditing" (an inefficient outcome) and "underauditing" (maybe an ineffective outcome) while nevertheless meeting professional auditing standards.

5. Misstatements in Financial Statements: Financial statements are "significantly misstated" when they contain errors (accidental or purposeful) whose effect, individually or in the aggregate, is important enough to cause them not to be presented fairly in accordance with GAAP. When reaching a conclusion as to whether the individual or cumulative effect of errors is significant, an auditor should consider the nature of the errors and their amount in relation to the nature and amount of other items in the financial statements. To assess the relative importance of amounts in error, auditors invoke the concept of "materiality."

6. Fraud: Under SAS 53 (AICPA, 1988), the term "irregularities" refers to intentional misstatements or omission of amounts or disclosures in financial statements (i.e., fraud). Irregularities include fraudulent financial reporting undertaken to render financial statements misleading, sometimes called *management fraud*, and misappropriation of assets, sometimes called *defalcation.*

7. Business/Audit Risk: Business risk represents the risk of loss or injury to an auditor's professional practice from litigation, adverse publicity, or other event arising in connection with financial statements examined or reported upon. Audit risk is the risk that the auditor may unknowingly fail to appropriately modify his/her opinion on financial statements that are significantly misstated. To decide what constitutes a "significant misstatement" we need to rely upon the concept of materiality.

8. Materiality: An error in the financial statements is "material" when it is important enough to influence an investors decision. Carmichael (1969) lucidly explains that "...the auditor uses materiality in essentially two ways: (1) evaluating the fairness of presentation and reporting (materiality in accounting) and (2) in deciding questions involving the development and execution of the audit program (materiality in auditing)." He proceeds to point out that it is important to recognize that materiality in auditing is dependent upon materiality in accounting. Thus, an item would be material for auditing purposes if failure to detect misstatement or misrepresentation of the item would influence decisions based upon the factual statements. Materiality, a threshold amount

that helps distinguish the important from the trivial, is critical to deciding which segments of a company to audit as well as the amount of effort to be devoted to examining certain portions of the financial statements; it affects both audit efficiency and effectiveness. While planning an audit engagement, an auditor must not only make a preliminary judgment about the overall materiality that applies to the financial statementcs taken as a whole (OVMAT) but also estimate the segment-specific materiality which refers to allocation of materiality to a segment of a company (SYSMAT), e.g., in a transaction cycle approach, the sales, purchases, finance, or administration cycle.

9. OVMAT/SYSMAT Examples: Suppose at the end of the audit it is determined that the financial statements are overstated by $15,000 when the OVMAT (overall materiality) has been set at $10,000. In such a case, the auditor would require that a financial statement adjustment be made by the client with regard to the overstatement. Should the client choose not to make the adjustment, the auditor would communicate, in his report, his reservations about the disclsures made in the financial statements by issuing a "qualified" opinion. SYSMAT (testing materiality), on the other hand, provides a systematic way to partition segments of the population of accounting records to be examined in such a way that auditors completely examine supporting evidence for larger amounts while verifying documentation for only a sample of the smaller amounts. For instance, from a purchases transaction cycle aggregating $200,000 and consisting of 1,000 invoices, an auditor may choose to select all invoices exceeding $5,000 in amount (assume there are 20 such invoices with amounts greater than $5,000, totalling $125,000)

and sampling from the remaining 980 invoices which account for the remaining $75,000.

10. Risk, Materiality, and Audit Evidence: Arens & Loebbecke (1991) point out that risk is a measure of uncertainty and materiality, a measure of magnitude or size: taken together, they measure the uncertainty of amounts of a given magnitude. Notice that, for a particular segment of the audited population, using testing materiality (i.e., SYSMAT) is a strategy that trades off risk, materiality, and audit effor expended to gather evidence. Thus, an increase in perceived client riskiness should cause a lower level of materiality to be set (inverse relationship) so that more evidence may be gathered to support the final audit opinion. Similarly for a less risky client, a higher materiality amount may be set so as not to perform "overauditing" but not less than the standard minimum amount of audit procedures (required by Generally Accepted Auditing Standards--GAAS).

Table A.1 gives a comprehensive outline of the audit process based on Cushing & Loebbecke (1986). Section 2.0 ("Planning Activities") is directly relevant to this study, particularly subsections 2.12 ("Appraisal of Risk") and 2.2 ("Preliminary Estimation of Materiality").

