

AUDITOR DECISION PROCESSING AND THE  
IMPLICATIONS OF BRAIN DOMINANCE:  
A PREDECISIONAL BEHAVIOR STUDY

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## CHAPTER I

### INTRODUCTION

#### Statement of Problem

One problem facing the accounting profession is improving the quality of decisions relating to the auditing environment [Libby, 1981; Joyce and Libby, 1982]. Human information processing (HIP) is an area of behavioral research that focuses on human judgment and human information usage as it relates to auditor decision making and the improvement of auditor judgment. Although this area of research has grown in popularity since the middle 1960's, much remains unknown about the way in which auditors make decisions. Of the behavioral accounting research conducted to date, the results suggest that the quality of decision making in the auditing profession is affected by both inconsistencies among auditors in making specific judgments [Ashton, 1974; Joyce, 1976] and auditors' reliance on heuristics during the decision-making process [Joyce and Biddle, 1981a; 1981b]. However, as the profession strives to improve the quality of judgments, researchers continue their efforts to obtain additional knowledge about the behavior of auditors.

The purpose of this study is to examine some behavioral aspects, specifically those of auditors' thought processes. This research may help to explain the reasons for the inconsistencies suggested by the results of earlier studies.

The behavioral studies of HIP research investigate the practices of auditors under various decision situations. Primary studies can be categorized into three specific areas: (1) probabilistic judgment, (2) policy-capturing, and (3) predecisional behavior [Joyce and Libby, 1982]. Probabilistic judgment research investigates whether decision makers follow the rules of statistical decision theory. Studies in policy-capturing attempt to build predictive models which capture the factors used by auditors in making decisions. Research in predecisional behavior examines the thought processes that auditors use before making the actual decision. All three areas are important in understanding an individual's decision-making behavior.

As described by Libby [1981], many accounting studies have relied on the psychological literature as a basis for exploring behavioral topics that relate to accounting [Hoffman, et.al., 1968; Tversky and Kahneman, 1972; Newell and Simon, 1972; Slovic, et.al., 1977; Einhorn, et.al., 1979]. In fact, behavioral decision theory is a branch of psychology that attempts to answer questions requiring descriptions of individual behavior. The emphasis of this type of research is on describing actual decision behavior, evaluating the quality of decisions, and developing theories

relating to the psychological processes which affect an individual's decision behavior.

Since an important part of auditors' responsibility in practice is dependent upon individual behavior, accounting researchers have pursued many of the topics addressed within behavioral decision theory. For example, many of the accounting studies focusing on probabilistic judgment have examined the effects of heuristics on decision making [Joyce and Biddle, 1981a; 1981b; Johnson, 1983]. Generalized results indicate that accountants develop their own unique "rules of thumb" in an effort to make complex decision tasks cognitively tractable. Additionally, the decisions are made in a manner different from that which would be predicted by statistical decision theory, e.g. the Bayesian model.

Another area of HIP literature that has relied on prior psychological research is policy-capturing. The lens model framework [Brunswick, 1952] has played a critical role in identifying the characteristics of auditor judgments in decision making [Ashton, 1974; Ashton, 1985; Boatsman and Robertson, 1974; Joyce, 1976] and has been applied in empirical studies that focus on the consensus of auditor judgment and the consistency of those judgments over time. Results indicate that there is a lack of consensus among auditors in making certain decisions [Joyce, 1976; Joyce and Biddle, 1981].

The psychology literature that examines the cognitive processes of how people solve complex problems also has laid

the groundwork for research in the area of predecisional behavior [Newell and Simon, 1972; Einhorn, et.al., 1979; Einhorn and Hogarth, 1981]. There are few accounting studies in this area. Perhaps this lack of research is due to the difficulties associated with limitations of the measurement methods that are available to the researcher of predecisional behavior. Although generalized results are presently vague, results of research do indicate that information search and evaluation require a significant portion of an individual's decision process [Biggs and Mock, 1983]. There is also some evidence that individual auditors do not use the same information search procedures [Mock and Turner, 1981; Biggs and Mock, 1983; Biggs, et.al., 1988], which may be a factor that leads to different auditor decisions. Of the three behavioral areas described above, each body of literature has as its primary objective the improvement of auditor judgment, with particular emphasis on the quality of those judgments.

#### Research Objective

Following the established pattern of reliance on the psychology literature, this study focuses on the area of predecisional behavior in an effort to expand on the limited results that are currently available. Utilizing the methodology known as "verbal protocol analysis," the results of this research technique were examined from a novel perspective based on the psychology concept of cerebral



dominance [Sperry, 1964]. The concept of cerebral dominance, or brain dominance, has been the focus of several studies in the psychology literature [Springer and Duetsch, 1981; Ornstein, 1978; Levy, 1983; Gazzaniga, 1970]. Research indicates that brain dominance plays a role in an individual's decision-making process. Some researchers of brain dominance even suggest that "whole thinkers" (who do not exhibit a particular brain dominance) may produce better decisions and thus are more capable of holding higher-level positions within an organization [Mintzberg, 1976; Taggart and Robey, 1981; Wonder and Donovan, 1984; from an interview with Ned Herrmann in Discover, 1985].

Specifically, the study addresses the following research objectives:

- (1) To evaluate the thinking style (i.e. left-brain dominant, right-brain dominant, or whole-brain) of auditors holding different ranks within a CPA firm.
- (2) To examine the thought processes of auditors during decision making and determine if there is a significant difference between these processes depending on the individual's brain dominance and rank within the firm.

Although existing evidence suggests that brain dominance plays a role in the decision-making process, this concept has not been applied to accounting research. The primary objective of this research, therefore, is to investigate the brain dominance of auditors and any effect it may have on auditors' decisions, which, in turn, may offer an insight into factors explaining inconsistencies among auditors' decisions.

Practicing auditors served as subjects for this study. Initially, the selected subjects were tested for hemispheric preference. Once tested, each subject was given a decision task whereby he/she was asked to recommend the extent of substantive testing that would be necessary in the audit of a firm's internal controls. As the subjects made their decisions, they were asked to "think aloud". Their verbalizations were recorded on a tape recorder. Finally, these verbal protocols were coded and categorized into predetermined operators in order to identify specific decision processes and determine the effect, if any, that brain dominance had upon his/her audit judgment.

The following chapter reviews the protocol analysis research and the predecisional behavior literature that has been conducted to date. In addition, a review of the cerebral dominance research is provided including a description of the various methods available for measuring hemispheric preference. The following chapters present the methodology for the current study, and provide the results for the brain dominance and protocol analyses. The final chapter includes both a summary of the study along with a discussion of possible extensions for future research.

## CHAPTER II

### REVIEW OF LITERATURE

The review of the literature will consist of three segments: protocol analysis, predecisional behavior, and cerebral dominance literature. Prior to reviewing the literature of predecisional behavior, a brief overview of the protocol methodology (which is predominant in this behavioral research) is provided along with a review of the non-accounting literature relating to protocol analysis. In the second segment, a review of the predecisional behavior studies that have been conducted in accounting is provided, while the last segment reviews the cerebral dominance research that is relevant to the present study.

#### Protocol Analysis

Verbal protocol analysis is the most prominent methodology used by researchers to evaluate an individual's thought processes with respect to information acquisition and decision making. This process-tracing technique requires subjects to verbalize their thought processes or "think aloud" as they complete a decision task, thereby allowing researchers to gain insight into the subject's information search and evaluation processes. The

verbalizations are recorded and interpreted in an effort to construct a description of the subject's judgment process.

#### Non-Accounting Protocol Research

Payne [1976] examined two process-tracing techniques (explicit information search and verbal protocols) in an effort to examine the information processing strategies subjects use in reaching a decision. He concluded that most of the research on decision behavior has focused on data which reflect only the end product of the decision processes. Thus, Payne's objective was to provide insights into the information processing strategies of individuals in a decision-making situation rather than to examine the individual's final decision.

In conducting the experiment, student subjects were provided with information relating to various apartments and then asked to choose among the alternatives. While making their selections, subjects were asked to "think aloud" as they proceeded with the decisions. The results indicated that when subjects were faced with a complex (or multialternative) decision task, they employed decision strategies designed to eliminate some of the available alternatives as quickly as possible utilizing a limited amount of information search and evaluation. However, when faced with a two-alternative situation, the subjects employed search strategies consistent with a decision process that evaluates each alternative separately. The

overall results indicated that the amount and method of information processing leading to a choice varied as a function of task complexity.

Payne, Braunstein, and Carroll [1978] indicated that verbal protocol analysis may be useful in (1) an exploratory sense, (2) a supplementary way, (3) the testing of hypotheses about information search and selection and (4) the building and testing of decision-making models. In their study, the authors observed a trend of research that places emphasis on the understanding of the psychological processes underlying observed judgments. In an effort to examine decision making from an information processing perspective, they attempted to illustrate how the process-tracing techniques of cognitive psychology can be applied to this research. The focus of their study was the technique of verbal protocol analysis and the analysis of information search measures. The results of the study indicate that the technique may prove more valuable as the experimental decision task becomes more complex. However, since the analysis provides researchers with a large amount of data, the time required to evaluate the data leads researchers to the limitation of utilizing few subjects.

Within the HIP theoretical framework, Ericsson and Simon [1980] proposed that verbal reports are data even though some schools of thought have been uncertain about the status of verbalizations as data. In fact, Ericsson and Simon argued that modern psychology has been vague about the

use that can be made of verbalizations produced by subjects in a decision-making situation. In an effort to support verbalizations, they discussed the different types of processes underlying the methodology. In the study, they presented a model of how subjects verbalize information. The focus was on the information that individuals attend to in short-term memory. The results of their analysis suggested that verbalizing information affects cognitive processes only if the instructions required subjects to verbalize information that would not otherwise be given attention. Their analysis also suggested that the reason prior studies have had difficulties in obtaining accurate reports from verbal protocols is that the requested information in those studies required subjects to infer rather than remember their mental processes. They suggested that if requested information contains only that which is directly heeded, then verbalized information can be reliably reported.

#### Limitations of Protocol Analysis

A limitation of protocol analysis is the utilization of few subjects due to the time and cost constraints of coding the verbalizations. In addition to this limitation, Einhorn, Kleinmuntz, and Kleinmuntz [1979] identified two significant problems of the analysis technique:

- (1) the degree to which verbal reports access cognitive processes (or cannot access)

- (2) the ability (or inability) of the experimenter to adequately translate the verbal reports.

Although they recognized the above limitations, the authors argued that process-tracing models capture the basic nature of the judgment process. Ericsson and Simon [1980] agree and suggest that problems with the analysis relate to retrospective verbal reports rather than concurrent verbal reports. By obtaining reports during the performance of the task, the subjects' cognitive processes are less likely to be affected. Subjectivity of coding procedures, however, remains a problem but may be controlled by specifying coding procedures in advance.

While the discussion of protocol analysis in a non-accounting setting is not all-inclusive, it is indicative of the usefulness of the methodology in examining the information search and selection processes of a decision maker. In the next subsection, the predecisional behavior research will be reviewed. Included is an examination of those accounting studies that have utilized the protocol methodology.

#### Predecisional Behavior

Research in predecisional behavior attempts to obtain insight into the auditor's process of making judgments prior to the final judgment. While much of the previous research in HIP has placed an emphasis on the decision itself [Ashton, 1974; Joyce, 1976; Ashton and Kramer, 1980], a lesser portion has focused on the evidence-gathering

processes leading to the auditor's final decision. The development of this accounting research, which utilizes the protocol methodology, is in its early stages. A few studies, however, have been conducted and are reviewed in the following discussion.

#### Predecisional Behavior Research

Early accounting studies of predecisional behavior examined the decision processes of financial analysts [Clarkson, 1962, Biggs, 1979; Bouwman, 1980]. Results indicated that constructed behavior models based on the analysts' verbalizations were accurate in terms of predictive ability. Results also suggested that the decision processes of financial analysts differed depending whether or not he/she was an expert and or a novice.

Mock and Turner [1981] indicated that most internal control evaluations are represented by a simple linear decision rule. These simple models, however, may not represent decisions involving judgments that seem highly complex. The authors criticized linear models for not capturing the way in which individual subjects actually process information in making their judgments. As an alternative methodology, they suggested verbal protocol analysis because models of a subject's problem-solving behavior may be developed from the verbalizations. Thus, as subjects completed complex experimental tasks (similar to



those of practicing auditors), their step-by-step information processes may be traced.

Based on this reasoning, Mock and Turner utilized the protocol research technique on four subjects who were asked to prepare recommendations concerning the nature, extent, and timing of substantive procedures. The results indicated that three general categories of operators were used by subjects. These included information search, analytical, and choice. Approximately 93 percent of the subjects' activities were directed toward information search as they focused on each audit procedure and on an understanding of the accounting system.

Prior to applying the protocol analysis in their study, Mock and Turner conducted an experiment involving the same auditing task but applying an ANOVA methodology. In this version, 200 audit seniors and supervisors were presented with the cases containing information on improvements in internal accounting controls. Subjects were required to adjust the planned sample size for four auditing procedures. The design included assigning subjects to the cases and systematically varying both (1) changes in internal accounting controls and (2) guidance provided to the subjects concerning their evaluation of internal accounting control. Detailed data were provided about sample size decisions and documentation of decision rationales. Analysis of the documentation indicated that there was considerable variability in auditors' decisions, but only 24

percent of the variability was explained by the two experimental treatments. One treatment involved changes in internal accounting controls where controls improved in all the cases but more so for the strong treatment than for the fair treatment. The second treatment involved a variation in the amount of guidance that was provided to the subject in a decision task.

Biggs and Mock [1983] extend the research of Mock and Turner by analyzing the results obtained from the protocol analysis to investigate information-processing behavior. The purpose of their analysis was to identify the elements of each subject's cognitive representation of a task and provide insight into why the decisions of the Mock and Turner study were variable.

The experimental task was the same as that employed by Mock and Turner and involved four experienced senior auditors. A collection of the operators utilized by the subjects was obtained by a tape recording of their verbalizations. An examination of these operators indicated that information search and evaluation demanded a significant portion of the decision process. Since the subjects' responses were analyzed individually, the protocol technique allowed the researchers to identify why the auditors made their decisions, thus explaining the variability obtained by the earlier study. Basing their conclusions on the results of only four subjects, however, was a limitation of the study.

In a more recent study, Biggs, Mock, and Watkins [1988] investigated how auditors perform judgmental analytical review in a complex and realistic task setting. Utilizing the protocol methodology, they examined the differences in analytical review judgments and procedures of auditors with differing levels of experience, e.g. managers, seniors.

Participating in two sessions, four subjects were initially provided with a comprehensive audit case and were asked to review the case and prepare a program of analytical review procedures. At that time, subjects prepared a list of analytical review information made available to them during the second session. Along with the requested information, subjects reviewed a planned audit program for the case firm, and the planned substantive audit program was evaluated with respect to nature, timing, and extent.

Consistent with the previous research on experts and novices, the results indicated that differences exist in information acquisition between the seniors and managers. For example, experts (i.e. managers) tended to have internal schemata (problem representations in memory) while novices (i.e. seniors) did not exhibit well-developed internal schemata [Chi, Glaser, and Rees, 1981]. In evaluating the case, seniors spent much of their information acquisition activity referring back to instructions while managers made decisions after reviewing the instructions once. Additional results indicated that neither the managers nor the seniors used probabilistic reasoning in making their judgments.

Research in the area of predecisional behavior is limited, although generalized results suggest that an auditor's thought processes during decision making can be categorized into basically three areas: information search, analytical, and choice. Results also suggested that subjects tend to direct most of their attention to information search as indicated by the feedback obtained through the verbal protocols. A review of this literature, however, indicates the need for additional research that examines the information search and selection processes since the results are somewhat vague and inconclusive.

Based on this need, this study is primarily an extension of the Mock and Turner [1981], Biggs and Mock [1983], and Biggs, Mock, and Watkins [1988] studies in that it examined the thought processes of auditors while making a substantive testing decision but varied in that it used a larger sample size. It also differs from prior studies in that it examined the impact an auditor's brain dominance has upon his/her thought processes. Although there are unresolved methodological problems, predecisional behavior research does provide information concerning sequential measures of decision behavior and thus provides more detailed insight into the decision-making process. The next section discusses cerebral dominance and the alternative methods for measuring hemispheric preference.

## Cerebral Dominance

Since the term "cerebral dominance" is new to accounting research, a definition of the concept along with an introduction of related terminology is provided. This is followed by a discussion of "whole-brain thinking."

### Concept Defined

Cerebral dominance (also referred to as brain or hemispheric dominance) is a concept that describes the relationship between the two hemispheres of the brain. Researchers have gathered an abundance of evidence indicating that the two hemispheres of the human brain are specialized to perform different cognitive functions [Springer and Duetsch, 1981]. In fact, two prominent researchers in this area, Roger Sperry and Robert Ornstein, have discovered that an independent stream of consciousness resides in each hemisphere. These two sides of an individual's brain (i.e. two brains) are linked by a complex network of nerve fibres referred to as the corpus callosum. Each side deals with different types of mental activity. Individuals are classified as either right- or left-brain dominant dependent on which hemisphere most often guides the individual's behavior. Research indicates that the left hemisphere treats stimuli serially (i.e. separately, in a series) whereas the right hemisphere processes stimuli many at a time as a gestalt (i.e. in unity, as a whole). Because of this difference, the left hemisphere is involved with

analytic processes such as functions of language, reasoning, logic, and mathematics while the right hemisphere directs the creative, artistic, musical, emotional, and non-verbal or spatial tasks.

### Whole-Brain Thinking

According to Wonder and Donovan [1984], "whole-brain thinking" is the concept of mixed dominance. Individuals who exhibit holistic thinking preferences have refined talents in both hemispheres and the ability to shift appropriately between them. These individuals use an integrated thinking style with the possibility of being rational or spontaneous, analytical or intuitive, self-reliant, and self-trusting. They are able to tap into their inner sources and creativity [Sonnier, 1985].

While there are some mixed dominants who do not develop clear brain lateralization, i.e. dyslectic and indecisive individuals, others are highly lateralized and perform in the task-appropriate hemisphere depending on the needed skills. Some whole thinkers develop a more generalized thinking style and perceive the whole scene, not just the task at hand. According to Wonder and Donovan [1984], most modern cultures encourage a pattern of lateralization in men and generalization in women.

In the United States, our society tends to reward the individual with left-brain skills. "Money, technology, efficiency and power are thought to be the rewards of left-

brain planning" [Wonder and Donovan, 1984, p.14]. This encouragement to develop left-brain processes may result at the expense of one's right-brain qualities. For example, Black and Hispanic groups generally have right-brain preferences [Wonder and Donovan, 1984]. In an effort to become successful and hold high-status positions, these minority members have acquired the left-brain skills and preferences necessary to meet communication, social, and financial barriers.

Wonder and Donovan [1984] argued, however, that successful managers and entrepreneurs have learned how and when to use both sides of their brain. These managers combine detail and logic with a sense of overview and invention. For example, one reason for the success of the Japanese management techniques is due to their holistic talents. These talents have even been recognized by accounting researchers as being superior to those of American management [Johnson and Kaplan, 1987].

Mintzberg [1976] discussed the logical and nonlogical processes that form the decision-making abilities of a manager. He suggested that good planners tend to exhibit the strengths of the left hemisphere while good managers exhibit the strength of the right. For either to become more proficient, individuals need to overcome hemispheric biases and draw at will on the processing style appropriate to the circumstances. This research implies that whole-

brain thinking is necessary for those who desire increased career success.

Suggesting that managers should become more "whole-brained" in their approach to problems, Taggart and Robey [1981] developed a HIP framework in an effort to provide alternative managerial approaches. Recognizing that the current educational system encourages and rewards left-hemispheric skills, they recommended that aspiring managers improve right-hemisphere decision skills while retaining those of their left brain. To be an effective manager, they argued that a balanced use of both cerebral hemispheres is necessary. Taggart, Robey, and Kroeck [1985, p.190] supported this argument and state, "managerial tasks commonly call for use of the whole brain." They stressed that managers should be educated in the use of their whole brain in an effort to prepare them for the complex tasks they will face in the future.

Ned Herrmann, a management educator who has pioneered research on hemispheric dominance and has designed the Herrmann Brain Dominance Instrument (HBDI) used for testing brain dominance, established Applied Creative Thinking (ACT) seminars in an effort to teach participants to expand their creative-thought processes. During his seminars, participants reach their creative potential by developing a "whole-brain" approach to thinking. While promoting creativity, Herrmann emphasized that the term encompasses more than simply artistic imagination.



Creativity can be thought of as a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, etc.; identifying the difficulty; searching for solutions, making guesses, formulating hypotheses about the deficiencies; testing and retesting these hypotheses and possibly modifying and retesting them; and communicating the results [from G.E. Monogram, November-December, 1980, p. 30].

He suggested that the key to achieving creative potential is to use both one's analytical and logical strengths as well as one's artistic and emotional resources. In other words, the whole approach to creativity is the right-hemisphere/left-hemisphere model of the human brain. Herrmann's model is quadripartite in that two types of dominance are designated for each hemisphere:

- (1) cerebral left: the analytical, logical, problem-solving person;
- (2) lower left: the reliable, organized, controlling, conservative person;
- (3) cerebral right: the creative, conceptual, synthesizing person; and
- (4) lower right: the interpersonal, emotional, sensitive, musical person.

Herrmann suggests that creativity is whole-brained and, for an individual to use his brain creatively, he needs to draw from all four parts. At the same time, it is necessary that these parts work together cooperatively as opposed to allowing a particular brain dominance to guide thought processes [Policoff, 1985]. The overall benefit of this whole-brained approach is not only an expansion of creative-thought processes but also the improvement of problem-solving ability.

## Measuring Cerebral Dominance

There are several methods available for measuring an individual's cerebral preferences. These include physiological state indicators, psychological tests, and self-description inventories that measure an individual's stated preferences. Specific testing instruments include electroencephalograms (EEG), the embedded figures test (EFT), the Vasarhelyi questionnaire, the Myers-Briggs Type Indicator (MBTI), the Herrmann Brain Dominance Instrument (HBDI), the Kolb Learning Style Inventory, and the "Your Style of Learning and Thinking."

