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DIFFERENTIAL PERFORMANCE BETWEEN AUDIT TASKS

AS A FUNCTION OF COGNITIVE STYLE

by

Lori R. Fuller

A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

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Lori R. Fuller

has been approved

August 1995

APPROVED:

Steven E Kaal , Chair

J. Hal Reneau

Cindy Reeder

Supervisory Committee

ACCEPTED:

Dean of the College

Sandra L. Luehrsen

Dean, Graduate College

ABSTRACT

Research literature in accounting, management and psychology was reviewed concerning the issues of cognitive style preferences and decision making in a judgment context. Two audit judgment tasks were developed to test the hypothesis that auditor performance is best when the task attributes match their preferred cognitive style. The first task was designed and validated to represent an analytic task. The second task was designed and validated to represent an intuitive task. The Myers Briggs Type Indicator was administered to determine each participant's cognitive style. Cognitive style was classified as either pure analytic, pure intuitive, or hybrid. Repeated measure ANOVA models were run to determine if a cognitive style × task interaction occurred. The results supported the research hypotheses in that auditors performed best when their cognitive style matched the task attributes.

A competing hypothesis predicting no significant main effects or interactions was also tested. This hypothesis was to test for contingent decision processing on a judgment task. The purpose of the test was to expand the Payne, Johnson, and Bettman research on adaptive decision making on choice decisions. The research presented found that in the audit judgment contexts presented, subjects were not adaptive in their judgment decisions; performance was not equal across tasks.

To God, through whom all is possible.

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1. INTRODUCTION

Decision making is an integral part of every audit. It is pervasive and must be performed at each of the hierarchical levels within the team staffing the audit job. Unfortunately, some individuals are more successful than others in making decisions. Recognition of this fact has led to considerable interest over the last twenty years in variables that affect an individual's decisions (Libby and Luft, 1993). These variables range from the physiological to the psychological (Taggart and Robey, 1981). This interest in individual differences has lead researchers like Simon (1980) and Hogarth (1993) to formulate decision-making behavior as an interactive function of the individual decision-maker's characteristics and the task characteristics.[1,2] Peters (1993) has stated that if accounting decision making theories are to assist in improving performance, both the task and processor must be made specific. Additionally, Hogarth (1991) stated that research about decision-maker behavior should address the different types of judgments made and the demands of those different judgment tasks in terms of the knowledge and processes required. Thus, the research should specify the task demands, the knowledge available to the decision-maker, the characteristics of the information processing mechanism employed by the decision-maker, and how these elements interact.

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[1] Libby and Luft (1993) have used a similar equation: behavior or performance = *f*(ability, knowledge, motivation and environment); where the first three variables relate to the individual decision-maker and the last variable relates to the task demands. Because of the nature of this research, the interactive version is adopted.

[2] Decision-making behavior is typically operationalized as a subject's performance on a task in an experimental research setting.

Only recently has audit research examined the interaction of task and person components on performance. For example, Bonner (1990) found a knowledge-task interaction by examining experience effects between two risk assessment tasks. The purpose of the present research was to examine the interaction of individual characteristics (other than knowledge or experience/expertise) and task characteristics to gain further understanding of differential performance among auditors.

Extant research shows a number of factors that combine to form a task and determine its complexity (Bonner, 1994; Abdolmohammadi, 1993; and Wood, 1986). Some of these elements are the number of alternatives available; the number, measurement, clarity and redundancy of available cues; as well as the specification and clarity of processing procedures (Bonner, 1994). Hammond and his associates (1987) show that the alignment of certain task characteristics indicate the underlying cognitive process (e.g. analytic or intuitive) that should be used to correctly solve a task. The inference is that if certain task characteristics are known, the decision maker should use a certain cognitive process to solve the problem. One can now raise the question "Can a decision-maker adapt his cognitive process to better solve the problem?".

Many studies of differential performance using an audit scenario have used ability, knowledge, experience/expertise, personality and cognitive measures to operationalize the "person" component (Bonner, 1990; Bonner and Lewis, 1990; Bernardi, 1993; Pincus, 1990; and Ponemon, 1992). This study used cognitive style as the "person" variable because it represents an individual's unique preference for

acquiring and using information for problem solution (Myers, 1980). These preferences of perceiving and processing information are stable over time; and, *ceteris paribus*, are an individual's usual approach towards problem solution (Myers and McCaulley, 1985).

The primary motivation of the study was to examine the extent to which an auditor's judgment process adapts to different task environments. Researchers such as Payne and Johnson (1993) theorize that individuals are adaptive and can change their processing to solve a decision choice problem. More specifically, in a series of choice studies by Payne, Bettman and Johnson [1993, 1988]; Johnson, Payne and Bettman [1988]; and Payne, Bettman, Coupey and Johnson [1992], the authors argue and provide evidence that individuals have a repertoire of preferences for decision strategies and can instantaneously change their processing depending upon the information they encounter while solving the "choice" problem. Thus, in performing two distinct tasks requiring different approaches for successful performance, these authors would predict that an individual auditor would use the decision strategy that best fits the task. However, these researchers state that "judgment is different from choice" and "there is a good deal of evidence that judgment responses are contingent on properties of the task" (Payne et. al., 1993, p.258). Choice typically involves selection from multiple fixed alternatives, while judgment does not. Judgment involves assessing facts and other information to reach a conclusion. Thus, they stipulate that future research be performed on the adaptability of judgment decisions and that it be approached in the same manner as their research on choice decisions.

Audit decisions involve judgments, not choices, among multiple alternatives (Bonner, 1994). Rarely are multiple alternatives available in an audit decision setting.[3] The present study agrees with Payne and his associates in assuming that judgment situations are indeed different than choice situations, and hopes to add evidence concerning the adaptivity of judgment decisions. More specifically, this research assumes that auditors are not initially adaptive in the audit environment. Because an individual's cognitive style is stable over time and is a person's preferred method of perceiving incoming data and processing that data, the present research used the following assumptions: 1) an auditor has specific individual preferences in the way (s)he approaches an audit judgment, 2) that auditor will begin each task of an audit job in accordance with that preference, 3) that auditor will continue with that method of processing towards judgment solution, and 4) that auditor will perform best on a task where his/her cognitive style matches the task demands. Of course, this method of problem approach and solution does not create a deficiency in auditor judgment if the auditor's cognitive style matches the task processing requirements. However, a judgment deficiency would occur when the decision-maker's cognitive style preference does not match the task processing requirements and the auditor does not adapt his processing to meet those task demands. Thus, this research has important implications on the performance effectiveness of an audit and on the audit risk of rendering an incorrect opinion.

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[3] In some instances, multiple alternatives are available; as in an audit opinion.

This study employed two audit tasks; where each task was best performed using a different cognitive process and measured each subject's cognitive style. Different task environments were employed to answer the primary research question, "Does an auditor adapt his cognitive style preferences to match the task attributes to perform equally well in both task environments?" The potential benefits obtainable from the research are audit performance improvements through more efficient and effective staffing of human resources within the audit firm organization. Additionally, once the audit task mix is known further benefits are achievable in the profession's recruiting and training functions.

2. LITERATURE REVIEW & HYPOTHESIS DEVELOPMENT

From the problem solving literature Biggs and Wild (1985) adapted the following process to arrive at a decision or problem solution:

Information Acquisition	⇒	Processing/ Evaluation	⇒	Decision/ Solution

Thus, the process of reaching a decision/solution is characterized as sequential.[4] This characterization implies that if all individuals acquire and process information in the same way, they should arrive at the same solution. However, many studies in research areas such as psychology, marketing and accounting have found that people do not always arrive at the same problem solution. If individuals are given the same information at the acquisition stage, the implication is that some phenomenon occurs during processing that leads to differential solutions.[5] Much of the existing research has attributed either task or individual differences as determinants of variation in problem performance. To a large extent, prior research in auditing has only begun to explore the interactional role of task

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[4] This does not suggest that information processing is only sequential in nature. In fact, Hogarth (1987) and other researchers show that information processing is also an iterative process. This research is only implying that simplisticly, the steps to problem solution begin with information acquisition, proceed to process/ evaluation, and end in a solution.

[5] There is a debate as to where personal attributes interact in the processing of information. Some believe that individual differences come into play during the processing stage; others believe these differences start from the initial perception of the task data and continue throughout processing (Bonner, 1994). Although this research leans toward the later theory (as discussed later in the paper), the focal point is that individual differences *are occurring* that render differential solutions (performance) in a decision setting, not *where* they are occurring.

and individual attributes on performance. Such evidence is essential to understand which individuals perform best on what types of tasks.

To show that task demands and individual characteristics combine interactively to affect performance, the research design must jointly involve these attributes. Accordingly, the power of the experimental design is important to the researcher in that it is intended to provide a high degree of assurance that any results are due to the specified variables, and not to other subject or knowledge content differences. Libby and Luft (1993) suggest three guidelines for the design of experimental studies of knowledge issues. These guidelines were used to develop the research framework. The first guideline states that any hypotheses should be developed in advance about the effects of specific elements on observable behavior, including the process(es) through which it will be brought to bear on the task. The second guideline states that to demonstrate a hypothesized difference and/or its effect(s) on performance requires constructing an experimental task where the observable implications of using and not using the experimental variable are different. The third guideline indicates that "the existence of a knowledge effect can best be established by manipulating stimuli and/or context factors and comparing individuals with different experiences" (p. 430).

Thus, the logical steps for examining differential performance are to first, identify the types of individual differences that exist from current research, then select the attribute that best fits the experimental paradigm; second, discuss the task characteristics that are associated with differential problem performance; and third, design an

experiment that combines both the task and individual characteristics that should interactively explain performance differences.

2.1 Individual Differences

The introduction of this research referred to performance as an interactive function of both the task environment and the person performing the task. Research in management, marketing and accounting has shown that individuals are different in their problem solving methods due to certain factors (Cowan, 1987; Robey and Taggart, 1981; Henderson and Nutt, 1980). These factors can be defined as characteristic of the individual or knowledge related. A factor that is characteristic of the individual refers to any motivational, personality, or delineating style of an individual that differentiates him/her from another individual (Ho and Rodgers, 1993). Alternatively, any differentiating variable other than those that are knowledge related are characteristic of the individual. In the short run these characteristics are stable within the individual; however, in the long run they may change but rarely do (Ho and Rodgers, 1993). Factors characteristic of the individual used in prior research include: cognitive differences (Henderson & Nutt, 1980; Casey, 1980b; Blayloc & Rees, 1984; York & Tinsley, 1986; Rodgers & Housel, 1987; Pincus, 1990; Bernardi, 1993); moral reasonings (Ponemon & Gabhart, 1990; Arnold & Ponemon, 1991; Ponemon, 1992); organizational/professional commitments (Wallace, 1995; Larkin & Schweikart, 1992); and adopted goals for the decision situation, e.g., maximize accuracy or justifiability, or minimize effort, regret, or conflict (Einhorn & Hogarth, 1981; Tetlock, 1985).

Factors that are knowledge related include: processing capacities (Bettman et al., 1990), innate ability (Bonner & Lewis, 1990), and prior knowledge or expertise (Shanteau, 1988; Bonner, 1990; Bonner & Lewis, 1990). In sum, a number of factors can influence the person component of the performance equation.

To more efficiently research the interaction of the person and the task environment, one overall delineating person variable needs to be selected. One such variable is cognitive style. Cognitive style refers to an individual's characteristic mode of perceiving and organizing information about the environment (Myers, 1992; Ho & Rodgers, 1993). Cognitive style can be viewed as a filter of information before it becomes stored into memory. This filter affects one's experience and perhaps even expertise, and therefore, is the person variable with which the present research is interested.[6] Audit seniors were targeted as the subjects of this research in order to control for other competing explanations of differential performance. In general audit seniors have approximately the same goals (accurate completion of the audit in question with minimum effort and conflict). Furthermore, audit seniors possess the requisite domain specific knowledge necessary to ensure successful completion of both of the audit tasks

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[6] Prior research in audit judgment using experience as a delineating individual difference variable on task performance has generally ignored the "characteristic" variables, while much has been researched on experience and expertise (see Bonner and Pennington's (1991) review of the literature). This study is interested in manipulating the latter type of individual difference variable while holding the knowledge component constant.

chosen in this research. Therefore, the remainder of this literature review focuses on cognitive style differences rather than experience related differences.

As stated above, the individual characteristic measure that was chosen in the present research was cognitive style. Prior studies have characterized cognitive style as either 1) simple vs. complex; 2) field-dependence vs. field-independence; or 3) analytic vs. intuitive[7] (Ruble and Cosier, 1990). Since most research performed in accounting has used the latter two measures of cognitive style, these two measures and their related research are expounded below.

2.1.1 Accounting Related Research Using the Field-Dependence/Independence Measure of Cognitive Style.

Field dependence/independence refers to the ease with which a person can disembed pieces of information from a complex field. Witkin's Embedded Figures Test (EFT) measures the field dependence/ independence construct (Witkin, Oltman, Ruskin, & Karp, 1971). The test presents a series of geometric figures, each of which contain an embedded figure that the subject must try to find. The embedded figure's size, shape, and direction are shown to the subject separately; the subject must then locate that figure within the larger figure. Subjects are scored on the number of correct hidden figures they find or on the amount of time it takes to find them. Field-independent persons are those who locate more of these figures. They are able to separate the embedded figures from

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[7] Other terms have been used in the research that are synonyms of those shown here. For example analytic processing has been termed systematic whereas intuitive processing has been termed heuristic or global.

the background better than field-dependent persons and have a high level of selective attention ability. Because they can separately attend to the individual features of multidimensional stimuli, they are sometimes termed high analytics. Field-independent processors also have greater skill than field-dependent persons in cognitive restructuring, e.g. the ability to get at the crux of a problem despite misleading contexts (Pincus, 1990). Field-dependent processors are more global oriented in that they tend to be more responsive to the dominant properties of a field of information. Extensive psychological research on field dependence-independence may be found in Witkin and Goodenough (W&G, 1981); Witkin, Goodenough, and Oltman (1979); and Bertini and Pizzamiglio (1986). Additionally, Singer (1984, p.217) states that research on this measure ". . .constitutes perhaps the strongest body of evidence available for any trait or style in personality psychology."

In their review on cognitive characteristics, Ho and Rodgers (1993)used Kogan's (1973) taxonomy as a framework for categorizing extant accounting related research. This taxonomy defines cognitive styles, abilities and strategies.[8] Although Ho and Rodgers categorized accounting research that used the EFT as descriptive of cognitive

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[8] Kogan's definition of cognitive style is similar to the definition above, i.e. a cognitive style is the distinct way in which an individual acquires, stores, retrieves and transforms information. A person's cognitive style is consistent over time. Kogan defines cognitive ability as the processes related to the encoding and the retrieval of knowledge. He further states that cognitive abilities are concerned with levels of skill, are situational and can change over time. Finally, he describes cognitive strategies as the combination of style and ability and the environment. Strategies are affected by task requirements, problem contents and situational constraints. Thus, the present research is consistent with Kogan's taxonomy.

ability, the EFT is traditionally used as a measure of cognitive style, not ability. In fact, the EFT was originally conceived as a test of perception (Robey & Taggart, 1981). In their monograph of field-dependence/independence, W&G (1981) state that this construct is stable over time, which aligns more with individual characteristics than knowledge characteristics. Furthermore, W&G (1981, p. 58) state that their dimension ". . . may be seen to conform with the concept of style (manner of moving toward a goal) rather than the concept of ability (competence in goal attainment)." Finally, they note that even though cognitive restructuring is defined as an ability dimension, the relationship repeatedly found between field-independence and restructuring ability in verbal ability tests cannot be accounted for on the basis of greater overall capabilities of field-independent over field-dependent persons[9]. The present review, therefore, will stay consistent with the underlying psychological theory (as advanced by Witkin and Goodenough, 1981) and discuss the literature using the EFT as evidence concerning cognitive style.

The research reviewed in this section was selected according to the following criteria: 1) the EFT was used to measure field-independence/dependence; and 2) the subjects participating in the research project had to consist of business students or professionals.

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[9] In a meta-analysis of 11 studies examining the relation of vocabulary-test scores to EFT performance using adult subjects, W&G found an insignificant correlation between their construct and the verbal-comprehension construct.

In their study on cognitive style and report format preference, Doktor and Hamilton (1973) found no significant difference in report style preference between field-independent and field-dependent practicing managers on management science recommendation reports. However, counter-intuitive marginal significance was found between report format preference of the field-independent versus dependent student subjects. Specifically, field-dependents tended to prefer the analytic report format whereas field-independents preferred the general report format. An explanation for these counter-intuitive results is that these student subjects may not have had the requisite domain specific knowledge for the task and, therefore, chose the report format opposite of their cognitive style because it may have appeared more informative in an unfamiliar task.

Lusk (1973), found that a significant difference existed between report format preferences on financial statements and field-independent/dependent cognitive styles using practicing financial analysts and graduate student subjects. Specifically, the field-independent subjects preferred to invest in a company when that company's financials were presented in a differentiated, articulated form (e.g. high analytic format); whereas field-dependent subjects preferred to invest in a company when its financials were presented in a generalized form with minimal information breakdown (the low analytic format).

A second study by Lusk (1979) examined the relationships between cognitive style, report format, and task performance. Three hundred students were presented with

one of five reports: the reports were formatted either tabularly (2 formats) or graphically (3 formats); each depicted the annual incomes of three separate professions. The subjects answered 20 questions relative to the report. Four of the questions could be directly answered from the report, whereas the remaining 16 questions required some type of arithmetic transformation to be correctly answered. The subjects were divided into the respective field-dependent/independent groups using a median split. Based on task scores, measured by the number of correct responses, the field-independents (e.g. high analytics) outperformed the field dependents. Since the task questions and environment were predominantly analytic, these results are not surprising. One would not expect a global processor to perform better than an analytic processor in an analytic environment.

Benbasat and Dexter (B&D, 1979, 1982, 1985) examined the effects of cognitive style and information systems on report preferences and decision quality using investment contexts. In their first study, using a multi-period game scenario, non-student[10] and student subjects acted as inventory production managers and set order points, quantities, and production figures for 20 periods. The authors felt that all subjects had the knowledge necessary to complete the task, because all had equal opportunity to study the setting for one week and had a two hour practice session. Of the forty-eight participants, 13 were scored as field-dependent and the remaining 35 as field independent. Each subject was given one of two information formats. The first format

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[10] The nonstudents consisted of 20 faculty members in Commerce and Business Administration at the University of British Columbia, and four professional accountants.

was a database inquiry system and the second was a structured, aggregated report format. B&D found that field-independents outperformed field-dependents when using the structured, aggregated report (e.g. they were better at disembedding the necessary information). However, field-dependents performed as well as field-independents when using the database inquiry system. In addition, the field-dependents preferred to use this system, whereas the field-independents preferred the structured, aggregated report. Thus, subject report format preferences matched their cognitive style.

In their second study, Benbasat and Dexter (1982) examined whether a decision aid could improve the performance of field-dependent subjects in a task environment more suitable for field-independent persons. The judgment scenario was similar to their first study, e.g. the graduate and undergraduate students acted as inventory production managers and set order points, quantities and production figures for 20 periods. The report format was highly structured and aggregated, hence more conducive to field-independent persons. The decision aid provided the decision maker with an opportunity to examine the impact of key variables (e.g. demand, lead time, and decision parameters) on performance by allowing the subject to test his/her decisions before being committed to them. One half of each cognitive style group were given the decision aid. Not surprisingly, within the field-dependent group, performance was significantly better for those who received the decision aid over those without the aid. In fact, their performance (those receiving the aid) reached the aggregate performance of the field-independent groups. However, contrary to prediction, within the field-independent group, those that

received the decision aid outperformed those that did not. Thus, the decision aid design was conducive to both cognitive styles in that it allowed "what if" practice within the game setting.

In their last study, B&D (1985) used a fixed promotional budget allocation task and examined the effect of graphical and color-enhanced information presentation on decision quality and user perceptions of information system attributes. They predicted and found that field-independent subjects had no preference for graphical versus tabular information presentation, and found no significant performance differentials between the monochrome versus multicolor reports. However, the field-dependent subjects preferred the tabular report format over the graphical format. Additionally, B&D predicted that the field-dependent subjects would perform better using the multicolor reports because these reports would help disembed information. B&D did find that the biggest performance improvement was for the field-dependent subjects using colored reports. They state that prior research findings showing poor performances by field-dependent subjects are due to a mismatch between information presentation and personality type. Thus, performance levels between the two styles can be equivalent if the information or decision support system given to a person matches his/her cognitive style.

Gul (1984) examined the relationship between manager decision confidence and accounting information in a human resource accounting context. Specifically, he looked

at the interaction of cognitive style and tolerance for ambiguity.[11] Managers from multiple Malaysian electronics firms participated in the study. After the estimated payroll savings resulting from the layoff and the estimated costs of rehiring and replacing the work force were given to the subjects, they made a decision regarding the layoff of personnel. A marginally significant interaction occurred between intolerance for ambiguity and field-dependence on decision confidence. The main effect for field-dependence/independence showed that field-dependent persons where significantly less confident in their layoff decisions. The results of this layoff decision are reasonable because field-dependents are more competent in interpersonal skills and are more willing to help others (Witkin and Goodenough, 1981) than are field-independent persons. In this layoff decision the field-dependent person would view himself as the "bad guy" and not feel confident in his decision. This task environment is more conducive for field-dependents, e.g. they should perform better but their confidence will not be as high because they are sensitive to "people" situations. However, decision confidence, not performance was the dependent variable measured.