TABLE A.1

A COMPREHENSIVE OUTLINE OF THE AUDIT PROCESS
(From Cushing and Loebecke (1986, pp. 6-7))

1.0 PRE-ENGAGEMENT ACTIVITIES

- 1.1 Accept/Reject New Client
- 2.1 Establish Terms of Engagement
- 1.3 Assignment of Staff

2.0 PLANNING ACTIVITIES

- 2.1 Obtain Knowledge of the Business
  - 2.11 Preliminary Analytical Review
  - 2.12 Appraisal of Risk
- 2.2 Preliminary Estimation of Materiality
- 2.3 Review of Internal Accounting Control
  - 2.31 Preliminary Phase
  - 2.32 Completion Phase
- 2.4 Develop Overall Audit Plan
  - 2.41 Determine Optimal Reliance on Internal Accounting Control
  - 2.42 Design Compliance Testing Procedures
  - 2.43 Design Substantive Procedures
  - 2.44 Write Audit Program

3.0 COMPLIANCE TESTING ACTIVITIES

- 3.1 Conduct Tests
- 3.2 Make Final Evaluation of Internal Accounting Control
  - 3.21 Make Evaluation
  - 3.22 Modify Audit Plan

4.0 SUBSTANTIVE TESTING ACTIVITIES

- 4.1 Conduct Substantive Tests of Transactions
- 4.2 Conduct Analytical Review Procedures
- 4.3 Conduct Tests of Details of Balances
- 4.4 Post Balance Sheet Review Procedures
- 4.5 Evaluate Results of Substantive Procedures
  - 4.51 Aggregate Findings
  - 4.52 Make Evaluation
  - 4.53 Modify Audit Plan
- 4.6 Obtain Representations
  - 4.61 Management
  - 4.62 Attorneys
  - 4.63 Others

5.0 OPINION FORMULATION AND REPORTING ACTIVITIES

- 5.1 Review Financial Statements
- 5.2 Review Audit Results
- 5.3 Formulate Opinion
- 5.4 Draft and Issue Report

6.0 CONTINUOUS ACTIVITIES

6.1 Supervise Conduct of Examination

6.2 Review Work of Continuing Relationship with Client

6.3 Consider Appropriateness of Continuing Relationship with Client

6.4 Make Required Special Communications

6.41 Material Weakness in Internal Accounting Control

6.42 Material Errors or Irregularities

6.43 Illegal Acts by Client

6.5 Consult With Appropriate Persons in Connection With Special Problems

6.6 Document Work Performed, Findings, and Conclusion in Appropriate Working Papers

APPENDIX B

TEXT OF FRAMING MANIPULATIONS APPEARING ON THE COMPUTER SCREEN DURING EXPERIMENT

1. PRIMARY FRAMING

(i) Normal Audit Setting: See Problem Description in Appendix D

Note that this section is identical for both groups of participants.

(ii) Suspected Fraud Setting (Defalcation condition):

"NEW DEVELOPMENTS

EMERGENCY PLANNING MEETING

ONE WEEK LATER after the initial planning meeting, the Partner calls an EMERGENCY audit planning meeting to discuss his meeting with the Finance Director and member of the client's Audit Committee.

It appears that a junior employee of the client has blown the whistle on certain alleged irregularities perpetrated by another employee who has been on forced medical leave. The junior employee, during a physical count of inventory, noted several expensive inventory parts to be missing. Further, numerous other inventory parts had been over-valued presumably to compensate for the shortages. The management, with assistance from internal audit, is currently taking steps to determine the nature and extent of the exposure, if any, arising from this situation.

The partner has concluded that, in light of this information, all planning materiality estimates may need to be appropriately re-evaluated."

(ii) Suspected Fraud Setting (Management Fraud condition):

"NEW DEVELOPMENTS

EMERGENCY PLANNING MEETING

ONE WEEK LATER after the initial planning meeting, the Partner calls an EMERGENCY audit planning meeting to discuss his meeting with the Finance Director and member of the client's Audit Committee.