With the exception of the EEG, researchers have extensively examined the reliability and validity of only the HBDI, MBTI, and EFT instruments. Therefore, a description of only these four instruments will be included.

Electroencephalograms. Electroencephalographic (EEG) techniques have been useful in the study of hemispheric processing. Since the brain continuously emits low frequency electrical signals, it is possible to record this activity by placing electrodes on each side of a person's head. Researchers measure an individual's hemispheric activity while engaged in a task by examining his EEG wave pattern of alpha frequency. This is accomplished by comparing the ratio of alpha components (relaxed wakefulness) of the two hemispheres. The results of this research are consistent with the pattern of hemispheric

specialization that was previously described, in that the left hemisphere is predominantly involved with analytical processes and controls speech while the right hemisphere controls the creative and artistic aspects of an individual. Although EEG techniques are very time consuming and expensive, this instrument has been used to isolate hemispheric activity for both logical and spatial tasks [Butler and Glass, 1974; Galin and Ellis, 1975].

The Herrmann Brain Dominance Instrument. The HBDI is a pencil and paper questionnaire that was developed by Ned Herrmann and is used by researchers to determine an individual's right- or left-hemisphere dominance and whether or not he/she exhibits a whole-brain thinking style. Developed on the basis of practical application and continuing empirical research over a period of years, this diagnostic tool includes questions about work and play, biographical material, questions on hobbies and values, an introversion/extraversion scale, and additional questions aimed at identifying one's mode of thinking [see Appendix A]. The preference profile is interpreted in conformity with a four-quadrant model, "ABCD", where "AB" and "CD" represent the left and right brain quadrants respectively. Therefore, two types of dominance, i.e. upper and lower quadrants, are specified for each hemisphere. For example, an individual may have a 1133 profile, suggesting a left-dominant thinking preference or a 1111 profile indicating a whole-brain thinker. When scored with an approved scoring

method, the HBDI provides a valid, reliable measure of human mental preferences. (The HBDI method of hemispheric scoring is described in detail in Chapter III).

The validity of the HBDI has been examined by Schkade and Potvin [1981] and C. Victor Bunderson [1987], researchers at The University of Texas at Arlington and President of the WICAT Education Institute, respectively. Schkade and Potvin [1981] examine cognitive style, EEG waveforms, and multiple brain levels consistent with the concept of triune human brain levels, i.e. cerebral, limbic, and reptilian.

The outer brain is the intellectual cerebral cortex with its specialized hemispheres. The middle level is the limbic system that processes emotion. The inner level is the so-called reptilian brain, the most primitive part [Schkade and Potvin, 1981, p.330].

In their study, the participants were limited to accountants and artists. An EEG analysis, which examines primarily the cerebral cortex brain level, was performed. Based on each groups' EEG wave patterns, the results indicate that accountants and artists have very different cognitive styles and that these are manifested physiologically. The findings also suggest that persons in each of these two career areas chose career fields that reflected their hemisphere dominance.

The next stage of their research included the validation of the HBDI to determine whether the instrument indeed measures what it purports to measure. As previously mentioned, the HBDI is designed to determine an individual's

right- or left-thinking preference while also designating two types of dominance for each hemisphere. Additionally, this instrument considers emotions which are processed in the lower right hemisphere. Since it captures emotional processes, the HBDI seeks to obtain information not only on the cerebral brain level but also on the limbic level as well. Schkade and Potvin [1981] reported that the HBDI identifies hemisphere and limbic activity by individuals:

The EEG data in our analysis supports the validity of Herrmann's test for identifying hemisphere dominance of individuals. The subjects demonstrated physiologically (in terms of hemisphere EEG power ratio) precisely what the Herrmann test predicted for brain dominance [Schkade and Potvin, 1981, p.331].

Thus, the HBDI appears to be a valid measure of cognitive style. In addition, the HBDI is less costly and more convenient to administer.

Bunderson [1986] examined the validity and reliability of the HBDI. Specifically, he investigates the following questions:

- (1) Is the quadrant model of brain dominance supported by research data?
- (2) Is the instrument a good way to quantify and thus make evident the underlying preferences for different ways of using the brain?
- (3) Is a particular application of the scores appropriate and valid?

Prior to addressing the above questions in his study, the constructs measured by the instrument are described in detail along with the nine main scores that are derived from the HBDI. These include left and right dominance, the four

quadrant scores, cerebral and limbic preferences, and introversion/extraversion. In addition, minor scores and "whole-brain" constructs are a by-product of the preference profile.

1. Left/Right Brain Dominance. Two overall scores indicating left- or right-brain dominance are provided by the HBDI without making a distinction between the cerebral and limbic preferences.
2. The Four Quadrant Constructs. Individual preferences for the four quadrant constructs (as previously described) are provided.
3. The Cerebral/Limbic Scores. Two scores are provided which statistically combine the left and the right cerebral for an overall cerebral score, and the left and the right limbic for an overall limbic score. The cerebral (upper) is a combination of upper left and right hemispheres. The limbic (lower) is a combination of lower left and right hemispheres.
4. Introversion/Extraversion. This construct refers to the extent to which an individual prefers to look within (introvert) for information about the world versus looking outside (extravert). This dimension is highly correlated to the MBTI.
5. Minor Scores. These minor constructs provide additional diagnostic information such as an individual's receptiveness to or acceptance of experiences processed by the less preferred quadrant.
6. The "Whole-Brained" Construct. This construct refers to brain processes that are utilized situationally. In other words, the person's dominance pattern is quadruple dominant.

Test-retest reliabilities for 78 repeated measures of the same persons in a large data set were conducted for the above constructs. Consistent results were obtained for all except the "whole-brain" construct. This construct acknowledges that a person's brain dominance scores can

change over time but the overall pattern appears to be fairly stable. This result can be explained in that an avoided brain quadrant may become more used through a conscious whole-brain effort.

In an attempt to examine the validity of the HBDI, Bunderson [1986] compared the results of recognized human trait measurements to those of the Herrmann instrument. These measurements included instruments that assess personality, cognitive abilities, learning styles, and learning strategies. Selected from various backgrounds and careers, 143 participants completed 15 instruments. Results of these profiles suggest that the HBDI displays four stable, discrete clusters of preference which are compatible with the previously mentioned four-quadrant model. The scores derived from the instrument are valid indicators of the four clusters. In addition, the scores permit valid inferences about a person's preferences and avoidances for each of these clusters of mental activity.

In terms of appropriate uses of the HBDI, Bunderson emphasized that the validity of the instrument depends upon honest responses from each respondent. It is probable that a coached person could influence the scores if detailed information about the profile construct were provided. Users of the HBDI must be certified to administer the profile in an effort to provide a reliable and valid preference analysis and to meet professional standards as

established by the American Educational Research Association.

The Myers-Briggs Type Indicator. The MBTI is an instrument available to researchers used to test cognitive style. It was developed by Isabel Briggs Myers and is based on the theory of Carl Jung [1923] which states that random variation in human behavior is actually orderly and consistent. This is due to the observation that basic differences exist in the way in which people prefer to use perception and judgment in their daily lives.

The underlying assumption is that every individual has a natural preference for relying on either "perception" or "judgment" and if these individuals differ systematically in what they perceive, they may, as a result, show differences in their interests, responses, values, needs, and motivations. If an individual relies on perception, he/she is focusing on the processes of becoming aware of things, people, occurrences or ideas. If one relies on judgment, his/her cognitive processes focus on conclusions about what has been perceived.

Continuing with this concept, the MBTI is a self-report inventory which measures not only the variables suggested by Jung [1923], (i.e. perception and judgment), but also aims to ascertain people's basic preference for extraversion-introversion, sensing-intuition, and thinking-feeling. These preferences structure the individual's personality. The purpose of the Indicator is to provide separate indices



for each of the above-mentioned scales thereby allowing the researcher to isolate personality preferences. This in turn may provide an individual with information that is valuable in making decisions relating to vocation, counseling, and personnel selection. It may also be utilized as an instrument for testing hemispheric specialization [Taggart and Robey, 1981], as will be its purpose in the current study. These characteristics can be seen in Figure 1 below.

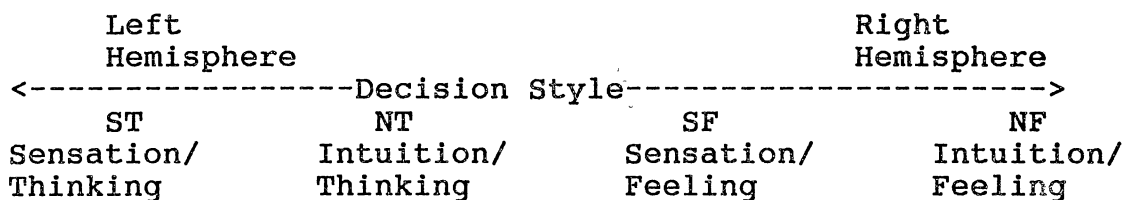


Figure 1. Hemispheric Specialization

Similar in format to the HBDI, the Myers-Briggs is a pencil and paper questionnaire aimed at determining the four personality scales as previously described [see Appendix B]. The questions are set up in a force-choice format with one answer weighted in favor of one of the eight preferences and the other weighted in favor of the opposite preference. Points for each preference are totalled resulting in eight numerical scores. These are interpreted as four pairs of scores with the preferred trait being the larger score of the pair. Individuals are finally classified as one of 16

possible types. For a summary showing the effects of the combinations of all thinking preferences, see Appendix C [Meyers, 1962].

An assessment of the MBTI has been completed by Carlyn [1977] which includes an extensive review of inter-correlation studies, reliability studies, and validity studies conducted with the Indicator. She also examined the independence of the EI, SI, and TF scales along with their consistency with the theory of Carl Jung. On the basis of results of Stricker and Ross [1963], Webb [1964], and Stricker, Schiffman, and Ross [1965] it can be concluded that the scales appear to be relatively independent of each other and in conformance with Jung [1923].

In terms of reliability, Carlyn reviewed studies by Stricker and Ross [1963], Webb [1964], Myers [1963], Hoffman [1974], Levy, Murphy, and Carlson [1972], Stalcup [1968], and Wright [1966]. Specifically, she examined the internal consistency of type-category scores of the MBTI along with the stability of the measures. Conclusions concerning internal consistency are supported by reliability estimates derived with phi coefficients and estimates derived with tetrachoric coefficients. Results indicated the type-categories appear to be satisfactory although there may exist a wide range between conservative and liberal estimates of internal consistency. Test-retest data for the MBTI type-category scores indicated that in every case the

proportion of agreement was significantly higher than would be expected by chance.

In examining the validity of the indicator, studies by Bradway [1964], Stricker and Ross [1964b], Goldschmid [1967], Conary [1966], Ross [1966], Webb [1964], Madison, Wilder, and Suddiford [1963], and Richek and Bown [1968] were reviewed. Of the studies that examined the Indicator's ability to predict choice of major and success in college, the results indicated that the MBTI has moderate predictive validity in certain areas although combining all four type categories generally had greater predictive validity than did individual scales. Researchers used factor analysis to investigate the construct validity of the indicator and each of the study results tended to lend support to the MBTI. Overall results indicated that the individual scales of the MBTI measure important dimensions of personality similar to those postulated by Jung. In addition, the findings indicated that MBTI scores appear to be a reasonably valid instrument which is potentially useful for a variety of research purposes.

Embedded Figures Test. The Embedded Figures Test [EFT], published by Witkin, Oltman, Ruskin, and Karp [1971], measures an individual's ability to break a complex figure into its simpler parts. It was originally conceived as a test of perception but has since been used as an instrument for measuring analytic ability. Two behavioral styles of perceiving called field dependence and field independence

are revealed through completion of the EFT tasks. Each participant is previously shown a complex figure and is asked to describe it in any way he/she wishes. Next, a simple figure is displayed with its size and shape specifically pointed out by the EFT administrator. At this time, the complex figure is once again presented and it contains the simpler shape but in a hidden or "embedded" fashion. Scoring is based on the number of correct embedded figures that the subject locates or on the amount of time it takes to complete the task. In other words, the EFT reflects the extent of competence at perceptual disembedding.

Several study results have validated the concept that the EFT is a test of field dependence and field independence in perception [Gardner, et.al, 1960; and Witkin et.al., 1962; Mock, et.al., 1972]. Specifically, these studies are representative of the literature that used the individual EFT to assess field dependence. The results of these studies provide evidence that performance in the EFT is related to performance in a variety of other perceptual tests which involve the ability to overcome an embedding contest and to perform in a variety of intellectual tasks which involve the same ability.

#### Summary

In the literature reviewed, the results suggest that protocol analysis is a useful methodology in both non-

accounting and accounting studies of predecisional behavior. Currently, there are only a few accounting studies that have examined the thought processes of auditors, and generalized results are presently vague.

The cerebral dominance research suggests that individuals may be right-, left-, or whole-brain dominant, but as decisions become more complex, successful decision makers are forced to rely on both cerebral hemispheres as a whole. In addition, several valid and reliable instruments are available to determine an individual's cognitive style. Two of these instruments, the HBDI and the MBTI, were selected for this study in an effort to obtain a verifiable measure of the auditors' brain dominance. Other alternative testing instruments were excluded as the HBDI and the MBTI provide reliable measures and the other methods are either too costly or too time consuming to administer.

As discussed in Chapter I, the primary objective of this research was to investigate the brain dominance of auditors and any effect it may have on auditors' decisions. The next chapter will describe in detail the methodology for examining brain dominance and provide the results of that study.

CHAPTER III  
METHODOLOGY AND RESULTS FOR  
BRAIN DOMINANCE

Overview

Practicing auditors served as subjects for this study. The selected subjects initially were tested for hemispheric preference. These results will be summarized in a subsequent section of this chapter. Once tested, each subject was given a decision task whereby he/she was asked to recommend the extent of substantive testing that would be necessary in the audit of a firm's internal controls. As the subjects made their decisions, they were asked to "think aloud." Their verbalizations were recorded on a tape recorder. Finally, these verbal protocols were analyzed in order to determine the effect, if any, that brain dominance had upon his/her decision processes. These results will be discussed in Chapter IV.

Subjects

The subjects of the study consisted of 20 auditors from six Big-Eight accounting firms located in the midwest. They were not selected at random but were secured by contacting area firms and asking for the cooperation of available

auditors. Included was a combination of auditors including six partners, ten managers, and four senior accountants with experience ranging from 4 to 30 years. The experiment took place at the subjects' respective firm locations and at a time that was convenient for the participants. A pretest questionnaire was given to each subject prior to measuring each auditor's brain dominance in an effort to ascertain personal background such as years of auditing experience, firm position, age, education, etc. (see Appendix D).

#### Measuring Cerebral Dominance

Although the EEG, HBDI, MBTI, and EFT are valid and reliable measures of human mental preferences (as described in the literature review), only the HBDI and the MBTI were selected for this study to test brain dominance. The EEG and the EFT were not included due to either the costs and time involved to administer the test or the nature of the test results.

Although research indicated that either of the selected instruments is a reliable measure [Carlyn, 1977; Schkade and Potvin, 1981; Bunderson, 1987], both were used in an effort to ensure that a reliable measure of each subject's cognitive style is indicated. The HBDI specifically identifies the subjects' brain dominance. While the MBTI was interpreted to indicate cognitive preference, it also provides additional information (such as judgment and perception preferences) that is useful in analyzing the

verbal protocols. In addition, each was a relatively inexpensive measure and easy to administer. The HBDI requires that a certified user is available to analyze the individual. However, Applied Creative Services, LTD., under the direction of Ned Herrmann, agreed to analyze the auditors' questionnaires.

#### The Herrmann Brain Dominance Instrument

The results of each subject's HBDI were available through the efforts of Applied Creative Services, LTD. In fact, the HBDI results are only available through the coordinated efforts of Ned Herrmann and his staff since, as developer of the HBDI, he maintains the exclusive right to questionnaire interpretations. Each subject was given the Herrmann Participant Survey Form (see Appendix A for a copy of the instrument) which included 120 answers in the following areas:

- biographical information
- handedness
- best/worst subject
- work elements (a ranking in terms of a particular strength for an activity)
- key descriptors (adjectives describing oneself)
- hobbies
- energy level (day or night person)
- motion sickness
- adjective pairs
- introversion/extroversion
- 20 questions requiring a response ranging from "strongly agree" to "strongly disagree"

Subject responses were then mailed to Applied Creative Services, LTD for a brain-dominance analysis.



Along with explanatory materials, both a visual profile display and profile code number were provided for each subject. These were obtained by assigning numeric values to each of the subjects' questionnaire responses and then computer-generated summations of data were presented in a model format such as the one shown in Figure 2. This model not only displayed the subject's preference to utilize a particular brain quadrant by graphical representation, but also interpreted numerically the same information in terms of both a profile code and score. Reading from left to right, the four-digit profile code represents the upper left, lower left, lower right, and upper right quadrants of the brain, i.e. 1133, 1122, 1233, 3311, etc. The profile keys 1, 2, and 3 represent the terms primaries, secondaries, and tertiaries respectively and are used to represent an individual's brain dominance. In any given quadrant, a "primary" indicates a preference for the modes in that quadrant while a secondary suggests an ease with or a comfortable usage of the modes in a given quadrant. The secondaries are also thinking preferences but are secondary in nature when compared to the primaries. A tertiary score corresponds to an avoidance of or, at best, a lack of preference in a given quadrant. In fact, tertiaries in one's profile code strengthen the opposing primaries. In other words, avoiding certain thinking styles increases the preference of other styles. In addition, it is possible to have two or more primaries, secondaries, or tertiaries for

THE VISUAL PROFILE DISPLAY

HERRMANN BRAIN DOMINANCE PROFILE

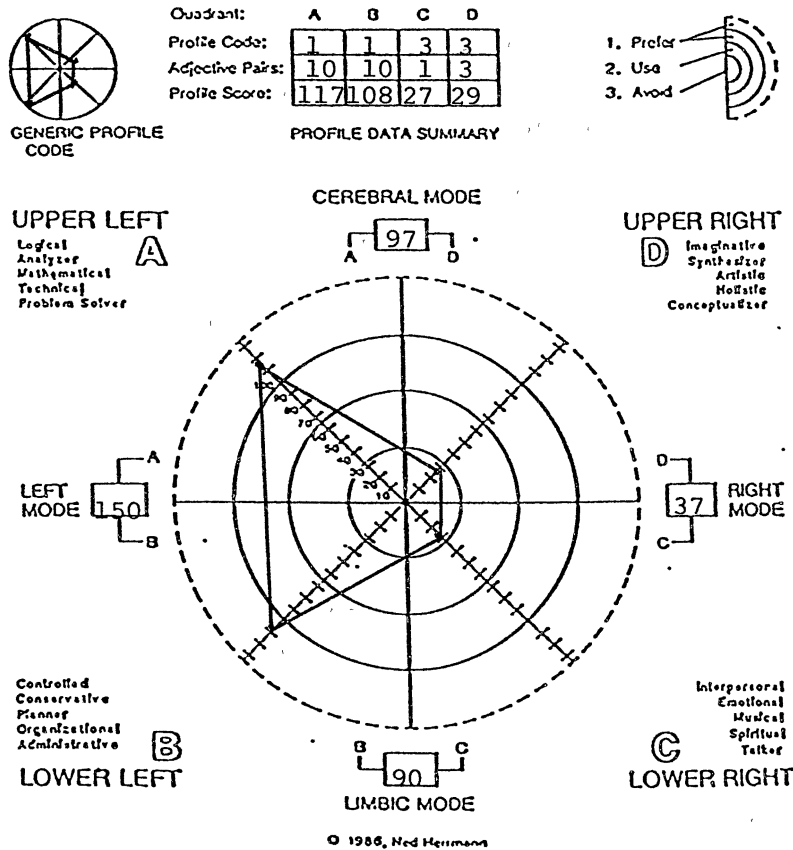


Figure 2. The Visual Profile Display

any given individual's profile code. For example, the profile code "1133" as shown in Figure 2 suggests that the individual is double dominant with two strong primaries occurring in the upper left A and lower left B quadrants. The "33" indicates two contrasting tertiaries in the lower right C and upper right D quadrants and thus, this individual would not prefer or may even avoid utilization of the right brain hemisphere. This individual would be rational, logical, and analytic and as a result, would be classified as left-brain dominant. See Appendix E for complete profile descriptions of the HBDI.

As previously mentioned, other instrument data was provided based on the completion of the HBDI questionnaires. For example, Figure 3 shows a consolidated score sheet that was included with each subject's visual profiles and profile codes. Included on this score sheet is an abundance of individual qualitative information such as key descriptors and work elements that are typical of each participant's unique thinking style. Although these score sheets provide supplemental information, the data merely supports the interpretations concerning thinking preferences as indicated by the HBDI visual displays and profile codes.

Before interpreting the data, it must be remembered that the profiles simply represent a distribution of preferences and not competencies. Although there is a close correlation between the two, they are entirely different



since competence must be acquired through education, training, and expression [Herrmann, 1984].

### The Myers-Briggs Type Indicator

The MBTI provides separate indices for a basic preference scale that includes extraversion-introversion, sensing-intuition, thinking-feeling, and perception-judgment (see Appendix B for the MBTI questionnaire). Individual preference characteristics are indicated through a four-letter "type." For example, ESTJ would suggest that an individual is "extraverted", prefers to utilize his "senses", is more comfortable with "thinking", and would rather "judge" than "perceive" (see Appendix C). In terms of suggesting brain dominance, only the combination of each subject's preference for sensing/intuition, and thinking/feeling is used to determine hemispheric preference. The scale used to determine thinking preferences was described in section 3 of Chapter II and is provided at the bottom of Table II. Essentially, an individual's preference for either "sensing" or "intuition" combined with his/her preference for "thinking" or "feeling" can be interpreted to determine brain dominance. For example, a person with a "ST" combination would be classified as being left-brained while an individual characterized as having a "NF" combination would be considered right-brain dominant. Any individual with a "NT"

or "SF" characterization would approach a whole-brain classification.