Awasthi and Pratt (1990) examined the effect of monetary incentives on decision performance between cognitive styles. Student subjects answered three comprehension questions concerning conjunction probability, sample size, and sunk cost rules; then

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[11] This construct refers to an individual's reaction to ambiguous situations. Budner (1962) defined ambiguity intolerance as "the tendency to perceive (e.g. interpret) ambiguous situations as sources of threat". One who is ambiguity-intolerant finds uncertain situations noxious and must find a way to cope. Gul used this construct as a personality trait variable.

applied those decision rules to solving three distinct problems. Monetary incentives improved performance only for field-independent subjects on the conjunction probability and sample size application tasks. This finding is not surprising since the decision environment (e.g. the mode of information presentation and task contexts) was unfamiliar to the subjects; and thus, more conducive to analytic processors (field-independent individuals).

Pincus (1990) was the first study to use an actual audit task in the literature reviewed thus far. She used three individual measures (tolerance for ambiguity, field-dependence/independence, and catetory width) to detect differential performance in a fairness of presentation audit judgment task. In an actual case where inventory was intentionally misstated, Pincus instructed audit seniors to review inventory documentation and decide whether the inventory was fairly stated. Subjects who were accurate in their decisions were more likely to be ambiguity-tolerant and field- independent.[12] The task environment was more conducive to analytic (field-independent) processors in that the fraud was a straight-forward inventory manipulation. The irregularity was easily found if one examined the inventory cards and matched prior year's ending with current year's beginning balance. Thus, the findings are consistent with the proposed theory in the current research in that those who performed best on this analytic task were analytic processors.

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[12] The third individual difference variable, category width, did not approach any conventional statistical significance.

In a follow-up study employing Pincus' (1990) case materials, Bernardi (1993) used field-dependence/independence, locus of control, and moral development as individuating variables for the fairness of presentation audit judgment task. The only deviation from the original case materials was the addition of a statement regarding the firm's perception of the client's management integrity and competence, and the elicitation of the auditor's priors concerning the existence of fraud (obtained in the background questionnaire). None of the three individual difference variables by themselves was significant in the judgment of the fairness of balance sheet presentation. Bernardi, had two levels of experience in his subjects, audit seniors and managers. He found that audit managers who scored higher on the moral development scale detected the inventory fraud at a higher rate than did audit seniors. Additionally, client integrity and competence did not affect an auditor's ability to detect fraud (except for the high moral development managers as stated earlier); and fraud detection was directly proportional to the auditor's priors concerning the existence of fraud. When Bernardi's research is viewed in light of the present study's predictions, one would expect the field-independent processors to perform best on this task because the task environment was more conducive to field-independents. However, no significance was found for this construct, thus his results do not support the theory that cognitive style differentiates task performance.

Anderson and Reckers (1992) used an analytical review task where auditors predicted current sales based on either graphic or tabular presentations of prior sales. The task was between subjects, a subject received either a tabular or graphic representation of

prior sales, but not both. Two individual difference measures were used to partial out performance variance: tolerance for ambiguity and field-dependence/independence. The results indicated that the mode of presentation (graphic) and field-independence were the only significant main effects in accurately predicting current month sales. Because of the way the graphs were arranged, subjects had to disembed (extract) the required information to be able to accurately predict sales. Thus, the environment was an analytic environment.

Initially, the research reviewed indicates that field-independent information processors are generally more accurate and confident in their decisions. However, one must be cautious in this interpretation because all but one of the task environments was more conducive to the field-independent processing style, thus enabling that cognitive style to outperform the field-dependents. Also, the one study that was more conducive to field-dependents only reported confidence scores and not performance scores. Finally, all the research used a single task, thus the research is not able to distinguish if field-independent processors are actually more accurate in decision making between tasks requiring different processing methods. Not yet addressed in the accounting literature is whether a field-independent (e.g. analytic) processor would remain a superior performer when faced with a field-dependent (e.g. intuitive) designed task. Additionally, if each processing style were presented with both task types (e.g., an analytic and intuitive task), would one style maintain superior performance on one or both tasks?

2.1.2 Accounting Related Research Using the MBTI Measure of Cognitive Style

The Myers-Briggs Type Indicator (MBTI) is another measure of cognitive style used extensively in other fields and has had limited use in accounting research. The MBTI is based on the Jungian theory of personality type (Myers and McCaulley, 1985). It provides an indication of a person's preferred method of acquiring and processing informational cues in different situations. These preferences are an individual's normal and most practiced methods of perceiving and processing information for decision-making. Because the non-preferenced methods are rarely practiced and used by an individual, they will be less confident with any decisions using these methods. Unless a situation expressly states one method is beneficial over another, and an individual is aware of the statement, he/she will typically use his/her preferred method of perceiving and processing (Myers, 1980).

The MBTI is comprised of four bipolar dimensions (attitude, perception, judgment, and orientation) which define an individual's personality type. However, when defining cognitive style through use of the MBTI, only the perception and judgment dimensions are used. According to the MBTI manual, perception includes the many ways of becoming aware of things, people, events, or ideas. It includes gathering information, seeking sensation or inspiration, and selecting the stimulus one wishes to attend. Judgment includes all ways of coming to conclusions about what has been perceived. It includes decision making, evaluation, choice, and response selection after

the stimulus is perceived (Myers and McCaulley, 1985). These two defining dimensions of cognitive style and their respective anchors are described below.

1. The Perception Dimension: Anchored by sensation (S) and intuition (N), it represents the manner in which one perceives incoming information. This dimension is the information processing mode. The sensor prefers to work with known, objective facts on what is immediate and real; whereas the intuitor prefers to look at meanings, relationships and the furthest reaches of the possible, rather than known facts. Intuition permits perception beyond what is visible to the senses, including possible future events (Myers and McCaulley, 1985).

2. The Judgment Dimension: Anchored by thinking (T) and feeling (F), it represents the method one uses to arrive at a decision. The thinker seeks rational order and makes judgments based on impersonal logic and analysis rather than on personal values. Thinkers rely on principles of cause and effect and tend to be impersonal. Feelers rely on the rational process of association, which is subjective in nature. They arrive at a decision by weighing the relative values and merits of the issues. Thus, feelers tend to be humanistic and make their judgments based on good/bad or pleasant/unpleasant comparisons (Myers and McCaulley, 1985).

Because the two perception modes are independent of the two judgment modes (Carlyn, 1977; Keen and Bronsema, 1981; Zmud, 1979), four cognitive styles can be produced: ST, SF, NF, NT.

According to Myers' (1977) theory, an individual who fits the ST mode of decision-making focuses primarily upon facts that can be collected and verified by the senses, and makes judgments about problems primarily through an impersonal evaluation of those facts. These analytic persons prefer detailed, structural problems and have the patience for routine, precise work. These individuals make decisions that tend to be practical and matter-of-fact.

By comparison, persons with the SF cognitive style focus primarily upon facts that can be collected and verified by the senses, but tend to make judgments about problems primarily by weighing values and considering others' thoughts and feelings. Decisions made by SF persons tend to be empathetic.

The third cognitive style, NF, is represented by those who use intuition for perception and combine it with judgment through feeling. Persons with this style perceive problems in a Gestalt manner, recognizing a wide range of possible solutions and rarely focus on individual elements in isolation. They judge those possibilities by weighing values and considering others' thoughts and feelings. Intuitive persons dislike routine and precise work and prefer new, unstructured problems. Decisions made by this type tend to be enthusiastic and insightful.

The fourth cognitive style, NT, is represented by those who use intuition for perception and combine it with analytical thinking for judging. A person with this style will focus on an array of possible solutions to a problem, yet approach the solutions with impersonal analysis. Consequently, the decision which is chosen by an NT will usually be a theoretical or technical one that tends to be logical and ingenious.

Much of the accounting related research has employed the MBTI to determine the frequency of the 16 personality types among accountants. Specifically, accountants are primarily sensor-thinkers (Barrett, 1969; Descouzis, 1989; Jacoby, 1981; Kiersey and Bates, 1978; Myers, 1980; Myers and McCaulley, 1985). However, Jacoby (1981) in examining the audit sections of public accounting firms, found a diversity in personality

type at the senior/staff levels and homogeneity at the manager/partner levels. Specifically, he found that 74% of the audit partners sampled had the same personality type when all four dimensions of personality were used.

There are six accounting related research studies that have focused on the cognitive style dimensions of the MBTI. In the first study Casey (1980b) examined cognitive styles performance on corporate failure judgments. Bank loan officers were provided with five accounting ratios for each of thirty firms. The subjects were then asked to predict which firms would go bankrupt within the next three years. Each subject was typed using the MBTI. Interestingly, only the perception (sensor/intuitor) dimension of the MBTI was assessed for each subject. Results showed that intuitive perceivers of information performed significantly better than sensing perceivers on an intuitive task, thus showing support for the theory proposed in the current study.

In research designed to examine the effects of cognitive style, decision environment and risk on capital expansion project adoption, Henderson and Nutt (1980) found that the likelihood of adoption was greater when the decision environment was compatible to the decision makers cognitive style. They also found that no differences in perceived risk were found for a decision maker in a compatible versus incompatible environment. Risk was assessed as either high (ranging from 0-20% return on investment) or low (8-12% return on investment). The decision environment was either

compatible or incompatible with decision style,[13] and information source was either from discussion with other colleagues or from a computer-based model.

Blaylock and Rees (1984) measured the cognitive style of 50 MBA students using only the perception dimension of the MBTI to classify subjects as intuitives (NF and NT) or analytics (ST and SF).[14] Sixteen (four from each type) were selected and grouped by type to participate in an unstructured merger/acquisition decision task. Each group was given 50 pieces of information and asked to rank them from most to least useful. Additionally, each group was to provide written comments about the usefulness of its top 20 items. The researchers found that the intuitive subject groups preferred different information than the analytic groups. Specifically, the intuitives (as defined by the researchers) preferred more social information. These research results are in agreement with the Jungian theory.

Rodgers and Housel (R&H, 1987) used a loan decision scenario to examine the efficacy of the two-stage cognitive model of decision making, e.g. the perception and judgment dimensions of the MBTI. Experienced loan officers and MBA students were asked to make 10 loan decisions based solely on financial accounting information (economic and managerial information was not provided). The MBTI was used to type

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[13] The researchers prepared four separate environment description paragraphs for each of the cognitive styles, ST, SF, NF and NT. They defined the ST and NF environments as opposites and therefore, incompatible. Likewise, the SF and NT environments also were deemed opposite and incompatible.

[14] Because the task was one of information usefulness, it is reasonable to classify the subjects by using only the perception dimension of the MBTI.

each subject as either intuitive or analytic on each of the perception/judgment dimensions. The researchers presumed that the perception dimension would ultimately influence the decision outcome. They predicted, based upon the results of Casey (1980a), that the intuitive would outperform the analytic loan officers (where analytic and intuitive are based on the perception dimension) in making overall correct decisions. The results of R&H's study were contrary to predictions. Intuitive loan officers performed worse than analytic loan officers and there was no significant difference between the loan officers and the MBA students on most of the loan decisions. However, Casey used a global task whereas R&H used a task where only analytic information was given. Thus, R&H may have given the analytic loan officers an advantage in that the task environment was more conducive to analytic cognitive styles. Additionally, the MBA student performance equalled the loan officer performance. This result is not surprising because the task was data driven and MBA students posses the requisite knowledge of business and relationships between financial ratios. Finally, the poorer performance and more conservative decisions made by the intuitive loan officers can be attributed to the lack of global information present in the case.

In the final study, Fisher (1993) used the MBTI to examine the relationship between the level of moral reasoning (as measured by the Defining Issues Test) and personality traits. Using senior accounting student subjects, he found that intuitive types (especially females) displayed higher levels of moral reasoning than sensing types.

In summary, the research reviewed above appears to be consistent with the proposed theoretical assumptions. Cognitive style impacts subject performance. The individuals in these studies preferred information that matched their cognitive style. Additionally, the better performers in the tasks reviewed were those whose cognitive style's were compatible with the task demands.

The MBTI was chosen over the field independence measure because: 1) it provides more information on individual differences and 2) field-dependence/independence correlates highly with the perception (sensor/intuitor) dimension of the MBTI (Corman and Platt, 1988). Viewed together, the four styles that emerge from the MBTI represent very different approaches to solving a problem or task. If a relationship can be detected between cognitive style and performance, such information might be quite useful in a variety of organizational settings. Based on the literature reviewed above one can predict that cognitive style can effect one's performance on a task. Thus, one general hypothesis can be identified:

H1: An auditor's cognitive style as measured by the MBTI will have a significant main effect upon his/her task performance.

2.2 Task Differences

Current behavioral research in auditing emphasizes the need for consideration of task-specific complexity and knowledge base and calls for further research regarding specification of these variables (Abdolmohammadi, 1993, p1). Libby (1992) acknowledges that "the key to successful study of knowledge related determinants of

performance is specifying the knowledge needed and the *cognitive processes* involved in performing specific audit tasks" (italics added). This section describes how tasks can be differentiated based upon separate cognitive demands.

In their seminal paper, Abdolmohammadi and Wright (A&W, 1987) were able to show, using Simon's (1960) model of the decision process, how task complexity was able to moderate experience effects in different auditing tasks. Up to that point, research was unable to explain why certain tasks showed experience effects and others did not. A&W contended that when "structure" was introduced as an operational variable for task complexity, it would moderate the effect of experience on performance. They were able to show that structured and semi-structured tasks (sample size judgments vs. internal control evaluations, respectively) were routine and less complex, thus explaining why no experience effects existed with auditors at or above the experience required for those tasks. However, since unstructured tasks (opinion or severe adjustment judgments) are more complex and less routine, experience could affect judgment. Alternatives in severe adjustment situations are less defined and require more judgment, implying that the more experience leads to better judgment. In addition, Bonner and Lewis (1990) state that experience with the audit firm alone is not enough to identify the experience necessary to perform a task well and that the auditor also needs task specific experience as well as some innate ability.

The present research contends that if an auditor's specific cognitive style matches the corresponding task continuum (analytical and intuitive tasks are at each polar end),

judgments will be more accurate. The task continuum is espoused by Hammond et. al. (1987) and based upon Simon's (1960) work. Hammond et. al. argue that task conditions span a similar continuum to cognitive style (the cognitive continuum ranges from pure analytical to pure intuitive styles). Specifically, they argue that a package of task properties corresponds with a package of cognitive properties. Decision accuracy should be greatest when a person's cognitive process matches the task conditions as opposed to when they are misaligned with the task conditions.

Exhibit 1, based on Hammond et. al.'s work, identifies those task characteristics associated with improved performance under analytic and intuitive cognitive processing styles. The present research two audit tasks; one analytical in design, the other intuitive (described in the methodology section), in a within-subject design.

2.3 Cognitive Style and Task Structure Interaction Using Multiple Tasks

Only two studies have directly assessed the impact of cognitive style (as measured by the MBTI) on differential task performance using more than one task in a within-subject design (Ruble and Cosier, 1990; Bracato and Seaberg, 1987). For purposes of this review, a structured task was used interchangeably with an analytic task; whereas an unstructured task was used interchangeably with an intuitive task. A structured task equates easily to an analytical task because it is objective, task decomposition is high, and cues are not redundant. Likewise, an unstructured task equates to an intuitive task because it is perceptual, has high cue redundancy, and decomposition is low.

Exhibit 1
Associations Between Task Characteristics And Cognitive Styles

	Task Characteristic	*Intuitive Cognitive Style*	*Analytical Cognitive Style*
1.	Number of Cues	Large (>5)	Small
2.	Cue Measurement	Perceptual	Objective
3.	Cue Value Distribution	Continuous; highly variable	Unknown; cues are dichotomous values are discrete
4.	Cue Redundancy	High	Low
5.	Task Decomposition	Low	High
6.	Degree of Uncertainty	High	Low
7.	Relation between Cues & Criterion	Linear	Nonlinear
8.	Cue Weighting	Equal	Unequal
9.	Availability of Organizing Principle	Unavailable	Available
10.	Cue Display*a*	Simultaneous	Sequential
11.	Time Period	Brief	Long

a Applicable to surface conditions only
Source: Hammond, Hamm, Grassia and Pearson (1987).

Ruble and Cosier (1990) developed two tasks using the Multiple-Cue Probability Learning Paradigm (MCPLP). Each task consisted of three blocks with 20 trials within each block. Each business student subject completed one task. The first task was a human relations decision setting designed to align with the intuitive end of the task continuum (e.g. intuitive processors should outperform analytic processors on this task). For this task, each subject examined three cues to predict an employee performance index. The three cues represented a combination of quantity and quality of work for that employee. Because the cues were perceptual and a judgment was elicited, the authors deemed the task intuitive. The second task was aligned with the analytic end of the task continuum. In this setting each subject examined three financial ratios and asked to predict a price-earnings ratio. Because the cues were quantitative and a ratio had to be calculated, the authors deemed the task analytic. The authors predicted that analytic subjects (those who were sensors on the perception scale and thinkers on the judgment scale, i.e., STs) would perform better on the financial indicator task, while intuitives (those who were intuitors in the perception dimension and feelers in the judgment dimension, i.e. NFs) would perform better on the human resource task. A repeated measures ANOVA with the decision setting, subject perceptive dimension and subject judgment dimension as the between-subject factors and block of trials as the within-subject factor was used to analyze the data. The total absolute error for each block was used as the dependent variable (Σ |subject predictions - criterion value|). The results did not support the hypotheses; that is a significant interaction was not found for cognitive

style × decision setting. However, significant main effects were found for the decision setting, where performance was best on the human relations setting, and for block, subject performance improved over blocks of trial. The second result is not surprising in that such improvement is typical of MCPLP research.

One problem with the experiment concerns its construct validity. When viewing both decision settings based on Hammond et al.'s task continuum, it could be argued that both tasks were analytic. Three cues were given, no redundancy existed among them, and all measures were fairly objective. Finally, the higher performance of the human resource decision setting over that of the financial can be attributable to an experience effect. The financial task would not be familiar to most business students, whereas judging human performance is performed almost daily by most individuals. It would have been interesting had the authors collapsed the latter two between-subject variables (e.g. the perception and judgment demensions measures) into one variable called cognitive style. This variable would represent three levels: pure intuitive subjects, NF; pure analytic subjects, ST; and hybrid subjects, SF and NT. The authors did present a table of mean absolute error per block for both decision settings and each cognitive style; however, they did not present any standard deviations or t-statistics for this table. The table revealed counter-intuitive results in that the NF cognitive style outperformed all other styles on the analytic task and the ST cognitive style outperformed all others on the human relations task. However, because the authors did not provide statistics for this table, no statistical interpretation exits.

Brocato and Seaberg (B&S, 1987) focused on differential group performance using both structured and unstructured (ambiguous) tasks. This study was unique because it defined "group" in terms of a typical of real world organization: a leader (a school superintendent) and two subordinates (two secondary school principals). After administering the MBTI, the authors separated subjects into three person groups. Each group contained team members with either compatible or complementary cognitive styles. Compatible teams included subjects that had virtually the same cognitive style (see below). Subjects in complementary groups had differing cognitive styles. Each team performed two tasks: a structured task requiring the completion of two bus routes, and an unstructured task requiring a decision on a contract renewal of a fictitious teacher. Each task was measured in terms of efficiency (time to complete the task) and effectiveness (amount of total miles in the bus routes or independent rater score of team defense position). The authors predicted that compatible groups would perform more efficiently and effectively on the structured task, whereas the complementary groups would perform better on the ambiguous task.

The structured task revealed that compatible teams were more efficient than complementary teams; however, effectiveness was the same. In the unstructured task, complementary teams were more effective (rating on position defense as measured by an independent judges) in supporting their decisions than the compatible teams, but were significantly less efficient. Unlike the prior study which focused on the compatibility of the individual's cognitive style with the task type, B&S focused on the compatibility

(complementary) aspects of the within-team cognitive style of the participants. Interestingly, eight of the 10 teams defined as compatible by S&G, were comprised of all Sensor/Thinker (e.g. pure analytic) cognitive styles. Of the remaining two teams one contained two ST members and a SF (sensor/feeler), the other also contained two ST members and an IT (intuitive/thinker) member. In the ten complementary groups all team members had differing cognitive styles; however, each group contained one ST member. Thus, S&G's work partially supports the idea that the pure analytic groups perform better on structured tasks, while hybrid teams perform better on unstructured tasks. Unfortunately, because none of the compatible groups contained all pure intuitive members (e.g. Intuitive/Feelers), it is uncertain whether pure intuitives would have outperformed hybrids on the unstructured task.

Based on the preceding literature review and the fact that cognitive style is stable over time (Myers & McCaulley, 1985), four assumptions were developed to be applied in an audit research setting. First, an auditor has specific individual preferences in the way (s)he approaches an audit judgment (e.g. preferences in perceiving and processing information). Second, the auditor will begin each task of an audit job in accordance with those preferences. Third, the auditor will continue with that method of processing towards problem solution.[15] Finally, the auditor's performance will be best on a task

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[15] This assumes that the auditor is not interrupted in the judgment process with some type of cue to change his processing method. The cue could be a decision aid or specific, detailed instructions that enable the subject to employ a different cognitive processing method for accurate completion. Any "cueing" at this point in the examination stage is beyond the scope of this research, and thus, is assumed not to occur.

where cognitive style matches the task demands. Based on these assumptions the following general hypotheses was derived:

H2: A significant interaction will occur between a subject's cognitive style and task type on his/her task performance.

Specifically, the interactions are predicted in the following manner:

a: Analytic cognitive style subjects will perform better on an analytic task than intuitive cognitive style subjects;

b: Intuitive cognitive style subjects will perform better on an intuitive task than the analytic cognitive style subjects; and

c: Hybrid cognitive style subject performance will fall between the intuitive and analytic cognitive style subjects on both tasks.

d: Intuitive (analytic) cognitive styles subject will perform best on the intuitive (analytic) task.