The Finance Director seems to have questioned the client management's integrity indicating that the Chief Financial Officer was under considerable pressure from the management to maintain the stable trend in earnings. As a result, the Finance Director claimed, the hypothesis of income smoothing could not be ruled out. The Partner felt that client management was not setting the proper 'tone at the top' and hence, management override of internal controls appeared to be a distinct possibility. Although there was no direct evidence of any irregularities having occurred, there was a heightened need for the audit firm's staff to exercise professional skepticism while conducting their audit for the current year.

The Partner has concluded that, in light of this information, all planning materiality estimates may need to be appropriately re-evaluated."

2. SECONDARY FRAMING

(i) Audit Efficiency Condition

"Scenario I: Read this carefully...

Suppose that at the planning meeting, the Partner expresses concerns about (1) the fiercely competitive auditing environment and (2) the risk of under-reliance on the client's internal controls.

In particular, he emphasizes the need for (a) RESTRICTING THE EXTENT of audit work, and (b) CONFORMING STRICTLY TO TIGHT BUDGETS AND TIME DEADLINES."

(ii) Audit Effectiveness Condition

"Scenario II: Read this carefully...

Disregarding scenario I, suppose that at the planning meeting, the Partner expresses concerns about (1) the highly litigious environment and (2) the risk of over-reliance on the client's internal controls.

In particular, he emphasizes the need for (a) exercising PROFESSIONAL SKEPTICISM and performing (b) a THOROUGH, HIGH-QUALITY AUDIT that lays the basis for (c) DEFENSIBILITY of audit decisions and conclusions."

(iii) Suspected Fraud Effectiveness Condition

"Scenario III: Read this carefully...

Suppose that at the EMERGENCY planning meeting, the Partner expresses concerns about (1) the highly litigious environment and (2) the risk of over-reliance on the client's internal controls.

In particular, he emphasizes the need for (a) exercising PROFESSIONAL SKEPTICISM and performing (b) a THOROUGH, HIGH-QUALITY AUDIT that lays the basis for (c) DEFENSIBILITY of audit decisions and conclusions."

(iv) Suspected Fraud Efficiency Condition

"Scenario IV: Read this carefully...

Disregarding scenario III, suppose that at the EMERGENCY planning meeting, the Partner expresses concerns about (1) the fiercely competitive auditing environment and (2) the risk of under-reliance on the client's internal controls.

In particular, he emphasizes the need for (a) RESTRICTING THE EXTENT of audit work, and (b) CONFORMING STRICTLY TO TIGHT BUDGETS AND TIME DEADLINES."

APPENDIX C

ACCOUNTING FIRMS AND OTHER ORGANIZATIONS PARTICIPATING IN STUDY

Participants from public accounting firms hold the CPA certification; participants from Internal Audit Departments hold either CIA, CPA, or both certifications.

Accounting firms	Location
1. Arthur Anderson	Columbus, Ohio
2. Deloitte & Touche	Columbus, Ohio
3. Greene & Walllace	Columbus, Ohio
4. Heimlich, Spettel & Michalak	Columbus, Ohio
5. Kenneth Leventhal	Columbus, Ohio
6. KPMG Peat Marwick	Columbus, Ohio
7. Manoranjan & Jayanthan	Dayton, Ohio
8. Nerone & Associates	Columbus, Ohio
9. Price Waterhouse	Columbus, Ohio

Other Organizations	Location
1. American Electric Power	Columbus, Ohio
2. Banc One Corp	Columbus, Ohio
3. Household International	Chicago, Illinois
4. Huntington Bancshares	Columbus, Ohio
5. Key Corp	Cleveland, Ohio
6. McDonald's Corp	Columbus, Ohio
7. National City Corp	Columbus, Ohio
8. Nationwide City Corp	Columbus, Ohio
9. The Ohio State University	Columbus, Ohio
10. Wendy's International	Columbus, Ohio

APPENDIX D

EXPERIMENTAL MATERIALS

DISTRIBUTED TO PARTICIPANTS

EXPERIMENTAL MATERIALS INDEX-I (Sections D.1 to D.6)

(to be used <u>during</u> experiment**)**

I. READ Sections D.1 through D.3 FIRST:

Sec. D.1: Instructions for the "Audit Materiality" experiment

Sec. D.2: Preliminary Judgment About Materiality-Problem Description

Sec. D.3: Helmvolz Inc.--Condensed Financial Statements

II. NEXT, REVIEW PICTORIAL SEQUENCE in Section D.4

Sec. D.4: Experimental Setup and Sequence Picture

III. REFER to GLOSSARY in Section D.5, if necessary

Sec. D.5: Glossary of Selected Terms

IV. NOW, follow instructions to LOAD the PROGRAM in Section D.6

Sec. D.6: Loading the Program

YOUR SUBJECT ID# _____

SECTION D.1:

INSTRUCTIONS FOR THE "AUDIT MATERIALITY" EXPERIMENT

(Note: Do NOT refer to audit manuals or other sources while doing this experiment!!)