### Results

The results of the cerebral dominance questionnaires are summarized in Tables I and II which will be referred to throughout this section. Table I provides the results of the Herrmann Brain Dominance Instrument (HBDI) while Table II provides those of the Myers-Briggs Type Indicator (MBTI). The tabulations indicate the number of subjects whose thinking preference falls within the left-, right-, or whole-brain category. As can be seen from a comparison of the two tables, the results of these instruments are in agreement with one exception. The HBDI output suggests that our senior level accountant has a right hemispheric dominance while the MBTI suggests a whole-brain thinking style for the same individual. As previously mentioned, the HBDI has been specifically identified as the preferred method for measuring thinking preferences while the MBTI has been selected to support any HBDI results and to provide additional information useful in analyzing the verbal protocols. Therefore, the results of the HBDI questionnaires will be the primary indicators of brain dominance and will override any discrepancies between the MBTI and the HBDI.

TABLE I  
 TABULATION OF SUBJECT'S CEREBRAL DOMINANCE

----- Herrmann Brain Dominance Instrument -----					
Type	Senior	Manager	Partner	Total	Dominance
-----					
1123	1	2	0	3	left
1132	0	1	0	1	left
1133	0	3	0	3	left
1222	<u>0</u>	<u>0</u>	<u>1</u>	<u>1</u>	left
Total left	1	6	1	8	
1122	0	3	3	6	(left)whole
2211	1	0	0	1	(right)whole
1112	1	0	1	2	whole
1221	1	0	0	1	whole
1121	<u>0</u>	<u>1</u>	<u>1</u>	<u>2</u>	whole
Total whole	3	4	5	12	
-----					

Type:                   four-quadrant profile, ABCD, where:  
                           A - upper left brain quadrant  
                           B - lower left brain quadrant  
                           C - upper right brain quadrant  
                           D - lower right brain quadrant

profile codes:  
   1 - primary preference  
   2 - secondary preference  
   3 - lack of preference or avoidance





### Descriptive Analysis of Brain Dominance Results

The HBDI tabulations, as provided in Table I, indicate that of the 20 research participants, 14 appear to exhibit left-brain thinking preferences, one has a right hemispheric preference, and five are categorized as whole-brained. Based on the logic that only the primaries (code 1) should be interpreted as an individual's preferred quadrant, a further breakdown suggests that of the 14 who were described as having left-brain preferences, one is a senior accountant, nine are managers, and four are partners. The whole-brain participants include two seniors, one manager, and two partners.

As previously described, a 1123 profile code would suggest that the subject has a primary preference for the upper and lower left brain quadrants while a 3311 would suggest an upper and lower right quadrant preference. Although an equal distribution of preferences for each quadrant would indicate a "true" whole-brain thinking style, i.e. 1111 or 2222, it is unlikely that any individual would exhibit this type of thinking traits. Therefore, a combination of left and right primaries was interpreted as whole-brained. For example, a profile code of 1112 suggests a preference for the upper and lower left quadrants as well as the upper right quadrant and was interpreted as representing an individual's whole-brained thinking preference.

Since the secondaries (code 2) indicate a comfortable usage of the modes in a given quadrant and are considered preferences secondary in nature, it seems reasonable that a 1122 or a 2211 profile code would suggest that an individual's overall preference could also be interpreted as whole-brained. Based on this rationality, seven of the subjects who were originally interpreted as having either left- or right-brain dominance were also considered to be whole-brain thinkers. Therefore, a final tabulation (see Table I) includes eight left-brain (one senior, six managers, and one partner) and 12 whole-brain subjects (three seniors, four managers, and five partners).

#### Examining The Hypotheses

The following two hypotheses were examined based upon the simple tabulation of left-, right-, and whole-brain dominant auditors (see Tables I and II):

HA1: Staff accountants exhibit left-dominant thinking styles.

HA2: Managers and partners exhibit "whole-brain" thinking styles.

In examining HA1, the frequency counts indicate that of the four senior-level (or staff accountants), only one exhibits a left-dominant thinking style. In analyzing HA2, HBDI questionnaire results for six of the ten managers suggest a left-dominant preference and not a whole-brain thinking style as hypothesized. In addition, the MBTI results are

even more contradictory to HA2 and suggest that only one of the ten managers exhibited a whole-brain dominance. Of the six partners tested, however, five appear to have whole-brain styles which is consistent with the second hypothesis. HA2 implies that older auditors, and therefore, those with generally more auditing experience, exhibit "whole-brain" thinking preferences (i.e. managers and partners tend to be older and more experienced than staff accountants). In an effort to examine this implication, a tabulation of the subjects' age and years of auditing experience, combined with their respective hemispheric dominance, was completed (see Table III). The results of the tabulation suggest that as the auditors' age, as well as experience, increased, there was no difference in thinking preference. As shown in Table III, of those auditors in the 25-30 age group with 4-7 years of experience, two were left-brained and two were whole brained. Of those in the 31-40 age group, six were left-brained and seven were whole-brained, contradictory to the implications of HA2. However, consistent with HA2, those auditors in the 41 and over age group, with 17-30 years of experience, were all whole-brained.

TABLE III  
TABULATION OF AGE AND EXPERIENCE

<u>Auditor Age Group</u>	<u>Years of Experience</u>	<u>Brain Dominance Left</u>	<u>Whole</u>
25-30	4- 7 years	2 subjects	2 subjects
31-40	5-12 years	6 subjects	7 subjects
41 and over	17-30 years	0 subjects	3 subjects

#### Summary

Based on the tabulation results, both HA1 and HA2 must be rejected with the exception of the hypothesis concerning partners. It should be noted that along with the use of tabulations in examining the hypotheses, a Chi-Square analysis was also considered but eliminated due to the small sample size of seniors, managers, and partners. In fact, due to the relatively small sample size, the frequency results and the decision to reject HA1 and HA2 must be interpreted with caution since the 20 participants may or may not be representative of the true population of auditors and thus, this research may lack external validity.

The next chapter will examine the protocol methodology and any effect brain dominance may have on auditor decisions. In this context, the results of the verbal protocols along with a comparison of decision consistency among auditors will be discussed.

CHAPTER IV  
METHODOLOGY AND RESULTS OF  
PROTOCOL ANALYSIS

Overview

Once tested for brain dominance, each subject was given a set of decision cases whereby he/she was asked to provide substantive testing decisions and evaluate internal controls. Verbal protocols were recorded for each subject that attempted to capture thought processes that occurred prior to making final decisions. These protocols were then analyzed to determine the effect that brain dominance had upon decision making. In addition, final decisions among auditors were examined for consistency and compared to the results of those obtained by Joyce [1976].

Decision Task

The decision task that was utilized by Joyce [1976] to examine the consensus of auditors in planning audit programs was also given to the subjects of this study. Based on the evaluation of a hypothetical company's internal controls, the task required the auditor to provide a decision concerning the extent of substantive testing procedures that would be necessary in the course of a typical audit.

Prior studies suggest that the level of consensus among auditors in evaluating the strength of internal controls is high while the judgmental selection of sample sizes is not [Ashton, 1974; Ashton and Kramer, 1980; Hamilton and Wright, 1982]. This lack of consensus relating to substantive testing procedures was, therefore, the motivation for including this type of decision in the experimental task. The decision task of Joyce's study was selected for several reasons:

- (1) Joyce [1976] was the first to focus on the consensus of substantive testing decisions.
- (2) Joyce [1976] included accounts receivable as the area for which subjects prepare summary audit programs. This is an area that is familiar to all auditors at each level of the organization.
- (3) The results of the study indicated low consensus among auditors in audit planning but the study did not isolate the reason for the lack of consensus.
- (4) Joyce [1976] was replicated by Gaumnitz, et.al., [1982], and the results conflicted with those of Joyce in that a higher level of consensus was indicated.

Since the present study utilized a replication of the Joyce [1976] cases, the decision task was administered in the same manner as the original study. The auditors were asked, however, to evaluate only 20 instead of 36 cases since the recording of verbalizations was more time consuming for both the participants and the researcher (when compared to the methodology of Joyce [1976]). Five cues to an accounts receivable subsystem were manipulated. These included (1) sales approval, (2) bad debt expense/sales, (3)

write-off approval, (4) separation of billing function and subsidiary ledger maintenance, and (5) sales/average accounts receivable. Consistent with Joyce [1976], additional background data also were provided since information other than the five manipulated variables may be relevant for the audit of accounts receivable [see Appendix F].

To facilitate the analysis of the results, Joyce [1976] reduced the numerous steps in the audit of receivables to a relatively small number as follows:

- (1) Confirmation of accounts receivable.
- (2) Review of accounts written off as uncollectible.
- (3) Review of cash collections of accounts receivable subsequent to balance sheet date.
- (4) Determination of adequacy of allowance for uncollectible accounts.
- (5) Review of year-end sales cutoff.

Figure 4 provides an example of the 20 decision cases that were used. Each situation varied the case information prior to asking for the planned extent of substantive testing and internal control evaluations. For example, Figure 4 indicates that credits for returned merchandise are supported and approved by a receiving report while some variations of the decision case would indicate no support or approval (see Appendix G for the 20 decision tasks). Following the procedures of Joyce [1976], these 20 cases were made available to the subjects along with a booklet

Situation: 00.

-----  
Receiving report support. Credits for returned merchandise are supported and approved by a receiving report.

Separation of billing function and subsidiary ledger maintenance. Accounts receivable subsidiary ledger is maintained by a clerk other than the one who prepares and mails out monthly statements to customers.

Write-off approval. Write-offs of receivables are reviewed and approved by the controller.

Receivable confirmation by Client. Accounts receivable are confirmed during the year by an employee independent of the accounts receivable and cash functions.

Sales approval. All sales orders are approved by the credit manager before shipment.

Audit Procedures	Planned Extent of Application
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as collectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet data	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

-----  
 Based on the booklet information and that provided in Situation 00 above, evaluate that quality of internal control over accounts receivable using the following six-point scale:

extremely    very    substantial    some    not quite    adequate  
                   weak    weak    weakness    weakness    adequate    to strong

Why? \_\_\_\_\_.

Figure 4. Sample Decision Case



containing additional background information. A debriefing questionnaire was also given to the subjects following their completion of the decision task [see Appendix H].

Joyce [1976] utilized both an ANOVA and MANOVA experimental design for interpreting his results. The research design for this study, however, varies from that of Joyce's due to the inclusion of the brain dominance independent variables and the analysis of the verbal protocols. A description of the specific design that was utilized follows in the next section.

#### Data Collection

Subsequent to the measurement of each subject's thinking preferences, his or her verbal protocols were tape recorded as the decision task was completed. Of the 20 subjects that participated in the brain-dominance evaluation, only 14 completed the series of decision cases as requested. Included were three seniors, six managers, and five partners. Each subject was provided a set of 20 decision cases. Each case required the subject to evaluate the quality of internal control over accounts receivable (using a six-point scale) and to indicate his/her planned extent of application of five different audit procedures (in hours). A short practice problem was provided so that subjects could adjust to the verbalizations.

Consistent with the procedures used by Biggs, Mock, and Watkins [1988] and in conformance with those recommended by

Ericsson and Simon [1980], the participants were instructed to verbalize all thoughts as they performed the task and these verbalizations were captured on individual tape recorders. Obtaining reports during the task performance, rather than after, increases the probability that cognitive processes will be unaffected. The participants completed the decision cases independently and at their own pace and convenience. Prior to administering the cases, however, the researcher met with each subject at his/her office. During that time, each participant was provided a packet of case information including background materials and specific instructions for completing the decisions. Subjects were given verbal instructions consistent with those that were written and were given the opportunity to review the materials and ask questions. Subjects were reminded to verbalize all thoughts during decision making even if those thoughts were not related to the decision task. Since the researcher was not present during the case completions, written reminders to "verbalize all thoughts" were scattered throughout the cases.

Once the verbal protocols were recorded, the tapes were transcribed by breaking the verbalizations into short phrases. The transcripts were then analyzed using the predefined operators (see Table IV). The operators and operator definitions were primarily determined in advance in an effort to reduce the subjectivity of coding procedures [Einhorn, et.al., 1979]. Biggs, et.al. [1988] identified

the significant operators based on their current research and prior predecisional behavior studies [Mock and Turner, 1981; Biggs and Mock, 1983]. Accordingly, 15 operators selected for this study are the ones chosen by Biggs, et.al. [1988] and are included within four categories. Five additional operators were also included due to the specific subject responses.

### Data Analysis

Subject's protocols were independently coded by two researchers and any discrepancies were re-evaluated. As previously discussed, operators used by subjects were classified into five general categories, of which four were established prior to data collection and are consistent with those utilized by Biggs and Mock [1983]. An additional category of operators was required due to the specific subject responses. In fact, a part of subject A's protocols was used as a basis for finalizing operator definitions and thus, complete independence of protocol coding was not achieved. Final operator categories include:

1. Task Structuring - operators that involved the subjects' processes as they gained understanding of the task and set various task goals and subgoals.
2. Information Acquisition - operators that involved the subjects' processes as they sought information contained in the client's audit workpapers.

TABLE IV  
 OPERATORS AND THEIR DEFINITIONS USED  
 IN CODING OF VERBAL PROTOCOLS

Operator	Notation	Brief Description
<b>Task Structuring</b>		
1. Set Goal	SG	Assigned when the subject specifies a goal to be accomplished in performing the task.
<b>Information Acquisition</b>		
2. Information Search	IS	Assigned when the subject searches the case materials for specific pieces of information.
3. Information Retrieval	IR	Assigned when subject retrieves a previously stored piece of information from external memory (i.e., notes, calculations) or internal memory.
4. Algebraic Calculation	AC	Assigned when subject makes a mathematical calculation.
<b>Analytical Operators</b>		
5. Assumption	AS	Assigned when subject generates an arbitrary fact about the case.
6. Conjecture	CJ	Assigned when subject makes an if-then or hypothetical statement.
7. Comparison	CN	Assigned when subject makes a judgment based upon a comparative process.
8. Evaluation	E	Assigned when the subject makes a teleological judgment about the task based on some explicit or implicit criterion.

TABLE IV (Continued)

9.	Generate Query	GQ	Assigned when subject raises a question about the task.
10.	Logical Support	LS	Assigned when the subject provides logical support for any decision.
<b>Action Operators</b>			
11.	Sample Size Decision	SS	Assigned when subject finalizes sample size (in terms of hours).
12.	Generate Alternative	GA	Assigned when subject states, in a tentative form, an alternative sample size, audit procedure, or other task-related action.
13.	Temporary Decision	TSS	Specifies a temporary decision which is ultimately revised.
14.	Decision Rule	DR	Assigned when subject specifies a method (including heuristics) of determining a sample size.
15.	Other Decisions	OD	Assigned when subject recommends actions to be taken other than a sample decision (i.e. evaluation of internal controls).
<b>Other Operators</b>			
16.	Unrelated Comments	UN	Assigned when subject verbalizes any thoughts unrelated to the cases.
17.	Personal Preferences	P	Assigned when subject expresses personal preferences in terms of how to approach a decision.

TABLE IV (Continued)

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18. Reciting	TH	Assigned when subject is reciting any of the case information.
19. Disagreement	D	Assigned when subject expresses any disagreement with the case design.
20. Missing Information	M	Assigned when subject expresses a desire for information other than the information provided.

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3. Analytical - operators that involved the subjects' processes as they evaluated the information in terms of the assumptions and judgments they made.
4. Action - operators that involved the subjects' processes as they generated alternatives and determined the planned extent of application and provided a final evaluation of internal control.
5. Other - operators that involved the subjects' processes as they verbalized thoughts unrelated to the case, recitations, or personal audit preferences. Also included thoughts expressing disagreement with the case design or a desire to obtain unavailable information.

The operators were coded on the basis of coding guidelines summarized in Table IV.

#### Evaluation of Subjects' Task Performance

Tables V through XVIII summarize the results of the coded verbalizations (see Appendix I). Included in the table summaries are the subject's brain dominance, job title, time taken to complete the task, and audit experience. In addition, selected subject comments along with any specific researcher observations are provided.

An examination of each subject's coded verbal protocols indicates that "evaluation" and "information search" were the two operators that were primarily utilized by subjects during decision making, excluding the use of the "decision" and "reciting" operators. Table XIX was comprised by selecting from Tables V through XVIII the highest percent of total operators used by each subject. In addition, specific

subject information such as brain dominance, position, and years of experience is also summarized in this table.

An examination of Table XIX shows that 12 of the 14 subjects relied on "evaluation" during decision making as indicated by the highest isolated percent of total verbalization per subject. The range of percent utilization for evaluation was 16.6 percent to 44.4 percent with no particular decision patterns for partners, managers, or seniors. The "decision" operator was coded as the highest percent of total verbalizations for the remaining two subjects (subjects C and Q), however, "evaluation" ranked second in total use for these participants. Theoretically, all subjects should have verbalized the same number of "decisions" since each auditor was asked to make five decisions for each of 20 cases. Therefore, the percent result for subjects C and Q only suggests that they verbalized more actual decisions when compared to the remaining 12 subjects and the overall primary operator that was utilized was "evaluation."

"Information search" ranked in either the second, third, or fourth position in terms of a percent of total coded operators. The percentage range was 4.0 percent to 28.6 percent depending on each subject's extent of utilization of the "evaluation," "decision," or "reciting" operators. Similar to the percentage ranking results of the "evaluation" operator, 7 of the 14 subjects verbalized either more "decision," "recitings," or both when compared



TABLE XIX  
EVALUATION OF PRIMARY OPERATORS

Subject	Brain Dominance	Job Position	Years	Operators* .			
				"E" 1st	"IS" 2nd	"CN" 3rd	other
A	Left 1133 ISTJ	Manager	11	21.7 1st	21.2 2nd	5.9 3rd**	
B	Whole 2211 ENTJ	Senior	5	23.6 1st	14.8 3rd	2.3 4th	15 R 2nd
C	Whole 1122 ESTJ	Manager	10	18.0 2nd	6.5 3rd	1.0 4th	49 D 1st
F	Left 1123 ESTJ	Senior	5	35.7 1st	28.6 2nd	1.4 3rd	
H	Whole 1112 ESTJ	Partner	12	47.0 1st	13.9 2nd	7.2 3rd	
I	Whole 1221 ENTP	Senior	5	44.4 1st	24.7 2nd	1.2 3rd	
K	Left 1222 ISTJ	Partner	11	33.9 1st	18.2 2nd	3.0 3rd	
L	Whole 1122 ISTJ	Partner	8	38.1 1st	4.0 4th	1.6 5th	17 D 18 R 3rd 2nd
M	Left 1123 ISTJ	Manager	7	27.2 1st	22.3 2nd	0.6 4th	16 D 3rd
N	Left 1132 ISTJ	Manager	10	29.0 1st	13.3 3rd	9.9 4th	19 D 3rd
O	Whole 1121 INTP	Manager	7	25.2 1st	13.6 3rd	6.4 4th	17 D 2nd

TABLE XIX (Continued)

P	Whole 1121 ENTP	Partner	17	20.2	15.4	3.8	20	D
				1st	4th	5th	16	R
							2nd	
							3rd	
Q	Whole 1122 ESTJ	Manager	11	16.6	12.3	5.4	32	D
				2nd	3rd	4th	1st	
T	Whole 1122 ESTP	Partner	18	30.9	12.4	6.7	14	D
				1st	3rd	5th	11	R
							2nd	
							4th	

\* Includes only the primary operators that were utilized by subjects

\*\* percentage ranking of total verbalizations

E - Evaluation

IS - Information Search

CN - Comparison

D - Decision

R - Reciting

to the utilization of "information search." Again, since all subjects were expected to verbalize the same number of actual decisions, this result indicates that the remaining seven subjects made the final decision silently. As the "reciting" operator represents the actual reading of any words within the set of decision cases, the second or third ranking of "information search" for the respective subjects only suggests that 4 of the 14 participants had a greater preference for reading aloud. The act of reciting, however, was not expected to have any effect on the actual decision process.

Although there is no pattern of usage based on firm position, six of the seven subjects that tended to verbalize both "decisions" and "recitings" were classified as whole-brain. This observation, however, does not present any significant implications since three of the remaining seven subjects that did not extensively utilize the "decision" and "reciting" operators were also whole-brained.

The research result suggesting primary use of "evaluation" and "information search" by auditors during decision making is consistent with the results of Biggs and Mock [1983]. As they point out, the results indicate that subjects expend a significant effort in searching for relevant cues and evaluating the cues with respect to the appropriateness of the audit plan. It also appears that partners expend the most effort in "evaluating." In terms of brain dominance, however, subject's utilization of

"evaluation" and "information search" did not vary depending on their particular hemispheric dominance. In addition, firm position had no apparent impact on operator utilization. The specific percentage use of "evaluation" and "information search" did, however, vary depending on the extent of "reciting" and "decision" operators that were verbalized.

Consistent with the results of prior studies examining auditor judgment [Joyce and Biddle, 1981a; 1981b], every subject relied on the heuristic "anchoring and adjusting" in completing their problem analysis prior to making their final decision. Subjects' verbalizations revealed that once the subject had made substantive testing decisions for case one, this case was initially used as a comparison for making decisions in subsequent cases. Also, subjects looked for similarities among cases in terms of specific case information and anchored on prior substantive testing decisions based on new case information. It should be noted, however, that subject T (a partner with 18 years of experience) did not rely on comparisons for decision making until case seven and then consistently utilized the anchoring and adjustment heuristic. The remaining 13 subjects relied on the heuristic throughout decision making for all 20 cases. Specific comments such as "...like patterns and consistency ..," "...concerned about consistencies ..checking for consistencies....," "...using lotus spread sheet. .," and time concerns suggest that

subjects may have anchored and adjusted in an effort to make decisions in a logical, consistent, and timely manner.

Although the anchoring and adjusting method of decision making is recognized as a specific decision rule, it was coded as a comparison, (i.e. coded as "CN" rather than "DR") since subjects relied on a comparative analysis in order to utilize the heuristic. The percent of verbalizations coded as "CN" ranged from .6 percent to 9.9 percent of total verbal protocols. Even though both end points of this range were the responses of managers with seven and 10 years of experience, respectively, partners and managers had overall higher percent verbalizations for "CN" when compared to those of seniors.

#### Descriptive Patterns Consistent With Hemispheric Preference

Recognizing that individuals with a left- or whole-hemispheric thinking preference treat stimuli differently, it was observed that left- and whole-brain subjects made comments or exhibited a decision style that was consistent with their particular thinking preference.