2.4 Adaptive Verses Singular Approaches to Decision Making

Inherent in the literature reviewed above is the implication that people have a preference for the way they perceive incoming information and form a judgment using that information. In addition, they will use that preference with each decision problem they approach. Another stream of research by Payne et al. (1993, 1992, 1988) and Johnson et al. (1988) presents a constructive theory of decision making. This theory clearly asserts that people adapt their decision styles to meet the decision situation.[16]

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[16] The authors believe there are at least three ways in which a decision maker adapts his behavior to changes in the decision task: 1) by doing more of what he is already doing; 2) by changing some parameter of the current strategy (e.g. increase cut-off levels); and 3) by changing from a selective non-compensatory strategy to a more compensatory strategy.

Specifically, in a series of choice studies, Payne, Bettman and Johnson (1993, 1988); Johnson, Payne and Bettman (1988); and Payne, Bettman, Coupey and Johnson (1992) provide evidence that individuals have preferences for decision strategies and can change their processing strategy "on the spot" depending upon the information they encounter during the course of solving the decision problem.

Underlying their constructive theory of decision behavior is a cost benefit tradeoff. This tradeoff is composed of the desires of the decision maker to 1) achieve an accurate decision and 2) minimize the cognitive effort needed to reach that decision. As the task environment becomes more complex, decision makers will change their methods or strategies (rules) towards problem solution to maintain the accuracy/effort balance. These methods or strategies originate from both experience and training, are contingent on task demands, and are used to minimize effort to achieve decision effectiveness (Payne, et. al., 1993).

The tasks in the constructive line of research used choice decisions, such as a lotteries or games, where each subject plays multiple rounds. Each round consists of a fixed number of known alternatives with varying probability outcome attributes. The magnitude of the number of alternative/attribute comparisons was manipulated to induce more or less cognitive effort for decision performance. Specifically, increasing the number of comparisons within a choice decision are requires more effort to achieve the desired performance level. Thus, a task attribute (the amount of pairwise comparisons) was used as a surrogate measure for the amount of cognitive effort exercised. The

researchers theorize that to keep the accuracy/effort balance, people will change their processing strategies.

For example, Payne, Bettman, and Johnson (1988) performed two experiments to determine to what extent people adapt their processing behavior to meet the demands of a choice decision. The task environment included context factors (the dispersion of attribute probabilities) and task factors (time pressure) in a game scenario setting. Subjects could choose from four risky options (alternatives) with four possible outcomes (attributes) for each option. For any given outcome, the probability was the same for all four options. Each subject was given 20 sets of choices varying in the amount of probability dispersion in the attributes (either low or high-dispersion, where high dispersion implies more effort) and time pressure (none or severe). In a replication experiment moderate time pressure replaced the severe time pressure.[17] The dependent variables included the amount and sequence of information acquired along with the time spent acquiring the information. The authors found that under severe time pressure the student subjects adapted their decision behavior by accelerating their processing (e.g., less time was spent per item of information acquired), increasing the selectivity of processing (e.g. focus was made on a subset of the available information), and moving toward more attribute-based processing when the dispersion probabilities were high

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[17] To increase motivation subjects were given a fixed fee in the first experiment and had an opportunity to be selected to play a gamble, where the potential winnings could go up to $40. In the replication study (moderate time conditions) the authors randomly selected 10% of the subjects to play one of the last two gambles they witnessed. If subjects won, they received the indicated payoff.

rather than low. Under moderate time pressure subjects showed an acceleration in processing. Thus, given the changes in the context and task attributes of the decision environment, individuals used differing decision strategies to balance their accuracy/effort tradeoffs.

Notably, researchers of the constructive theory clearly state that judgment is different from choice. Choice typically involves selection from multiple fixed alternatives whereas judgment involves assessing facts and other information to reach a conclusion. In their literature review Payne et. al. (1993) provide evidence that judgment is similar to choice in that both are contingent on properties of the task. Unfortunately, they have researched only choice events, thus they advocate that future research should examine the adaptability of judgment decisions. Furthermore, they believe that judgment decision research could use the same accuracy/effort framework approach used on choice decisions.

The present research uses audit judgment contexts to explore and extend the Payne et. al. research. It extends their research by focusin on judgment rather than choice. The audit context typically involves judgment decisions. Rarely are fixed alternatives available for an auditor to choose to find the correct decision (Bonner, 1994). Actual outcome feedback (in terms of audit failure) is so far removed from the audit that a choice scenario does not apply to this particular research design.

In addition, this research advocates that cognitive style affects cognitive effort (as measured by the number of alternative/attribute comparisons in Payne, et. al.). As stated

in section 2.1, cognitive style is an individual's preferences for perceiving and processing information. These preferences vary among individuals and may affect effort and, ultimately, performance. Given the accuracy/effort framework, as the number of pairwise comparisons increases, an individual's cognitive effort must also increase, regardless of the individual's cognitive style, to achieve accurate performance. It is now necessary to determine whether cognitive style explains performance differences on a given task where the amount of effort (in terms of number of comparisons) is held constant. For example, if the task characteristics match a person's cognitive style, *ceteris paribus*, would (should) performance increase? Alternatively, if cognitive style does not match the task characteristics, *ceteris paribus*, would (should) performance decrease?

The present study enabled a test of the constructive theory on judgment decisions. The research design held effort constant within each task: that is, each task was performed only once, thus eliminating pairwise comparison manipulation. The study included two distinct tasks requiring different approaches (strategies) towards problem solution for successful performance. If subjects perform equally well on both tasks, the implication is that individuals can change their processing strategy, thus supporting the constructive theory of Payne, et. al. Specific hypotheses are not introduced in this section because rejection of both H1 and H2 indicates that subject performance was equivalent between the two tasks regardless of cognitive style.[18] If these hypotheses are rejected,

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[18] H1 stated that cognitive style would affect performance, whereas H2 stated that a style × task interaction would significantly affect performance.

then one can argue that it is likely that individuals in these two judgment tasks can change their processing strategies, thereby supporting the constructive theory of judgment decision.

3. METHODOLOGY

An experiment was conducted to examine the individual difference and task factors that have been hypothesized earlier. The research materials consisted of one envelope containing three folders and an overall set of instructions describing the purpose of the research. The first two folders contained the analytic (workpaper review) and intuitive (analytical review) tasks. The order of the tasks was crossed between subjects. Each task had its own set of instructions and questions within its folder. The third folder included the MBTI instrument, demographic questions and questions designed to determine whether the subjects' perceived each task's attributes as intended. In addition, a $100 and $50 bonus drawing was offered to help induce subject participation. To be eligible for the bonus, all research materials needed to be fully completed and returned to the author. Finally, all subjects were guaranteed anonymity.

3.1 Tasks

Each subject completed two separate tasks that were selected and designed based on Abdolmohammadi's (1993) taxonomy of task complexity and knowledge base demands. The tasks were similar in their ratings of difficulty and level of knowledge required to perform the task.[19] These tasks were also chosen to specifically satisfy the polar ends, analytic vs. intuitive, of Hammond et al.'s task continuum. Manipulation

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[19] The two tasks chosen can be associated with Prawitt's tasks: evaluate results of substantive tests (ERS) and make final review of financial statements (MFR). His results also showed that seniors could perform these tasks, although a more experienced senior would perform the latter task. His results on experience levels are consistent with the experience level used in the current research.

check questions, found in the demographic portion of the packet, assessed whether the task attributes were perceived by the subjects as intended. Exhibit 2 lists the five task characteristics that were chosen from Hammond's table to design the two audit tasks representing the opposing ends of the task continuum.

Exhibit 2
Task Characteristics Chosen for Case Design

Task Characteristic	*Intuitive*	*Analytical*
1. Number of cues	High	Low
2. Cue measurement	Perceptual	Objective
3. Task decomposition	Low	High
4. Cue Display	Simultaneous	Sequential

3.1.1 Analytic Task

The case chosen for the analytic task, based on Moeckel (1989, 1990), included subtle changes, such as the company name and locations. The premise of the case was a workpaper review of an average staff person's work on a small manufacturing company. The case was seeded with eight errors described in Exhibit 3. Appendix A contains a copy of the case. The case is considered to be an analytical task based on the following factors:

Exhibit 3
Contradicting Cues that Create Errors in the Analytic Task

	Cue 1	*Cue 2*
1	The company had an eight year contract with the government to supply product, thus there was protection from inherent risk.	The contract expired during the current year end.
2	The company sold 2/5 of a parcel of land. The remaining land is being held for investment purposes.	The EPA has recently rendered the land uninhabitable due to a toxic waste dump. Therefore, the land value may need to be written down.
3	One workpaper indicates that the company increased its prices across the board in two months of the year due to strong markets	A second workpaper states that the company decreased its prices during those two months to reduce inventory buildup.
4	One workpaper states that SG&A expenses decreased during the year because a plant was closed.	The detailed numbers of the SG&A expenses do not show the said decrease.
5	The client profile indicated that all invoices go to the Stillwater plant and that inventory costs are higher at the Baltimore plant.	Price testing for the Stillwater plant included invoices for goods shipped to Baltimore. Therefore, inventory is incorrectly costed.
6	The audit program stated that price testing on WIP should be performed on a job with design, labor and component costs.	The job selected did not have design charges; however, there were jobs available for selection that had design charges.
7	The plant was scheduled to be closed the day of the inventory count. Thus, no movement of goods should have occurred between inventories.	The Ryland system was *moved* from WIP to FG and *valued* in both inventories.
8	A $10,000 T-note was reclassed from other assets to cash equivalents.	The T-note was pledged as collateral; therefore, it should not be reclassed.

1. Each error had two cues: one piece of evidence conflicted with another piece of evidence (see Exhibit 3), thus the number of cues per piece of evidence is low (e.g. two).

2. Based on the evidence, cue measurement was deemed objective, i.e. it was either correct or incorrect.

3. The task was amenable to high decomposition. There were four sections: cash, inventory, debt and subsequent events. In addition, inventory could be further subdivided into raw material, work in process, finished goods and price testing components.

4. Along with high decomposition, the workpapers were sequential in display which more directly corresponds to the analytic end of the task continuum.[20]

3.1.2 Intuitive Task

The intuitive case, based on an Alabama court case where Comptronix Corporation and KPMG Peat Marwick Co. were defendants in a civil suit.[21] The subjects performed an analytical review of pre-report financials. Pre-report analytical review is an intuitive task because it is a reasonableness test requiring the auditor to compare what is actually asserted on the financial statements with his/her expectations. Appendix B contains a copy of the case. This case is considered to be an intuitive task based on the following factors:

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[20] The total number of cues within the analytic case is not the focus of that task characteristic because the task is sequential in nature and easily decomposed into separate parts (e.g. evidence). Thus, the focus of this task characteristic should be on the decomposed parts.

[21] The instrument was adapted from Ingram, Samson and Klersey's (1995, forthcoming) instructional case study.

1. The number of cues was best viewed simultaneously.

2. Cue measurement was perceptual (subjective). One needed to perceive all evidence in conjunction in order to determine that the financials were not as they appeared.

3. The number of cues were high and needed to be combined (cues consisted of: SAS 53 red flags; inventory; property, plant and equipment; income; working capital; and cash flows from operations).

4. The ability to decompose the task was low.

The fraud perpetrated in this case consisted mainly of a clever method of capitalizing costs of goods sold as PP&E. A combination of the following clues should have signaled to the subject that descrepancies existed and the company's finanicials were not as they appeared. First, the SAS 53 red flags of an overly aggressive, profit seeking, hands on manager who made most of the business decisions. Second, the relationship between the statements and the numbers revealed tell-tale signs of fraud. The reported aggregate cash flow amounts from operations exceeded the aggregate net income amounts reported for the years 1991-93. Even though the company was growing very quickly, one would normally expect operating cash flow to be greater than net income, particularly for a manufacturer with large investments in PP&E where depreciation expense is a large noncash expense (i.e. it reduces net income but not cash flow).

Third, the traditional accrual based financial ratios initially appear reasonable for a fast growing company. However, the rapid rise in sales combined with an even greater percentage increase in net income and assets (particularly inventory and PP&E) should

cause the auditor to question the fast growth. Additionally, the operating cash flow to income figure was extremely volatile, where one wouldn't expect to see such volatility. Finally, this last relation should have appeared abnormally low. Again, one should have expected that cash flow from operations would be greater than net income.

A fourth cue was that cash collected from customers (computed by adjusting sales for changes in A/R) was consistently less than reported sales for the periods presented. The auditors should suspect a potential problem in the significant lag between sales and cash receipts. Again, the expectation about cash inflow based on reported sales and the actual amount reported should signal a potential "error".

During the period when the fraud was perpetrated, 1991-93, the total net income was $10,900,000. However, for the same period the total cash inflow from operations was a negative $176,000. The difference between net income and cash flow could be explained primarily by the increase in inventory (cash was supposedly being used to acquire inventory). The cost of inventory supposedly acquired or produced during this period was consistently larger than the cost of inventory sold. The subjects should question why the company produced millions of dollars of unneeded inventory and further examine the inventory balance. The large gap between the expected level of inventory and the amount reported warranted further investigation by the auditor.

Another cue that should be considered is the timing differences between changes in current assets and liabilities normally wash out over time. Therefore, cash flow from operations should approximately equal net income plus depreciation and amortization.

The inconsistency between the reported and expected (based on reported net income plus depreciation and amortization) amounts of operating cash flow should be a warning to the auditor. An explanation for this inconsistency could be found in the increase in inventory. If the increase in inventory each year were added to cash flow from operations, a close relationship is observable between this new amount and the expected amount.

A final cue was the comparison of the company's financial ratios with the same ratios of its leading competitor (these are given in the case materials). Given the poor performance of its competitor, the auditor should question the performance of the company they are reviewing.

In combination these cues should signal the auditor to asset and income manipulation; specifically, overstatements. The number of questionable accounts and size of the amounts concerned should have made the auditor suspect fraud. If an auditor does not perceive the effects of the combined errors in overstated assets and income, his/her likelihood of detecting the fraud is small. In conclusion, the task is placed at the intuitive end of the task continuum because it requires the examination of possiblilities.

3.1.3 Validation of Instruments

Four professors from across the country and two doctoral students pilot tested the two task instruments. All had public accounting experience and auditing as their primary research interest. The results showed that the tasks were consistent with their intended location on the task continuum, e.g. the workpaper review task was placed at the analytic

end of the continuum and the analytical review task was at the intuitive end. In addition, this subject group believed that the cases were realistic.

3.2 Subjects and Data Collection

Subjects were audit seniors from two Big Six accounting firms. To minimize any experience effects, audit seniors were used in this research because their particular experience level matched the two tasks. Additionaly, prior research shows that audit seniors are more heterogeneous in cognitive style than are partners and managers (Jacoby, 1981). Forty-five subjects participated: 30 from the Coopers & Lybrand, Atlanta office (Firm 1) and 15 from the Price Waterhouse, St. Louis office (Firm 2). Of the 45 participants, one did not return her workpaper review notes and thus, was deleted from the sample. The average length of employment was 34 months which is consistent with an audit senior level. Twenty-four participants were male and 21 were female. Table 1 contains subject demographic descriptive statistics. of his/her workpaper review notes.

All instruments were sent to a coordinating contact person in the two firms. The contact person was instructed to select audit seniors with greater than two but no more than five years experience.[22] Because of the length and complexity of the research materials. participants worked on the instruments at their convenience. The only restrictions were: a) once a task was completed, the auditor could not later return to it; and b) each task was to be performed without breaks, until it was completed.

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[22] The range of experience was from 14 to 67 months. Even though 12 subjects fell outside the requested range, when experience was categorized into two groups (those above and below 24 months) and added to the model no statistical significance occurred.

Table 1
Subject Demographics

Demographic Question	*Mean / (Std. Dev.)*	
Months employed as an auditor in public accounting?	34	(14.2)
Percentage of time spent on clients with inventory?	42%	(29.6)
Gender?	24 Males	21 Females
Age?	26	(3.1)
Percentage of audit engagements where a material error and/or irregularity corrected?	21%	(22.3)
Length of time (in months) since an accounting irregularity was found in an audit?[a]	18	(15.2)

[a] If the subject indicated that they had never experienced an irregularity, this variable was coded as the number of months of employment. If those subjects were not used, the mean (std. dev.) was 10 months (9.9) where $n = 30$.

3.3 Independent Measures

There were two independent measures: the type of task (analytical or intuitive) and cognitive style (analytic, hybrid, or intuitive). The analytical task was the workpaper review task whereas the intuitive task was the analytical review exercise.

Cognitive style was measured using the MBTI short form. This form measures the perception and judgment dimensions (i.e., Sensing/Intuitive and Thinking/Feeling, respectively). The instrument is fixed choice, bipolar in nature, and has been subjected to extensive validity testing (Carlyn, 1977; Myers and McCaulley, 1985), which indicates

that the results obtained from application of the MBTI are meaningfully interpreted. The MBTI is a standardized test containing 126 questions comprising the four dimensions. Each subject's preference on each dimension consists of a letter or numeric score. Scoring is determined by points. These points are the weighted total of answers for each pole of the four indices. The pole containing the most points within the dimension determines the preference letter. The difference between points on each end are then found, and this difference is used to determine the preference score (found in a table in the MBTI manual). For example a score of 17 on the intuitive scale and 6 on the sensing scale yields an intuitive subject on the perception dimension. Likewise, the difference is 11 and converts into a preference score of 23, and a continuous score of 123. (See Myers & McCalley, 1985, for the conversion table for preference and continuous scores.)

The subject's preferences were determined using the letter scoring. This method is consistent with all the MBTI research reviewed above. The subjects were coded as analytics if they were sensors and thinkers (ST) on the perception and judgment dimensions, respectively. Likewise, they were coded as intuitives if they were intuitive and feeling (NF) on the perception and judgment dimensions, respectively. Finally, if the subjects were sensor/feelers (SF) or intuitive/thinkers (NT), on those dimensions they were coded as a hybrid cognitive style.

Of the 44 subjects evaluated in the research, 26 were pure analytics (STs), eight were pure intuitives (NFs) and ten were hybrids. Nine hybrids were intuitive in their methods of perceiving data and analytic in processing that data (e.g. they were NTs). The

remaining hybrid was analytic in data gathering method but intuitive in data judgment (e.g. SF). This distribution of cognitive style is consistent with Jacoby's (1981) research using auditor subjects and Myers' (1980) sample of accountants. In fact, in Myers' sample, 64% of the population were ST and 4% were NF, which is very similar to the current sample. However, Myers found more SF hybrids than NT, whereas the current study found the opposite.

3.4 Dependent Measures

The dependent measures for both tasks were coded as follows: for the workpaper review task, subjects were asked to review the workpapers and identify any corrections on the review sheets provided. Materiality was set at $1,000. In addition, subjects were informed that any helpful comments they could give to the preparer could also be included. Each subject's review notes were examined to ascertain whether they found the seeded errors. Thus, this measure can range from one to eight. Similarly, each subject's analytical notes and their response to the question "Which account(s), if any, are misstated?" were examined to ascertain if the subject suspected any fraudulent activity. This measure could range from one to six. A direct question concerning fraud was not elicited because it was felt that the risk of an experimenter demand effect was too high.

An independent rater also graded the number of errors and accounts determined misstated. This person is a current graduate student in accounting and has some experience in auditing. An initial agreement of 98% was achieved. Fifteen differences were found and reconciled.

The dependent measure used for statistical analysis of the workpaper review (analytical) task was the percentage of errors found out of the eight seeded. For the analytical review (intuitive) task, the dependent variable was the percentage of accounts affected by the perpetrated fraud (the six accounts were: A/R, Inventory/CGS, PP&E, A/P, Sales, and Retained Earnings). Percentages were used in the analyses rather than the total number of errors found and accounts affected because the design was a repeated measures ANOVA which presumes comparable scale measurement of the dependent variables. Likewise, this measure must be continuous.

4. STATISTICAL ANALYSIS AND RESULTS

To ensure that the results of the statistical analysis of the hypotheses and related dependent variables are meaningful, it is necessary to ascertain whether the tasks were perceived by the subjects as intended. Thus, the validation of the task characteristics is discussed first. The remainder of the section discusses the transformation of the hypotheses into their operationalized forms followed by detailed sections on data analysis.

4.1 Validation of Task Characteristics & Attributes

Table 2 presents the descriptive statistics for subject ratings on questions asked to determine whether the subjects perceived each task's characteristics as intended. For each case, subjects answered the same five questions concerning certain task characteristics. These questions were designed to determine if these characteristics were viewed as equivalent by the subjects between the two tasks. An 11 point likert scale was used where one represented the answer most optimistic and 11 represented the most pessimistic answer for the questions regarding senior knowledge, ability, and assignment as well as task difficulty. For the question concerning task realism, the polar ends one and eleven represented the least and most realism, respectively. Table 4 presents the descriptive statistics of seven additional questions regarding which task best fits the attribute queried. These questions were designed to determine if subjects perceived each attribute between task as intended; that is, on polar ends of the task attribute continuum. Again, an 11 point likert scale was used where one represented the analytic task and 11

the intuitive task. Sections 4.11 and 4.12 describe results of analyses on task characteristics and attributes.

4.1.1 Task Characteristics

The means of the questions reported in Table 2 were evaluated using three analyses. First, a one-way ANOVA for each of the five questions was analyzed where the independent variable was cognitive style (three levels) and the dependent variable was the subject's rating on the task characteristic. This analysis was performed within task to determine whether all cognitive styles viewed the task equivalently. Second, repeated measure ANOVA models were performed where cognitive style was the independent variable, subject ratings on the task characteristic was the dependent variable, and task was the repeated measure. This analysis was performed between task to determine the cognitive style × task interaction on subject ratings for each task characteristic. Finally, a difference score was calculated for each subject on each question between the audit tasks, where the analytic task rating was subtracted from the intuitive task rating. A *t*-test on these difference scores was performed to determine if the difference was statistically equal to zero. If the difference is not statistically different from zero, the interpretation is that the subjects viewed both tasks as equivalent on that task characteristic. This analysis is equivalent to the repeated measures ANOVA in that it takes into consideration the within-subject design of the research, that is, each subject answered identical questions regarding both tasks. It should be noted that if the tasks were perfectly matched on these characteristics, then all results would be non-significant for each analyses.