1. Hypothetical scenario

In this experiment, you are to assume that you are an audit supervisor with Lippman & Coates, CPAs, assigned to the annual audit of Helmvolz, Inc. for the year 1994.

2. Information provided

Based on a brief description of the client, Helmvolz Inc., relevant industry information and a set of condensed financial statements for the years 1992, 1993 and 1994, you will be making planning materiality (PMAT) judgments for the 1994 audit. Your PMAT estimates will be responsive to the audit partner's comments in two distinct scenarios followed by feedback on your estimates from a new audit manager of Lippman & Coates, CPAs (in relation to other audit managers, the new manager will be described as "more conservative" or "less conservative" corresponding to the specific scenario.) Please review the attached "Experimental Setup and Sequence Picture" (see PIC-p4) to understand this better.

3. Experimental task and time required

The experimental task requires you to computer-input your planning materiality estimates. At each stage, please take your time to read all materials and instructions displayed on the computer screen carefully, because the data will be collected only once.

The entire computer exercise should not take more than 30-35 minutes. In addition, you will be requested to fill in some background and other information (contained in a separate envelope to be opened only at the end of the experiment) which will not take more than 10-15 minutes. The total time required is unlikely to exceed one hour.

4. Confidentiality

All the data collected from this study will be kept confidential (you need not reveal your name). Please do not discuss the experiment with your friends and/or colleagues.

5. Completed experiment

Upon completion, please place the whole packet including the diskette and the filled-in forms into the box in the custody of the person designated for this purpose in your unit. Otherwise, please mail back all materials to: Sridhar Ramamoorti, CPA, Department of Psychology, The Ohio State University, 1885 Neil Ave Mall, Columbus, OH 43210.

☞ Please proceed to read the problem description accompanied by the condensed financial statements.

SECTION D.2:

PRELIMINARY JUDGMENT ABOUT MATERIALITY-- PROBLEM DESCRIPTION

In this two-part planning materiality estimation problem, you are to assume that you are one of the audit supervisors employed with the medium-sized public accounting firm of Lippman & Coates, CPAs. Further, along with a newly promoted audit manager, you have been assigned to the audit of the 1994 financial statements of an existing client, HELMVOLZ, Inc. The balance sheets and income statements of HELMVOLZ Inc. for the years 1992 through 1994 are presented in condensed form in Section D.3. Annualized amounts for 1994 are based on third quarter information.

HELMVOLZ Inc., which went public in 1990, is engaged in the manufacture and nationwide distribution of uninterrupted power supply (UPS) systems to computer installation locations. The Helmvolz™ brand of UPS systems is quite popular, and has achieved a stable market share of approximately 35% over the past 4 years. While the cost of production for their standard model has largely remained unchanged, its selling price has been marginally raised for the current year. The company has 4 major competitors (see Table D.1 for summary of relevant industry information).

Table D.1

Summary of Relevant Industry Information

Company (Year UPS introduced)	Product profile	Market share (US only)	Total Sales Revenue in 1993 ($)	Total Assets in 1993 ($)	Pretax Net Income/ (Loss) for 1993 ($)
Helmvolz Inc.(1990)	UPS systems only	35	200 million	131 million	20 million
CompuWare Inc.(1989)	UPS systems and other	15	65 million	55 million	6 million
Electronix Inc.(1992)	UPS systems and other	5	13 million	40 million	(11 million)
PWRsupply Inc.(1986)	UPS systems only	20	114 million	93 million	13 million
Computer Support Inc. (1987)	UPS systems and other	20	445 million	360 million	(1 million)
TOTAL		**95%**	**837 million**	**679 million**	

A standard practice at Lippman & Coates, CPAs, is to begin each audit with a planning meeting approximately three weeks prior to commencing the fieldwork. At the meeting, the current year's draft financial statements of a client are discussed. One objective of the planning meeting is to quantify the preliminary judgment about materiality to be used in planning the scope of audit procedures. Helmvolz Inc. is one of the larger clients of the firm, and, over the years, Lippman & Coates' audit remuneration has kept pace with the growth in the client's revenues. "Clean" audit opinions have been rendered in the

past; also, no material weaknesses in internal control have been noted over the past four years. From 1992 onwards, the management of Helmvolz Inc. has established an Audit Committee that coordinates the work of the internal audit department. With a view to improving audit efficiency and controlling costs of the external audit, since 1993, Lippman and Coates, CPAs, have decided to rely on the work done by the internal audit department for specific areas of the audit.