#### Left-Hemispheric Preference

As described in Chapter III, those five subjects characterized as having HBDI profiles of 1133, 1123, 1222, and 1132 were also classified as having a left-hemispheric thinking preference. Research suggests that left-brained

individuals treat stimuli separately (as in a series) and are comfortable with analytic processes such as functions of reasoning, logic, and mathematics. In addition, HBDI individual profiles for the above characterizations are described, in part, as having the following qualities (see Appendix E):

- rational, logical, analytic, and quantitative
- controlled, planned, organized, and structured
- lack of emotions
- lack of preference for the holistic (or a secondary preference)
- lack of preference for the right mode (or a secondary preference)

These same subjects were also characterized as having MBTI profiles of ISTJ or ESTJ and typical personality traits include (see Appendix C):

- practical, orderly, matter-of-fact
- logical, realistic, dependable, organized
- responsible
- work steadily toward work

Therefore, these subjects' verbal protocols were expected to contain comments that were consistent with the personality traits as described above. A review of the results indicate that subject responses were consistent with research expectations.

For example, subject A stated, "I have a tendency to like patterns and consistency in my treatment of things." Subject F limited his comments to those concerning the actual case and established a lotus spread sheet as a tool for making decisions. Subjects K and M tended to rely on algebraic computations while subject N frequently expressed a concern that his decisions or evaluations "make sense"

(see Tables V - XIX). These comments and analysis of the protocols indicate that these five subjects followed a logical, organized, and controlled approach to decision making which is typical behavior for a left-dominant individual.

#### Whole-Hemispheric Preference

Since whole-brain thinking is the concept of mixed dominance, individuals within this category tend to exhibit holistic thinking preferences and have refined talents in both hemispheres. They use an integrated thinking style and thus, rely on both the logical and nonlogical processes. Nine of the 14 participants were classified as being whole brained given their HBDI profiles of 1122, 1112, 1221, 1121, 2211, and MBTI profiles of ENTJ, ENTP, INTP, and ESTP. Based on the profile descriptions, subjects were expected to exhibit the following traits:

- logical, analytic, technical
- effective in rational problem solving
- planned, organized, administrative
- functional in the holistic and creative modes
- interpersonal, emotional, and spiritual
- well balanced (in terms of reliance of specific brain quadrants, i.e. 1112 and 1121 profiles)
- "risk-oriented" behavior (i.e. 1121, and 2211 profiles)

In coding the verbalizations, it was observed that whole-brain subjects not only made comments consistent with analytical functions but also made references indicating that a sense of intuition or spontaneity was being utilized in their style of decision making. In other words, the thought processes recorded for these whole-brain

participants included left-hemispheric traits as well as holistic characteristics.

For example, subject B's use of intuition was revealed when he stated, "I think this is a catch or hitch," but also expressed a logical need for "consistency" and obtaining the "right" answer as he completed the series of decision. The first quote suggests that he was drawing from his right hemisphere since the use of intuition is processed there, while additional remarks are consistent with those processed in the left hemisphere. It was observed that subject H made few comments consistent with a left-hemispheric processing approach although left-brain processing must have occurred in order to complete the decision tasks. He seldom made verbalizations in complete sentences and thoughts were broken, lacking any logical sequence which is typical of thought processes in the right hemisphere. Subject I indicated, "it is difficult to verbalize all thoughts," and subsequently, limited the extent of verbalizations making it difficult to determine any logical sequence to her decision processes. Subject L's whole approach to decision making was revealed through his use of a "plus and minus" system to evaluate each case (left-brain behavior) but the verbalizations did not flow in a sequential manner.

While the above subjects' comments are typical for whole-brained individuals and provide evidence of the kinds of thought processes that occur during decision making there was no verbal evidence that extensive use of the right



hemisphere was taking place for any of the subjects. In other words, emotional, creative, interpersonal and "risk-oriented" behavior was not exposed through the verbalizations. This may be partially due to the nature of the decision tasks that inherently required left-hemispheric processes to be utilized.

### Examination Of the Hypothesis

The following hypothesis was examined based upon the descriptive analysis in the previous section.

HA3: There is a significant difference between the thought processes of right-brain dominant, left-brain dominant, and whole-brain auditors exhibited in making an auditing decision.

To test the third hypothesis, a descriptive analysis rather than an ANOVA is appropriate due to the nature of the protocol data. This format is consistent with that used by Biggs and Mock [1983] and Biggs, et.al., [1988]. Specifically, the results of the verbal protocols are presented in sections based on the operator categories (as previously described, i.e. task structuring, information acquisition, analytical/inferential, action/choice, and other). For each category, a breakdown of the auditor's thought processes is listed as percentages of the total amount of time devoted to each operator as well as category subtotals for each subject (see Appendix I, Tables V - XVIII). Although it was noted that there were identifiable differences in the thought processes of left- and whole-brained auditors, the differences were not as distinct as

hypothesized. Clearly, all 14 subjects utilized the left-brain hemisphere, however, whole-brain subjects also provided verbalizations that suggested the right hemisphere was being utilized in conjunction with the left. Therefore, a holistic style of decision processing was evident for the whole-brain participants. Although there is evidence of a distinction, it is not the conclusion that a "significant" difference exists as stated in HA3. As previously recognized, this may be due, in part, to the nature of the decision tasks that required left-hemispheric processing prior to making decisions. Alternative decision tasks may have revealed more significant differences between the thought process of left- and whole-brain auditors.

#### Subject Consistency in Decision Making

Each subject was asked to make five decisions per case regarding the planned extent of substantive testing along with his/her evaluation of internal controls. Table XX provides a summary of each subject's decisions regarding the total planned extent of substantive testing required for the 20 cases. This table is divided so that any significant differences in the decisions of seniors, managers, and partners, or those exhibiting left- or whole-brain thinking preferences may be identified. As can be seen from the table, the range of total planned hours varies between a low decision of 12 hours (subjects I and Q) and a high decision

TABLE XX  
RANGE OF SUBJECT'S SUBSTANTIVE  
TESTING DECISIONS

<u>Subject/ Hemispheric Dominance</u>	<u>Age/Exper- ience</u>	<u>Planned Hours</u>	<u>Average</u>
<b>Left-Brain Subjects:</b>			
A	36/11	16 - 29	
F	29/5	40 - 60	
M	31/7	66 - 90	
N	34/10	54 - 132	
K	36/11	105 - 111	56.2-84.4
<b>Whole-Brain Subjects:</b>			
B	29/5	36 - 45	
I	31/5	12 - 52	
C	34/10	30 - 59	
O	31/7	63 - 87	
Q	35/11	12 - 20	
H	37/12	15 - 25	
L	32/8	14 - 23	
P	41/17	23 - 43	
T	45/18	24 - 44	25.4-44.2
<u>Job Position</u>		<u>Planned Hours</u>	<u>Average</u>
<b>Senior Subjects:</b>			
B	29/5	36 - 45	
F	29/5	40 - 46	
I	31/5	12 - 52	29.3-47.7
<b>Manager Subjects:</b>			
A	36/11	16 - 29	
C	34/10	30 - 59	
M	31/7	66 - 90	
N	34/10	54 - 132	
O	31/7	63 - 87	
Q	35/11	12 - 20	40.2-69.5
<b>Partner Subjects:</b>			
H	37/12	15 - 25	
K	36/11	105 - 111	
L	32/8	14 - 23	
P	41/17	23 - 43	
T	45/18	24 - 44	36.2-49.2

TABLE XX (Continued)

<u>Combination Dominance/Job</u>	<u>Age/Exper- ience</u>	<u>Planned Hours</u>	<u>Average</u>
Left-Brain Senior: F	29/5	40 - 60	40.0-60.0
Left-Brain Managers: A	36/11	16 - 29	
M	31/7	66 - 90	
N	34/10	54 -132	45.3-83.7
Left-Brain Partner: K	36/11	105-111	105 -111
Whole-Brain Seniors: B	29/5	36 - 45	
I	31/5	12 - 52	24 - 48.5
Whole-Brain Managers: C	34/10	30 - 59	
O	31/7	63 - 87	
Q	35/11	12 - 20	35.0-55.3
Whole-Brain Partners: H	37/12	15 - 25	
L	32/8	14 - 23	
P	41/17	23 - 43	
T	45/18	24 - 44	19.0-33.8

Note: None of the auditors reported any experience in the wholesale tire industry.

of 132 (subject N) and indicate a general lack of consistency among auditors in making substantive testing decisions. Additional analysis, however, indicates that whole-brain auditors, on average, planned fewer substantive-testing hours when compared to the average of left-hemispheric auditors, i.e. average range of 25.4-44.2 hours compared to 56.2-84.4 hours. More specifically, a breakdown combining brain dominance with job position suggests that whole-brain partners, on average, planned the least amount of substantive-testing hours while the left-brain partner planned the most, i.e. 19-33.8 hours and 105-111 hours respectively. Even though the left-brained partner planned the most substantive hours, any conclusions concerning firm position and brain dominance should be made with caution since his/her decisions are inconsistent when compared to those of other auditors.

In terms of the auditors' age or experience having an effect on substantive planning, there is no distinction between the decisions of the left-brain and whole-brain subjects. Left-brain auditors' age ranged from 29-36 years while their respective auditing experience ranged from 5-11 years. Whole-brained subjects had a wider age range, 29-45 years, as were their years of experience, 5-18 years. However, there was no pattern that suggested a correlation between age/experience and substantive decisions.

Overall, these results suggest that whole-brain auditors, especially those that are partners, plan less time

for substantive testing procedures than do left-brain auditors. One possible explanation for this outcome is that whole-brain individuals tend to exhibit "risk-oriented" behavior, and therefore, should be willing to accept greater amounts of risk as compared to left-brain individuals. Planning fewer substantive testing hours would result in smaller sample sizes and thus, would imply an acceptance of greater amounts of auditing risk. Therefore, the behavior of the research subjects is consistent with the described personality traits of a whole-brain person, in general.

The lack of consistency among the subjects in making substantive testing decisions is consistent with the results of Joyce [1976]. Although Joyce concluded there was a general lack of consistency among auditors, he was unable to isolate the reasons for the inconsistencies, other than suggesting that individualistic variables along with the probabilistic audit environment exceed the overall strength of certification standards that should encourage consistency. Joyce also noted that consistencies may be greater for those auditors within the same firm due to specific internal procedures of the firms. This was not, however, a result of the current research. Again, although there was a general lack of consistency among auditors, the lesser amounts of planned substantive testing for whole-brain auditors does provide some evidence that individualistic variables, as suggested by Joyce, does affect overall substantive testing decisions.

Even though there was a lack of consistency among the substantive testing decisions, some consistency was observed among the 14 subjects in evaluating internal controls (see Table XXI). Although the degree of internal control evaluation varied for some decision makers, i.e. "some weakness" compared to "substantial weakness," the tabulations in Table XXI suggest that the majority of subjects either exactly agreed or differed only one degree of strength or weakness in their decisions. Therefore, the analysis suggests some degree of consensus in evaluating internal controls. This result is consistent with those of Ashton [1974] whose subjects made ratings of internal control quality. Also using a six-point scale ranging from "extremely weak" to "adequate to strong," Ashton reported a moderately high degree of consensus (agreement among different auditors given the same stimulus combinations).

A further examination of Table XXI reveals that those auditor decisions not included among the majority of evaluations were quality control ratings at the extreme ends of the six-point scale. For example, one to three auditors may have evaluated a case situation as being "extremely weak" or "very weak" while the majority of auditors gave the same case a "some weakness" rating. This type of evaluation suggested a more conservative auditing approach and thus, would be the expected behavior of left-dominant auditors. The results shown in Table XXI are consistent with this expectation as four of the six subjects whose decisions

TABLE XXI  
 TABULATION OF SUBJECTS' INTERNAL  
 CONTROL EVALUATIONS

Case	Subject Responses					
	Extremely Weak	Very Weak	Substantial Weakness	Some Weak	Not Quite Adequate	Adequate To Strong
1				FMA	PB	QCTLKHNO
2			MNA	CFTL PH	QBO	K
3			MA	FLBHN	CTPKOQ	
4			FTBNA	CMLP KH	QO	
5			MLNA	FTP BH	QCO	
6		A	MLNP	FTBH	QCKO	
7			MLA	FN	TPKBHO	QC
8	NA	ML	THO	CFPK B	Q	
9	LA	FMN	TPBHO	K	QC	
10		LNA	M	FTP		QC
11		M	TNA	QFL PBHO	CK	
12		L	MN	FPBA	QTKB HO	C
13				TNA	FLP KH	QCMBO
14					QFL	CTMPKH NAO
15		MN	TLHA	QF PBO	CK	



TABLE XXI (Continued)

16	M	TNA	OLP HQ	FB	CK
17		T	FML BAN	QPKH	CO
18	M	TLNA	QFBH	CPO	K
19	M	TLA	QP BN	CFHO	K
20				NA	QCFTM LPKBHO

Note: Subject I appears to circle opposite of intended response, i.e. in case 20 the subject indicates a "perfect environment" but responds "extremely weak," and therefore, was removed from the above analysis.

Left-Brain Subjects: A,F,K,M,N

tended to be conservative were also left-brained. It was also noted that subject I's lack of consensus with other auditors may have been due to a misunderstanding of the six-point scale. In situation 20, the auditor makes the comment that the case suggested a "perfect environment" and yet, the internal controls were evaluated as being "extremely weak." Therefore, given these inconsistencies within the subject's own decision processes which suggest a possible misunderstanding of the evaluation scale, subject I's decisions were removed from the analysis.

Table XXII provides another perspective of the results shown in Table XXI where internal control evaluations are grouped according to brain dominance. An examination of this table shows that although there exists a general consensus among auditors in evaluating internal controls, whole-brain auditors appear to be more consistent in their evaluations when compared to left-brain subjects. The whole-brain auditors either agree or had less variation in their individual decisions with the majority of evaluations clustering within the "substantial weakness" to "not quite adequate" range. In comparison, left-brain subjects had more variation in their final decisions as suggested by the wider range of responses fluctuating primarily within the "very weak" to "adequate to strong" range. Therefore, the results suggest that the holistic approach to decision making may result in "improved" consistency among auditors in making internal control evaluations when compared to the

TABLE XXII  
 TABULATION OF SUBJECTS' INTERNAL  
 CONTROL EVALUATIONS  
 (LEFT/WHOLE-BRAIN PERSPECTIVE)

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 Left-Brain Auditors:

	<u>Case Number</u>																			
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>20</u>
Extreme-ly Weak								2	1											
Very Weak						1		1	3	2	1				2	1		1	1	
Substan- tial Weak		3	2	3	3	2	2			1	2	2			1	2		2	1	
Some Weak	3	1	2	2	2	1	2	2	1	2	1	2	2		1		4	1	1	
Not Quite Adequate			1			1	1				1	1	2	1	1	1	1		1	2
Adequate to Strong	2	1											1	4		1		1	1	3

TABLE XXII (Continued)

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Whole-Brain Auditors:

	Case Number																			
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>20</u>
Extreme- ly Weak									1											
Very Weak							1			1		1								
Substan- tial Weak				2	1	2	1	3	5		1	2	1		3	1	1	2	2	
Some Weak		5	3	4	4	3	5	3		5	6	4	3		4	5	2	3	3	
Not Quite Ade- quate	2	3	5	2	3	3	2	1	2	2	1	1	4	2	1	1	3	3	3	
Adequate To Strong	6													6		1	2			8

results of prior studies indicating a "moderately" high degree of consensus [Ashton, 1974].

### Summary

In summary, the protocol analysis suggests that auditors tend to primarily utilize the "evaluation" and "information search" operators dependent on the extent of "reciting" and actual verbalization of final decisions that take place. In addition, whole-brain auditors typically provided more total verbalizations when compared to those that were left-brained. All 14 subjects relied on comparisons when making substantive-testing decisions, which in turn, suggested that the heuristic "anchor and adjustment" was being used. Although subjects utilized this common decision technique, it was also observed that auditors were not in agreement in making substantive testing decisions. When evaluating internal controls, however, a level of consensus was observed among auditors, in general, although left-brain subjects tended to be more conservative in their evaluations of specific case situations.

The next chapter provides a summary of the research along with conclusions, following a brief discussion of prior research results related to the current study. Identified in this chapter are the research limitations, and finally, possible extensions for future research are provided.

## CHAPTER V

### SUMMARY AND CONCLUSIONS

This chapter provides a summary of the research. It is divided into five sections with the first section discussing the inconsistencies of auditing decisions that have been identified in prior research. Included in this section is a review of the research objective. The next section defines hemispheric preference and discusses the brain dominance results. Section three describes the protocol methodology and the findings of the auditors' verbal protocol analysis. The fourth section identifies limitations of the study while the last section provides a discussion of possible extensions for future research.

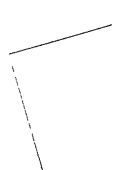
#### Inconsistencies in Auditing Judgments

Improving the quality of decisions relating to the auditing environment is a problem currently facing the auditing profession. To date, behavioral research focusing on human judgment and human information usage as it relates to auditor decision making suggests that the quality of auditing decision making is affected by judgmental inconsistencies among auditors. In addition, auditors' reliance on heuristics during the decision-making process

also affects the quality of their decisions. More specifically, this research suggests that a level of consensus exists among auditors in evaluating internal controls but that auditors are not in agreement in making substantive testing decisions. The purpose of this study was to examine some behavioral aspects of auditors, such as hemispheric preference and thought processes, in an effort to explain the reason for the inconsistencies suggested by the results of prior research. The research objectives were to evaluate the thinking style of auditing seniors, managers, and partners, and to examine their thought processes during decision making to determine whether or not a particular brain dominance affected those processes.

#### Hemispheric Preference

Hemispheric preference (cerebral or brain dominance) is a concept that describes the relationship between the two hemispheres of the brain. Each side processes different types of mental activity, and individuals are classified as either right-, left-, or whole-brain dominant dependent on which hemisphere, or both, most often guides the individual's behavior. While the left hemisphere is involved with analytic and logical processes, the right hemisphere processes creative, artistic, and emotional tasks. Whole-brain individuals develop a generalized or integrated style of thinking and perception and prior



research suggests that successful decision makers rely on both cerebral hemispheres as a whole.

Based on the results of prior hemispheric dominance research, two hypotheses were examined. The first hypothesized that staff accountants exhibit left-dominant thinking styles. The second hypothesized that managers and partners to be whole-brained. Although several valid methods are available for determining brain dominance, two reliable and inexpensive measures, the HBDI and MBTI, were utilized in an effort to analyze the hypotheses. Tabulation results indicated that of the 20 CPA's that were selected as subjects, eight exhibited left-brain thinking preferences (one senior, six managers, and one partner), and 12 were classified as whole-brained (three seniors, four managers, and five partners). Since several managers and one partner were considered left-brain dominant (not whole-brained as hypothesized), and three seniors were whole-brained (not left-brained as hypothesized), both hypotheses were rejected. However, a third hypothesis separating the expected brain dominances of managers and partners, i.e. hypothesizing that only partners are whole-brained, would not have been rejected.

#### Protocol Analysis

To examine the thought processes of auditors during decision making, verbal protocol analysis was the selected methodology, since it is the most prominent methodology used



by researchers to evaluate an individual's thought processes. Protocol analysis is a process-tracing technique that requires subjects to verbalize their thought processes or "think aloud" as they complete a decision task. The subject's verbalizations are recorded on a tape recorder and then interpreted to provide a description of the individual's judgment processes.

Previous research in the area of predecisional behavior has attempted to obtain insight into the auditor's process of making judgments through utilization of the protocol methodology. Few studies have been conducted, however, and limited results are available. The research of Mock and Turner [1981] provided generalized results that suggested an auditor's thought processes during decision making can be categorized into basically three areas: information search, analytical, and choice, and most of the thought processes are devoted to information search. In addition, no prior study has examined the effect an auditor's brain dominance has on decision making.

Of the 20 auditors that were tested for hemispheric dominance, 14 submitted responses to a set of decision cases whereby he/she was asked to provide substantive testing decisions and evaluate internal controls. Each subject's verbalizations were captured on a tape recorder, and these protocols were then analyzed to determine the effect that brain dominance had upon decision making. Along with this analysis, final decisions were examined for consistency.

The results of the protocol analysis suggests that auditors tend to primarily rely on "evaluation" and "information search" as they process decisions. Subjects also relied on heuristics when making substantive-testing decisions which is consistent with the results of prior research [Biggs and Mock, 1983]. Specific comments suggested that both the left-brain and whole-brain auditors followed decision processes that were identified as typical behavior for their respective hemispheric preferences. For example, the left-brain subjects processed in a logical, organized, and controlled approach to decision making, while the whole-brain auditors used an integrated thinking style. In addition, it was observed that whole-brain auditors were more intuitive and more risk oriented in decision making when compared to the left-brain subjects.

Although there was a general consensus among all auditors in their evaluations of internal controls, whole-brain auditors were more consistent than those that were left-brained. These results were consistent with those of Ashton [1974], that concluded a moderately high degree of consensus exists among auditors in evaluating internal controls. The current results, however, provide additional information concerning internal control decisions, suggesting improved consistency among auditors that are whole-brained.

Substantive testing decisions, however, were not consistent with the whole-brain auditors, on average,

planning fewer hours than the average of the left-brain subjects. Joyce [1976] reached a similar conclusion in that a general lack of consistency exists among auditors in making substantive testing decisions. He suggested that certain individualistic variables are responsible for the inconsistencies but was unable to identify any specific variables. The results of the current study suggests one possible explanation for the inconsistencies. Substantive testing decisions are dependent on each auditor's risk assessment of a specific audit situation, and varying perceptions of risk would affect the auditor's decisions. Since whole-brain individuals exhibit "risk-oriented" behavior, their decision of fewer planned hours (a more risky auditing decision) would be expected when compared to the decisions of left-brain auditors. Other variables such as age and experience were also examined to determine the impact on substantive decision making. The results, however, did not suggest any relationship between these variables and the planned substantive testing hours.

#### Limitations

As is the problem with any study that utilizes the protocol methodology, the major limitation of this study is the involvement of only 20 subjects. This limitation is unavoidable, however, due to the time consumption required in transcribing the verbalizations. Due to time constraints as noted, prior research has included as few as four

subjects [Biggs and Mock, 1983; Mock and Turner, 1981}, therefore, this study includes substantially more participants as compared to those of earlier predecisional behavior studies. Although this restriction prevents generalizing the results to the auditing population, the insight into auditor decision making which is gained offsets this limitation.