Table 2
Mean Ratings on Task Characteristics by Style

Panel A - Analytic Task

Question: *Scale Endpoints*		*Task Means:* [a] *(Standard Deviations)*			
		Overall	*A*	*H*	*I*
1 =	*11 =*	*n = 41*	*n =24*	*n = 10*	*n = 7*[b]
1. How difficult did you find the case to be?		4.98	4.58	5.60	5.43
not difficult	extremely difficult	(2.07)	(1.98)	(2.41)	(1.81)
2. How realistic did you find the case to be?		6.46	6.79	6.20	5.71
not realistic	extremely realistic	(2.05)	(2.11)	(1.93)	(2.06)
3. Does an audit senior possess the knowledge to successfully complete this task?					
definitely has the knowledge	definitely does not	2.71 (1.57)	2.75 (1.82)	2.70 (0.95)	2.57 (1.51)
4. Does an audit senior possess the ability to successfully complete this task?					
definitely has the ability	definitely does not	2.17 (1.02)	1.96 (0.91)	2.40 (0.84)	2.57 (1.51)
5. Do you believe that it is reasonable for an audit senior to be assigned this task?					
highly reasonable	highly unreasonable	2.02 (1.23)	1.92 (1.06)	2.40 (1.78)	1.86 (0.90)

[a] A = Analytic; H = Hybrid; I = Intuitive

[b] Sample sizes vary from the original 26, 10 and eight for the analytic, hybrid and intuitive subjects due to missing data.

Table 2 - Continued
Mean Ratings on Task Characteristics by Style

Panel B - Intuitive Task

Question: *Scale Endpoints*		*Task Means:* [a] *(Standard Deviations)*			
		Overall	*A*	*H*	*I*
1 =	*11 =*	*n = 44*	*n = 26*	*n = 10*	*n = 8*[b]
1. How difficult did you find the case to be?		6.64	7.04	6.40	5.63
not difficult	extremely difficult	(1.98)	(2.16)	(1.27)	(1.85)
2. How realistic did you find the case to be?		6.30	5.85	7.70	6.00
not realistic	extremely realistic	(2.51)	(2.77)	(2.16)	(1.31)
3. Does an audit senior possess the knowledge to successfully complete this task?					
definitely has the knowledge	definitely does not	4.56 (2.35)	4.77 (2.52)	5.00 (2.06)	3.14 (1.77)
4. Does an audit senior possess the ability to successfully complete this task?					
definitely has the ability	definitely does not	4.09 (2.43)	4.42 (2.60)	4.20 (2.44)	2.71 (1.25)
5. Do you believe that it is reasonable for an audit senior to be assigned this task?					
highly reasonable	highly unreasonable	4.36 (2.62)	4.42 (2.69)	5.20 (2.90)	3.13 (1.72)

[a] A = Analytic; H = Hybrid; I = Intuitive

[b] Sample sizes vary (either seven or eight) for the intuitive subjects due to missing data.

Table 3

Summary Statistical Results On Task Characteristics - Across Cognitive Style[a]

Characteristic	*One Way ANOVAs:* *Analytic Task*	*Intuitive Task*	*Repeated Measures ANOVA:*	*Difference Score: By Style (Intuitive – Analytic)*
Task Difficulty	N.S. *n = 41*	N.S. *n = 44*	SME: Analytic performance between tasks: p < .001 Hybrid & intuitives between tasks: N.S. *n = 41*	Analytics - significant at p < .001 Hybrids - N.S. Intuitives - N.S. *n = 41*
Task Realism	N.S. *n = 41*	N.S. *n = 44*	N.S. *n = 41*	All N.S. *n = 41*
Task Knowledge	N.S. *n = 41*	N.S. *n = 43*	SME: Analytic performance between tasks: p = .002 Hybrid performance between tasks: p = .002 Intuitive performance between tasks: N.S. *n = 40*	Analytics - significant at p = .002 Hybrids - significant at p = .002 Intuitives - N.S. *n = 40*
Task Ability	N.S. *n = 41*	N.S. *n = 43*	SME: Analytic performance between tasks: p < .001 Hybrid performance between tasks: p = .032 Intuitive performance between tasks: N.S. *n = 40*	Analytics - significant at p < . 001 Hybrids - significant at p = . 032 Intuitives - N.S. *n = 40*
Task Assignment	N.S. *n = 41*	N.S. *n = 44*	SME: Analytic performance between tasks: p < .001 Hybrid performance between tasks: p < .013 Intuitive performance between tasks: p = .045 *n = 41*	Analytics - significant at p < .001 Hybrids - significant at p < .013 Intuitives - significant at p = .045 *n = 41*

[a] Due to missing observations *n* varies across each analysis. N.S. = Not significant SME = simple main effects.

Table 3 summarizes the results of each of these three analyses. When only the one-way ANOVA results are viewed it appears that a subject's cognitive style is not associated with his/her perception of the five task characteristics (all style main effects were non-significant on each task characteristic). However, a different picture arises when the repeated measures ANOVA and difference score results are analyzed. Although a significant difference exists between tasks for the analytic cognitive style on the task difficulty measure, the hybrid and intuitive cognitive styles perceived the two tasks as equivalent. The analytics perceived the analytical review task as more difficult. The proposed theory states that a person will perform best on the task that matches his/her cognitive style. If this theory is true, an extrapolation would pose that a person would find the task opposite of his cognitive style more difficult than the task matching their cognitive style. However, this extrapolation is only true for the analytics. As stated above, only the analytics deemed the intuitive task as more difficult. Both the intuitive and hybrids perceived both tasks equal in difficulty. While both task means were midrange in difficulty, neither task was deemed too difficult nor extremely easy.

On all analyses, subjects perceived task realism as equivalent across tasks. When the "knowledge necessary to perform the task" characteristic is analyzed (using repeated measures or difference scores), significant differences occur. Both the analytic and hybrid cognitive styles perceived that the intuitive task required more knowledge than did the analytic task. Again, one could extrapolate the proposed theory. If true, then subjects would perceive a task opposite of their cognitive style as requiring more knowledge than

one matching their style. All the analytic and nine out of ten of the hybrids are analytic on the judgment dimension. These subjects may indeed perceive the intuitive task as requiring more knowledge because it does not match their cognitive style on the judgment dimension. It is this dimension that is most likely used to decide the knowledge required for a task. Additionally, it is not surprising that the analytics perceived the intuitive task as requiring more knowledge because they also perceived it as the more difficult task. However, the intuitive subjects perceived the tasks as equivalent in both difficulty and knowledge required. The theory extrapolation does not explain this finding. Finally, one should note that the mean subject rating on each cognitive style reveals that the subjects perceived seniors to have the necessary knowledge to perform both tasks. This indication is given because all means on this measure are on the left hand side of the midrange split between "definitely has the knowledge" and "definitely does not have the knowledge".

The results for the "ability" characteristic are identical to the knowledge characteristic; analytics and hybrids perceived the intuitive task as requiring more ability from a senior. These results again fit into an extrapolation of the proposed theory. If the theory is true, subjects would perceive the task that is opposite of their cognitive style as requiring more ability. Again, the analytics and hybrids fit this extrapolation, but the intuitives perceived both tasks equivilently in ability requirements. As above, the mean subject rating on each cognitive style revealed that the subjects perceived seniors as possessing the necessary ability to perform both tasks. This indication is given because

all means on this measure are on the left hand side of the midrange split between "definitely has the ability" and "definitely does not have the ability".

Finally, the results for the "assignment" characteristic found that all styles (analytic, hybrid, and intuitive) perceived the analytic task as more reasonable for assignment than the intuitive task. The result is not surprising because the intuitive task is typically performed by a senior with greater than two years senioring experience while the analytic task is performed throughout one's senioring experience (Prawitt, 1995). Finally, all means were on the left hand side of the midrange split between highly reasonable and highly unreasonable that a senior be assigned the task.

The overall interpretation of this data is that both tasks were not perfectly matched on all of these task characteristics. However, both were perceived as realistic. Third, audit seniors possess the knowledge and ability necessary to successfully complete the tasks; however, the analytics and hybrids perceived the intuitive task as more challenging. Finally, it is reasonable for an audit senior to be assigned each task of these audit tasks (although more so for the workpaper review task).

4.1.2 Task attributes

Table 4 contains a summary of the task attribute means; Table 5 presents the results of the statistical analysis on the attribute means. As described above, an 11 point likert scale was used where one represented the analytic task and 11 represented the intui-

Table 4
Mean Ratings on Task Attribute Fit

Attribute:	*Task Means:* [a] *(Standard Deviations)*			
	Overall $n = 44$	*A* $n = 26$	*H* $n = 10$	*I* $n = 8$
1. Which case uses an analytic approach towards successful task completion?	4.70 (2.82)	4.69 (2.92)	5.30 (2.54)	4.00 (3.02)
2. Which case uses a global approach towards successful task completion?	7.66 (2.44)	7.50 (2.88)	7.50 (1.84)	8.38 (1.30)
3. In which case is it be more beneficial to break the task into smaller subcomponents for successful completion?	4.09 (2.88)	3.15 (2.26)	6.70 (3.16)	3.88 (2.64)
4. In which case is it more beneficial to view all pertinent task information sequentially in order to successfully complete the task?	4.27 (2.73)	4.58 (2.94)	4.00 (2.58)	3.63 (2.33)
5. In which case is it more beneficial to view all pertinent task information simultaneously in order to successfully complete the task?	7.73 (2.27)	7.54 (2.47)	8.00 (2.40)	8.0 (1.41)
6. Which case is more subjective?	7.02 (3.30)	7.11 (3.59)	8.00 (2.31)	5.50 (3.16)
7. Which case is more objective?	4.77 (3.15)	4.73 (3.37)	4.10 (2.60)	5.75 (3.15)

[a] An 11 point likert scale was used to measure the responses where one represented the analytical task and 11 represented the intuitive task.

Table 5

Summary Statistical Results On Task Attributes - Across Cognitive Style

***n* = 44**

Attributes Compared	*One-Way ANOVA*	*Chi-Square: Analytic n =*	*Neutral n =*	*Intuitive n =*	*Repeated Measures ANOVA:*
Analytic	N.S.	26	2	16	Simple main effects:
v.s.					Analytic attribute perception between tasks: p = .013
Global	N.S.	9	2	33	Hybrid attribute perception between tasks: p = .093
					Intuitive attribute perception between tasks: p = .012
		$\chi^2 = 14.15$, $p < .001$			
Global	N.S.	9	2	33	Simple main effects:
v.s.					Analytic attribute perception between tasks: p < .001
Breakdown	p = .002[a]	32	1	11	Hybrid attribute perception between tasks: n.s.
					Intuitive attribute perception between tasks: p < .001
		$\chi^2 = 24.24$, $p < .001$			
Sequential	N.S.	27	7	10	Simple main effects:
v.s.					Analytic attribute perception between tasks: p < .003
Simultaneous	N.S.	7	4	33	Hybrid attribute perception between tasks: p = .007
					Intuitive attribute perception between tasks: p < .006
		$\chi^2 = 43.97$, $p < .001$			
Subjective	N.S.	12	2	30	Simple main effects:
v.s.					Analytic attribute perception between tasks: p = .089
Objective	N.S.	29	2	13	Hybrid attribute perception between tasks: p = . 024
					Intuitive attribute perception between tasks: n.s.
		$\chi^2 = 13.76$, $p < .01$			

[a] Hybrids were significantly different from analytics (p < .001) and intuitives (p = .024).

N.S. = non significant

tive task.[23] These attributes were queried to determine if subjects perceived each task as intended by its design -- on opposite polar ends of the task attribute continuum. The experimental design suggests that each attribute would best be represented by only one of the tasks. For example, the analytic attribute question asked: "In which task do you believe that an analytic (e.g. a sequential or step-by-step) approach towards task solution would be more beneficial for successful completion?" The experiment was designed so that the workpaper review (analytical) task would be the appropriate answer.

Three analysis were performed to determine if the subjects perceived the attributes differentially between the tasks as intended. These analyses were a: 1) one-way ANOVA on each attribute; 2) chi-square analysis on specific paired attributes (see below); and 3) repeated measure ANOVA on the paired attributes used in the second analysis. The dependent measure for each of the analyses was the 11 point likert scale ratings whereas the independent measure was each subject's cognitive style. Thus, if the tasks were designed as intended, there would be a significant differences found in each analysis.

The first analysis consisted of one-way ANOVAs across cognitive style for each attribute to determine if any of the styles differentially perceived the tasks on that attribute. With one exception, the results of the analyses found no significant differences between the cognitive style means for any of the attributes. Thus, each of the cognitive styles perceived each attribute question in the same manner. The exception was the

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[23] An 11 point scale was used rather than a forced choice dichotomy between the tasks. It was felt that a scale would be more informative to the research because it would allow the participants to register degrees of difference between the two tasks.

breakdown attribute where the hybrid cognitive style was significantly different from the analytic and intuitive cognitive styles ($p < .001$ and $p = .024$, respectively). Thus, the hybrids perceived the intuitive task (analytical review) to be more beneficial to break into smaller subcomponents for successful completion whereas the analytic and intuitive cognitive styles perceived the analytic (workpaper review) task to be most beneficial.

The following four sets of paired attributes were contrasted for both the chi-square and repeated measure analyses: 1) "in which task would an analytic approach be more successful" verses "which task would a global approach be more successful"; 2) "which task would a global approach be more successful" verses "in which task is it more beneficial to break into smaller subcomponents"; 3) "which task is best viewed sequentially" verses "which task is best viewed simultaneously"; and 4) "which task is more subjective" verses "which task is more objective". These specific comparisons were made because each attribute in the paired questions was intended to match one end of the task continuum. Thus, if the tasks were designed as intended, there would be a significant one-to-one correspondence for each attribute and one of the tasks. Additionally, all cognitive styles should perceive a significant difference between the tasks on each attribute.

The second series of analyses on the attribute fit variables included a 2×3 chi-square analyses on each of the attribute pairs described above. The subject ratings for each attribute were divided into three categories using six as a midpoint split on the 11 point scale: one to five represented the analytic task, six was neutral, and seven to 11 represented the intuitive task. A significant F on the χ^2 would indicate the subjects

perceived a one-to-one association between each attribute of the pair and one of the tasks. As shown in Table 5 all chi-square analyses were significant; each attribute was perceived as matching the intended task. The first paired attribute comparisons, analytic vs. global, was significant at $p < .001$. Thus, the subjects perceived the analytic attribute as matching the workpaper review (analytical) task best, and the global attribute as matching the intuitive (analytical review) task best. Likewise, the global vs. breakdown and the sequential vs. simultaneous attribute pairs were also significant at $p < .001$. Again, the subjects perceived the global and simultaneous (breakdown and sequential) attributes as best matching the intuitive (analytic) task. Finally, the subjective vs. objective attribute paired comparison was significant at $p < .01$. Similar to the other comparisons, subject perception was that the subjective attribute best matched the intuitive task while the objective attribute best matched the analytic task.

In the final analysis, a repeated measure ANOVA was performed where task was the repeated measure, cognitive style (three levels) was the independent variable, and the dependent variables were the subject ratings on the paired task attributes described earlier. This latter analysis was performed to determine whether cognitive style would differentially affect an association between each task and the attributes under comparison while controlling for the fact that all subjects participated in both tasks. Significant simple main effects (SME) on the within style attribute comparisons would indicate that subjects perceive each attribute as matching one particular task. The first analysis found significant SME between the analytic and global attributes within each cognitive style

(analytic p = .013; hybrid = .093; and intuitive p = .012). As in the one-way ANOVA, each within attribute comparison across cognitive style was nonsignificant. The second analysis also found significant SME between the breakdown and global attributes within the analytic and intuitive cognitive styles (p = .001 in both analyses) where breakdown was associated with the analytic task and global was associated with the intuitive task. However, the hybrid style found no significance between the two attributes. These subjects viewed both attributes as fitting the intuitive task best (means of 6.70 and 7.50, respectively). The within attribute comparisons across cognitive styles found the same results as the one-way ANOVA above. The third analysis found significant SME between the sequential and simultaneous attributes within all three cognitive styles (analytic p = .003; hybrid p = .007; and intuitive p = .006) where sequential (simultaneous) was associated with the analytic (intuitive) task. Again, no within attribute across style significance was found. Finally, the fourth analysis found significant SME between the subjective and objective attributes within the analytic and hybrid cognitive styles (analytic p = .089; hybrid p = .024) where subjective (objective) was associated with the analytic (intuitive) task. However, the intuitive cognitive style found no significance between these two attributes. These subjects viewed both the attributes as fitting the analytic task best (means of 5.50 and 5.75, respectively). As in the one-way ANOVA reported above, no within attribute across style significance was found.

In conclusion, significance was achieved in virtually all of the analyses in the manner intended. The subjects perceived the workpaper review (analytic) task as

intended in that it was rated more analytic and amenable to decomposition; performance would be best when information is viewed sequentially; and it was more objective in comparison with the intuitive task. Likewise, the analytical review (intuitive) task was perceived as intended in that it was rated more global; performance would be best when information is viewed simultaneously; and it was viewed as more subjective in comparison with the analytic task. The overall interpretation of this data is that both tasks were perceived by all cognitive style subjects as designed, e.g. the task attributes matched the intended task.

4.2 Operalization of the Hypotheses

H1 states that cognitive style will have a significant effect on an auditor's task performance. Operationally, H1 predicts a main effect for cognitive style. H2 states that a significant interaction will occur between a subjects cognitive style and their task performance. Operationally, H2 predicts a cognitive style × task interaction, rather than the main effect predicted by H1. Significant simple main effects (SME) are expected within-task for the analytic task. Specifically, auditors with an analytic cognitive style should outperform the hybrid and intuitive cognitive styles. Likewise, significant SME are expected on the intuitive task. Auditors with an intuitive cognitive style should outperform the hybrid and analytic cognitive styles. In both tasks, it is expected that the hybrid style performance will fall between the analytic and intuitive style performances. In addition, significant SME are predicted within-style where the analytic auditors should

perform significantly better on the analytic task and the intuitive auditors should perform significantly better on intuitive task.

H1 and H2 are competing hypotheses in that the former predicts a main effect for cognitive style and the latter predicts a style × task interaction. The analysis of both H1 and H2 used the dependent measures described in section 3.4: the proportion of errors found in the workpaper review (analytic) task and the proportion of accounts deemed misstated in the analytical review (intuitive) task. The dependent variables were analyzed using a repeated measure ANOVA model[24] where task was the repeated measure, the type of task was the within-subjects measure and cognitive style was the between-subjects measure.[25] Table 6 presents a summary of the hypotheses and their predictions.

To control for any potential covariates that may exist, correlations were executed between all the demographic variables, cognitive style, and dependent measures. Table 7 presents these correlations. The only demographic variable to reach a significant correlation with the dependent variables was age; however, it was only significant with the analytic task dependent measure ($p < .03$). Therefore, age was not added to the model as a covariate to create a more conservative test.[26]

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[24] The statistical package used to analyze the data was SAS Proc GLM procedure, rather than the Proc ANOVA procedure because it takes into account unequal cell sizes.

[25] Both task order and firm were included in the model as additional between-subjects variables. However, neither variable reached any significance, therefore, both were excluded from all analyses.

[26] When age was included in the model, overall significance of the task × style interaction increased significantly from $p = .063$ to $p = .029$.

Table 6
Hypothesis Prediction Summary

	Hypothesis	*Operationalized Prediction*
H1	An auditor's cognitive style as measured by the MBTI will have a significant effect upon his/her task performance.	* A main effect for cognitive style
H2	A significant interaction will occur between a subjects cognitive style and their task performance.	* A significant style x task interaction * Simple main effects: *Within-task*: Analytic performance > intuitive performance on the analytic task Intuitive performance > analytic performance on the intuitive task *Within-style*: Analytics will perform best on the workpaper review (analytic) task Intuitives will perform best on the analytical review (intuitive) task Hybrid performance will fall between the analytic and intuitive performances on both tasks

A non-surprising significant correlation occurred between age and the number of months of employment ($p < .05$). Interestingly, a significant negative correlation occurred between cognitive style and length of employment ($p < .05$). The interpretation of this correlation is the greater the number of months employment a person has, the more likely their cognitive style will be analytic. This result supports Jacoby's (1981) finding that the higher one progresses up in a CPA firm, the larger the percentage of the analytic cognitive style (ST). Another significant correlation existed between months of employment and the length of time since an irregularity was found. However, this is a

Table 7

Correlations (p-values) of Subject Demographics & Dependent Measures

	<---------- *Demographic* ---------->						<--*Dependent*-->		
	Age	*Gender*	*% Inv*	*Emp*	*% Err*	*Length*	*Style*	*A*	*I*
Age	1.00 (0)								
Gender	-.161 (.297)	1.00 (0)							
% Inv	-.050 (.745)	-.013 (.936)	1.00 (0)						
Emp	.299* (.049)	.166 (.282)	.079 (.608)	1.00 (0)					
% Err	-.139 (.381)	.095 (.551)	.133 (.401)	-.164 (.300)	1.00 (0)				
Length	.005 (.972)	.249 (.103)	.148 (.337)	.377* (.012)	.079 (.618)	1.00 (0)			
Style	-.161 (.299)	.093 (.548)	-.253 (.098)	-.300* (.048)	-.048 (.761)	-.119 (.442)	1.00 (0)		
A	-.353* (.029)	-.080 (.604)	.219 (.154)	.194 (.206)	-.182 (.249)	.170 (.270)	-.178 (.246)	1.00 (0)	
I	-.115 (.457)	-.005 (.973)	-.126 (.414)	-.016 (.916)	-.096 (.544)	-.146 (.343)	.260 (.081)	.044 (.777)	1.00 (0)

Where: *% Inv* is the percentage of clients with inventory.
% Err is the percentage of engagements where a material error and/or irregularity was corrected.
Emp is the number of months employed in public accounting as an auditor.
Length is the amount of time (in months) since an accounting irregularity was found in an audit performed by the subject .
A is the analytic task dependent measure (# errors found/8).
I is the intuitive task dependent measure (# accounts found/6).