Using the financial information in Section D.3, you are to make a preliminary judgment about materiality for use in audit planning. Your estimates will be discussed (1) at the planning meeting in the presence of the partner-in-charge and the newly promoted audit manager for the audit of Helmvolz Inc. and later, (2) separately, with the new audit manager providing you with feedback on your estimates.

HELMVOLZ INC.--CONDENSED FINANCIAL STATEMENTS

(All amounts expressed in US $'000s except EPS and selected financial ratios)

BALANCE SHEETS	December 31		
ASSETS	1992 (Audited)	1993 (Audited)	***1994 (Unaudited)***
Cash	6,133	6,412	***6,212***
Accounts receivable, net	22,605	21,334	***22,310***
Inventory	30,611	31,402	***34,034***
Other current assets	5,285	2,557	***2,445***
Plant and equipment (less dep.)	68,521	69,411	***70,088***
Total assets	133,155	131,116	***135,089***
LIABILITIES AND SHAREHOLDERS' EQUITY			
Current Liabilities	31,145	32,778	***33,005***
Long-term liabilities	21,665	19,120	***20,786***
Common stock	20,000	20,000	***20,000***
Retained earnings	60,345	59,218	***61,298***
Total liabilities and equity	133,155	131,116	***135,089***

STATEMENTS OF INCOME	Years ended December 31		
	1992 (Audited)	1993 (Audited)	***1994 (Unaudited)***
Net sales	199,733	200,518	***210,899***
Cost of goods sold	118,842	119,320	***126,777***
Gross margin on sales	80,891	81,198	***84,122***
Selling, general & other expenses	59,924	61,121	***62,225***
Income before income taxes	20,967	20,077	***21,897***
Provision for income taxes	8,389	8,042	***8,320***
Net income	12,578	12,035	***13,577***
Earnings Per Share (EPS)	$ 0.63	$ 0.60	***$ 0.68***
Selected Financial Ratios/Percentages			
Gross Margin on Net Sales (%)	*40.50%*	*40.50%*	*39.88%*
Net income to Net Sales (%)	*6.30%*	*6.00%*	*6.44%*
Asset-Turnover ratio	*1.50 times*	*1.53 times*	*1.56 times*
Inventory-Turnover ratio	*3.88 times*	*3.80 times*	*3.73 times*
Return on Investment (%)	*9.45%*	*9.18%*	*10.05%*

This schematic representation is designed to help you follow the progression of computer screens.