Other noted limitations were based upon the subjects' responses to the post-test questionnaire. Although 11 of the subjects found the study to be either very interesting or interesting, three found the cases dull. In addition, 2 of the 14 subjects perceived the cases as being unrepresentative of actual audit engagements. Six of the auditors noted they had difficulty in verbalizing their actual thoughts and indicated that they were only able to verbalize as much as 20 - 50 percent of their total thoughts. Finally, several of the participants noted they would have found additional information helpful in completing the decision cases. Identified information included:

- analytical procedures
- complete financial statements
- results of interval confirmations
- dollar amounts of historical charge-offs
- prior confirmation results
- more financial statement information to help determine materiality
- extent and nature of compliance tests
- aging schedule of accounts receivable

The above post-questionnaire feedback indicates that the subjects' interest in the study, perception of the cases,

and limited availability of wanted information may have had an impact on either their willingness to participate or their ability to respond objectively, and thus, may have had an overall affect on the research results.

#### Future Research

Possible extensions of the current study could be divided into three groups: (1) additional research relating to accountants' thinking preferences, (2) further examinations of auditors' thought processes, and (similar to this study), (3) a combination of both types of research. Since the protocol methodology utilized in the current research resulted in a limited number of subjects, it was difficult to draw any clear conclusions concerning the expected brain dominance of auditing seniors, managers, and partners. Future research could significantly increase the sample size of auditors including an increase in the number of auditors holding specific firm positions. With an increase in sample size, not only would the sample be more representative of the true auditing population, additional testing techniques, such as a Chi Square analysis, could be utilized. Not only would this increase the external validity of the research, but it would also improve the reliability of the testing procedures.

Future brain-dominance research could also examine the differences between male and female auditors' hemispheric preferences. The current study involved only two females,

making it impossible to recognize any significant cerebral-dominance differences that may provide additional explanations for inconsistencies among auditors' judgments. Again, a significant increase in total sample size would be necessary to distinguish between the thinking preferences of males and females holding senior, manager, and partner positions within a CPA firm. Possible studies could also focus on only male or female subjects and examine the respective results.

Although time constraints are always a factor, future protocol research should involve more subjects in an effort to increase the overall external validity of this type of research. Previous studies have identified specific processing techniques that occur prior to final decisions being made, however, generalizations cannot yet be accepted. A limited number of protocol studies have been conducted in the accounting area, and still, little is known about the thought processes of auditors.

Finally, additional research could involve an expansion of the current study by combining the above suggestions for future research. Again, time constraints may limit the sample size, however, the thought processes of a larger auditor sample, including females, could provide interesting insight into auditing decisions. In addition, the case design could be altered, taking into consideration the participants' post-test questionnaire feedback. Providing additional case information may eliminate some of the

experimental error that was present in the current study and possibly result in auditor decisions that are more objective.

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## APPENDIXES

**APPENDIX A**

**HERRMANN BRAIN DOMINANCE INDICATOR  
QUESTIONNAIRE**



APPLIED CREATIVE SERVICES, LTD.  
QUADRA, INC.

Herrmann  
Participant Survey Form



## DIRECTIONS

Answer each question by writing in the appropriate words or numbers, or checking the boxes provided. This is *not* a test, and there are no right or wrong answers. You are only indicating your preferences. When you are done, complete the name and address information on the back of the form, tear on the dotted line, and return the form to the address on the back.

## DEFINITION OF TERMS

- analytic** • Breaking up things or ideas into parts and examining them to see how they fit together
- artistic** • Taking enjoyment from or skillful in painting, drawing, music, or sculpture. Able to coordinate color, design, and texture for pleasing effects
- conceptual** • Able to conceive thoughts and ideas—to generalize abstract ideas from specific instances
- controlled** • Restrained, holding back, in charge of one's emotions
- conservative** • Tending toward maintaining traditional and proven views, conditions, and institutions
- creative** • Having unusual ideas and innovative thoughts. Able to put things together in new and imaginative ways
- critical** • Judging the value or feasibility of an idea or product. Looking for faults
- detailed** • Paying attention to the small items or parts of an idea or project
- dominant** • Ruling or controlling, having strong impact on others
- emotional** • Having feelings that are easily stirred, displaying those feelings.
- empathetic** • Able to understand how another person feels, and able to communicate that feeling
- extrovert** • More interested in people and things outside of self than internal thoughts and feelings. Quickly and easily exposes thoughts, reactions, feelings, etc. to others.
- financial** • Competent in monitoring and handling of quantitative issues related to costs, budgets, and investments
- holistic** • Able to perceive and understand the "big picture" without dwelling on individual elements of an idea, concept, or situation
- imaginative** • Able to form mental images of things not immediately available to the senses or never wholly perceived in reality, able to confront and deal with a problem in a new way
- implementation** • Able to carry out an activity and ensure fulfillment by concrete measures and results
- innovating** • Able to introduce new or novel ideas, methods, or devices
- integration** • Combining similar but unique pieces and parts or ideas into a harmonious whole
- intellectual** • Having superior reasoning powers. Able to acquire and retain knowledge
- interpersonal** • Able easily to develop and maintain meaningful and pleasant relationships with many different kinds of people
- introvert** • Directed more toward inward reflection and understanding than toward people and things outside of self. Slow to expose reactions, feelings, and thoughts to others
- intuitive** • Knowing something without thinking it out—having instant understanding without need for facts or proof
- logical** • Able to reason from expectations based on what has gone before
- mathematical** • Perceiving and understanding numbers and being able to manipulate them to a desired end
- metaphorical** • Able to understand and make use of visual and verbal figures of speech to suggest a likeness or an analogy in place of literal descriptions, i.e., "heart of gold"
- musical** • Having an interest in or talent for music and/or dance
- organized** • Able to arrange people, concepts, objects, elements, etc. into a coherent relationship with each other
- planning** • Formulating methods or means to achieve a desired end in advance of taking actions to implement
- problem solving** • Able to find solutions to difficult problems by reasoning
- quantitative** • Oriented to numerical relationships and inclined toward measurement of amounts, proportions, and dimensions
- rational** • Making choices on the basis of reason as opposed to emotion
- reader** • One who reads often and enjoys it
- rigorous thinking** • Having a thorough, detailed approach to problem-solving.
- sequential** • Dealing with things and ideas one after another or in order
- simultaneous** • Able to process and make sense of two or more mental inputs, such as visual, musical, or verbal inputs, at the same time. Able to attend to two or more activities at the same time
- spatial** • Able to perceive and understand the relative position of objects in space, and able to manipulate them into a desired relationship
- spiritual** • Having to do with spirit or soul as apart from the body or material things
- symbolic** • Able to use and understand objects, marks, and signs as representative of facts and ideas
- synthesizer** • One who unites separate ideas, elements, or concepts into a unified whole
- technical** • Able to understand and apply engineering and scientific knowledge
- teaching training** • Able to explain ideas and procedures in a way that people can understand and apply them
- verbal** • Having good speaking skills. Clear and effective with words
- writer** • One who communicates clearly with the written word and enjoys it

**BIOGRAPHICAL INFORMATION**

- 1 Name \_\_\_\_\_ 2 Sex M  F
- 3 Educational Focus or Major \_\_\_\_\_
- 4 Occupation or Job Title \_\_\_\_\_
- Describe your work \_\_\_\_\_

**HANDEDNESS**

- 5 Which picture most closely resembles the way you hold a pencil? Mark box A, B, C, or D.



- 6 What is the strength and direction of your handedness? Mark box A, B, C, D, or E

A  primary left    B  primary left, some right    C  both hands equal    D  primary right, some left    E  primary right

**BEST/WORST SUBJECTS**

Think back to your best/worst elementary and/or secondary school subjects. Rank all three subjects identified below by entering a 1, 2, or 3 on the basis of how well you did 1 = best, 2 = second best, 3 = third best

7 \_\_\_\_\_ math    8 \_\_\_\_\_ foreign language    9 \_\_\_\_\_ native language or mother tongue

**WORK ELEMENTS**

Rate each of the work elements below according to your strength in that activity, using the following scale Enter the appropriate number next to each element Do not use any number more than four times 5 = work I do best, 4 = work I do well, 3 = neutral, 2 = work I do less well, 1 = work I do least well

- |                            |                                 |                             |
|----------------------------|---------------------------------|-----------------------------|
| 10. _____ analytical       | 16. _____ technical aspects     | 21. _____ innovating        |
| 11. _____ administrative   | 17. _____ implementation        | 22. _____ teaching/training |
| 12. _____ conceptualizing  | 18. _____ planning              | 23. _____ organization      |
| 13. _____ expressing ideas | 19. _____ interpersonal aspects | 24. _____ creative aspects  |
| 14. _____ integration      | 20. _____ problem solving       | 25. _____ financial aspects |
| 15. _____ writing          |                                 |                             |

**KEY DESCRIPTORS**

Select the eight adjectives which best describe the way you see yourself Enter a 2 next to each of your eight selections Then change one 2 to a 3 for the adjective which best describes you

- |                        |                        |                        |
|------------------------|------------------------|------------------------|
| 26. _____ logical      | 35. _____ emotional    | 43. _____ symbolic     |
| 27. _____ creative     | 36. _____ spatial      | 44. _____ dominant     |
| 28. _____ musical      | 37. _____ critical     | 45. _____ holistic     |
| 29. _____ sequential   | 38. _____ artistic     | 46. _____ intuitive    |
| 30. _____ synthesizer  | 39. _____ spiritual    | 47. _____ quantitative |
| 31. _____ verbal       | 40. _____ rational     | 48. _____ reader       |
| 32. _____ conservative | 41. _____ controlled   | 49. _____ simultaneous |
| 33. _____ analytical   | 42. _____ mathematical | 50. _____ factual      |
| 34. _____ detailed     |                        |                        |

**HOBBIES**

Indicate a maximum of six hobbies you are actively engaged in. Enter a 3 next to your major hobby, a 2 next to each primary hobby, and a 1 next to each secondary hobby.

- |                           |                            |                           |
|---------------------------|----------------------------|---------------------------|
| 51 _____ arts/crafts      | 59 _____ gardening/plants  | 67 _____ sewing           |
| 52 _____ boating          | 60 _____ golf              | 68 _____ spectator sports |
| 53 _____ camping/hiking   | 61 _____ home improvements | 69 _____ swimming/diving  |
| 54 _____ cards            | 62 _____ music listening   | 70 _____ tennis           |
| 55 _____ collecting       | 63 _____ music playing     | 71 _____ travel           |
| 56 _____ cooking          | 64 _____ photography       | 72 _____ woodworking      |
| 57 _____ creative writing | 65 _____ reading           | _____ other _____         |
| 58 _____ fishing          | 66 _____ sailing           | _____                     |

**ENERGY LEVEL**

73 Thinking about your energy level or "drive," select the one that best represents you. Check box A, B, or C.

- A  day person    B  day/night person equally    C  night person

**MOTION SICKNESS**

74 Have you ever experienced motion sickness (nausea, vomiting) in response to vehicular motion (while in a car, boat, plane, bus, train, amusement ride)? Check box A, B, C, or D to indicate the number of times.

- A  none    B  1-2    C  3-10    D  more than 10

75 Check box A or B to indicate whether you can read while traveling in a car without stomach awareness, nausea, or vomiting.

- A  yes    B  no

**ADJECTIVE PAIRS**

For each paired item below, check the word or phrase which is more descriptive of yourself. Check box A or B in each case, even if the choice is a difficult one. Do not omit any pairs.

- | A / B |  | A / B |  |
|-------|--|-------|--|
| 76    | conservative <input type="checkbox"/> / <input type="checkbox"/> empathetic              | 88    | imaginative <input type="checkbox"/> / <input type="checkbox"/> sequential                       |
| 77    | analyst <input type="checkbox"/> / <input type="checkbox"/> synthesizer                  | 89    | original <input type="checkbox"/> / <input type="checkbox"/> reliable                            |
| 78    | quantitative <input type="checkbox"/> / <input type="checkbox"/> musical                 | 90    | creative <input type="checkbox"/> / <input type="checkbox"/> logical                             |
| 79    | problem-solver <input type="checkbox"/> / <input type="checkbox"/> planner               | 91    | controlled <input type="checkbox"/> / <input type="checkbox"/> emotional                         |
| 80    | controlled <input type="checkbox"/> / <input type="checkbox"/> creative                  | 92    | musical <input type="checkbox"/> / <input type="checkbox"/> detailed                             |
| 81    | original <input type="checkbox"/> / <input type="checkbox"/> emotional                   | 93    | simultaneous <input type="checkbox"/> / <input type="checkbox"/> empathetic                      |
| 82    | feeling <input type="checkbox"/> / <input type="checkbox"/> thinking                     | 94    | communicator <input type="checkbox"/> / <input type="checkbox"/> conceptualizer                  |
| 83    | interpersonal <input type="checkbox"/> / <input type="checkbox"/> organizer              | 95    | technical things <input type="checkbox"/> / <input type="checkbox"/> people-oriented             |
| 84    | spiritual <input type="checkbox"/> / <input type="checkbox"/> creative                   | 96    | well-organized <input type="checkbox"/> / <input type="checkbox"/> logical                       |
| 85    | detailed <input type="checkbox"/> / <input type="checkbox"/> holistic                    | 97    | rigorous thinking <input type="checkbox"/> / <input type="checkbox"/> metaphorical thinking      |
| 86    | originate ideas <input type="checkbox"/> / <input type="checkbox"/> test and prove ideas | 98    | like things planned <input type="checkbox"/> / <input type="checkbox"/> like things mathematical |
| 87    | warm, friendly <input type="checkbox"/> / <input type="checkbox"/> analytical            | 99    | technical <input type="checkbox"/> / <input type="checkbox"/> dominant                           |

**INTROVERSION EXTROVERSION**

100 Check one box only to place yourself on this introvert-extrovert scale

introvert  .....  .....  .....  .....  .....  .....  .....  .....  .....  ..... extrovert

**TWENTY QUESTIONS**

Respond to each statement by checking the box in the appropriate column

	strongly agree	agree	in between	disagree	strongly disagree
101 I feel that a step by step method is best for solving problems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
102 Daydreaming has provided the impetus for the solution of many of my more important problems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
103 I like people who are most sure of their conclusions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
104 I would rather be known as a reliable than an imaginative person	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
105 I often get my best ideas when doing nothing in particular	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
106 I rely on hunches and the feeling of "rightness" or "wrongness" when moving toward the solution to a problem	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
107 I sometimes get a kick out of breaking the rules and doing things I'm not supposed to do	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
108 Much of what is most important in life cannot be expressed in words	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
109 I'm basically more competitive with others than self-competitive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
110 I would enjoy spending an entire day "alone with my thoughts "	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
111 I dislike things being uncertain and unpredictable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
112 I prefer to work with others in a team effort rather than solo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
113 It is important for me to have a place for everything and everything in its place	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
114 Unusual ideas and daring concepts interest and intrigue me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
115 I prefer specific instructions to those which leave many details optional	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
116 Know-why is more important than know-how	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
117 Thorough planning and organization of time are mandatory for solving difficult problems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
118 I can frequently anticipate the solutions to my problems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
119 I tend to rely more on my first impressions and feelings when making judgements than on a careful analysis of the situation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
120 I feel that laws should be strictly enforced	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

PLEASE COMPLETE NEXT PAGE ➡

**For Confidential Research Purposes,**  
*please provide as much of this additional personal information as possible.*

Date of Birth \_\_\_\_\_

MALE	1	2	3	4	5	6	7	8	9	10	11	12
FEMALE	1	2	3	4	5	6	7	8	9	10	11	12

*Indicate the birth order of you and all your brothers and sisters by darkening the appropriate male or female symbols, then circle your personal birth position*

Country of Birth \_\_\_\_\_

Native Language: \_\_\_\_\_

Racial Self Description \_\_\_\_\_

Cultural Self Description \_\_\_\_\_

Religious Self Description \_\_\_\_\_

Other Personal Information \_\_\_\_\_

**FROM**

Date \_\_\_\_\_

Name \_\_\_\_\_

Company \_\_\_\_\_

Company Address \_\_\_\_\_ Phone (\_\_\_\_) \_\_\_\_\_

Home Address \_\_\_\_\_ Phone (\_\_\_\_) \_\_\_\_\_

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## Herrmann Participant Survey Form

**APPENDIX B**

**MYERS BRIGGS TYPE INDICATOR**

**QUESTIONNAIRE**

# MYERS-BRIGGS TYPE INDICATOR

FORM F

by Katharine C. Briggs and Isabel Briggs Myers

## DIRECTIONS:

There are no "right" or "wrong" answers to these questions. Your answers will help show how you like to look at things and how you like to go about deciding things. Knowing your own preferences and learning about other people's can help you understand where your special strengths are, what kinds of work you might enjoy and be successful doing, and how people with different preferences can relate to each other and be valuable to society.

Read each question carefully and mark your answer on the separate answer sheet. *Make no marks on the question booklet.* Do not think too long about any question. If you cannot decide on a question, skip it but be careful that the *next* space you mark on the answer sheet has the same number as the question you are then answering.

Read the directions on your answer sheet, fill in your name and any other facts asked for, and work through until you have answered all the questions.



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TWELFTH PRINTING, 1986

Which answer comes closest to telling how you usually feel or act?

1. Does following a schedule
  - (A) appeal to you, or
  - (B) crank you?
2. Do you usually get along better with
  - (A) imaginative people, or
  - (B) realistic people?
3. If strangers are staring at you in a crowd, do you
  - (A) often become aware of it, or
  - (B) seldom notice it?
4. Are you more careful about
  - (A) people's feelings, or
  - (B) their rights?
5. Are you
  - (A) inclined to enjoy deciding things, or
  - (B) just as glad to have circumstances decide a matter for you?
6. When you are with a group of people, would you usually rather
  - (A) join in the talk of the group, or
  - (B) talk individually with people you know well?
7. When you have more knowledge or skill in something than the people around you, is it more satisfying
  - (A) to guard your superior knowledge, or
  - (B) to share it with those who want to learn?
8. When you have done all you can to remedy a troublesome situation, are you
  - (A) able to stop worrying about it, or
  - (B) still more or less haunted by it?
9. If you were asked on a Saturday morning what you were going to do that day, would you
  - (A) be able to tell pretty well, or
  - (B) list twice too many things, or
  - (C) have to wait and see?
10. Do you think on the whole that
  - (A) children have the best of it, or
  - (B) life is more interesting for grown-ups?
11. In doing something that many other people do, does it appeal to you more to
  - (A) do it in the accepted way, or
  - (B) invent a way of your own?
12. When you were small, did you
  - (A) feel sure of your parents' love and devotion to you, or
  - (B) feel that they admired and approved of some other child more than they did of you?
13. Do you
  - (A) rather prefer to do things at the last minute, or
  - (B) find that hard on the nerves?
14. If a breakdown or mix-up halted a job on which you and a lot of others were working, would your impulse be to
  - (A) enjoy the breathing spell, or
  - (B) look for some part of the work where you could still make progress, or
  - (C) join the "trouble-shooters" who were wrestling with the difficulty?
15. Do you usually
  - (A) show your feelings freely, or
  - (B) keep your feelings to yourself?
16. When you have decided upon a course of action, do you
  - (A) reconsider it if unforeseen disadvantages are pointed out to you, or
  - (B) usually put it through to a finish, however it may inconvenience yourself and others?
17. In reading for pleasure, do you
  - (A) enjoy odd or original ways of saying things, or
  - (B) like writers to say exactly what they mean?



18. In any of the ordinary emergencies of everyday life, do you prefer to  
 (A) take orders and be helpful, or  
 (B) give orders and be responsible?
19. At parties, do you  
 (A) sometimes get bored, or  
 (B) always have fun?
20. Is it harder for you to adapt to  
 (A) routine, or  
 (B) constant change?
21. Would you be more willing to take on a heavy load of extra work for the sake of  
 (A) extra comforts and luxuries, or  
 (B) a chance to achieve something important?
22. Are the things you plan or undertake  
 (A) almost always things you can finish, or  
 (B) often things that prove too difficult to carry through?
23. Are you more attracted to  
 (A) a person with a quick and brilliant mind, or  
 (B) a practical person with a lot of common sense?
24. Do you find people in general  
 (A) slow to appreciate and accept ideas not their own, or  
 (B) reasonably open-minded?
25. When you have to meet strangers, do you find it  
 (A) pleasant, or at least easy, or  
 (B) something that takes a good deal of effort?
26. Are you inclined to  
 (A) value sentiment more than logic, or  
 (B) value logic more than sentiment?
27. Do you prefer to  
 (A) arrange dates, parties, etc. well in advance, or  
 (B) be free to do whatever looks like fun when the time comes?
28. In making plans which concern other people, do you prefer to  
 (A) take them into your confidence, or  
 (B) keep them in the dark until the last possible moment?
29. Is it a higher compliment to be called  
 (A) a person of real feeling, or  
 (B) a consistently reasonable person?
30. When you have a decision to make, do you usually  
 (A) make it right away, or  
 (B) wait as long as you reasonably can before deciding?
31. When you run into an unexpected difficulty in something you are doing, do you feel it to be  
 (A) a piece of bad luck, or  
 (B) a nuisance, or  
 (C) all in the day's work?
32. Do you almost always  
 (A) enjoy the present moment and make the most of it, or  
 (B) feel that something just ahead is more important?
33. Are you  
 (A) easy to get to know, or  
 (B) hard to get to know?
34. With most of the people you know, do you  
 (A) feel that they mean what they say, or  
 (B) feel you must watch for a hidden meaning?
35. When you start a big project that is due in a week, do you  
 (A) take time to list the separate things to be done and the order of doing them, or  
 (B) plunge in?
36. In solving a personal problem, do you  
 (A) feel more confident about it if you have asked other people's advice, or  
 (B) feel that nobody else is in as good a position to judge as you are?
37. Do you admire more the people who are  
 (A) conventional enough never to make themselves conspicuous, or  
 (B) too original and individual to care whether they are conspicuous or not?
38. Which mistake would be more natural for you:  
 (A) to drift from one thing to another all your life, or  
 (B) to stay in a rut that didn't suit you?