* Significant at $p < .05$.

spurious correlation because if the subject left the length variable blank, meaning no irregularity had occurred on any audits in which they were involved, it was coded as their length of employment. Finally, a marginally significant negative correlation ($p < .10$) existed between the subject's cognitive style and the percentage of clients with inventory. The interpretation being that those subjects who had more clients with inventory tended to be more analytic in their cognitive style.

The data for H1 and H2 were analyzed in three different combinations. First, to more directly test H2, only intuitive and analytic subjects were compared. This analysis excluded the hybrid subjects. The second analysis included all three cognitive styles -- intuitive, analytic and hybrid. The final comparison was between intuitives and non-intuitives (a combination of the analytics and hybrids). Table 8 shows the dependent measure cell means by cognitive style used by all analyses. [27]

4.3 Pure Intuitive vs. Pure Analytic Results

Table 9 shows the results of the repeated measure ANOVA where the pure analytics and intuitives are compared. First, cognitive style did not have a significant main effect, thus H1 is rejected. The significant style × task interaction effect supports H2 ($F = 5.14$, $p < .03$). Figure 1 shows a diagrammatic representation of the interaction effect. Table 10 provides Tukey's multiple comparison tests of the simple main effects

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[27] Libby (1985) advocates the use of an arcsine transformation for dependent variables represented by percentages. This transformation is used because percentages and ratios possess heterogeneous variances. However, homogeneity test of variances on the current data are not rejected. Therefore, the transformation is not necessary.

Table 8
Task Performance Means by Cognitive Style

Cognitive Style *n*	*Task Performance Means: (Std. Deviations)* *Analytic*[28]	*Intuitive*
Analytic (ST) $n = 26$	.264 (.092)	.122 (.091)
Hybrid (SF or NT) $n = 10$	.200 (.149)	.083 (.147)
Intuitive (NF) $n = 8$	.188 (.166)	.292 (.164)
Overall $n = 44$	.236 (.138)	.144 (.196)

Note: the dependent variables were (# errors found)/8 for the workpaper review task and (# of accounts misstated)/6 for the analytical review task.

(SME) that identify the sources of differences. The within-task SME results show that the intuitives performed significantly better than the analytics on the analytical review (intuitive) task [.292 vs. .122, p = .041]. However, although the analytics performed better on the workpaper review (analytic) task, the difference was not statistically significant [.264 vs. .188, p = .33]. Additional support for H2 is found by viewing the within-style SME comparisons. These results show that the intuitives performed best on the intuitive task (p = .078) and analytics performed best on the workpaper review task (p = .021).

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[28] The overall mean across style was .236 where $n = 44$. Moeckel (1991) reports a mean of .150 ($n = 15$) for her comparably experienced audit seniors.

Table 9
Repeated Measure ANOVA on Pure Intuitives & Pure Analytics

Source of Variation	*df*	*Sum of Squares*	*Mean Squares*	*F*	*Significance of F*
Between Subjects					
Style	1	.0264	.0264	.66	.4218
Error	32	1.2770	.0399		
Within Subjects					
Task	1	.0045	.0045	.12	.7262
Task × Style	1	.1863	.1863	5.14	.0303
Error	32	1.1600	.0363		
Total	67	2.6542			

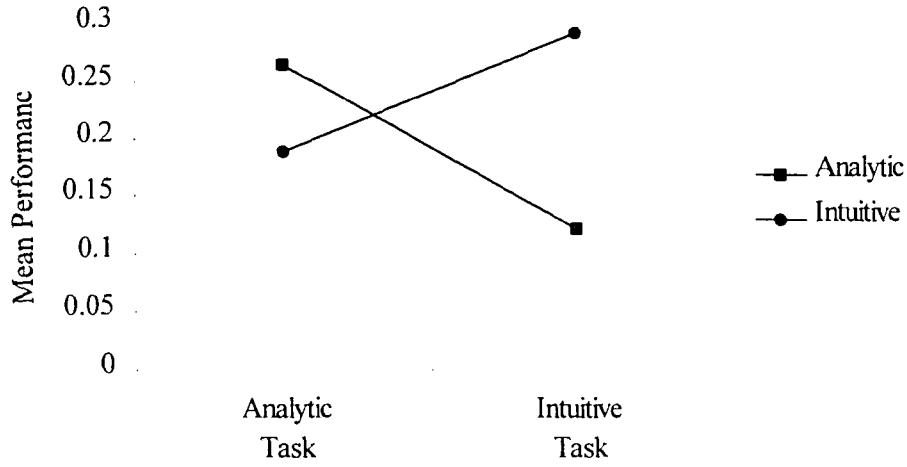
Note: the dependent variables were (# errors found)/8 for the workpaper review task and (# of accounts misstated)/6 for the analytical review task.

Finally, this analysis finds mixed results for the constructive theory of judgment decision espoused by Payne et. al. (1993). Because performance was best when cognitive style matched the type of task, the inference can be made that auditors are not adaptive in these judgment tasks (using the within-style SME comparisons). However, no difference between styles was found in the within-task SME comparisons on the analytic task performance. This result provides some support for the theory in that one could interpret the intuitives as adaptable. This would be a premature interpretation because intuitives performed significantly better on the intuitive task ($p = .078$). Regardless, if all auditors were able to adapt their cognitive style, they would perfom equally across both tasks on all of the cognitive styles.

Table 10
Multiple Comparisons of Simple Main Effects: Analytics & Intuitives

Comparison	*Mean Difference*	*p-value*
Intuitive vs. analytic performance on intuitive task	.1699	.041
Analytic vs. intuitive performance on analytic task	.0769	n.s.
Intuitive performance on intuitive vs. analytic task	.1042	.078
Analytic performance on analytic vs. intuitive task	.1426	.021

Figure 1
A Diagrammatic Representation of the Style-by-Task Interaction Effect on Mean Performance Analytics vs. Intuitives



4.4 Analytic vs. Hybrid vs. Intuitive Results

Table 11 shows the results of the repeated measure ANOVA where the analytic, intuitive, and hybrid cognitive styles are compared. Again, H1 is rejected in that no significant main effect occurred for cognitive style. The significant style × task interaction effect support H2 ($F = 2.96$, $p < .06$). Table 12 reveals Tukey's multiple comparison tests of the simple main effects that identify the sources of the mean differences. Figure 2 presents a diagrammatic representation of the interaction effect. The within-style SME results indicate that performance is best on the task that matches the subjects cognitive style. Intuitives performed best on the analytical review (intuitive) task ($p = .078$), whereas analytics performed best on the workpaper review (analytical) task ($p = .021$). When the within-task SME are viewed the analytics outperform the intuitives on the workpaper review task, although the difference is not significant ($p > .10$). However, the intuitives outperform both the analytics and hybrids on the intuitive task ($p = .029$ and .023, respectively). Furthermore, the hybrid cognitive style performance on the workpaper review task was between the mean performance of the analytic and intuitive cognitive styles. Unexpectedly, the hybrids performed worse than the analytics on the intuitive task. The expectation was that hybrid performance would split the intuitive and analytic performance on both tasks. Thus, the results from the hybrid subjects on the intuitive task do not support H2.

Table 11
Repeated Measures ANOVA on Analytics, Intuitives & Hybrids

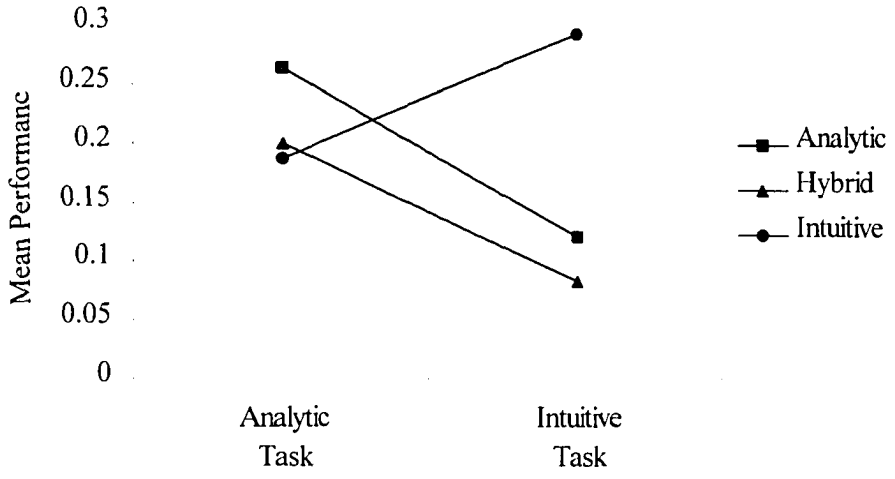
Source of Variation	*df*	*Sum of Squares*	*Mean Squares*	*F*	*Significance of F*
Between Subjects					
Style	2	.0866	.0433	1.14	.3301
Error	41	1.5579	.0380		
Within Subjects					
Task	1	.0457	.0457	1.42	.2398
Task × Style	2	.1903	.0951	2.96	.0627
Error	41	1.3159	.0321		
Total	87	3.1964			

Note: the dependent variables were (# errors found)/8 for the workpaper review task and (# of accounts misstated)/6 for the analytical review task.

Table 12
Multiple Comparisons of Simple Main Effects: All Styles

Comparison	*Mean Difference*	*p-value*
Analytic vs. intuitive performance on the analytic task	.0769	n.s.
Analytic vs. hybrid performance on the analytic task	.0644	n.s.
Hybrid vs. intuitive performance on the analytic task	.0125	n.s.
Intuitive vs. analytic performance on the intuitive task	.1699	.029
Intuitive vs. hybrid performance on the intuitive task	.2084	.023
Hybrid vs. analytic performance on the intuitive task	.0385	n.s.
Analytic performance on analytic vs. intuitive task	.1426	.0210
Hybrid performance on analytic vs. intuitive task	.1167	.0788
Intuitive performance on intuitive vs. analytic task	.1042	.0777

Figure 2
A Diagrammatic Representation of the Style-by-Task Interaction Effect on Mean Performance All Styles



Lastly, this analysis shows mixed support for the constructive theory of judgment decision. Again, due to the significant interaction and because performance was best when cognitive style matched the type of task, the inference is that auditors are not adaptive in these judgment tasks (using the within-style SME comparisons). However, when the within-task SME comparisons are examined some support is found for the theory because no significant difference was found between styles on the analytic task performance. This result shows some support for the theory in that one could interpret the intuitives as adaptable. Again, this would be a premature interpretation because intuitives performed significantly better on the intuitive task ($p = .078$). If all auditors

were able to adapt their cognitive style, they would perform equally across both tasks regardless of their cognitive styles.

4.5 Intuitive vs. Non-intuitive Results

In this final analysis, intuitive cognitive styles were compared to non-intuitive cognitive styles. This post hoc analysis was performed in order to increase the power of the design. Because the hybrid performance paralleled the analytic performance, these groups were collapsed into a new group termed "non-intuitives". The combination is justifiable based on the specific type of hybrids in the present study (nine of the ten hybrids were NTs. as discussed below), the results of the above section, and Figure 2.

Of the total hybrid population (10), nine were NT and one was a SF. These nine hybrids were all analytic on the judgment dimension of cognitive style. It is this dimension that appears to be the focus of many audit firms since audits are judgment oriented. Because the majority of the hybrids aligned on the analytic side of the judgment dimension, it is appropriate that they be combined with the pure analytics into a new group called non-intuitives.

Table 13 shows the results of the repeated measure ANOVA comparing the intuitive and non-intuitive cognitive styles. As in the above two analyses, H1 is rejected due to a non-significant cognitive style main effect. Likewise, a significant style × task interaction occurred ($F = 5.98$, $p < .02$), supporting H2. Again, the means are in the predicted directions. The intuitives outperform the non-intuitives on the analytical review (intuitive) task and the non-intuitives outperform the intuitives on the workpaper

review (analytical) task. However, the only significance in the within-task mean comparisons was on the intuitive task, the intuitives significantly outperformed the non-intuitives (mean difference .1806, p = .016). No significant performance differential was found between the intuitives and non-intuitives on the analytic task (mean difference .0590, p > .10); however, as stated above, the means were in the predicted direction. When viewing the within-style SME, non-intuitive performance between tasks was significant (p = .004), where performance was best on the analytic task (mean difference .1354). Likewise, the intuitive performance between tasks was marginally significant at p = .078 (mean difference .1042), where their performance was best on the intuitive task. Figure 3 presents a diagrammatic representation of the interaction effect; whereas Table 14 provides Tukey's multiple comparison tests of the simple main effects that identify the sources of differences.

Lastly, this analysis shows mixed support for the constructive theory of judgment decision. Again, due to the significant interaction and because performance was best when cognitive style matched the type of task, the inference it is unlikely auditors are adaptive in these judgment tasks (using the within-style SME comparisons). The marginally significant difference (p = .078) for the intuitives between the analytical and workpaper review tasks and the significant difference for the non-intuitives across tasks do not support the constructive theory. However, when the within-task SME comparisons are examined some support is gained for the theory because no significant difference was found between styles on the analytic task performance. This result shows

Table 13
Repeated Measures ANOVA on Intuitives & Non-intuitives

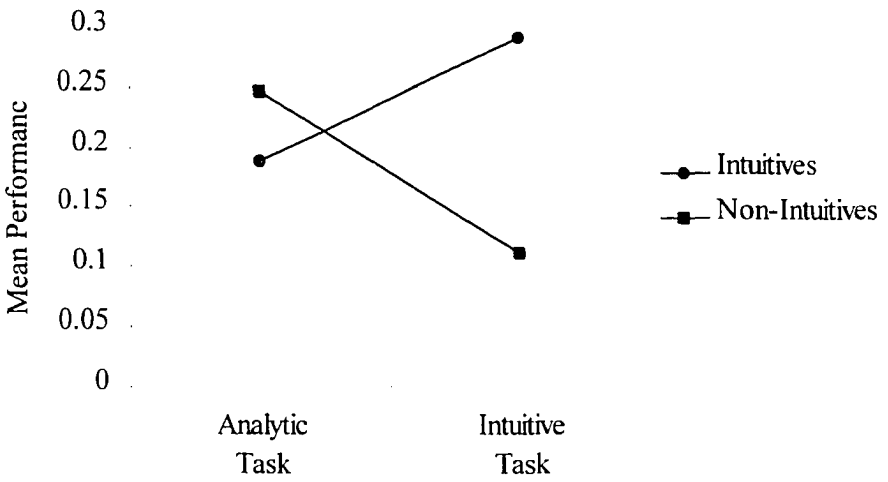
Source of Variation	*df*	*Sum of Squares*	*Mean Squares*	*F*	*Significance of F*
Between Subjects					
Style	1	.0483	.0483	1.27	.2658
Error	42	1.5961	.0380		
Within Subjects					
Task	1	.0032	.0032	.10	.7512
Task × Style	1	.1879	.1879	5.98	.0187
Error	42	1.3184	.0313		
Total	67	3.1539			

Note: the dependent variables were (# errors found)/8 for the workpaper review task and (# of accounts misstated)/6 for the analytical review task.

Table 14
Multiple Comparisons of Simple Main Effects: Intuitives & Non-Intuitives

Comparison	*Mean Difference*	*p-value*
Intuitive vs. non-intuitive performance on intuitive task	.1806	.016
Intuitive vs. non-intuitive performance on analytic task	.0590	n.s.
Non-intuitive performance on analytic vs. intuitive task	.1354	.004
Intuitive performance on intuitive vs. analytic task	.1042	.078

Figure 3
A Diagrammatic Representation of the Style-by-Task Interaction Effect on Mean Performance Intuitives vs. Non-intuitives



some support for the theory in that one could interpret the intuitives as adaptable. This would be a premature interpretation because intuitives performed significantly better on the intuitive task ($p = .078$). Regardless, if all auditors were able to adapt their cognitive style, we would see equal performance across both tasks on all of the cognitive styles.

4.6 Discussion

Table 15 presents a summary of the hypotheses and their results. Four main conclusions and one supposition can be formulated from these data. First, auditors perform best on tasks that match their cognitive style. If the effects of the cognitive style × task interaction were not partialled out, there would not be a differential task performance.

Alternatively, had only one task been employed, perhaps an inappropriate conclusion would have been made.

Second, although both tasks were designed to be equivalent on certain task characteristics (difficulty, realism, knowledge, ability, and reasonableness of assignment), cognitive style interacted with the task for these characteristics. Specifically, the analytic and hybrids perceived the intuitive task as more challenging than the analytic task.

Third, four attributes of Hammond et. al.'s task continuum were selected and used in the design of the tasks in the present study. Participants viewed the tasks differentially when queried on the task attributes, thus supporting the task continuum. Specifically, the workpaper review task (designed to be at the analytic end of the task continuum) was rated more objective and amenable to decomposition, as well as easiest to solve when viewed sequentially than the intuitive task. Likewise, the analytical review task (designed to be at the intuitive end of the task continuum) was deemed more global and subjective, as well as easiest to solve when information was viewed simultaneously. When the effects of cognitive style are partialled out, the results remain unchanged. In virtually all the analysis, each cognitive style perceived these two tasks on its respective polar end of the task continuum.

Fourth, Payne et. al. (1993) state that judgment decisions are not equal to choice decisions (p. 258). Their research has shown that decision makers adapt their decision strategies in choice decisions. The results of the present study find mixed evidence for the adaptivity of auditor decision strategy in the two judgment tasks presented. When the

Table 15
Research Summary

Hypothesis	*Results*
H1: Predicted a main effect for cognitive style	No significant cognitive style main effect in any analyses.
H2: Predicted a significant task × style interaction	*Interactions by Analysis:* All three cognitive styles - marginally significant at p = .063. Pure intuitive vs. pure analytic - significant at p = .030. Non-intuitive vs. intuitive analysis - significant at p = .019.
H2: Specific *a priori* predictions reported by analysis	*Pure Intuitive vs. Pure Analytic Analysis:* Analytics performed better than the intuitives on the analytic task, although not statistically (p > .10). Intuitives performed significantly better than the analytics on the intuitive task (p < .041). Analytics performed best on the analytic task (p = .021). Intuitives performed best on the intuitive task (p = .078). *Analytic vs. Hybrid vs. Intuitive Analysis:* Analytics performed better than the intuitives on the analytic task, although not statistically (p > .10). Intuitives performed significantly better than the analytics and hybrids on the intuitive task (p < .029 and .023, respectively). Analytics performed best on the analytical task between tasks (p = .021) Intuitives performed best on the intuitive task between tasks (p = .078). Hybrid performance was between the analytic and intuitive performance on the analytic task as predicted. Hybrid performance was not between the analytic and intuitive performance on the intuitive task. In fact performance was lower than the analytics. Thus, a significant difference (p .023) existed between the hybrids and intuitives on the intuitive task. *Intuitive vs. Non-intuitive Analysis:* Analytics performed better than the intuitives on the analytic task, although not statistically (p > .10). Intuitives performed significantly better than non-intuitives on the intuitive task (p < .05). Non-intuitives performed best on the analytic task (p = .004). Intuitives performed best on the intuitive task (p = .078).

within-task SME comparisons are viewed, the intuitives performance is not statistically different from the analytics on the analytic task, whereas they perform significantly better on the intuitive task. Thus, it appears that the intuitive auditors could adapt their judgment process across both tasks, while the analytic auditors could not adapt. However, when the within-style SME comparisons are viewed, each style performs significantly better on the task that matches their cognitive style. Thus, the present research adds to the Payne et. al. (1993) research by demonstrating the non-equal adaptivity between choice and judgment decision strategy. Cognitive style appears to affect the adaptivity of judgment decisions.

Finally, based on the results one could postulate that intuitive auditors are better performers on all tasks because they are adaptive in their judgments. However, this would be a premature assumption based on the following. First, even though no significant difference between performance of the intuitive and analytic cognitive styles on the workpaper review (analytic) task exists, the means were in the predicted direction. The analytics did perform better than the intuitives. One cannot say that all differences would be non-significant on *all* analytic tasks. Second, there are a greater number of practicing accountants who are analytic in their cognitive style than intuitive. Thus, the total population and hence the sample size of the intuitives was small, which limits generalizability to other analytic tasks.

5. CONTRIBUTIONS

The presented research contains numerous potential contributions. Pincus (1990) stated that the literature needed to move to multiple tasks to determine whether individual differences have the same effects across the numerous audit tasks. The present study is the first in the accounting literature to address multiple, realistic, and complex audit tasks performed within subjects (Bonner, 1990, used multiple tasks, but the methodology was between subjects; in addition, Bonner and Lewis, 1990, used four audit tasks within-subject, but the tasks varied in terms of simplicity and realism).

Second, the research results extend the audit decision making literature, as well as the contingent decision processing literature espoused by Payne and his associates. Specifically, Payne et. al. (1993) showed that decision makers are adaptive in choice decisions. They did note that choice decisions are not equivalent to judgments. However, they predict that decision makers should also be adaptive in judgment decisions, but research has not yet been performed to support this prediction. The present study extends their research by including audit judgments and partialling out the effects of cognitive style. Specifically, the results of this study found that cognitive style may affect one's adaptability on judgment decisions. Analytic auditors were not adaptive in the judgment decisions tested. Subject performance was best when cognitive style matched task style. Thus, at least in these judgment contexts, the present results do not entirely support Payne et. al.'s prediction of contingent decision making on judgment

decisions. Further research could examine if intuitive auditors can adapt their performances to equal the performance of analytics in other analytic tasks.