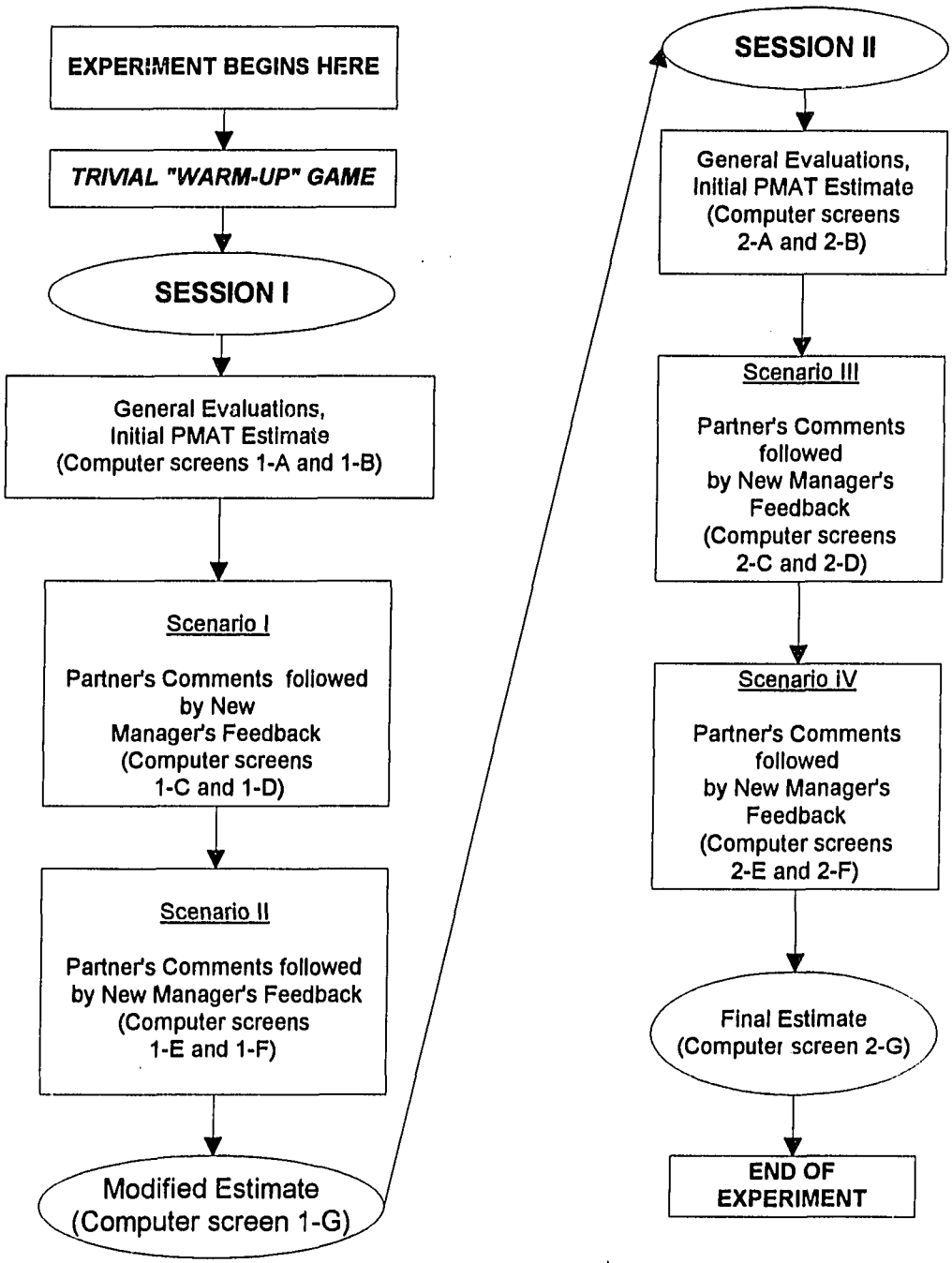

Figure D.1

Experimental Setup and Sequence Picture

SECTION D.5

GLOSSARY OF SELECTED TERMS
(This glossary is optional. Read if necessary.)

AUDIT RISK: The risk that the auditor may unknowingly fail to appropriately modify his/her opinion on financial statements that are significantly misstated. To decide what constitutes a "significant misstatement" we need to rely upon the concept of materiality Materiality and audit risk are really inseparable--materiality relates to how precise auditing procedures need to be; and audit risk, to the degree of certainty achieved by the procedures.

BUSINESS RISK: The risk of loss or injury to an auditor's professional practice arising from litigation or adverse publicity in connection with the financial statements examined or reported upon.

CONSERVATISM: A prudent reaction to uncertainty to try to ensure that uncertainties and risks inherent in business situations are adequately considered. Among auditors, the tendency to give more attention to, and to be more influenced by negative information or outcomes, probably owing to the potentially serious consequences of audit judgments (e.g., liability to third parties, especially when financial reports overstate the profitability or economic viability of a company).

CONTROL RISK: The risk that material error in an account balance may occur and not be prevented or detected on a timely basis by prescribed accounting control procedures.

EVALUATIVE MATERIALITY: At the conclusion of an audit engagement, the auditor uses evaluative materiality to determine whether the financial statements are presented fairly in conformity with generally accepted accounting principles. For this purpose, the auditor should aggregate the "unadjusted" errors in a way that helps conclude whether in relation to individual amounts, subtotals, or totals in the financial statements, they materially misstate the financial statements taken as a whole.