*Go on to the next page*

39. When you run across people who are mistaken in their beliefs, do you feel that  
 (A) it is your duty to set them right, or  
 (B) it is their privilege to be wrong?
40. When an attractive chance for leadership comes to you, do you  
 (A) accept it if it is something you can really swing, or  
 (B) sometimes let it slip because you are too modest about your own abilities,  
 (C) or doesn't leadership ever attract you?
41. Among your friends, are you  
 (A) one of the last to hear what is going on, or  
 (B) full of news about everybody?
42. Are you at your best  
 (A) when dealing with the unexpected, or  
 (B) when following a carefully worked-out plan?
43. Does the importance of doing well on a test make it generally  
 (A) easier for you to concentrate and do your best, or  
 (B) harder for you to concentrate and do yourself justice?
44. In your free hours, do you  
 (A) very much enjoy stopping somewhere for refreshments, or  
 (B) usually want to use the time and money another way?
45. At the time in your life when things piled up on you the worst, did you find  
 (A) that you had gotten into an impossible situation, or  
 (B) that by doing only the necessary things you could work your way out?
46. Do most of the people you know  
 (A) take their fair share of praise and blame, or  
 (B) grab all the credit they can but shift any blame on to someone else?
47. When you are in an embarrassing spot, do you usually  
 (A) change the subject, or  
 (B) turn it into a joke, or  
 (C) days later, think of what you should have said?
48. Are such emotional "ups and downs" as you may feel  
 (A) very marked, or  
 (B) rather moderate?
49. Do you think that having a daily routine is  
 (A) a comfortable way to get things done, or  
 (B) painful even when necessary?
50. Are you usually  
 (A) a "good mixer", or  
 (B) rather quiet and reserved?
51. In your early childhood (at six or eight), did you  
 (A) feel your parents were very wise people who should be obeyed, or  
 (B) find their authority irksome and escape it when possible?
52. When you have a suggestion that ought to be made at a meeting, do you  
 (A) stand up and make it as a matter of course, or  
 (B) hesitate to do so?
53. Do you get more annoyed at  
 (A) fancy theories, or  
 (B) people who don't like theories?
54. When you are helping in a group undertaking, are you more often struck by  
 (A) the cooperation, or  
 (B) the inefficiency,  
 (C) or don't you get involved in group undertakings?
55. When you go somewhere for the day, would you rather  
 (A) plan what you will do and when, or  
 (B) just go?
56. Are the things you worry about  
 (A) often really not worth it, or  
 (B) always more or less serious?
57. In deciding something important, do you  
 (A) find you can trust your feeling about what is best to do, or  
 (B) think you should do the *logical* thing, no matter how you feel about it?

58. Do you tend to have  
 (A) deep friendships with a very few people, or  
 (B) broad friendships with many different people?
59. Do you think your friends  
 (A) feel you are open to suggestions, or  
 (B) know better than to try to talk you out of anything you've decided to do?
60. Does the idea of making a list of what you should get done over a week-end  
 (A) appeal to you, or  
 (B) leave you cold, or  
 (C) positively depress you?
61. In traveling, would you rather go  
 (A) with a companion who had made the trip before and "knew the ropes", or  
 (B) alone or with someone greener at it than yourself?
62. Would you rather have  
 (A) an opportunity that may lead to bigger things, or  
 (B) an experience that you are sure to enjoy?
63. Among your personal beliefs, are there  
 (A) some things that cannot be proved, or  
 (B) only things that *can* be proved?
64. Would you rather  
 (A) support the established methods of doing good, or  
 (B) analyze what is still wrong and attack unsolved problems?
65. Has it been your experience that you  
 (A) often fall in love with a notion or project that turns out to be a disappointment—so that you "go up like a rocket and come down like the stick", or do you  
 (B) use enough judgment on your enthusiasms so that they do not let you down?
66. Do you think you get  
 (A) more enthusiastic about things than the average person, or  
 (B) less enthusiastic about things than the average person?
67. If you divided all the people you know into those you like, those you dislike, and those toward whom you feel indifferent, would there be more of  
 (A) those you like, or  
 (B) those you dislike?
- [On this next question *only*, if two answers are true, mark both.]
68. In your daily work, do you  
 (A) rather enjoy an emergency that makes you work against time, or  
 (B) hate to work under pressure, or  
 (C) usually plan your work so you won't *need* to work under pressure?
69. Are you more likely to speak up in  
 (A) praise, or  
 (B) blame?
70. Is it higher praise to say someone has  
 (A) vision, or  
 (B) common sense?
71. When playing cards, do you enjoy most  
 (A) the sociability,  
 (B) the excitement of winning,  
 (C) the problem of getting the most out of each hand,  
 (D) the risk of playing for stakes,  
 (E) or don't you enjoy playing cards?

Go on to the next page

## Which word in each pair appeals to you more?

Think what the words mean, not how they look or how they sound.

- |                     |                |     |                     |             |     |
|---------------------|----------------|-----|---------------------|-------------|-----|
| 72. (A) firm-minded | warm-hearted   | (B) | 98. (A) sensible    | fascinating | (B) |
| 73. (A) imaginative | matter-of-fact | (B) | 99. (A) changing    | permanent   | (B) |
| 74. (A) systematic  | spontaneous    | (B) | 100. (A) determined | devoted     | (B) |
| 75. (A) congenial   | effective      | (B) | 101. (A) system     | zest        | (B) |
| 76. (A) theory      | certainty      | (B) | 102. (A) facts      | ideas       | (B) |
| 77. (A) party       | theater        | (B) | 103. (A) compassion | foresight   | (B) |
| 78. (A) build       | invent         | (B) | 104. (A) concrete   | abstract    | (B) |
| 79. (A) analyze     | sympathize     | (B) | 105. (A) justice    | mercy       | (B) |
| 80. (A) popular     | intimate       | (B) | 106. (A) calm       | lively      | (B) |
| 81. (A) benefits    | blessings      | (B) | 107. (A) make       | create      | (B) |
| 82. (A) casual      | correct        | (B) | 108. (A) wary       | trustful    | (B) |
| 83. (A) active      | intellectual   | (B) | 109. (A) orderly    | easy-going  | (B) |
| 84. (A) uncritical  | critical       | (B) | 110. (A) approve    | question    | (B) |
| 85. (A) scheduled   | unplanned      | (B) | 111. (A) gentle     | firm        | (B) |
| 86. (A) convincing  | touching       | (B) | 112. (A) foundation | spire       | (B) |
| 87. (A) reserved    | talkative      | (B) | 113. (A) quick      | careful     | (B) |
| 88. (A) statement   | concept        | (B) | 114. (A) thinking   | feeling     | (B) |
| 89. (A) soft        | hard           | (B) | 115. (A) theory     | experience  | (B) |
| 90. (A) production  | design         | (B) | 116. (A) sociable   | detached    | (B) |
| 91. (A) forgive     | tolerate       | (B) | 117. (A) sign       | symbol      | (B) |
| 92. (A) hearty      | quiet          | (B) | 118. (A) systematic | casual      | (B) |
| 93. (A) who         | what           | (B) | 119. (A) literal    | figurative  | (B) |
| 94. (A) impulse     | decision       | (B) | 120. (A) peacemaker | judge       | (B) |
| 95. (A) speak       | write          | (B) | 121. (A) accept     | change      | (B) |
| 96. (A) affection   | tenderness     | (B) | 122. (A) agree      | discuss     | (B) |
| 97. (A) punctual    | leisurely      | (B) | 123. (A) executive  | scholar     | (B) |

Which answer comes closest to telling how you usually feel or act?

124. Do you find the more routine parts of your day  
(A) restful, or  
(B) boring?
125. If you think you are not getting a square deal in a club or team to which you belong, is it better to  
(A) shut up and take it, or  
(B) use the threat of resigning if necessary to get your rights?
126. Can you  
(A) talk easily to almost anyone for as long as you have to, or  
(B) find a lot to say only to certain people or under certain conditions?
127. When strangers notice you, does it  
(A) make you uncomfortable, or  
(B) not bother you at all?
128. If you were a teacher, would you rather teach  
(A) fact courses, or  
(B) courses involving theory?
129. When something starts to be the fashion, are you usually  
(A) one of the first to try it, or  
(B) not much interested?
130. In solving a difficult personal problem, do you  
(A) tend to do more worrying than is useful in reaching a decision, or  
(B) feel no more anxiety than the situation requires?
131. If people seem to slight you, do you  
(A) tell yourself they didn't mean anything by it, or  
(B) distrust their good will and stay on guard with them thereafter?
132. When you have a special job to do, do you like to  
(A) organize it carefully before you start, or  
(B) find out what is necessary as you go along?
133. Do you feel it is a worse fault  
(A) to show too much warmth, or  
(B) not to have warmth enough?
134. When you are at a party, do you like to  
(A) help get things going, or  
(B) let the others have fun in their own way?
135. When a new opportunity comes up, do you  
(A) decide about it fairly quickly, or  
(B) sometimes miss out through taking too long to make up your mind?
136. In managing your life, do you tend to  
(A) undertake too much and get into a tight spot, or  
(B) hold yourself down to what you can comfortably handle?
137. When you find yourself definitely in the wrong, would you rather  
(A) admit you are wrong, or  
(B) not admit it, though everyone knows it,  
(C) or don't you ever find yourself in the wrong?
138. Can the new people you meet tell what you are interested in  
(A) right away, or  
(B) only after they really get to know you?
139. In your home life, when you come to the end of some undertaking, are you  
(A) clear as to what comes next and ready to tackle it, or  
(B) glad to relax until the next inspiration hits you?
140. Do you think it more important to  
(A) be able to see the possibilities in a situation, or  
(B) be able to adjust to the facts as they are?
141. Do you feel that the people whom you know personally owe their successes more to  
(A) ability and hard work, or  
(B) luck, or  
(C) bluff, pull and shoving themselves ahead of others?
142. In getting a job done, do you depend upon  
(A) starting early, so as to finish with time to spare, or  
(B) the extra speed you develop at the last minute?
143. After associating with superstitious people, have you  
(A) found yourself slightly affected by their superstitions, or  
(B) remained entirely unaffected?

*Go on to the next page.*

144. When you don't agree with what has just been said, do you usually  
(A) let it go, or  
(B) put up an argument?
145. Would you rather be considered  
(A) a practical person, or  
(B) an ingenious person?
146. Out of all the good resolutions you may have made, are there  
(A) some you have kept to this day, or  
(B) none that have really lasted?
147. Would you rather work under someone who is  
(A) always kind, or  
(B) always fair?
148. In a large group, do you more often  
(A) introduce others, or  
(B) get introduced?
149. Would you rather have as a friend someone who  
(A) is always coming up with new ideas, or  
(B) has both feet on the ground?
150. When you have to do business with strangers, do you feel  
(A) confident and at ease, or  
(B) a little fussed or afraid that they won't want to bother with you?
151. When it is settled well in advance that you will do a certain thing at a certain time, do you find it  
(A) nice to be able to plan accordingly, or  
(B) a little unpleasant to be tied down?
152. Do you feel that sarcasm  
(A) should never be used where it can hurt people's feelings, or  
(B) is too effective a form of speech to be discarded for such a reason?
153. When you think of some little thing you should do or buy, do you  
(A) often forget it till much later, or  
(B) usually get it down on paper to remind yourself, or  
(C) always carry through on it without reminders?
154. Do you more often let  
(A) your heart rule your head, or  
(B) your head rule your heart?
155. In listening to a new idea, are you more anxious to  
(A) find out all about it, or  
(B) judge whether it is right or wrong?
156. Are you oppressed by  
(A) many different worries, or  
(B) comparatively few?
157. When you don't approve of the way a friend is acting, do you  
(A) wait and see what happens, or  
(B) do or say something about it?
158. Do you feel it is a worse fault to be  
(A) unsympathetic, or  
(B) unreasonable?
159. When a new situation comes up which conflicts with your plans, do you try first to  
(A) change your plans to fit the situation, or  
(B) change the situation to fit your plans?
160. Do you think the people close to you know how you feel  
(A) about most things, or  
(B) only when you have had some special reason to tell them?
161. When you have a serious choice to make, do you  
(A) almost always come to a clear-cut decision, or  
(B) sometimes find it so hard to decide that you do not wholeheartedly follow up either choice?
162. On most matters, do you  
(A) have a pretty definite opinion, or  
(B) like to keep an open mind?
163. As you get to know people better, do you more often find that they  
(A) let you down or disappoint you in some way, or  
(B) improve upon acquaintance?
164. When the truth would not be polite, are you more likely to tell  
(A) a polite lie, or  
(B) the impolite truth?
165. In your way of living, do you prefer to be  
(A) original, or  
(B) conventional?
166. Would you have liked to argue the meaning of  
(A) a lot of these questions, or  
(B) only a few?

**APPENDIX C**

**MYERS BRIGGS COMBINATION SUMMARIES**

## CHARACTERISTICS OF THE TYPES IN HIGH SCHOOL

## SENSING TYPES

## WITH THINKING

## WITH FEELING

INTROVERTS  
 JUDGING  
 PERCEPTIVE  
 PERCEPTIVE  
 EXTRAVERTS  
 JUDGING

## ISTJ

Serious, quiet, earns his success by earnest concentration and unhurried thoroughness. Logical and orderly in his work and dependable in all he does. Sees to it that everything he touches is well organized. Takes responsibility of his own accord. Makes up his own mind as to what should be accomplished and works toward it steadily, regardless of protests or distractions.

## ISFJ

Quiet, friendly, responsible and conscientious. Works devotedly to meet his obligations and serve his friends and school. Thorough and painstaking, accurate with figures, but needs time to master technical subjects, as reasoning is not his strong point. Patient with detail and routine. Loyal, considerate, concerned with how other people feel even when they are in the wrong.

## ISTP

Quiet, reserved, a sort of cool onlooker at life, observing and analyzing it with detached curiosity and unexpected flashes of original humor. Interested mainly in mechanics, in cars, in sports and in business. Exerts himself only as much as he considers actually necessary, even if he happens to be a star athlete.

## ISFP

Retiring, quietly friendly, sensitive, hates argument of any kind, is always too modest about his abilities. Has no wish to be a leader, but is a loyal, willing follower. Puts things off to the last minute and beyond. Never really drives himself about anything, because he enjoys the present moment and does not want it spoiled.

## ESTP

Matter-of-fact, doesn't worry or hurry, always has a good time. Likes mechanical things, cars and sports, with friends on the side. A little blunt and insensitive. Can take school or leave it. Won't bother to follow a wordy explanation, but comes alive when there is something real to be worked, handled or taken apart. Can do math and technical stuff when he sees he will need it.

## ESFP

Outgoing, easy-going, uncritical, friendly, very fond of a good time. Enjoys sports and making things, restless if he has to sit still. Knows what's happening and joins in helpfully. Literal-minded, tries to remember rather than to reason, is easily confused by theory. Has good common sense and practical ability, but is not at all interested in study for its own sake.

## ESTJ

Practical, realistic, matter-of-fact, with a natural head for business. Likes the mechanics of things. Not interested in subjects that he sees no actual use for, but can apply himself when necessary. Is good at organizing and running school activities, but sometimes rubs people the wrong way by ignoring their feelings and viewpoints. Live their outer life more with thinking, inner more with sensing.

## ESFJ

Warm-hearted, talkative, popular, conscientious, interested in everyone, a born cooperater and active committee member. Has no capacity for analysis or abstract thinking, and so has trouble with technical subjects, but works hard to master the facts in a lesson and win approval. Works best with plenty of praise and encouragement. Always doing something nice for someone. Live their outer life more with feeling, inner more with sensing.



CHARACTERISTICS OF THE TYPES IN HIGH SCHOOL

INTUITIVES

WITH FEELING

WITH THINKING

INFJ

Gifted and original student who succeeds through combination of intelligence, perseverance, and desire to please. Puts his best efforts into his work because he wouldn't think of doing less than his best. Quiet, conscientious, considerate of others, widely respected if not popular, but suffers socially from unwillingness to compromise where a principle or conviction is involved.

INTJ

Has a very original mind and a great amount of drive which he uses only when it pleases him. In fields which appeal to his imagination he has a fine power to organize a job or piece of work and carry it through with or without the help of others. He is always sceptical, critical and independent, generally determined, and often stubborn. Can never be driven, seldom led.

INFP

Particularly enthusiastic about books, reads or tells the parts he likes best to his friends. Interested and responsive in class, always attentive and quick to see what the teacher is leading up to. Has a warm, friendly personality but is not sociable just for the sake of sociability and seldom puts his mind on his possessions or physical surroundings.

INTP

Quiet, reserved, brilliant in exams, especially in theoretical or scientific subjects. Logical to the point of hair-splitting. Has no capacity for small talk and is uncomfortable at parties. Primarily interested in his studies and wouldn't care to be president of his class. Liked by his teachers for his scholarship and by the few fellow-students who get to know him for himself.

ENFP

Warmly enthusiastic, high-spirited, ingenious, imaginative, can do almost anything that interests him. Quick with a solution for any difficulty and very ready to help people with a problem on their hands. Often relies on his spur-of-the-moment ability to improvise instead of preparing his work in advance. Can usually talk his way out of any jam with charm and ease.

ENTP

Quick, ingenious, gifted in many lines, lively and stimulating company, alert and outspoken, argues for fun on either side of any question. Resourceful in solving new and challenging problems, but tends to neglect routine assignments as a boring waste of time. Turns to one new interest after another. Can always find excellent reasons for whatever he wants.

ENFJ

Responsive and responsible. Feels a real concern for what others think and want, and tries always to handle things with due regard for the other fellow's feelings and desires. Can lead a group discussion or present a proposal with ease and tact. Sociable, popular, active in school affairs, but puts time enough on his lessons to do. Live their outer life more with feeling, inner more with intuition.

ENTJ

Hearty, frank, able in studies and a leader in activities. Particularly good in anything requiring reasoning and intelligent talk, like debating or public speaking. Well-informed and keeps adding to his fund of knowledge. May be a bit too positive in matters where his experience has not yet caught up with his self-confidence. Live their outer life more with thinking, inner more with intuition.

JUDGING  
INTROVERTS  
PERCEPTIVE

PERCEPTIVE  
EXTRAVERTS  
JUDGING

**APPENDIX D**

**PRETEST QUESTIONNAIRE**

## PRETEST QUESTIONNAIRE

Please provide the following background information.

1. To the nearest year, how many years have you been employed as an auditor? \_\_\_\_\_ years
2. What is the title of your position within your firm?
3. Are you a CPA? \_\_\_ yes \_\_\_ no
4. In what year were you born? 19\_\_\_\_.
5. What is your sex? \_\_\_\_\_ male \_\_\_\_\_ female
6. How many years of education beyond high school have you completed? \_\_\_\_\_ years
7. How many undergraduate or graduate auditing courses have you completed? \_\_\_\_\_ course(s)
8. What was your undergraduate major?
9. What institution granted your undergraduate degree?  
When?
10. Do you have a graduate degree? \_\_\_ yes \_\_\_ no
  - (a) If yes, which graduate degree(s) have you received?  
When?
  - (b) If yes, what institution(s) granted the degree?
11. Have you attended firm training schools?  
\_\_\_\_\_ yes \_\_\_\_\_ no
  - (a) If yes, please list those schools along with the topics covered during those sessions.
12. Do you have access to a cassette tape recorder?  
\_\_\_\_\_ yes \_\_\_\_\_ no  
If yes, what type of recorder is it?  
\_\_\_\_\_ standard \_\_\_\_\_ micro

**APPENDIX E**

**PROFILE DESCRIPTIONS OF THE HERRMANN  
BRAIN DOMINANCE INDICATOR**

## Herrmann Brain Dominance Instrument Profile Descriptions

### 1-3-3-2

This profile is a singular dominant profile, the most preferred quadrant being Upper Left A, characterized by logical, rational, mathematical, and analytic processing. The secondary of this profile occurs in Upper Right quadrant D, whose characteristics are functional, yet clearly secondary to those processing modes of the Upper Left quadrant A. The holistic, creative, and synthesizing processing modes of Upper Right D would be used, but the logical, rational, and quantitative modes of quadrant A would visibly be the most preferred. The two remaining quadrants, both Lower Left B and Lower Right C, are tertiaries. The characteristics of controlled, planning, and organizing of Lower Left B coupled with the interpersonal, emotional, and intuitive modes of Lower Right C would clearly be lacking or may even be avoided modes of processing. These tertiaries would tend to visibly reinforce the prominence of the primary and this person would be seen as singularly dominant in the Upper Left A quadrant. Occupations are varied, including engineering, those in technical fields, legal and financial work, and some in the technical middle management positions.

### 1-2-2-3

This is a singular dominant profile, the most preferred quadrant being the Upper Left quadrant A, with the characteristics of logical, analytical, rational, and quantitative processing. The Lower Left B and Lower Right C quadrants are secondaries. Therefore, this person would typically be functional in the processing modes of control, organization, structure, and planning of Lower Left B, as well as interpersonal, emotional, and spiritual in Lower Right C. The fourth quadrant (Upper Right D) is a tertiary and the characteristics of holistic, creative, and synthesizing in this quadrant would clearly be lacking or even avoided. This person would clearly be seen as logical, rational, and analytic, with some capabilities for administrative and detailed activities along with some interpersonal and emotional characteristics. The occupations typical of persons with this profile are technically, mathematically or financially based, with some working in the legal and middle management professions.

## 1-2-3-2

This profile is a singular dominant profile, the most preferred processing mode occurring in Upper Left A quadrant with characteristics of logical, analytical, rational, and quantitative. The secondary in the Lower Left quadrant B and the Upper Right quadrant D are functional in terms of controlled, conservative, and organizing modes of processing (in the Lower Left B), and holistic, creative, and synthesizing modes (in the Upper Right D). The fourth quadrant, Lower Right C, is a tertiary and its characteristics would clearly be the least preferred--the more interpersonal, emotional, and spiritual modes of processing. This person's most visible preferences would be logical, analytic, rational, quantitative, and technical processing with some secondary abilities for organizing and synthesizing. The lack of preference for the more interpersonal aspects would reinforce the strength of the primary in Upper Left A. Occupations would include those in the technical, legal and financial areas, including accounting and tax law, engineering, mathematics, and some middle management positions that require little Human Resource involvement.