Third, the research results could have policy implications for the audit training and staffing areas. For instance, in order to maximize outcome performance and minimize liability to third party users, perhaps audit teams should consist of auditors with complementary vs. compatible cognitive styles. Additionally, if the results found here are replicated on other analytic and intuitive audit tasks, possible training implications can be made. For example, auditors could be trained to recognize the type of task they were to perform and the type of processing that should be used for optimal performance on that task. Once this is accomplished, perhaps the auditor can become an adaptive decision maker on audit judgments.

Finally, the results provide a basis for further research regarding the type of conditions will cue an auditor to adapt his/her cognitive style to the task demands. For instance, would a decision aid, detailed instruction, or recognition that different tasks require differential processing to cue the auditor to use a different processing style for a particular decision.

6. LIMITATIONS

The main limitation of the research is its generalizability. First, the results may not generalize to the entire audit senior population. Only two firms were used, with only one office from each firm. Thus, results may not generalize to all audit firms. However, the non-significant firm effect lends some evidence towards rejecting this limitation.

Second, the tasks used in the research design may not generalize to other audit tasks. Furthermore, the tasks used may lack the realism of the audit environment. However, a task realism question showed that on a scale of 1 (no realism) to 11 (extreme realism), the subjects believed the tasks to be realistic of the true audit environment ($\bar{x}$ = 6.5 and 6.3 for the analytic and intuitive tasks, respectively).

Third, decision strategies, per se, where not actually tested. Rather the strategy was inferred through the judgments and decisions of the auditor subjects.

Fourth, the incentives to perform the tasks (likewise, task accountability) in this research may not match the incentives auditors face in real audit scenarios. Thus, subject participation in this research may not equal real audit performance. However, the mean time spent of the two tasks was 77 minutes on the workpaper review task and 64 minutes for the analytical review task. The amount of time the subjects spent on each task implies high subject involvement with the tasks.

Finally, subject performance levels were not spectacular. In fact one may contend that they were poor (overall means were 1.88 errors found out of eight on the analytic task and .86 accounts deemed incorrect out of six on the intuitive task) given that audit

seniors perceived both tasks as realistically performable at their level of experience. One could partially explain the low performance levels by the fact that the total number of errors/accounts affected were not given to the participants (to avoid any experimental demand effects). Additionally, materiality between the errors in the analytical review task (accounts affected in the intuitive task) may be perceived differentially. This low performance could imply that subject involvement was low. But as shown above, the amount of time spent on each task indicates high subject involvement.

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APPENDIX A
ANALYTIC TASK INSTRUMENT

Overall
INSTRUCTIONS

Thank you for your participation in this study! I am interested in the different thought processes of auditors as they perform audit tasks. You are asked to complete two separate audit tasks. The success of this research is dependent on your completion of both tasks and the participant profile. These tasks are not related, therefore, please work on one task at a time. Once you have finished the first task, do not return to it.

Three packets are enclosed. Two contain an audit task along with its specific instructions for completion. The third packet contains profile information that is necessary for me to better understand your thought patterns. Please do not omit this packet.

Again, your participation is greatly appreciated. I ask you not to discuss any part of this study with anyone else. Others in the firm will be participating at different times and any discussion could spoil the results.

Finally, indicate on the instruction page of each task the time you started and stopped. Please return all materials in the envelope provided to the research coordinator, Lynn Allred, by December 31, 1994. Each participant who completes and returns all the materials will be entered into a random drawing, where one recipient will receive a $100 cash bonus.

Very Truly Yours,

Lori R. Fuller, Ph.D. Candidate
Assistant Professor, University of Delaware

Enclosures

Instructions Case 1

It is September 15, 1994 and work is about to wrap up on the 7/31/94 audit of Crystal Clear, Inc., a manufacturer of equipment used to purify all types of liquids (drinking water, fuel, oil, etc.). In this packet you have been provided with a subset of the workpapers from this audit. The senior on the engagement had emergency surgery and was unable to review the workpapers enclosed. Your job is to review these remaining workpapers and write any points that need to be cleared up before the papers are given to the partner for final review and opinion.

The workpapers you are reviewing have been prepared by Sara Landon, who has about one year of experience with your firm. Sara has a neutral reputation in your firm and you have no reason to question her basic competence. You should assume that Sara has executed the audit program to the best of her ability.

For purposes of your review, assume the $1,000 is the materiality scope for Crystal Clear, Inc. Please write review points for any issue you think Sara needs to address or further clarify. You should also assume that one of your tasks is to write training notes to Sara, so you should raise points to help here when thinking about how to audit. Do not worry about differences in your documentation styles (points like "the date should precede the title of the workpaper). Feel free to write on the workpapers, if this facilitates your review. Please put all of your review notes on the sheets provided.

Once you have finished your review, please answer the general questions provided at the end of this packet.

Participant No. _____

Begin time _____

End time _____

Participants: The following is an index of Crystal Clear, Inc. workpapers that have been included in your abbreviated set of workpapers.

Perm-1	Client Profile
WTB-1	Working Trial Balance - Assets
WTB-2	Working Trial Balance - Liabilities and Stockholders' Equity
WTB-3	Working Trial Balance - Income Statement
WTB-4	Adjusting and Reclassification Journal Entries
E	Inventory Lead Schedule
E-2	Raw Materials & Components Inventory - Stillwater
E-5	Work in Process Inventory
E-6	Finished Goods Inventory
E-10	Test of Job Cost System
DD-1	Debt Schedule
MM-2	Subsequent Events Review
X-XX	You do not have any schedules with an X reference. Whenever one is referred to, assume that it has been properly completed in accordance with the audit work program and that no exceptions were revealed.

STANDARD TICKMARKS USED:

GL	Agreed to client's 7/31/94 general ledger and unaudited financial statements
T	Traced to 7/31/93 workpapers
^	Footed
^^	Crossfooted

Crystal Clear, Inc. Perm-1
1 of 3

Background and Industry Profile:
Crystal Clear made its entry into the market for water purification systems nearly ten years ago when it introduced a design for a compact roto reverser system, currently its major product. It has continued its design leadership, and still markets the same compact roto reversers with which it started. The systems Crystal builds are famous for their simplicity. (Crystal has been able to maintain very small inventories of raw materials and component parts as a result of its superior designs. This has been an advantage for a growing company in terms of its financing needs.) Crystal had early success in 1985 with a large eight year contract (totaling 30%) of its sales volume) with the US Department of Health and Human Services on its major product line. The protection from industry risk which such a contract affords has enabled Crystal to concentrate on growing rather than on the competition in its industry. In addition to the contract, there is a strong market with sales to small municipalities which is augmented by design and sale of systems for homes and smaller institutions such as hospitals and nursing homes.

Once the components are acquired or manufactured according to specification in a contract, client personnel supervise assembly and installation. Such contracts for design, production and installation account for about 2/3 of total revenues. Sales prices for Crystal systems range from $2,000 through $20,000. The other 1/3 of revenues comes from the sale of replacement parts and components.

Current Situation:
Crystal has plants located in Stillwater, Oklahoma (its central office) and Baltimore, Maryland. Crystal closed a plant in San Diego, California in December 1993 when its lease on the building expired. Crystal disposed of the equipment it owned at that location. The Baltimore operation is a warehouse for sales of component parts. Crystal has been considering closing the Baltimore plant, too. Purchase prices, local taxes, transportation and warehousing costs are substantially higher at Baltimore than at Stillwater. This is chiefly due to the higher costs of certain high volume inventory items such as preassembled pumps and rainbow assemblies which must be shipped from California. Such items require special handling to get to Baltimore, charges which would not be incurred at Stillwater.

Typical major customers of Crystal include Rath Co. (a producer of copper component oil filtration systems for furnaces, made chiefly with components which Crystal wholesales); Thimty (a holding company which owns retirement residences and "yuppie" resorts); Tipp City (which has purchased several small custom systems as it has grown); and Tyrell Homes, Inc. (a large construction company that constructs million dollar executive homes in Los Angeles, San Diego and Phoenix).

Management and Personnel:
Crystal likes to think of itself as a family, and has had the same core of 22 employees at its Stillwater and Baltimore plants for the last seven years. When it closed the San Diego plant, it laid off one full time office clerk, and transferred the other four employees to Stillwater. Almost all employees perform in multiple roles. Fore example, the engineers who were original founders of the company serve in top management positions while continuing to do desig work. Some of the commission sales people also double as designers. The production people double as shipping or receiving clerks. Each employee owns stock (68% of the total) which offers some flexibility (stock was offered in the early years in lieu of salary and wage increases).

During 1994, the person who was responsible for the financial management of the company was replaced because of questionable decisions made (including the investment six years ago in real estate as a speculative venture). With this one exception, the prior auditors express their confidence in the competence and integrity of management.

Engagement Risk Assessment:
Inherent Risk
In the current year, inherent risks for Crystal are affected by two major forces, and we have factored this into our audit plan.

1) Companies in the highly competitive and speculative arena in which Crystal operates require a marketing or production edge to reduce their exposure to inherent risk, particularly in design or production activities. Crystal co. has relied on the large contract with the Department of Health and Human Services mentioned above, which has provided protection from what would otherwise be stiff competition and exposure to inherent risk.

2) In the current year production costs were affected by steep decreases in wages across the board. All employees took steep wage cuts to help out during the current crunch. The substantial decreases enabled the company to remain financially stable in spite of slackening sales volume.

Control Risks, Detection Risks and Audit Planning

The inventory observation is rotated each year. This year we will observe inventory counts at both the Stillwater, OK and Baltimore, MD plants on 7/31/94. The plants will close on the day of the inventory counts to facilitate a proper count.

All accounting functions are performed at the Stillwater headquarters where we will be stationed for this audit. All purchases invoices are forwarded to Stillwater for processing, and all sales invoices are now issued there (in order to maintain better credit control).

We will rely heavily on computer generated reports, which have been tested in prior years and will be compliance tested again this year. These reports are used heavily in the accounts receivable aging and credit management functions, and in accumulation of costs as contracts progress to completion.

The scope for posting audit differences to the proposed journal entry summary page is $1,000 for both Balance Sheet and Income Statement accounts.

Crystal Clear, Inc.
Working Trial Balance

WTB-1
1 OF 2

ASSETS

	7/31/93	7/31/94
Cash	$ 18,090	$ 6,030
Marketable Securities	12,750	11,300
Accounts Receivable (net of allowances of $9,000 and $10,040 in 1993 and 1994 respectively)	209,070	216,940
Inventories	164,040	205,500
Property, Plant & Equipment (net of depreciation of $99,925 and $151,218 in 1993 and 1994, respectively)	399,890	287,110
Prepaid & Other Assets	2,520	11,250
Total	$ 806,360	$ 738,130

[Participants: You do not have any of the X-X referenced schedules; assume that they are properly completed, reveal no exceptions, and that all disclosures are properly made. Marketable securities are properly stated at LCM. Balance sheet amounts and gains and losses on dispositions of PP&E were properly recorded. Depreciation is properly stated and all related disclosures are properly made. The termination of the leases at San Diego was properly accounted in accordance with GAAP.]

WTB-1
2 OF 2

Per Discussions with Grant Green, Controller:

There were strong markets at the end of the prior FYE. Crystal had forecast at that time that the strong markets would bear both price and volume increases. Management decided to be very aggressive and do whatever was necessary to take full advantage of the situation. First, Crystal built inventory in order to be ready to capitalize on increased demand. Second, to get in on the price increases it had predicted would result from the stronger market at the end of FYE 1993, Crystal changed its pricing policies across the board in both March and June. This change in pricing policy backfired and contributed to further inventory buildup when the stronger market failed to materialize in 1994. See WTB-3 for further discussion of the sales results for the year. [Participants: assume at this point that this buildup in inventory does NOT indicate potential valuation problems; valuation is properly tested on schedule E-X.]

Six years ago, Crystal paid $125,000 for a small parcel of land in northern California. Crystal sold 3/5 of the acreage ($75,000 cost) in July 1993 for a 15% gain. Mr. Green was disappointed because the company will probably make about a 20% return on its remaining parcel of land (for a speculative gain of almost $10,000) since the federal government is considering making the land into a park and has paid top dollar in the past in such circumstances. The controller asked if it would be appropriate under GAAP to recognize the gain on the sale of the remaining land if the Feds have started on the park project. I informed him that GAAP required that this appreciated land be recorded at cost since gains may not be booked before being realized. Furthermore, since the land is being held as an investment, I propose reclassification journal entry (1) at PJE-1 to take this parcel out of PP&E and put it into long term investments. [Participants: assume that proper accounting and disclosure of all prior year amounts relating to this land will be made.]

RJE <1>

Investment in Land		$50,000
	PP&E	
	$50,000	

A $10,000 T-Note is included in "other assets". It was included in the cash figure in the PY. I examined the instrument at Crystal's bank safe deposit box when examining the titles to various other assets. Because this is an asset that can be readily converted into cash, it should be treated as a cash equivalent. Reclassification journal entry (2) is proposed at PJE-1.

RJE <2>

Cash		$10,000
	Other Assets	
	$10,000	

Crystal Clear, Inc.
Working Trial Balance

WTB-2
1 OF 1

LIABILITIES AND STOCKHOLDERS' EQUITY

	7/31/93	7/31/94
Accounts Payable	$ 103,450	$ 89,470
Accruals	10,720	6,600
Current Maturities of LTD	118,320	98,440
Other Liabilities	40,950	34,530
Retirement Plan Contributions (not due currently)	7,980	0
Long Term Debt	191,410	92,970
Stockholders' Equity:		
Common stock (par $1, authorized 200,000)	34,800	34,800
Paid-in Capital	230,260	230,260
Retained Earnings - Beginning	(151,770)	68,470
Income (loss)	220,240	82,590
Retained Earnings - Ending	68,470	151,060
Total	$ 806,360	$ 738,130

[Participants: You do not have any of the X-X referenced schedules; assume that they are properly completed revealing no exceptions; and that related disclosures and tests of compliance with ERISA, debt agreements and so forth have been made and revealed no exceptions.]

Crystal Clear, Inc.
Working Trial Balance

WTB-3
1 OF 2

INCOME AND EXPENSES

	% Change	7/31/93	7/31/94
Sales	(5.5)	$ 1,722,720	$ 1,628,630
Costs of Goods Sold	1.2	1,333,360	1,349,290
Gross Margin	(2.6)	389,360	279,340
Selling, General & Administrative	4.8	116,140	121,740
Interest	(3.2)	42,340	43,690
Other (Net)	(194.0)	10,640	31,320
Net Earnings	(62.5)	$ 220,240	$ 82,590

[Participants: You do not have any of the X-X referenced schedules; assume that they are properly completed and revealed no exceptions. Assume that taxes are currently provided for under "other", and will be properly tested and classified later as part of the final steps of the audit. There will be no differences requiring adjustments. Assume that quarterly figures by product line are discussed further on schedule I-X.]

Per discussions with Grant Green, Controller:

Sales were down 5.5%. There are two related reasons for this change. First, sales volume began to decline when the strong market at the end of the prior FYE failed to carry over into 1994. Second, Crystal decreased its prices across the board in both March and June in order to reduce its inventory buildup (per WTB-1, inventory is $164,040 and $205,500 in 1993 and 1994), and to shore up slackening sales.

While other components costs remained virtually constant, the costs of key components or roto reversers (copper tubing and certain preassembled motors and pumps) increased across the board (almost 16% on average). These increases in components costs were almost completely offset by decreases in production wages (see schedule II-X) and decreases in volume noted in (A) above (the net result was a 1.2% increase in COGS).

There were also offsetting decreases and increases in SG&A. A review of the comparative figures is below. The decreases in SG&A in 1994 were a result of the closing of the San Diego plant. The closing of the San Diego plant led to Crystal saving the salary of one full time office clerk. All the increases in SG&A were a result of raising commissions expenditures to help when sales volume began to fall. Commission expense is tested on schedule II-X and revealed no exceptions.

	1993	1994
Sales commissions	$ 57,173	$ 62,607
Office Salaries	25,842	25,391
Other G&A	33,125	33,742
	$116,140	$121,740

W/P ref	No.			
	Reclassification Entries			
WTB-1		Investment in Land	50,000	
		PP&E		50,000
	To reclassify the remaining land held for investment purposes.			
WTB-1		Cash	10,000	
		Other Assets		10,000
	To reclassify T-note to cash and cash equivalents.			
	Adjusting Entries			
C-X		Bad debt expense	7,186	
		Allow for Doubtful accts		7,186
	To increase allowance for doubtful accounts to cover specific review conducted at C-X.			

E

Crystal Clear, Inc.
Inventory Lead Schedule

W/P Ref	Account	7/31/93	7/31/94
	R.M. - Stillwater	$ 42,988.15	$ 55,785.97
	R.M. - Baltimore	28,312.43	33,643.44
	Work in Process	39,718.12	41,661.37
	Finished Goods	53,021.55	74,409.23
		$ 164,040.25	$ 205,500.01

[Participants: assume this memo covers all substantive points normally included in such a memo, e.g.: inventory instructions, procedures for test counts, discussion with management on consigned inventory. All scopes are in accordance with firm policy and the programs. Evaluate the specific areas of the memo that are extracted below. Assume that scopes are in accordance with firm policy.]

Crystal Clear, Inc.
Inventory Observation Memo - Stillwater

I observed the inventory count at the Stillwater, OK plant on 7/31/94. The counts were done by teams of production and design personnel, who are familiar with the components and systems in inventory and in production.

The first floor of the plant is where all production occurs and where all WIP and finished goods items are held. The second floor houses the raw materials and components inventory. The plant was scheduled to be closed on the day of the inventory count in order to facilitate an accurate count. All areas were arranged neatly and items were stacked into labeled bins to expedite counts. There were no movements from raw materials to WIP or from WIP to finished goods scheduled.

Two part count tags were used. One part was detached and used by the EDP clerk to enter the count. The second part was left attached to the inventory item or bin to indicate that it had been counted. I tested the tags at the conclusion of the count by obtaining the tickets from the EDP clerk and selecting two from each of the logs used to control RM, WIP, and FG inventories, and tracing the tags back to the floor to ensure agreement of counts. I also selected two each and traced from the floor to the logs noting agreement of the counts. I then surveyed the entire warehouse to ensure that each inventory item had one and only one tag. I accounted for the tag sequences in RM, WIP, and FG.

On the second floor, I noted two bins of reynolds rings that were segregated from the other stocks. Chris Colebeck, plant manager, explained that the goods in this area were awaiting return to the supplier because they were defective. [Participants: there is no problem with inventory valuation; the defective parts are being handled separately; you should assume that the valuation and cut-off are properly tested on schedule X.]

[A similar memo for the observation at Baltimore is filed on schedule E-X.]

E-2
1 of 2

PBC

Crystal Clear
Components and Raw Materials
July 31, 1994

Tag No.	Stock #	Description	QTY	Price	Total
R5987	B1647	beaker drum	14	115.64	1,618.96
R5979	B1650	flat shield	6	475.50	2,853.00
R5980	D3648	alloy gears	212	11.05	2,342.60
R5981	D3649	b-ring ass./A	25000ϕ	0.175	4,375.00
R5982	G1962	lugger outter	1	254.00	254.00
R5983	G1962A	cutter upper	92ϕ	36.75√	3,381.00
R5984	G1966	b-ring ass./B	3516	.25	879.00
R5985	K3647A	rainbow ass.	5ϕ	2,412.67√	12,063.35
R5986	T2875	louser upper	26	42.15	1,095.90
R5987	T2885	aluminum twitch	63ϕ	150.44√	9,477.72
R5988	T2899	clipper offer	163	9.34	1,522.42
R5989	M5432	copper coil-ft	40	51.98	2,079.20
R5990	M3980	alum. coil-ft	50	48.02	2,401.00
R5991	Z7961	boiler plate	9ϕ	361.78√	3,256.02
R5992	D9764	transom motor	1	220.00	220.00
R5993	K0974	RD5M pump	2ϕ	1,681.00√	3,362.00
R5994	C5555	bearings	420	1.44	604.80
R5995	D9763	piper motor	5ϕ	800.00√	4,000.00

		Total			55,785.97
					=========

E-2
2 of 2

Crystal Clear, Inc.
Raw Material & Components Inventory
Stillwater Plant
FYE 7/31/94

√ Cross referenced to price vouching tests at E-3. Scope > $3,000.

ϕ Agrees with firm test counts shown at schedule E-X. Scope > $3,000.

Note: See schedule X for test of proper FIFO valuation.

[Participants: you do not have any schedule Xs; assume they are properly completed and revealed no exceptions. Also assume that scope and selections are in accordance with the audit program.]

Russel Bros.

112 Industrial Rd.
Fort Worth, TX 77568

May 31, 1994

Sold to:
Crystal Clear Inc.
886 Walnut Street
Stillwater, OK 74126

Ship to:
Crystal Clear, Inc.
886 Walnut Street
Stillwater, OK 74126

Mfg. part #	Description	List Price	Qty	Total
D9763	piper motors	$ 800.00	5	$ 4,000.00
K3647A	rainbow assembly	2,162.67	1	2,162.67

Total due $ 6,162.67
Terms: 4/15, net 30
FOB: seller

LEECH, INC.