INTERNAL CONTROL: A process effected by an entity's board of directors, management and other personnel, designed to provide reasonable assurance regarding the achievement of objectives in the following categories: effectiveness and efficiency of operations; reliability of financial reporting; and compliance with applicable laws and regulations.

MATERIALITY: The magnitude of an omission or misstatement of accounting information that in the light of surrounding circumstances, makes it probable that the judgment of a reasonable person relying on the information would have been changed or influenced by the omission or misstatement.

PLANNING MATERIALITY: A preliminary judgment about the amount to be considered material to the financial statements taken as a whole that constitutes an important general planning decision. The auditor may use this judgment to identify components of financial statements to be emphasized, the locations to visit in a multi-location company, and, naturally, the size of an error to be considered material in planning the nature, timing and extent of specific auditing procedures. Both qualitative and quantitative considerations influence an auditor's preliminary judgment about materiality.

RISK OF OVER-RELIANCE ON INTERNAL CONTROLS: The risk of assessing control risk too low. If the auditor's planned level of reliance on internal accounting controls is higher than warranted, the auditor would proceed to limit the scope of substantive tests applicable. In these circumstances, the audit might appear to be more efficient but may compromise audit effectiveness. It is to avoid this undesirable outcome that the auditor is advised to allow for only a low level of risk of over-reliance.

RISK OF UNDER-RELIANCE ON INTERNAL CONTROLS: The risk of assessing control risk too high. If the auditor unnecessarily reduces the planned level of reliance on internal accounting controls, the auditor would ordinarily increase the scope of substantive tests to compensate for the reduced reliance. In these circumstances, the audit might be less efficient but would nevertheless be effective.

SECTION D.6:

LOADING THE PROGRAM

Having reviewed all the textual materials on the previous pages, you are now ready to insert the computer diskette, run the program, and begin the experiment. Please follow the instructions carefully.

How to use the diskette enclosed

A 3-1/2", high-density diskette (1.44 MB) is enclosed. The computer program requires an IBM or compatible personal computer (386 or 486) with a Windows environment. To start the program, load the Windows Program Manager and follow these procedures:

(i) Insert the diskette into drive **a:** or drive **b:** as appropriate.

(ii) Go to the "**File**" menu (leftmost menu) on the Program Manager and choose the "**Run...**" command. See the computer screen representation below.

PROGRAM MANAGER

File	**Options**	**Window**	**Help**
New...			
Open			
Move...			
Copy...			
Delete			
Properties			
Run...	**→ (choose this)**		
Exit Windows...			

(iii) When prompted, type **a:\audmat2.exe** or **b:\audmat2.exe** as appropriate.

(iv) Press **ENTER** or mouse-click **OK**, and the program should load automatically.

(v) From this point onwards, follow the instructions on each screen.

(vi) In case of any difficulty, please call "Shree" Ramamoorti at (614) 488-0933.

☞ Please involve yourself seriously in the experiment so that the data collected can form the basis for valid and meaningful interpretation. Thank you for your cooperation.

YOUR SUBJECT ID#_____

EXPERIMENTAL MATERIALS INDEX-II (Sections D.7 and D.8)

(to be used at <u>end of</u> experiment**)**

V. PLEASE READ AND FILL IN:

Sec. D.7: Debriefing Questionnaire

VI. NOW, PLEASE COMPLETE THIS INVENTORY:

Sec. D.8: Professor H. Mirels' Self-Description Inventory

YOUR SUBJECT ID# _____

SECTION D.7

DEBRIEFING QUESTIONNAIRE

1. Research Goals and Motivation

Making sound professional judgments is the hallmark of an auditor. Over the past two decades, behavioral auditing and cognitive science researchers have been interested in how professional auditors make judgments and decisions. The eventual aim of such research is to understand, evaluate and improve auditors' decision making capabilities, thus enhancing audit efficiency and effectiveness. Such research has potential to benefit both the academic and practitioner constituencies--academic researchers are interested in understanding the nature and determinants of professional expertise, the process by which expertise is acquired, and improving the teaching of auditing, while practitioners need such experimental and empirical data to carefully design professional training programs and to develop computerized decision aids such as expert and decision support systems. The problems in this area of research are complex and challenging and my PhD dissertation focuses on aspects of planning materiality judgments. Your voluntary participation in this study is greatly appreciated and indicates your commitment towards research designed to enhance the standing of our profession.[1] I will be glad to share the results of this study if you wish to know how it all turned out.