## 1-2-2-2

This profile is the profile of a clearly logical, analytical, mathematical, and rational person. It is a singular dominant profile, the most preferred quadrant being in Upper Left A. To a lesser extent, but still functional in processing, are the controlled, organized, planned modes of thinking in the Lower Left B quadrant, the interpersonal, emotive modes of the Lower Right C quadrant, and the holistic, creative, and synthesizing modes of Upper Right D quadrant. Individuals with this profile would typically be capable of functioning in the three secondaries, quadrants B, C, D, but the clear preference and preferred processing mode would be that of Upper Left A. Occupations that would be typical of this profile include chemists, mathematicians, technicians, engineers, and financial and technical managers.

## 1-1-3-3

This profile is a double dominant profile, with two strong primaries occurring in the Upper Left A and Lower Left B quadrants. The two contrasting tertiaries of this profile are in the Lower Right C and the Upper Right D quadrants. This profile is characterized by the distinct lack of preference, even avoidance, for the characteristics of the right modes of C & D. This individual would be rational, logical, analytic, and quantitative, coupled with controlled, planned, organized, and structured. There would be an extreme lack of preference for the emotional, interpersonal, and spiritual aspects of the Lower Right C quadrant, as well as the same lack of preference for the holistic, creative, synthesizing and integrative modes associated with Upper Right D. The preferences for the left modes of processing would be even more pronounced in this profile as they are reinforced by the extreme lack of preference for the right mode. Occupations would include professional contributors in technical, accounting, and financial occupations, manufacturing, and a variety in the management areas where "facts and form" rather than "people and concepts" are the primary focus.

## 1-1-2-3

This profile is double dominant with primaries occurring in Upper Left A and Lower Left B quadrants. The profile has a secondary in Lower Right C, and a tertiary in Upper Right D. This would indicate a strong preference for the analytic, rational, and logical processing of the Upper Left A, and an equally strong preference for the controlled, structured, and organized modes associated with the Lower Left B quadrant. The Lower Right C quadrant, characteristic of interpersonal, emotional, and intuitive thinking modes, would be functional, yet secondary. The Upper Right D quadrant, characteristic of holistic, imaginative, synthesizing, and integrative processes, would be tertiary or of low preference. Occupations for this profile would include technical managers, manufacturing managers, scientists, financial positions including accountants and bookkeepers, and operational and production oriented engineers.

## 1-1-3-2

This is a double dominant profile with the two most preferred modes of processing occurring in the Upper Left A and Lower Left B quadrants. The characteristics of this profile would be logical, analytical, and rational in Upper Left A and controlled, conservative, and organized in the Lower Left B. The secondary of this profile is in the Upper Right D quadrant, in which the characteristics of imaginative, holistic, and synthesizing modes would be functional, yet clearly secondary in comparison with the primary left hemisphere modes. The characteristics of the Lower Right C quadrant -- emotional, interpersonal, and spiritual, would be visibly lacking or even avoided as this is expressed as a tertiary. The distinct secondary/tertiary position of the two right quadrants would reinforce the strength and preference of the left modes and this person would clearly be seen as logical, rational, controlled, and organized. Occupations would include professional contributor positions in the technical and engineering professions, the financial occupations, and some in middle management positions.

## 1-1-2-2

This is a double dominant profile with primaries in the Left mode--Upper Left A and Lower Left B quadrants. It is the second most common profile in the general population, representing 15 percent, and the most common profile for males, representing 21 percent. The profile is characterized by a logical, analytic, technical orientation, and is effective in rational problem solving from the Upper Left A quadrant. Lower Left B quadrant preferences include planning, organizing, implementing and administrative activities. In this profile, the processing modes of Upper Left A and Lower Left B would clearly be the most preferred, and the interpersonal, emotional, and spiritual modes of Lower Right C and the holistic, creative, and synthesizing modes of Upper Right D would be at the secondary level, yet functional. This profile is typical of those occupations in technical fields, such as engineering and manufacturing, financial positions, middle managers, and in general, those positions for which left mode processing is clearly most important, and the right mode processing being necessary, yet secondary.

## 2-1-2-2

This profile is a singular dominant profile with the most preferred being the Lower Left B quadrant. The person with this profile would be characterized by strong preferences in the controlled, planning, organizational, and structured modes of processing. This person would tend to be a perfectionist in terms of detail and the implementation of activities. The secondaries in the remaining three quadrants represent the interpersonal and emotional modes of thinking of the Lower Right C quadrant, the holistic, creative, and conceptual modes of the Upper Right D quadrant, and the logical, analytic, and rational modes of the Upper Left A. While these processing modes are relatively well balanced and functional, the singular preference for quadrant B would represent the primary mode of thinking for this profile. Occupations of people with this profile typically include secretaries, foremen, office managers, bookkeepers, manufacturers and business administrators - occupations that typically require highly planned, organized, structured, and detailed work activities leading to specific results.

## 1-1-1-3

This is a triple dominant profile, with the three primaries occurring in Upper Left A, Lower Left B, and Lower Right C quadrants. The profile would be characterized by a relative balance between the modes of logical and analytical processing in Upper Left A, the control and planning in Lower Left B, and the interpersonal and emotional aspects associated with the Lower Right C quadrant. This profile would be further characterized by the lack of preference for the holistic, conceptual, and synthesizing modes of processing found in the Upper Right D quadrant, which is expressed as a tertiary. As a result, the Upper Right D characteristics would be relatively invisible, and the three primaries would impact the person's mental preferences with a fair amount of balance. Occupations typical of individuals with this profile would include human resource professionals, legal and technical secretaries, and some in middle management positions where the work requirements for D quadrant competencies are very low.

## 1-1-1-2

This profile is a triple dominant profile, featuring two primaries in the Left mode, both Upper Left A and Lower Left B quadrants, and a third primary in Lower Right C. The secondary is in Upper Right D quadrant. Characteristics of this profile would be analytical, rational, and quantitative processing of Upper Left A, with controlled, conservative, structured, and organized processing modes of Lower Left B. Coupled with this would be the interpersonal, emotional, and spiritual aspects of Lower Right C. Distinctly secondary, but usually functional, would be the integrative, creative, and holistic characteristics of Upper Right D. This profile is relatively well balanced, yet clearly the descriptors of the Upper Right D quadrant are secondary. Occupations that are typical of individuals with this profile include managers of a technical nature, such as engineering and manufacturing managers, and managers with a high administrative content to their work, such as hospital administrators.



## 1-1-2-1

This profile is a triple dominant profile with two primaries in the left mode, both Upper Left A and Lower Left B, and the third primary in the Upper Right D quadrant. The secondary, or less preferred mode, occurs in the Lower Right C quadrant—the more interpersonal, spiritual, and emotional mode. This profile is characterized by its multi-dominance, yet, in a relative sense, it lacks a level of "personal touch" that would be present if the Lower Right C quadrant was also a primary. Descriptors for this profile would include logical, analytical, and rational in the Upper Left A quadrant, and planning, organizing, and administrative preferences in the Lower Left B quadrant. This more conservative, safe-keeping preference of Lower Left B would be contrasted with the primary in the Upper Right D quadrant which would be characterized as conceptual, holistic, creative, and "risk oriented" in its mode. Occupations with this profile would be those requiring a combination of logical and analytic problem solving coupled with imaginative and innovative thinking along with administrative and managerial duties. Such occupations would include design engineers, researchers, and those making strategic and operational decisions.

## 1-1-1-1

This profile is a quadruple primary that is multi-dominant in all four quadrants (A,B,C,D) with relatively equal preferences in all four. This profile occurs in 5% of the population. Individuals with this profile would be characterized by being well balanced and having sufficiently strong preferences in all four quadrants to develop the understanding and the ability to use each of the processing modes of the four quadrants. This person is often a "multi-dominant translator", that is, acting as a "translator" for others in order to facilitate communication and understanding between the various modes. In the ideal case, they would be able to move back and forth between the quadrants on a situational basis. This can, however, lead to many conflicts within the individual—the "fact"—"feeling" dichotomy of the Upper Left A and Lower Right C diagonal, or the "form"—"futures" pull of the Lower Left B and Upper Right D diagonal that are evident in this profile. Ultimately, it can lead to a very well integrated person. Occupations with this profile are those that require effective processing in all four quadrants. Examples would be chief executive officers, chairmen of the board, executives with multi-functional responsibilities, and often times, executive secretaries.

## 1-3-3-1

This profile is double dominant with two primaries in both the cerebral quadrants, A and D. It would feature the logical, analytic, and rational processing of Upper Left quadrant A and the holistic, creative, and synthesizing modes of Upper Right quadrant D. The two remaining quadrants are expressed as tertiaries. The characteristics of the Lower Left quadrant B, the more controlled, conservative, and structured modes of thinking, coupled with the interpersonal, emotional, and spiritual aspects of the Lower Right quadrant C, would visibly be lacking or even avoided. This lack of preference for the two limbic quadrants (B & C) would reinforce the strength or preference for the two cerebral quadrants (A & D). Occupations typical of this profile would include researchers, particularly physicists, financial consultants or advisors, design engineers and many in top executive positions in technical or financial business where futures-oriented strategic thinking is a major work requirement.

## 1-2-3-1

This profile is double dominant featuring two primaries in the cerebral quadrants, A and D. Individuals with this profile prefer the more cognitive processing modes associated with these cerebral quadrants compared to the more visceral characteristics of the limbic mode (B and C quadrants). In particular, preferences for logical, analytical, quantitative modes of thinking in the Upper Left A quadrants along with integrative, synthesizing, imaginative, and holistic aspects of the Upper Right D quadrant are exhibited. This profile also indicates a clear secondary preference in the Lower Left B quadrant. Lower Right C is a tertiary or the least preferred quadrant in this profile. The interpersonal, emotional, and spiritual characteristics associated with this quadrant would situationally be avoided. Individuals with this profile frequently exhibit the ability to switch back and forth between the two cerebral modes A and D as the situation demands. Occupations typical of this profile would include those in technical fields, computer design, finance analysts, physicists, or research and development.

## 1-2-2-1

This profile is double dominant with the two primaries in the cerebral quadrants, A and D. Individuals with this profile would exhibit strong preferences for logical, analytic, quantitative modes of thinking in the Upper Left A quadrant, and in contrast would also have a preference for the integrative, synthesizing, creative, and holistic aspects of Upper Right D. This profile indicates a clear secondary preference for the emotional, interpersonal processing of Lower Right C as well as a clear secondary for the controlled, conservative, organized processing modes of the Lower Left B quadrant. Individuals with this profile frequently exhibit the ability to switch back and forth between the two cerebral quadrants, as the situation demands. Occupations typical of this profile include design engineers, financial consultants or advisors (those involved with forecasting financial trends), and research and development scientists, particularly physicists. It is also typical of senior executives in operating and strategic positions in technical organizations.

## 1-2-1-2

This is a double dominant profile on the diagonal axis between the Upper Left A quadrant, and the Lower Right C quadrant. The diagonal of Lower Left B, and Upper Right D, is at a secondary level. This profile is characterized by individuals who are very logical, analytic, and rational in the thinking styles of Upper Left A, but also is strong in the intuitive, interpersonal, "feeling" aspects of the Lower Right C quadrant. This person would show a very distinct preference for the "facts"--"feelings" axis, compared with a clearly secondary preference for the "form"--"futures" axis. It is quite possible for the primaries in Upper Left A and in Lower Right C to create an inner conflict for this person because of the quadrants' differing characteristics. Occupations would include positions that would be technically or financially oriented with a strong preference for people interaction or a "feeling" base, such as technical trainers, or social service lawyers.

## 2-1-2-1

This is a double dominant profile representing a cross relationship between preferences. The two primaries occur on the diagonal axis between the Lower Left quadrant B and Upper Right quadrant D. The opposite diagonal of Upper Left A and Lower Right C is at the secondary level. This profile is characterized by its distinctly opposing thinking processes—the Lower Left B quadrant being characterized by "safe-keeping" and the Upper Right D quadrant as experimental or "risk-taking". The Lower Left features control, structure, planning, organizing, and conservative modes of processing. The Upper Right is holistic, conceptual, creative, holistic, and synthesizing. The person with this profile would feel this distinct difference in their approach to work, communications, decision making, and life experiences. On one occasion, they may be quite controlled and structured and in another situation, quite loose and free-wheeling. The combination of these two preferences can be very powerful if the Lower Left B is able to stand aside and permit the more imaginative, creative Upper Right D to make its special contribution. Occupations typical of this profile are not clearly evident, although hotel owners, program administrators, quality control leaders, movie producers, some entrepreneurs, and occasionally researchers exhibit this profile. It appears in many fields.

## 2-1-1-2

This profile is a double dominant profile with the two primaries in the Lower Left B and Lower Right C quadrants. It is a double primary in the limbic area. The profile is characterized by very strong preferences in conservative thinking and controlled behavior with a desire for organization and structure as well as detail and accuracy from the Lower Left B quadrant. Persons with this profile tend to worry about details. The primary in the Lower Right C would equally show itself by emotional and interpersonal preferences, an interest in music, and a sense of spirituality. It would also show in an intuitive "feelings" sense of this person. The two limbic primaries could represent an important duality for the person to resolve within themselves. The opposing qualities of control and structure, of "form"—and the emotional and interpersonal "feelings" can cause internal conflict. The clear secondary preferences of the cerebral modes, both Upper Left A and Upper Right D, are also characteristic of this profile, with logical and analytical in the Upper Left A quadrant and holistic and creative thinking of Upper Right D quadrant. Occupations typical of those people with this profile include nurses, homemakers, secretaries, and other members of the "helping" profession.

## 1-2-1-1

This profile is triple dominant, with three preferred quadrants. These primaries occur in Upper Left A, Lower Right C, and Upper Right D quadrants. This is a multi-dominant profile that would be characterized by well balanced processing modes of Upper Left A – the analytic, logical, and rational processing; the interpersonal, emotional, and intuitive thinking modes of Lower Right C, combined with the artistic, creative, and holistic processing modes of the Upper Right D quadrant. The Lower Left B secondary quadrant would be functional, yet clearly of less preference in terms of organizing, control, structure and conservative thinking styles. This profile is also double dominant in the cerebral modes, both left and right. This individual would be more experimental than safe-keeping and more emotional than controlled. Occupations would involve those with less administrative detail and more attention to broad concepts, strategic planning as compared to operational planning, and those occupations tending towards a more "generalized" nature. Positions involving technical innovation and future planning fit this profile along with human resource and development professions.

## 2-2-1-2

This profile is a singular dominant profile with the most preferred quadrant being the Lower Right C. An individual with this profile would clearly prefer the interpersonal, emotional, musical, and spiritual aspects of this quadrant. The three remaining quadrants are functional, yet distinctly secondary to the Lower Right C characteristics. This individual would visibly be "feeling" and people oriented, but still functional and fairly well-balanced in terms of the secondary quadrants—logical, analytic, factual thinking styles of Upper Left A; organized, administrative and controlled in terms of Lower Left B; and finally the creative, synthesizing, holistic modes of processing in Upper Right D. Persons with this profile are typically nurses, social workers, musicians, teachers, counselors, or in the ministry.

## 2-2-1-1

This profile features two primaries in the right mode, quadrants C and D, and two secondaries in the left mode, quadrants A and B. It is the third most common profile in the population at large, at 14 percent, and with only a relatively slight difference in the male and female populations – respectively 11 percent and 17 percent. Typical characteristics would include the ability to be creative, holistic, and synthesizing in the Upper Right D quadrant, and interpersonal, emotional, and spiritual in the Lower Right C quadrant. The left mode secondaries with logical, analytical, and mathematical thinking styles from Upper Left A, and the organizational, planning, and structure from Lower Left B, would be functional, yet clearly secondary to the preferred right modes of thinking. Those with this profile often have the occupations of teaching or facilitating. Other occupations include the arts, such as writers, musicians, artists, and designers, as well as those in the "helping" fields -- psychologists and counselors. This profile could also support entrepreneurial behavior, since it features the imaginative, innovating, and "risk" oriented behavior of the right mode, quadrants C and D without the control or preference of the structured, logical, and conservative modes of the left quadrants A & B.

## 3-2-1-1

This profile features double dominant profiles in the right mode with the most preferred quadrants being the Lower Right C quadrant, and Upper Right D quadrant. The secondary preference appears in the Lower Left B, while the least preferred quadrant, expressed as a tertiary, is in the Upper Left A quadrant. The Upper Right D primary quadrant would express itself in creative, holistic, synthesizing, and artistic modes of thinking. The Lower Right C primary, is characterized by interpersonal, spiritual, and emotional aspects. Together, these would express themselves in intuitive, insightful thinking, both in the feeling and problem solving processes. The secondary in Lower Left B quadrant, would typically be functional in terms of organization, administrative responsibilities, and control, yet is distinctly secondary to the right modes. The tertiary in Upper Left A quadrant, is characterized by the lack of, or even avoidance, of logical, analytical, mathematical, and rational modes of thinking. This profile is frequently that of professionals in the human resource area, sales persons, teachers, social workers, nurses, entrepreneurs and artists.

## 3-3-1-1

This is a double dominant profile in the right mode, with the two primary preferences in the Lower Right C quadrant and the Upper Right D quadrant. The tertiaries occur in the two left mode quadrants, Upper Left A and Lower Left B. This profile is characterized by the Upper Right D primary aspects of imaginative, artistic, holistic, and conceptual processing and the Lower Right C aspects of interpersonal, emotional, and spiritual modes of thinking. These right mode primaries become visible in the absence of strong left mode qualities--those being the lack of, or even avoidance of, the logical, analytical, or rational thought of the Upper Left A quadrant and the controlled, conservative, structured, and organized modes of the Lower Left B quadrant. A person with this profile would exhibit very creative, imaginative, intuitive, emotional, and interpersonal qualities without any strong inclinations for rational thinking or organized implementation. For example, a person who has the imagination to create a new business, but is not well suited to operating it or maintaining it over the long term. Occupations with this profile are typically non-technical and include entrepreneurs, artists, and those in the teaching and "helping" professions.

## 2-3-1-1

This profile is a double dominant profile, with the two most preferred modes of processing occurring in Lower Right C and Upper Right D quadrants. Characteristics of this profile would include interpersonal, emotional, and spiritual aspects of the Lower Right C quadrant and the holistic, creative, and conceptual processing modes of the Upper Right D quadrant. The Upper Left A quadrant is expressed as a secondary, with the modes of processing including logical, analytic, and rational being functional, yet secondary in preference to the right modes. The tertiary in the Lower Left B quadrant would indicate an avoidance or lack of preference for control, planning, organization, and structure. The general lack of preference in the two left hemisphere quadrants, A & B, would reinforce the strength of the primaries in the right quadrants, C & D, and this person would clearly be seen as intuitive, holistic, interpersonal, creative, and imaginative. Occupations that would be typical of persons with this profile would include artists, sales representatives, entrepreneurs, human resource professionals, and teachers or trainers.

## 2-3-3-1

This profile is a singular dominant profile, with the most preferred mode of processing occurring in the Upper Right D quadrant. This profile is characterized by strong preferences in holistic, conceptual, artistic, and synthesizing modes of processing. The secondary in the Upper Left A quadrant would make the characteristics of logical, analytical, and rational thought functional, but secondary in nature. This profile is also typified by the lack of preference or even avoidance of the Lower Left B quadrant and the Lower Right C quadrant, with both expressed as tertiaries. The ability to organize, plan, or pay attention to detail and the interpersonal, emotional, and spiritual modes of processing of the limbic mode would clearly be the least preferred. This lack of preference or avoidance would emphasize and strengthen the primary preference of Upper Right D and this person would be viewed as artistic, creative, imaginative, and holistic. Occupations typical of persons with this profile would include artists, futurists, strategists, and some top level executives.

## 3-2-2-1

This is a singular dominant profile with the most preferred quadrant occurring in Upper Right D. It would be characterized by holistic, creative, synthesizing, and artistic modes of processing. The Lower Left B and Lower Right C quadrants are expressed as secondaries, and the characteristics of control, planning, and organizing of quadrant B, coupled with the interpersonal, emotional, and spiritual processing modes of the Lower Right C quadrant, would typically be functional yet secondary to the singular preference of the Upper Right D quadrant. The Upper Left A quadrant is expressed as a tertiary. The characteristics of logical, rational, and analytic processing are therefore avoided or of low preference. This tertiary in quadrant A, coupled with the secondaries of the two limbic quadrants, reinforces the strength and primary preference of the Upper Right D quadrant. This person would likely be seen as imaginative, holistic, conceptual, and synthesizing in their thinking style. Occupations typical of people with this profile would include entrepreneurs, those in top level management or executive positions, business advisors and consultants, and those in the more aesthetic/artistic occupations.

## 2-3-2-1

This profile is a singular dominant profile, with the most preferred mode of processing occurring in the Upper Right D quadrant which is characterized by holistic, conceptual, artistic, and synthesizing modes of processing. The Upper Left A quadrant and Lower Left B quadrant are expressed as secondaries. The characteristics of logical and analytical processing of the Upper Left A quadrant and interpersonal and emotional aspects of the Lower Right C quadrant would clearly be secondary to the preference in the Upper Right D quadrant. The least preferred quadrant, Lower Left B, would be lacking or even avoided in terms of organizational, planning, or structured modes of processing. This avoidance or lack of preference would reinforce the singular primary in quadrant D, and this person would visibly be seen as imaginative, creative, and holistic in their preferences. Occupations typical of this profile would include artists, teachers, facilitators, entrepreneurs, independent consultants, and many in top management positions.

## 3-1-1-2

This profile is a double dominant profile featuring two primaries occurring in Lower Left B and Lower Right C quadrants. The characteristics typical of this profile would be the controlled, organized, and structured processing modes of the Lower Left B and the interpersonal, emotional, and spiritual modes of the Lower Right C quadrant. The secondary in the Upper Right D quadrant would make the characteristics of holistic, artistic, and conceptual modes of processing functional, yet secondary in preference. This profile is further characterized by absence or avoidance of the logical, analytic, and rational processing of the Upper Left A quadrant. The tertiary in Upper Left A, coupled with the secondary in Upper Right D, make this profile clearly one with limbic mode preferences, which express safe-keeping, feeling and visceral processing. Occupations typical of people with this profile would include trainers, secretaries, nurses, social workers, and homemakers.