Billing Address:
Crystal Clear, Inc.
886 Walnut Street
Stillwater, OK 74126

Ship to Address:
477 Wyoming Blvd.
Baltimore, MD 25648

Date 6/15/94

Terms: 7/15, net 45
FOB: Leech Inc.
Odesa, TX

Quantity	Description	Price	S&H	Total
4	rainbow assembly	2,162.67	250.00	9,650.68
5	beaker tubes	193.45	n/a	580.35
13	drum sets	249.35	[illegible].00	3,436.55
	Total			$13,667.58

Thank you for your order!
Leech Inc.
2710 Jericho Turnpike
Odessa, TX 77482

July 10, 1994

Francis Sewer Supply
98763 Beaverton Pike
Middland, TX 77440

Ship to:
Crystal Clear, Inc.
477 Wyoming Road
Baltimore, MD 25648

Terms 7/15, net 30
FOB Francis Sewer Supply
Middland, TX

Invoice No.	Cust. No.	Terms	FOB
D66035	C2	7/15, net 30	Francis Sewer Supply

Description	ordered	shipped	list	s&h	extended amount
Boiler plates	10	10	361.78	n/c	$ 3,617.80
Rainbow assemblies	2	2	2,162.67	250.00	4,825.34
	Total due				$ 8,443.14

Bill to:
Crystal Clear, Inc
886 Walnut Street
Stillwater, OK 74126

Customer Invoice

TO: Crystal Clear, Inc.
886 Walnut Street
Stillwater, OK 74126

7/20/94
FOB: Eczello's

Invoice No: BE 3926

(75) Aluminium twitch @ 150.44 $ 11,283.00

Terms: Net 30

From:
Eczello's Supplies
P.O. Box 2463
Stillwater, OK 74122

BAINBRIDGE HOUSE: 200 Bainbridge Street, Stillwater,OK 74122

INVOICE #98-EJ-4376
Terms: 7/15/net 45
FOB: Seller

July 1, 1994

Crystal Clear, Inc.
886 Walnut Street
Stillwater, OK 74126

Order QTY	Description	Total
112	cutter upper	$ 4,116.00
30,000	b-ring assemblies-type A	5,250.00
	DUE	$ 9,366.00

Invoice No: 94/DUR188

July 25, 1994

Neptune Inc.
2855 Longevity Rd.
Milton, FL 32583

Terms: 7/15, 5/30, net 45

FOB: Shipper

Ship to: Crystal Clear, Inc.
477 Wyoming Road
Baltimore, MD 25648

Bill to: Crystal Clear, Inc.
886 Walnut Street
Stillwater, OK 74126

12	Wifter Doobers	$ 683.00
5	RD5M pumps	8,405.00 *
	total	$ 9,088.00

* (includes additional shipping & packing charges of $125.00 for each unit.)

Crystal Clear, Inc.
Inventory
Pricing Tests
FYE 7/31/94

Note: Crystal uses FIFO. I reviewed the client's list of suppliers of various stock items selected for vouching. From the A/P ledger, I selected the most recent invoices until I had sufficient invoices to support pricing the stock on hand.

The invoice dated 5/31/94 was the most recent shipment of piper motors recorded.

Rainbow assemblies:	from	p. 5/6	3 @ $2,412.67	6/15/94
		p. 6/6	2 @ 2,412.67	7/16/94
			5 $12,063.35	

E-5
1 of 2

PBC

Crystal Clear
Work in Process
July 31, 1994

Tag No.	Job No.	Description	<--- % Complete --> Design	Compnt	Labor	Total
W-1743	94-215-D	Romeo Falls	0	40	15	1,769.28
W-1744	94-109-A	Kalamath	95	75	40	4,783.12
W-1745	94-003-A	Turnkey	85	10	5	1,579.86
W-1746	94-524-B	Silo Industries	95	80	50	5,236.14
W-1747	94-109-B	Burlington χ	0	60	85	4,805.07
W-1748	94-237-B	Ryland	100	95	90	11,249.25
W-1749	93-498-C	Masonites	0	80	75	12,238.65ϕ

		Total				41,661.37
						==========

Crystal Clear, Inc.
Inventory
Work in Progress
FYE 7/31/94

According to Chris Colebeck, Plant Manager:

1 At any point in time Crystal has a number of contracts which involve no design or engineering. These contracts are for assembly of systems out of parts available "off the shelf".

2 These two projects included charges for a design that was common to both so each job has low charges for a design that is 95% complete. (The remaining 5% is or system testing, according to Lucinda Baker, engineer.) Crystal split the design charges incurred between the projects, since the jobs were so similar and the design work applied to the Kalamath and Silo Industries jobs equally. The components and labor charges were also very similar. The complete test of the job charges system is performed on schedule E-10.

χ This job was selected for the test of accumulation of charges through the job costing system (schedule E-10). This testing was done in lieu of further test counts. [Participants: assume the audit program called for the tests at E-10 instead of further test counts.]

ϕ Test counted by examining the unit, and discussing the project with Chris Colebeck and Lucinda Baker. The % completion appears reasonable according to discussion with Colebeck, Baker and review of the job manifest (tested at E-10). Scope: largest job in the warehouse.

[Participants: assume that overhead is applied properly to all WIP and finished goods job cost reports. Further assume that the above scope is in accord with the audit program.]

PBC

Crystal Clear
Finished Goods
July 31, 1994

Tag No.	Job No.	Description	Total
F-2323	94-515-D	Mebane	10,559.57
F-2324	94-401-A	Lewis Co.	14,470.18
F-2325	94-432-B	Tri-county homes	8,200.21
F-2326	94-281-C	Rath	17,303.20
F-2327	94-444-A	Blandland	2,030.01
F-2328	94-329-D	Westendorp	10,005.01
F-0000	94-237-B	Ryland	11,841.05
			74,409.23

Crystal Clear, Inc.
Inventory
Finished Goods
FYE 7/31/94

1 See schedule E-10 for test of controls over accumulation of costs on these contracts.

2 I pointed out to Chris Colebeck, plant manager, that the Ryland system was missed completely by the count team. He added this job to FG inventory by making a special count tag since this was noticed once the count had been completed. He explained that he had moved the FG team over to help the WIP team and they must have made the error then. I noted that this addition to the inventory sheet was properly approved by the controller, Grant Green, and I inspected the completed unit with Colebeck, noting that he concluded that it was ready to ship. I toured the entire warehouse at the end of the count and made sure that the count teams had not missed other inventory by noting the second copy of count tags attached to all items or bins.

ϕ Agreed to total costs per job cost card (tested on E-10). Scope: 2 largest jobs.

χ Examined the units, job manifests and sales contracts. Per discussion with Chris Colebeck, plant manager, and Lucinda Baker, production engineer, the job is complete. Scope: 2 largest jobs.

[Participants: assume that the scopes are in accord with the audit program.]

PBC

E-10
1 of 2

Crystal Clear
Job Manifest
Job # 94-109-B
Burlington, W. Virginia
Add-on-Pump

Stock # / Empl. #	Qty/ Hrs	Description	Date	Total Costs
D3648	3	alloy gears	Jun 15	33.15 √
T2885	4	aluminum twitch	May 23	601.76 √
B1647	1	beaker drum		
D3434	5	linear lugs		
C5555	200	bearings	May 23	288.00 √
Z7961	2	boiler plates	May 23	723.56 √
G1966	132	b-ring ass./type B	May 23	33.00 √
M5432	20 ft.	copper coil	May 24	1,039.60 √
T2875	3	louser upper		
G1962	6	lugger outter	May 23	1,524.00 √
K3647A	1	rainbow assembly		
E45	4	Cooper	May 2	48.00 ϕ
E21	8	Pinder	May 23	120.00 ϕ
E45	6	Cooper	May 24	72.00 ϕ
E30	6	Mackey	May 24	66.00 ϕ
E21	8	Pinder	May 24	120.00 ϕ
E45	4	Cooper	Jun 15	48.00 ϕ
E30	8	Mackey	Jun 15	88.00 ϕ

			Total	4,805.07
				========

Crystal Clear, Inc.
Inventory
Test of Job Cost System
FYE 7/31/94

1 According to discussion with J. Stone, production engineer, the job was delayed because of a delayed delivery of linear lugs. These must be installed before the rainbow assembly can be added.

ϕ Agreed amount, date, hours, job number to payroll records.

√ Agreed amount, date, quantity, job number to perpetual inventory records.

[Participants: assume overhead is properly applied, and that all figures were properly traced to the client's subsidiary records.]

Note 1:
The program for this test called for using a job with design charges in addition to components and labor charges, but according to discussion with Chris Colebeck, plant manager, there were no jobs in the warehouse at this time that included design charges, so I selected this job for testing. This is not a significant change in the audit plan. As a test of the accumulation of charges to the production jobs, I did the work tickmarked above.

Note 2:
A job manifest is produced when the design is completed or when the order is made if no design charges are involved in a particular job. The manifest is a list of the parts to be used. This list is entered into the job control system under the job number assigned to the work. As parts are withdrawn from the inventory area, inventory control tickets are completed and forwarded to EDP. Similarly, as time tickets for production staff are processed, charges to particular jobs are accumulated. The result is a report produced for each job at each month end.

DD-1
1 of 2

Crystal Clear, Inc.
Debt Schedule

Lender/ Collateral	Rate	Payments	7/31/93	7/31/94
Crest Bank revolving line A/R		monthly	$ 109,070	$ 86,390
Crest Bank PP&E	14.5	quarterly to 7/31/03	8,590	62,450
National Bank PP&E	14.25	quarterly to 7/31/03	37,220	32,570
National	9.36	semi-annual to 7/31/97	94,850	0
Crest Bank T-note	10.5	two year note due 7/31/96	0	10,000
Total			$ 309,730	$ 191,410
Current maturities of LTD			118,320	98,440
Total due after one year			$ 191,410	$ 92,970

[Participants: you do not have any of the DD-X schedules; assume that they are properly completed and revealed no exceptions. Also, assume that all proper footnote disclosures have been made, that all tests of interest expense and accruals were properly completed revealing no exceptions; and that current and long-term liabilities are properly tested and classified.]

Crystal Clear, Inc.
Subsequent Events Review

[Participants: this list is not the complete review of subsequent events. It omits the search for unrecorded liabilities for example. This is only a listing of specific items mentioned by the client for further consideration. They came up in discussions with the client when Sara asked the standard questions about subsequent events requiring consideration by your firm.]

Item	Disposition
The insurance agent with which Crystal has done business for the last 17 years informed them that premiums on the policy covering the production facility would increase by 25%, and product liability policies would next year.	No disclosure necessary; Crystal is still covered. The agent stated that there is no reason to suppose Crystal will lose its coverage, and Grant Green, controller, foresees no problem meeting the triple premiums. According to M. Murry,agent,the increase is due to the general problems in the insurance industry, and similar increases are hitting other companies in Crystal's industry.
The EPA has just confirmed that a toxic waste dump on the parcel of land Crystal sold has leaked PCB's into the groundwater. That land has been rendered uninhabitable.	According to the represen tation letter from Newburn & Associates (Crystal's attorneys) the sale was properly completed, so the new owner will have to bear any losses. No further work necessary on this transaction. [Participants: assume Sara Landon examined the sales agreement and that it was properly completed. Assume Newburn & Associates also stated in their letter that the EPA had made a ruling so you may assume there are no unasserted claims connected with Crystal's previous ownership of this parcel of land.]

[Participants: please number your review points.]

WORKPAPER REVIEW NOTES

W/P Ref.	Review Point

Case Questions

Assume that Sara has addressed and satisfactorily resolved your review points on the workpapers provided in this case.

1. Do you believe that the inventory balance is fairly stated?

_____ Yes _____ No

2. If you had to use a scale of zero to 100, where would you rate the fairness of the inventory balance?

0.....10.....20.....30.....40.....50.....60.....70.....80.....90.....100
Not fairly Presented — Fairly Presented

3. Using a like scale, what is your confidence in your assessment of the inventory balance?

0.....10.....20.....30.....40.....50.....60.....70.....80.....90.....100
No Confidence — Complete Confidence

Please answer the following questions concerning the **Workpaper Review Case** materials.

1. How difficult did you find the case to be?

/--------/--------/--------/--------/--------/--------/--------/--------/--------/--------/

Not Difficult — Extremely Difficult

2. How realistic did you find the case to be?

/--------/--------/--------/--------/--------/--------/--------/--------/--------/--------/

Not Realistic — Extremely Realistic

3. How confident or certain are you of your performance of this task?

/--------/--------/--------/--------/--------/--------/--------/--------/--------/--------/

Highly Confident — Highly Uncertain

4. Do you feel that an audit senior has both the necessary knowledge and ability to successfully complete this task?

/--------/--------/--------/--------/--------/--------/--------/--------/--------/--------/

Definitely has the Knowledge — Definitely does not have the Knowledge

/--------/--------/--------/--------/--------/--------/--------/--------/--------/--------/

Definitely has the Ability — Definitely does not have the Ability

If not, please explain why.

5. Do you believe that it is reasonable for someone at the senior level to be assigned this task?

/--------/--------/--------/--------/--------/--------/--------/--------/--------/--------/

Highly Reasonable — Highly Unreasonable

If not, please explain why.

6. (a) Were any of the instructions in the tasks that were unclear?

Yes No

(b) If so, please identify which instructions were unclear.

7. Is there any other comment you would like to share with the author of this research concerning this task?

APPENDIX B
INTUITIVE TASK INSTRUMENT

Instructions Case 2

This is a study of auditor judgment in the final review stage of the audit. The senior in charge of the job has signed off and is ready to prepare an unqualified opinion. The only task he lacks performing is the final analytical review. Because he had to go on an out of town emergency, you have been asked to perform this review. The case contains information on the nature of the client's business, the major corporate officers, the state of incorporation and the amount of outstanding stock.

Attached are the comparative financial statements for Okiedata, Inc. for the years ended December 31, 1989 through 1993 and related notes for the years ended December 31, 1991, 1992 and 1993. Your task is to perform the final phase analytical review on the data and determine whether you would concur with the in-charge as to an unqualified opinion. The information provided is based upon actual documents obtained from the company. Assume that no irregularities were noted during the substantive testing phase of the audit.

For purposes of your review you may make any marks on the case itself or unbind it. On the sheets at the beginning of the case please state and record each analytical review procedure you would perform. You may make any calculations in this space or anywhere in the case materials.

Once you have completed your review, please answer the general questions provided at the end of this packet.

Participant No. _____

Begin time _____

End time _____

Okiedata Inc.
Client Profile
FYE 12/31/93

Background and Industry Profile:
The Okiedata Corporation provides contract manufacturing services to original equipment manufactures in the electronics industry, including producers of computer peripherals, medical devices, communications equipment, industrial instruments and test equipment. Okiedata specializes in assembling printed circuit boards, using the latest in computer automated surface mount and pin-through-hole interconnection technologies, for customers requiring strict quality control and prompt, responsive service in response to design changes. Okiedata provides its manufacturing services primarily on a purchased material or "turnkey" basis. Turnkey manufacturing consists of a package of services for the production of printed circuit boards in accordance with customer specifications. These services include procurement of the components to be assembled, the assembly of the printed circuit board, and post-assembly testing. Okiedata also provides various services independently of its turnkey manufacturing services, including in-circuit test development, functional test development, manufacturing and test-related consultation services, and consignment assembly (i.e. assembly of components consigned by the customer rather than purchased for the customer by Okiedata).

Okiedata began its operations in 1985, with the opening of its first manufacturing facility and company headquarters in Enid, Oklahoma. In 1990, a second manufacturing facility was opened in Macon, Georgia. Later that year, Okiedata purchased certain assets of Eastronix, Inc., a contract manufacturer based in Greenville, North Carolina. The equipment purchased was moved to the Macon Facility. In 1991, Okiedata purchased certain assets associated with the printed circuit board assembly operations of Ampex Corporation and in connection therewith opened a third manufacturing facility in Reno, Nevada.

Okiedata made its first public offering in June 1991 by offering 1.8 million shares of stock. This initial offering raised $9.2 million. A second stock offering was made to the public in July 1993 wherein 1.8 million previously unissued shares of common stock brought in $10.7 million in additional capital. Okiedata is traded over-the-counter on NASDAQ with 730 shareholders of record. Their primary SIC code is 3672, Printed Circuit Boards. The stock's price has risen sharply from the $2.5-$4 range in 1991, to $13 in 1993, and currently it has a price of $24.

Current Situation:
Okiedata has four manufacturing facilities, two at its headquarters in Enid, Oklahoma; and one each in Reno, Nevada and Macon, Georgia. Typical major customers are computer and technology equipment manufacturers such as IBM, Ampex, QMS, and Northern Telecom. Okiedata does not seek to be a manufacturer of consumer-oriented products. Instead, their marketing effort s are concentrated towards companies in the industrial instrument, medical devices, communications equipment, computer and test equipment industries.

Competition for contract manufacturing services that Okiedata provides can come from in-house manufacturing capabilities of current and potential customers as well as many independent sources. Competitors of Okiedata include SCI Systems, Inc., Avex Electronics, Inc., and Microdot Corporation. Some of which have greater financial,

manufacturing and marketing resources than Okiedata. Okiedata believes that it competes favorably with respect to these factors. Okiedata markets its services to potential customers through its senior management, direct marketing personnel, program managers, and its independent manufacturers' representatives located in Arizona, Texas, North Carolina, Georgia, Florida, Massachusetts, Illinois, Colorado, Washington, Oregon, California, Nevada and Oklahoma. In addition, the program managers continually market its services to the accounts they manage.

The following table represents the key financial ratios of Microdot Corporation, the largest company in the printed circuit board industry. (Microdot has a 6/30 FYE whereas Okiedata has a 12/31 year end).

	1991	1992	1993
Yr to yr % change in sales	19.5%	(4.2)%	(2.9)%
Yr to yr % change in income before extraordinary items	(89)%	50 %	10 %
Profit Margin:			
a) operating profit/revenues	2.2%	1.7 %	1.4 %
b) net profit (before E.I.)/ revenues	.2%	.3 %	.4 %
Rate of Return on Assets	3.7%	6.3 %	6.2 %
Asset Turnover (revenues/assets)	1.9	2.1	1.7
Operating cash flow to income (before E.I.)	9.5	42.8	55.5

Officer Evaluation:
Charles William Baker is Chairman, Chief Executive Officer, Director and co-founder of Okiedata. He was previously employed as the comptroller of SCI Systems for ten years prior to the inception of Okiedata. He is a CPA and owns 30% of the company's stock. He is a hands on manager in all aspects of the business, particularly taking direct actions in accounting while also making all the financing and major operating decisions. Employees have described him as target profit driven, especially now that the company has gone "public".

Allen Asher is President, Chief Operating Officer and Director. He is responsible for manufacturing, engineering and programs operations. He too was previously employed by SCI as plant manager and manufacturing manager for the for years prior to forming Okiedata with Mr. Baker. He holds a B.S.I.E. degree from the University of Texas.

Cord MacPherson is Controller, Treasurer and Assistant Secretary of Okiedata and is responsible for all accounting and data processing activities. He also was previously employed by SCI as Accounting Supervisor for the six years prior to joining Okiedata. He has a B.S. in Accounting from the University of Kansas.

Legal Proceedings:

Okiedata is a defendant in a lawsuit filed by Harry Jorgensen, a co-founder and executive vice-president of the company. The plaintiff alleges wrongful termination of his employment and claims damages and other benefits under the terms of his employment agreement equal to his base pay through April 1994, or alternatively, reinstatement to his previous position with the Company. Okiedata believes they have valid defenses to the claims, and even if such claims were sustained, they would not have a material effect on the company.