---

[1] The author of the dissertation is a member of the American Institute of Certified Public Accountants, New York, as well as the Institute of Internal Auditors, Florida.

2. Please answer the following questions (you need not divulge your name):

General

(a) What is your current affiliation and position? (i.e., company or firm name; designation)

(b) Please list your certification(s) (e.g., CPA, CMA, CIA, CISA, CBA, CFE etc.)

(c) How many years of post-certification experience do you have in:

(i) external auditing yrs___ months ___ (ii) internal auditing yrs___ months ___

(d) Have you had experience in making planning materiality judgments? If yes, how many years of experience, specifically in making such judgments (internal audit, external audit)?

(e) If you are an internal auditor, how did the external auditing focus of the problem affect your ability, if at all, in making appropriate planning materiality judgements?

Technical

(i) Suppose the numbers in the financial statements are made 10 times larger (i.e., pretax net income is made $ 2.1 billion) will you magnify your preliminary judgment of planning materiality by a factor of 10? (Check ✓ one of the options below)

Yes ___ By more than 10 times ___ By less than 10 times ___

What if the multiplication factor is 100 (i.e., pretax income is made $ 20.1 billion)?

Yes ___ By more than 100 times ___ By less than 100 times ___

(ii) If your **initial** risk assessment for this client by merely glancing at the financial statements was High or Very high, please explain what led you to this conclusion?

(iii) If you **never** changed your materiality judgments throughout this experiment, why so?

Realism of experimental task

What were your general impressions about this experiment? Did you think the task was realistic and the scenarios plausible? Do you wish to comment on anything specific?

Thank you for participating in this experiment. ☺

Thank you for participating in this experiment. ☺

Self-Description Inventory -- Form SD30.P-S (page 1 of 2)

For each numbered item below, check ✓ the phrase which best indicates your degree of agreement or disagreement. Phrases Used: **sd** = strongly disagree; **md** = moderately disagree; **d** = disagree; **a** = agree; **ma** = moderately agree; and **sa** = strongly agree

#	ITEM DESCRIPTION	sd	md	d	a	ma	sa
1	I usually think most clearly when I am alone.						
2	I have difficulty making decisions.						
3	I often depend too much on what others say.						
4	I rarely doubt my judgments.						
5	Not knowing for sure what to do paralyzes me.						
6	I have an active imagination.						
7	I have a tendency to change my mind according to the last opinion I hear.						
8	Oftentimes, I feel "stuck" because of being uncertain about what to believe.						
9	I usually feel comfortable deciding things by myself without asking others what they would do.						
10	After deciding something, I tend to worry about whether my decision was wrong.						
11	I find myself asking others for their opinions, even when it would be better to think through an issue first myself.						
12	It is easy for me to persuade others of my views.						
13	I frequently find myself afraid of not doing the right thing.						
14	Once I make a decision, I don't stew on the matter any longer.						
15	I often have a sense that others know better than I do.						
16	I tend to think a great deal about the future.						
17	Oftentimes, I put off making difficult decisions.						
18	I often find myself changing my opinion several times after hearing the various opinions of others.						
19	Many times I don't know what to do next.						

20	I often don't trust myself to make the right decision.						
21	My work is usually well-organized.						
22	I often don't know what to feel or believe.						
23	In almost all situations I am confident of my ability to make the right choices.						
24	I get nervous when I have to make a difficult decision.						
25	I often trust the judgment of others more than my own.						
26	I often worry about whether a decision I make will have bad consequences.						
27	I don't have much difficulty keeping my attention focused.						
28	I have a great deal deal of confidence in my opinions.						
29	My judgments about situations often turn out to be mistaken.						
30	In making a decision, I often tire myself out by switching back and forth from one conclusion to another.						
31	Usually, the more I think about an issue, the simpler it becomes.						
32	I enjoy making difficult decisions.						
33	I am inclined to have trouble knowing where to stand on an issue.						
34	When making a decision, I often feel confused because I have trouble keeping all the relevant factors in mind.						
35	I feel I know myself well.						
36	I wish I were more confident in my opinions.						
37	Frequently, I doubt my ability to make sound judgments.						
38	I rarely switch back and forth from one conclusion to another; I make a decision and stick with it.						

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