OKIEDATA, INC.
BALANCE SHEETS
December 31, 1989-1993

Assets	1989	1990	1991	1992	1993
Current Assets:					
Cash	$ 257,812	$ 1,915,391	$ 294,623	$ 268,187	$ 1,045,330
Net Accounts Receivable (See Note A)	2,138,717	9,309,942	4,703,877	12,013,093	12,624,637
Inventories	3,668,570	8,962,682	7,481,253	20,660,227	28,531,792
Prepaid Expenses	213,211	272,674	274,628	203,249	279,812
Total Current Assets	6,278,310	20,460,689	12,754,381	33,144,756	42,481,571
Property, Plant & Equipment					
Land	85,000	85,000	85,000	295,386	295,386
Buildings	3,212,815	3,497,500	3,877,500	4,546,458	5,092,841
Construction in Process	--	--	1,885	20,983	541,783
Machinery & Equipment	2,470,609	5,889,954	19,547,930	31,009,244	49,225,801
	5,768,424	9,472,454	23,512,315	35,872,071	55,155,811
Accumulated Depreciation	1,190,454	2,336,042	4,708,430	9,244,954	16,436,226
Net Property, Plant, & Equipment	4,577,970	7,136,412	18,803,885	26,627,117	38,719,585
Other Assets	707,851	709,276	380,495	94,229	3,237
Total Assets	$ 11,564,131	$ 28,306,377	$ 31,938,761	$ 59,866,102	$ 81,204,393
Liabilities & Stockholders Equity					
Current Liabilities:					
Current Maturities of Long Term Debt	$ 2,247,412	$ 8,092,110	$ 1,066,068	$ 2,207,315	$ 753,430
Accounts Payable	1,114,274	7,286,882	3,360,265	8,444,566	8,530,726
Accrued Payroll	202,602	429,203	528,511	1,236,833	1,468,490
Accrued Income Tax	59,708	523,302	20,987	836,490	182,293
Other Accruals	45,254	242,833	355,154	819,619	797,032
Total Current Liabilities	3,669,250	16,574,330	5,330,985	13,544,823	11,731,971
Long Term Liabilities:					
Long Term Debt	3,295,144	4,140,905	7,462,685	24,084,324	29,209,584
Deferred Income Tax	--	--	--	--	586,547
Total Long Term Liabilities	3,295,144	4,140,905	7,462,685	24,084,324	29,796,131
Total Liabilities	6,964,394	20,715,235	12,793,670	37,629,147	41,528,102
Stockholders Equity:					
Common Stock--par value $.01 per share	51,222	59,222	83,578	84,588	106,768
Paid In Capital	4,843,761	6,806,669	16,865,958	16,928,939	29,274,810
Retained Earnings	(295,246)	725,251	2,195,555	5,223,428	10,294,713
Total Stockholders' Equity	4,599,737	7,591,142	19,145,091	22,236,955	39,676,291
Total Liabilities and Stockholders' Equity	$ 11,564,131	$ 28,306,377	$ 31,938,761	$ 59,866,102	$ 81,204,393
Note A: Allowance for Doubtful Accounts	98,271	368,164	379,834	427,834	475,834

OKIEDATA, INC.
STATEMENTS OF EARNINGS
For the Years Ended December 31, 1989-1993

	1989	1990	1991	1992	1993
Sales	$ 14,251,410	$ 29,255,652	$ 42,419,707	$ 70,228,594	$ 102,026,252
Cost of sales	12,186,998	24,943,418	36,725,708	59,329,532	85,404,377
Gross Profit	2,064,412	4,312,234	5,693,999	10,899,062	16,621,875
Selling, general & administrative expenses	1,434,315	1,956,283	2,297,833	3,823,595	5,468,526
Interest expense	252,147	763,797	1,085,949	1,952,921	2,664,747
Other (income) expense	66,874	306,313	(54,308)	76,667	39,793
Total Expenses	1,753,336	3,026,393	3,329,474	5,853,183	8,173,066
Income before income taxes	311,076	1,285,841	2,364,525	5,045,879	8,448,809
Income taxes	119,704	405,973	894,221	2,018,006	3,377,524
Income before extraordinary item	191,372	879,868	1,470,304	3,027,873	5,071,285
Income tax benefit from loss carryforward	119,498	140,629	--	--	--
Net income	$ 310,870	$ 1,020,497	$ 1,470,304	$ 3,027,873	$ 5,071,285
Shares of common stock outstanding	5,122,211	5,922,211	8,357,776	8,458,776	10,676,786
Earnings per share	$ 0.06	$ 0.17	$ 0.18	$ 0.36	$ 0.47

OKIEDATA, INC.
STATEMENT OF CASH FLOWS
For the Years Ended December 31, 1989-1993

	1989	1990	1991	1992	1993
Net Income	$ 310,870	$ 1,020,497	$ 1,470,304	$ 3,027,873	$ 5,071,285
Cash flows provided by operating activities:					
Depreciation and amoritization of PP&E	669,749	1,145,588	2,372,388	4,536,524	7,191,272
Allowance for doubtful Accounts	46,227	269,893	11,670	48,000	48,000
(Increase) decrease in trade receivables	(914,297)	(7,441,118)	4,594,395	(7,357,216)	(659,544)
(Increase) decrease in inventories	(1,939,583)	(5,294,112)	1,481,429	(13,178,974)	(7,871,565)
(Increase) decrease in deferred taxes	--	(202,572)	7,833	178,303	586,547
(Increase) decrease in prepaids & other assets	(136,069)	(64,463)	(1,454)	179,342	14,429
Increase (decrease) in trade accounts payable	42,755	6,172,608	(3,926,617)	5,084,301	86,160
Increase in accrued payroll expense	70,812	226,601	99,308	708,322	231,658
Increase (decrease) in other accruals	18,645	199,579	110,321	464,465	(22,588)
Increase (decrease) in accrued income taxes	--	463,594	(502,315)	815,503	278,241
Net cash (used in) provided by operations	(1,830,891)	(3,503,905)	5,717,262	(5,493,557)	4,953,895
Cash flows from investing activities:					
Purchase of marketable investment securities	--	(10,286)	8,643	--	--
Capital expenditures	(2,671,713)	(3,704,030)	(14,044,046)	(12,359,759)	(19,283,740)
Disposal of equipment	--	--	4,185	--	--
Decrease (increase) in unexpended quipment funds	(469,147)	275,966	313,759	--	--
Net cash used in investing activities	(3,140,860)	(3,438,350)	(13,717,459)	(12,359,759)	(19,283,740)
Cash flows from financing activities:					
Proceeds from issuance of long-term debt	17,031,858	8,107,449	8,088,000	21,112,287	29,657,300
Principal payments on lont-term debt	(14,663,749)	(1,416,990)	(11,792,216)	(3,349,401)	(25,985,925)
Proceeds from issuance of common stock	2,348,022	1,909,375	10,083,645	63,991	11,435,613
Net cash provided by financing activities	4,716,131	8,599,834	6,379,429	17,826,877	15,106,988
Net increase (decrease) in cash	(255,620)	1,657,579	(1,620,768)	(26,439)	777,143
Cash at beginning of period	513,432	257,812	1,915,391	294,623	268,187
Cash at end of period	$ 257,812	$ 1,915,391	$ 294,623	$ 268,184	$ 1,045,330
Supplemental noncash activity:					
Reduction of accrued income taxes and addition to paid in capital from exercise of options					$ 932,438

OKIEDATA, INC.
STATEMENTS OF STOCKHOLDERS' EQUITY
For the Years Ended December 31, 1989-1993

	1989	1990	1991	1992	1993
Common Stock:					
Beginning balance	$ 51,222	$ 51,222	$ 59,222	$ 83,578	$ 84,588
Option Exercise	--	8,000	3,356	1,010	3,742
Issuance of Common Stock	--	--	21,000	--	18,438
Ending Balance	51,222	59,222	83,578	84,588	106,768
Additional Paid in Capital:					
Beginning balance	4,843,761	4,843,761	6,806,669	16,865,958	16,928,939
From option exercise	--	1,962,908	880,289	62,981	693,125
Tax benefit from option exercise	--	--	--	--	932,438
From common stock issuance	--	--	9,179,000	--	10,720,308
Ending Balance	4,843,761	6,806,669	16,865,958	16,928,939	29,274,810
Retained Earnings:					
Beginning balance	(606,116)	(295,246)	725,251	2,195,555	5,223,428
Net income	310,870	1,020,497	1,470,304	3,027,873	5,071,285
Ending balance	(295,246)	725,251	2,195,555	5,223,428	10,294,713
Total Stockholders' Equity	$ 4,599,737	$ 7,591,142	$ 19,145,091	$ 22,236,955	$ 39,676,291
Shares outstanding	5,122,211	5,922,211	8,657,776	8,458,776	10,676,786

NOTES TO THE FINANCIAL STATEMENTS
December 31, 1991, 1992 & 1993

(1) Summary of Significant Accounting Policies

Business The Company is engaged in the contract manufacturing and testing of products and assemblies for use in the computer, communication, medical, and instrumentation industries.

Revenue Recognition Revenue from product sales to customers is recognized on the unit shipped basis.

Inventories Inventories include material, labor and overhead and are stated at the lower of cost (FIFO) or market. Recoverable costs incurred in connection with the start-up of new projects are deferred, not in excess of estimated realizable value, and amortized over the life of the contract based upon units shipped.

Property, Plant & Equipment Property, plant and equipment are recorded at cost. Depreciation is computed by the straight line method over three years for vehicles, five years for equipment and 19 years for buildings.

Income Taxes The company provides for income taxes based upon pretax income, adjusted for permanent differences between reported and taxable income. Certain items of income and expense are recognized in different periods for financial statement and income tax reporting purposes and a provision for deferred taxes is made in recognition of these timing differences.

Earnings Per Share Earnings per common and common equivalent share are computed on the basis of the number of common and common equivalent shares (stock options) outstanding at the end of the period. Fully diluted earnings per share are considered equal to primary earnings per share in all periods presented because use of the year end market price of the common Stock in determining common stock equivalents results in immaterial dilution.

(2) Inventories

Inventories consist of the following:

	December 31,	
	1992	1993
Finished goods	$ 708,234	$ 953,934
Work in process	6,508,901	9,547,497
Raw materials	13,246,723	17,826,058
Supplies	196,369	204,303
	$20,660,227	$28,531,792

The Company has incurred costs that are assignable to units not yet produced. The aggregate amount incurred, which is included in work-in-process, was approximately $988,000 and $750,000 as of December 31, 1992 and 1993, respectively.

(3) Notes payable and Long-Term Debt
A summary of long-term debt is as follows:

Loan	1992	1993	Collatreral
Economic Development loan 8 1/2%, 120 monthly payments	$ 120,724	$ -0-	equipment
Economic Development loan 8 1/2%, 120 monthly payments	145,037	-0-	equipment
Economic Development loan 11%, 120 monthly payments	435,591	-0-	equipment
Industrial Dev/Revenue Board Bonds 10 yr, rates 6.3 to 8.7%, due quarterly	2,144,881	1,838,500	buildings, equipment
Equipment loan, 5 year variable, monthly payments	3,600,000	-0-	equipment
Equipment loan, prime + 1%, quarterly payments	600,000	-0-	equipment
Revolving line of credit	15,400,000	16,442,500	
Equipment loan, 5 year 10.5%, monthly payments	3,845,406	-0-	equipment
Senior Notes, 10%, 40 quarterly payments beginning 11/30/93	-0-	6,682,014	equipment
Revolving equipment line of credit	-0-	5,000,000	
Total long-term debt	26,291,639	29,963,014	
Current Maturities	(2,207,315)	(753,430)	
Net long-term debt	$24,084,324	$29,209,584	

Maturities of long-term debt for each of the five years succeeding December 31, 1993, are as follows:

Year	Maturities of Long-Term Debt
1994	$ 753,430
1995	801,131
1996	22,351,799
1997	907,802
1998	968,256
Thereafter	4,180,596
Total	$29,963,014

The prime rate was 9.5% at December 31, 1992 and 6% at December 31, 1993. The Company has available a $20 million revolving line of credit bearing interest at an adjustable rate, currently equal to the lending bank's prime rate and which is collateralized by accounts receivable and inventory. At December 31, 1993, the Company had borrowed $16,442,500 under the revolving line of credit. The Company has available a $30 million revolving equipment line of credit bearing interest at an adjustable rate, currently equal to the bank's prime lending rate plus 1/2% and which is collateralized by certain equipment. At December 31, 1993, the Company had borrowed $5,000,000 under the equipment line of credit. Additional borrowings under the revolving equipment line of credit are limited to $7.5 million in 1994, $14.5 million in 1995 and $3.0 million in 1996 with the aggregate of such additional borrowings not to exceed $25 million. Both lines mature on April 30, 1996. At the sender's discretion, the lines may be converted to term loans due in sixty monthly installments plus interest. The agreements require maintenance of certain financial ratios relating to working capital, indebtedness and net worth. Without the prior consent of the banks, the Company is prohibited from paying dividends, incurring debt or other commitments in excess of specified amounts, or entering into acquisition, sales of business or merger agreements. Unamortized debt issuance costs were $95,119 and $322,074 at December 31, 1992 and 1993. The Company is contingently liable under a letter of credit in the amount of approximately $1,920,000 issued by its primary lender as additional collateral for an Industrial Development Revenue Bond. Interest paid was $1,085,517, $1,968,485 and $2,635,863 for the years ending December 31, 1991, 1992 and 1993, respectively.

(4) Common Stock

On June 12, 1991, the Company's stockholders approved a Restated Certificate of Incorporation increasing the number of authorized shares of Common Stock from 10 million to 50 million. On June 23, 1991, the Company completed its initial public offering of Common Stock in which $9,200,000 (net of issuance costs of $1,300,000) was raised from the sale of 2,100,000 shares.

On July 7, 1993, the Company completed a secondary public offering of Common Stock in which $10,738,746, (net of issuance costs of $784,691) was raised from the sale of 1,843,750 shares.

(5) Stock Option Plan

The Company's Employee Incentive Stock Option Plan and 1991 Employee Stock Incentive Plan provide for the granting of options to purchase shares of the Company's Common Stock at not less than fair market value on the date of grant. The stock options issued under the plans are subject to certain terms, conditions, and restrictions. The awards which may be granted include stock options, stock appreciation rights (SAR's) and/or other stock based awards. The plans also provide that if there is a change in control or potential change in control, SAR's and limited SAR's outstanding for at least six months, and any stock options which are not then exercisable will become fully exercisable and vested.

The Company granted certain directors nonqualified options to purchase shares of Common Stock at an exercise price equal to the fair value at the date of grant. The options became fully exercisable on the date of grant and remain exercisable for a period of up to 10 years following that date.

(6) Income Taxes

Total income tax expense consists of the following at December 31,

	1991	1992	1993
Current:			
Federal	$ 811,142	$ 1,659,728	$ 2,220,583
State	90,912	179,975	379,038
	902,054	1,839,703	2,599,621
Deferred:			
Federal	(7,038)	160,567	683,963
State	(795)	17,736	93,940
	(7,833)	178,303	777,903
	$ 894,221	$ 2,018,006	$ 3,377,524

Deferred tax charges of approximately $92,000 are included in other assets at December 31, 1990. Income taxes paid were $1,404,369, $1,024,000 and $2,421,526 for the years ended December 31, 1991, 1992 and 1993, respectively.

(7) Commitments and Contingencies

The Company maintains life insurance policies on the Company's Chairman and President in the amount of $2 million per person. The Company is the designated beneficiary of each of the policies; but has committed to repurchase $1 million of the Company's Common Stock from the estate, personal representative or beneficiary upon the Chairman's or the President's death.

The Company is obligated under an operating lease for an office/warehouse in Reno, Nevada that expires in 1996. The lease requires the Company to pay all executory costs, such as maintenance and insurance. Future minimum lease payments under the noncancelable term of the operating lease are as follows: $586,006 in 1993; $586,006 in 1995; $146,501 in 1996; and none thereafter. The Company is obligated under two operating leases for an office/warehouse in Macon, Georgia. One lease expires in 1994 and the other in 1997. Future minimum lease payments under the terms of these leases are as follows: $374,558 in 1994; $384,667 in 1995; $397,000 in 1996; and $529,328 thereafter. Total future minimum lease payments equal $3,004,066.

The Company's Bylaws provide for indemnification of its officers and directors to the extent permitted by Delaware law. At December 31, 1993, the Company does not have directors and officers liability insurance.

The Company is involved in various legal actions rising in the normal course of business. After taking into consideration legal counsel's evaluation of such actions, management is of the opinion that the outcome will not have a significant effect on the Company's financial position.

(8) Related Party Transactions

The Company purchased electronic components for $1,059,512 and $41,269 during the years ended December 31, 1990 and 1991, respectively, from a company owned by a member of the Company's Board of Directors.

[Participants: please number your analytical review procedures that you would perform.]

ANALYTICAL REVIEW POINTS

No.	Analytical Procedure

Case Questions

1. Do you believe that assets are fairly stated?

_____ Yes _____ No

2. If you had to use a scale of zero to 100, where would you rate the fairness of presentation of total assets?

0. . . . .10. . . . .20. . . . .30. . . . .40. . . . .50. . . . .60. . . . . 70. . . . . .80. . . . . 90. 100
Not Fairly Presented — Fairly Presented

3. Using a like scale, what is your confidence in your assessment of the fairness of presentation of total assets?

0. . . . .10. . . . .20. . . . .30. . . . .40. . . . .50. . . . .60. . . . . 70. . . . . .80. . . . . 90. 100
No Confidence — Complete Confidence

4. Do you believe that the overall financials are fairly stated?

_____ Yes _____ No

5. If you had to use a scale of zero to 100, where would you rate the fairness of presentation of the financial statements?

0. . . . .10. . . . .20. . . . .30. . . . .40. . . . .50. . . . .60. . . . . 70. . . . . .80. . . . . 90. 100
Not Fairly Presented — Fairly Presented

6. Using a like scale, what is your confidence in your assessment of the fairness of presentation of the overall financial statements?

0. . . . .10. . . . .20. . . . .30. . . . .40. . . . .50. . . . .60. . . . . 70. . . . . .80. . . . . 90. 100
No Confidence — Complete Confidence

7. If any of your answers to the above questions were "not fairly presented", please indicate the accounts affected, the direction of misstatement (e.g. over or under), your expectations of the true account balance, how you arrived at that expectation and your reasons for believing the account is not fairly presented

Account Affected	**Direction of Misstatement**	**Expected Balance**	**Reasons for Belief & Method of Calculating Expectation**

Please answer the following questions concerning the **Analytical Review Case** materials.

1. How difficult did you find the case to be?

/--------/--------/--------/--------/--------/--------/--------/--------/--------/--------/

Not Difficult — Extremely Difficult

2. How realistic did you find the case to be?

/--------/--------/--------/--------/--------/--------/--------/--------/--------/--------/

Not Realistic — Extremely Realistic

3. How confident or certain are you of your performance of this task?

/--------/--------/--------/--------/--------/--------/--------/--------/--------/--------/

Highly Confident — Highly Uncertain

4. Do you feel that an audit senior has both the necessary knowledge and ability to successfully complete this task?

/--------/--------/--------/--------/--------/--------/--------/--------/--------/--------/

Definitely has the Knowledge — Definitely does not have the Knowledge

/--------/--------/--------/--------/--------/--------/--------/--------/--------/--------/

Definitely has the Ability — Definitely does not have the Ability

If not, please explain why.

5. Do you believe that it is reasonable for someone at the senior level to be assigned this task?

/--------/--------/--------/--------/--------/--------/--------/--------/--------/--------/

Highly Reasonable — Highly Unreasonable

If not, please explain why.

6. (a) Were any of the instructions in the tasks that were unclear?

Yes No

(b) If so, please identify which instructions were unclear.

7. Is there any other comment you would like to share with the author of this research concerning this task?

APPENDIX C
DEMOGRAPHIC QUESTIONNAIRE

Instructions - Profile Information

There are three parts to this packet. Please complete all three, as the research will not be of any benefit otherwise. Part one is a participant profile questionnaire. Part two is a case profile questionnaire. Part three is a cognitive style profile which will allow me to assess your style of information processing. Once the research is published, there will be no way for any person to know your identity or any other information that is connected to you through these profiles. However, if you would like to know about your processing style, I will send you that information if you will indicate your name and home address at the bottom of this page. Please be assured that none of this information will be seen by anyone except myself. Again, thank you for the time and attention that you have given this research. It is invaluable to me.

Participant Profile Information

1. Approximately how many months have you been employed as an auditor in public accounting?

   _____ months

2. What percentage of your time has been spent on clients with inventory (e.g., manufacturing, wholesale and retail)?

   _____ %

3. What is your gender? _____ Male _____ Female

4. What year were you born? 19____

5. When reviewing a subordinates workpapers, you generally (circle one):

   (a) Start with the subordinate's work and amend as needed.

   (b) Form your own judgment ahead of time and compare it to the subordinate's judgments.

   (c) Other (briefly explain).

6. On what percentage of the audit engagements that you have been associated with was a material error and/or irregularity corrected? _____%

7. How would you rate your ability to evaluate a subordinates workpapers?

   /--------/--------/--------/--------/--------/--------/--------/--------/--------/--------/
   extremely poor — extremely good

8. How would you rate your ability to evaluate the results of ratio analysis and other analytical procedures when used during an audit?

   /--------/--------/--------/--------/--------/--------/--------/--------/--------/--------/
   extremely poor — extremely good

9. During your audit career, what percentage of you time was devoted to clients which:

   (a) were manufacturing companies? _____%

   (b) were publicly held manufacturing companies? _____%

10. Approximately how long has it been since you worked on an audit where an accounting irregularity was found?

   _____ years _____ months

Case Profile Information

Please answer the following questions which compare the **Workpaper & Analytical Review Case** materials.

1. In which case do you believe that an analytic (e.g. a sequential or mechanical) approach towards task solution would be more beneficial to successfully complete the case?

/--------/--------/--------/--------/--------/--------/--------/--------/--------/--------/

Workpaper Review — Analytical Review

2. In which case do you believe that a global (e.g. holistic) approach towards task solution would be more beneficial to successfully complete the case?

/--------/--------/--------/--------/--------/--------/--------/--------/--------/--------/

Workpaper Review — Analytical Review

3. In which case do you believe that is would be more beneficial to break the task into smaller subcomponents in order to successfully complete it?

/--------/--------/--------/--------/--------/--------/--------/--------/--------/--------/

Workpaper Review — Analytical Review

4. In which case do you believe it would be more beneficial to view all pertinent task information sequentially in order to successfully complete the task?

/--------/--------/--------/--------/--------/--------/--------/--------/--------/--------/

Workpaper Review — Analytical Review

5. In which case do you believe it would be more beneficial to view all pertinent task information simultaneously in order to successfully complete the task?

/--------/--------/--------/--------/--------/--------/--------/--------/--------/--------/

Workpaper Review — Analytical Review

6. Which case do you believe is a more subjective type of task?

/--------/--------/--------/--------/--------/--------/--------/--------/--------/--------/

Workpaper Review — Analytical Review

7. Which case do you believe is a more objective type of task?

/--------/--------/--------/--------/--------/--------/--------/--------/--------/--------/

Workpaper Review — Analytical Review

At this point the *Myers-Briggs Type Indicator* was administered. It is widely used and a reliable normal personality inventory. It was used to in this research to measure each participant's cognitive style. Because it is copyrighted, it has not been reproduced in this appendix. It is obtainable from Consulting Psychologists Press, Inc., 3803 East Bayshore Road, P.O. Box 10096, Palo Alto, CA 94303.

APPENDIX D
HUMAN SUBJECTS APPROVAL

Institutional Review Board (IRB)
Vice President for Research and Strategic Initiatives
Arizona State University

Box 878206
Tempe, AZ 85287-8206
602/965-6788 FAX: 602/965-7772

M E M O R A N D U M

August 3, 1995

TO: Steve Kaplan
Accountancy

FROM: Carol Jablonski
Human Research Coordinator

SUBJECT: "Differential Performance between Audit Tasks as a Function of Individual Differences" HS #03493-96

The Human Subjects Institutional Review Board has approved your above-referenced application for the conduct of research involving human subjects on August 2, 1995.

The IRB would like to remind you that Federal regulations require investigators to immediately report to the board any complaints, incidents, or injuries that may occur as part of the project.

Project directors are responsible for maintaining auditable files. Please sign below indicating your willingness to comply with these procedures, and return one copy with original signature to me at the Office of Human Research Administration (mail code 8206) for our files.

kh

xc: Lori Fuller

Signature

8-7-95
Date