## 3-1-1-1

This profile is a triple dominant profile, with the three most preferred quadrants occurring in the Lower Left B, Lower Right C, and the Upper Right D quadrant. A person with this profile would be characterized by a fair amount of balance between the organized and structured processing modes of the Lower Left C quadrant, coupled with the interpersonal and emotional modes of the Lower Right C, and finally, the Upper Right D aspects of holistic, synthesizing, and creative modes of processing. The lack of preference or even avoidance of the logical, rational, and analytic processes of the Upper Left A would also typify this profile. This tertiary expressed in the Upper Left A would tend to strengthen and make more visible the other three primaries. Occupations typical of this profile include teachers, social workers (particularly in heavy case-load positions), trainers, human resource professionals, and those in artistic professions requiring planning, organizing, and detailed administrative duties.

## 2-1-1-1

This is a triple dominant profile with two primaries in the right mode, Lower Right C and Upper Right D quadrants, and the third in Lower Left B. It is the most common of all profiles, with 16 percent of the population exhibiting this multi-dominant array of preferences. It is the clear majority for the female population, 24 percent exhibiting this profile. The 2-1-1-1 profile is characterized by its multi-dominant and "generalized" nature, and fairly balanced amount of understanding and ability to use the three primary quadrants – the preferred processing modes being creative and holistic in Upper Right D, interpersonal and feeling in Lower Right C, and planning and organizing in the Lower Left B. The Upper Left A quadrant is least preferred, but still the person is typically quite functional in their use of the logical and analytical aspects of this quadrant. This profile is typical of many personnel and human resource professionals, including teachers as well as those whose occupations require an understanding and ability to function on many levels, such as social workers, executive secretaries, and supervisory nurses.

2-2-2-1

This singularly dominant profile prefers the Upper Right D quadrant. Characteristics associated with this quadrant reflect creative, imaginative, holistic, and integrative processing. Synthesizing would likely be the most preferred thinking style. The three remaining quadrants are functional, yet distinctly secondary. This permits the person to be quite visibly imaginative, intuitive, experimental, and innovative – yet situationally functional and fairly well-balanced in terms of the logical, analytic, factual modes of thinking from the Upper Left A quadrant; organized, administrative, and controlled in terms of the Lower Left B quadrant; and finally, interpersonal and emotional aspects from the Lower Right C quadrant. Persons with this profile are typically entrepreneurs, facilitators, advisors, consultants, sales-oriented leaders, and artists.



**APPENDIX F**  
**BACKGROUND DATA TO THE**  
**DECISION CASES**

Individual professional judgment is of paramount importance in auditing. While Institute publications, textbooks, journal articles, and firm manuals provide general audit guidelines, an auditor works on specific engagements. Strict guidelines for information collection and evaluation do not exist for specific audit situations. In a given situation, an auditor must exercise professional judgment in determining what information should be collected, and then in assessing the audit implications of that information.

Despite the fact that the professional status of the auditor is derived primarily from his/her need to exercise expert judgment in specific audit situations, very little is known about this judgment process--the mental process by which an auditor uses information to arrive at decisions. The purpose of this study is to add to our knowledge in this area.

There is little that an auditor does in an audit engagement that doesn't involve some degree of judgment. It was therefore necessary--because of the methodology employed and the limited availability of your time--to confine the program planning for this study to an important subset of audit judgment, accounts receivable propriety and collectibility.

The responses of all participants will be held in strict confidence. While a summary of the results of this research will be made available to your firm (and to you if you so desire), information about a particular participant's responses will be made available only to that individual.

It is imperative that you work independently. Please do not consult with others in performing this experiment. The validity of this research and hence the contribution it makes to our knowledge is contingent upon your earnest cooperation. If you find it helpful, you may write on, or highlight information contained in the booklet. Your prompt completion and return of these materials is greatly appreciated.

### Instructions

Assume that you have been assigned by your firm as senior in charge of the audit of Tire Enterprises Incorporated (TEI), a tire wholesaler, for the year ended December 31, 1985. Although this is the first year that you have been on this engagement, your firm has performed the audit since 1982. An unqualified opinion has been issued for each year through 1984. The purpose of this engagement is to issue a standard short-form audit report in accordance with the provisions of a 10-year bank loan of \$300,000

received in 1983. Your assistant on the engagement is a junior accountant with one year of auditing experience. He has worked with you on a previous engagement where you found him to be conscientious and capable.

It is 1986, and you are now preparing the audit program for the 1985 year-end audit. Scheduling problems prevented any interim substantive tests of TEI's records. You were, however, able to conduct a review of internal control and perform compliance tests in October, 1985. No material exceptions were found and you were satisfied that internal controls were operating as intended. (A description of TEI's internal control system is given later.)

This experiment is concerned with how you would plan the audit of TEI's accounts receivable. You are about to be presented with information that a review of the auditing literature indicates may be of interest for such planning. This includes both general information about the wholesale tire industry as well as specific information about TEI. Most of the information is unchanging background information about industry conditions and TEI. Some of the information about TEI (five variables) is not held constant, but varied to form a series of 20 different hypothetical situations you might encounter in your audit of TEI's receivables. (It is the deliberate manipulation of the five variables across the 20 situations that permits insight into your judgment process to be gained.) You are to respond to each situation taking into account the specific information presented in that situation and the unchanging industry and firm background data. Your response for each situation will take the form of five separate time estimates, one for each of five different sets of audit procedures you would choose in that situation. Then you will be asked to evaluate the quality of internal control for each case situation.

As you make your decisions, you are to verbalize your thoughts so that they may be captured on a tape recorder. It is imperative that you verbalize all of your thoughts as you are making your decisions. For example, possible verbalizations would include, "now I am reading the instructions (or re-reading the instructions)," "I'm making a calculation," "I'm making a decision choice," or may even include other thoughts such as, "I'm thinking about what I'm going to have for lunch."

An example of a situation you might be presented with is contained in Figure 1 on pages 4-5. A more detailed description of the audit procedures included in each category is given immediately below.

(A) Confirmation of accounts receivable: includes choice of sampling technique; selection of sample; preparation and mailing of initial and (where needed) second

confirmation requests; checking of confirmation replies and investigation of discrepancies; summarization of results of confirmation requests. (TEI's staff types the confirmations.)

(B) Review of accounts written off as uncollectible: includes preparation of an analysis of Allowance for Doubtful Accounts and reconciliation with related bad debt expense and general ledger; examination of authorizing documents; investigation of suspicious write-offs; confirmation of selected charged-off accounts; examination of remittance advices for accounts not responding last year and not outstanding at 12-31-85.

(C) Review of cash collections of accounts receivable subsequent to balance sheet date: self-explanatory.

(D) Determination of adequacy of allowance for uncollectible accounts: includes examination of past-due accounts selected from aging schedule not paid subsequent to balance sheet date; investigation of credit standings for past-due or unusually large accounts. (TEI provides you with a copy of their 12-31-85 accounts receivable aging.)

(E) Review of year-end sales cutoff: includes comparison of shipping and receiving records with sales invoices and credit memoranda for periods before and after balance sheet date.

Figure 1. Sample Situation

Situation : 00

-----  
Receiving Report Support. Credits for returned merchandise are supported and approved by a receiving report.  
 -----

Separation of Billing Function and Subsidiary Ledger Maintenance. Accounts receivable subsidiary ledger is maintained by a clerk other than the one who prepares and mails out the monthly statements to customers.  
 -----

Write-Off Approval. Write offs of receivables are reviewed and approved by the controller.  
 -----

Receivable Confirmation by Client. Accounts receivable are confirmed during the year by an employee independent of the accounts receivable and cash functions.  
 -----

Sales Approval. All sales orders are approved by the credit manager before shipment.  
 -----

Given the background data in the booklet and the information in Situation 00 above, indicate your planned extent of application of the following procedures in determining the propriety and collectibility of accounts receivable.

Audit Procedures	Planned Extent of Application (man-hours)
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as uncollectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet date	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

-----

Based on the information provided in the booklet and in Situation 00 above, evaluate the quality of internal control over accounts receivable using the following six-point scale:

extremely	very	substantial	some	not quite	adequate
weak	weak	weakness	weakness	adequate	to strong

Why? \_\_\_\_\_.

\_\_\_\_\_.

\_\_\_\_\_.

The procedure to follow when responding to each situation is to (1) review the unchanging background information on the following pages, (2) examine the additional information presented in that situation, and (3) based solely upon this information, fill in the time you would plan for each of the five classes of procedures in the spaces provided. Assume that your assistant will perform all of these procedures. Note that a zero should be inserted in the blank for a set of procedures if you do not plan to use them in a given situation. Complete the case by evaluating the quality of internal control. Please keep track of the time you spend in completing the 20 situations as you will be asked to record that time in the debriefing questionnaire. (On average, it should take you from two to four hours to complete the experiment.) It is not necessary to complete the experiment in a single sitting. If you complete it over a period of several days, please review your last few responses before beginning new situations as it is important that you maintain a consistent decision strategy throughout the experiment.

Remember, it is important that you verbalize all of your thought processes while making your decisions.

A conscientious effort was made to ensure the representativeness of the information upon which you are to make your responses. The data concerning the wholesale tire industry were compiled from financial publications and trade journals and represent an accurate portrayal of industry conditions based upon publicly available information as of 1986. This information was included here as it is unlikely that you have audited a tire wholesaler or are familiar with the wholesale tire industry. It is important that you base your time estimates only on the data presented in this experiment (as well as your knowledge of general economic conditions). TEI, although a fictitious firm, was modeled closely after an actual tire wholesaler.

Because your time is limited, it was not possible--or desirable--to include in these materials all the information you might like to have for your decisions. Yet it is rare in actual audit situations for an auditor to have all the information he wants for program planning. The time estimates you make here are tentative, of course, and would be revised as necessary as additional information was gathered during the performance of the audit tests you planned.

When you have responded to the situations and completed the debriefing questionnaire, simply insert the booklet of experimental materials into the envelope provided and return it to me. Your cooperation is greatly appreciated.

### Industry Conditions

For the first 10 months of 1985, unit tire sales in the replacement market were 11% below 1984 levels. Industry analysts attribute the decline to reduced discretionary driving and to the longer-wearing bias-belted and radial tires that have been fitted as original equipment on new cars in recent years.

Despite the decline in unit sales, replacement market dollar sales for the first 10 months of 1985 were approximately 4% above 1984 levels. This is due to (1) price increases of 25% on passenger vehicle tires and 35% on truck and other heavy service tires since the beginning of 1985 and (2) a larger proportion of higher priced radial tires being sold.

The major tire manufacturers, faced with depressed sales in the replacement market and a more serious (21%) volume decline in the original equipment market, quickly brought production into line with sales and avoided price cutting. They adopted, and were able to maintain, a strong pricing policy, increasing prices to wholesalers about 25% during 1985. Wholesalers immediately passed these increase on to their customers, maintaining their gross profit margins on all lines of tires. Because of this strong pricing policy and greater sales of higher-margin radial tires (two to four times higher margins than conventional tires), wholesaler profits are expected to be near 1984 levels.

Supply. Passenger car tires were readily available to wholesalers in all sizes and constructions throughout 1985, although (as noted above) at steadily increasing prices. There were shortages, however, in truck, bus, farm, and other heavy service tires as unit sales in these categories for the first 10 months of 1985 ran 10% ahead of 1984. For 1986, adequate supplies of passenger tires are anticipated, and heavy service tires will be more readily available-- although spot shortages of the latter are likely to occur.

Future prospects. According to industry analysts, vehicle miles driven is the best predictor of tire sales. There is a considerable amount of uncertainty regarding future replacement market prospects. Most industry analysts are predicting a 5% increase in unit replacement sales for 1986 in the absence of rationing or a large (15-20 cent per gallon) gasoline tax increase. The analysts point out that new-car sales were good in 1982 and 1983 and that these cars should be needing replacement tires in 1986. Furthermore, the 1985 decline in replacement sales is felt to be out of proportion to the small decrease in passenger miles driven



for that period, leading analysts to suspect that existence of pent-up demand which would be realized in 1986.

The intermediate to long-run prospects are even more uncertain. Government policy over this period is likely to be aimed at constraining discretionary driving. Unit replacement sales for 1987 and 1988 are expected to be somewhat below the 1986 forecast as the long-wearing radial tires fitted as original equipment on increasingly more new cars go longer between replacements. Beyond 1988, a 2-3% annual growth in unit replacement sales is forecast into the early 1990's.

Radial tires will account for an increasing share of replacement market sales, growing from 20% of unit replacement sales in 1985 to an estimated 50% by 1990. The higher profit margins of these tires will help to augment revenues from the modest growth rate in replacement sales over this period.

Price increases from manufacturers are expected through the first quarter of 1986 with wholesalers almost certain to pass the increase(s) on to their customers. Price increases beyond the first quarter are possible although some analysts are doubtful that the manufacturers can maintain a strong pricing policy throughout 1986. A few are even predicting price decreases to wholesalers of about 5% for 1986.

#### Firm History

Tire Enterprises Incorporated (TEI) is a large Chicago wholesaler for 12 different brands of tires. Tires and tubes are the firm's only products and include both foreign and domestic lines for automobiles, trucks, farm equipment, and recreational vehicles. TEI was founded in 1966 by its majority shareholder and chief executive officer who holds 60% of its stock. A further 30% is owned by his son, who serves as controller. The remaining 10% is held by the sales manager, who has been with TEI in that capacity since 1969.

TEI has grown steadily from total assets of \$75,000 and total sales of \$200,000 in 1966 to total assets of \$1.9 million and sales of \$5.6 million in 1984. Unadjusted year-end figures indicate total assets of \$2.1 million as of December 31, 1985, and 1985 sales up 25% to \$7 million.

## Sales Operations

TEI operates in the replacement market at the wholesale level only, and its customers include retail tire stores, service stations, car dealerships, and farm equipment stores. Passenger car tires account for about 75% of TEI's dollar sales while truck, bus, farm, and other heavy service account for the remainder. Approximately 70% of the company's sales are in the Chicago area. Northwestern Indiana, downstate Illinois, and southern Wisconsin account for 14%, 11%, and 5% respectively of TEI's sales. While 1985 dollar sales are up 25% (versus +4% for the replacement industry), unit sales are up only 5% for the same period (versus an 11% decrease for the replacement industry). The disparity between unit and dollar sales increases is due to (1) price increases totaling 23% since January 1, 1985, and (2) a change in sales mix to a higher proportion of radial tires (which have a higher selling price per unit than comparably-sized conventional tires).

Sales terms. Virtually all TEI's sales are on account, the infrequent exceptions being new customers without established credit. In these cases the tires are shipped C.O.D. The firm does not offer cash discounts to any customers. The longstanding policy is that customer payments are due in full by the 10th day of the month following sale. This policy is to be reviewed in the near future, however, as some competing wholesalers have increased their receivables turnover by offering 5/10;n/30 terms. TEI offers a quarterly discount to its customers ranging from 2% for quarterly purchases between \$6,000 and \$9,000 up to 9% for quarterly purchases in excess of \$66,500. The amount of the discount is credited to each customer's account after the quarter's sales have been totaled for each customer.

All customer orders are placed with one of TEI's three salesmen who make regular visits to their customers. The salesmen are paid a salary plus commission. They spend approximately 80% of their time in the field and drop off sales orders daily.

Customers. TEI presently has 800 customers compared with 815 in December of 1984. The decrease is due to the closings of some service station and car dealership customers in 1985. The firm's books show an unadjusted year-end accounts receivable balance of \$875,000. This compares with a December 31, 1984, balance of \$690,000. Approximately 85% of TEI's sales are to steady customers with the remainder to transient customers. This relationship has not appreciably changed since 1981.

The controller provides you with the following frequency distribution of customer accounts:

<u># Customers</u>	<u>Customers' receivable balances as of 12-31-85 (unaudited)</u>	<u>Total</u>
2	\$100,000 - \$150,000	\$250,000
-0-	50,000 - 99,999	-0-
2	25,000 - 49,999	75,000
2	10,000 - 24,999	35,000
10	5,000 - 9,999	75,000
24	2,500 - 4,999	90,000
32	1,000 - 2,499	56,000
320	500 - 999	240,000
170	100 - 499	51,000
202	0 - 99	10,100
36	credit balances	(7,100)
-----		-----
<u>800</u>		<u>\$875,000</u>

Pricing. TEI's pricing policy is to maintain gross profit margins of 18% on conventional passenger tires, 40% on radial passenger tires, and 30% on heavy service tires. TEI's prices are competitive with other Chicago wholesalers.

Suppliers. TEI buys domestic tires directly from U.S. tire manufacturers and buys foreign-made radial tires from European tire brokers. Both foreign and domestic passenger tires were in good supply during 1985. Truck, farm, and bus tires were not available in quantities demanded. TEI's suppliers increased prices a weighted average of 23% during 1985 and the firm's president expects price increases to continue for at least the first half of 1986.

Internal control. TEI has a manual accounts receivable system. During your internal control review and compliance tests in October, 1985, your assistant completed the internal control questionnaire on page 12. You have learned that the firm does not have a job rotation policy. All employees are required to take annual vacations, however, and their duties are temporarily assumed by other employees.

During your interim work in October, 1985, you observed that the client's personnel appeared to be knowledgeable and efficient in performing their duties. All of the clerical personnel had been with TEI for at least two years. There were no resignations or dismissals from the clerical staff during 1985. The number of clerical personnel is adequate for the segregation of duties described in the following internal control questionnaire and the following situations. The executive personnel appeared aggressive and capable. The only executive change in 1985 was the addition of a credit manager in January, 1985. He assumed credit duties that had previously been handled by the president, controller, and sales manager.

Bad debts. TEI's accounts receivable turnover (Sales/Average accounts receivable) and Bad debts/Sales have approximated the industry averages for the years 1982-84. While they have not yet been compiled for 1985, the wholesale tire industry averages of bad debts to sales and accounts receivable turnover are expected to compare unfavorably with prior years. TEI's bad debt expense is determined through an annual review of the aged trial balance of accounts receivable by the controller and credit manager, a procedure that was initiated in January, 1985, when the credit manager assumed his duties.

This completes the unchanging background information.

INTERNAL CONTROL QUESTIONNAIRE  
Accounts Receivable

Company: Tire Enterprises Incorporated

Period: Year ended 12-31-85

	YES	NO
1. Is the accounts receivable subsidiary ledger regularly balanced to the control account?	X	
2. Are numerically controlled sales orders prepared for all customers orders	X	
3. Are credit and billing functions separated?	X	
4. Are sales order entry and billing functions separated from the shipping function?	X	
5. Are aged trial balances of accounts receivable regularly prepared and approved by an executive?	X	
6. Are the following functions performed by personnel other than accounts receivable personnel:		
a) Cash handling and cash record keeping?	X	
b) Mail opening?	X	
c) Credit?	X	
d) Approval of sales returns and allowances?	X	
e) General ledger maintenance?	X	
7. Are shipping orders numerically accounted for to assure that every shipment is billed?	X	
8. Are all customer billings reviewed for accuracy?	X	
9. Are customer billings controlled to prevent interception prior to mailing?	X	
10. Are invoices priced from authorized price schedules?	X	
11. Are customers' differences promptly investigated by a person independent of the cash and accounts receivable function?	X	

12. After write-off, is proper control exercised  
in the event of future collection? X
- 

Note: Additional information about TEI's internal control  
is included in each specific situation presented  
in the booklet.

The auditors who participated in the pretesting of these materials reported that the first few situations were by far the most difficult and time consuming to complete. The remaining situations were answered progressively more easily (and quickly), however, as each auditor's decision strategy became developed. Therefore do not become discouraged if, after the first few situations, the experiment seems hopelessly difficult and time consuming.

Please proceed to the specific case situations.

**APPENDIX G**  
**DECISION CASES**

DECISION CASES



PLEASE REMEMBER TO VERBALIZE

ALL THOUGHTS !!

Situation: 1.

-----  
Receiving report support. Credits for returned merchandise are supported and approved by a receiving report.

Separation of billing function and subsidiary ledger maintenance. Accounts receivable subsidiary ledger is maintained by a clerk other than the one who prepares and mails out monthly statements to customers.

Write-off approval. Write-offs of receivables are reviewed and approved by the credit manager.

Receivable confirmation by client. Accounts receivable are not confirmed during the year by an employee independent of the accounts receivable and cash functions.

Sales approval. All sales orders are approved by the credit manager before shipment.

-----  
 Given the background data in the booklet and the information in Situation 1 above, indicate your planned extent of application of the following procedures in determining the propriety and collectibility of accounts receivable.  
 -----

Audit Procedures	Planned Extent of Application
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as uncollectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet date	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

-----  
 Based on the booklet information and that provided in Situation 1 above, evaluate the quality of internal control over accounts receivable using the following six-point scale:

extremely    very    substantial    some    not quite    adequate  
           weak    weak    weakness    weakness    adequate    to strong

Why? \_\_\_\_\_.

Situation:  2 .

Receiving report support. Credits for returned merchandise are supported and approved by a receiving report.

Separation of billing function and subsidiary ledger maintenance. Accounts receivable subsidiary ledger is maintained by a clerk other than the one who prepares and mails out monthly statements to customers.

Write-off approval. Write-offs of receivables are reviewed and approved by the controller.

Receivable confirmation by client. Accounts receivable are not confirmed during the year by an employee independent of the accounts receivable and cash functions.

Sales approval. All sales orders are shipped upon receipt from salesmen without approval by the credit manager.

Given the background data in the booklet and the information in Situation  2  above, indicate your planned extent of application of the following procedures in determining the propriety and collectibility of accounts receivable.

Audit Procedures	Planned Extent of Application
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as uncollectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet date	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

Based on the booklet information and that provided in Situation  2  above, evaluate the quality of internal control over accounts receivable using the following six-point scale:

extremely      very      substantial      some      not quite      adequate  
 weak          weak          weakness      weakness      adequate      to strong

Why? \_\_\_\_\_.

Situation:  3 .

Receiving report support. Credits for returned merchandise are supported and approved by a receiving report.

Separation of billing function and subsidiary ledger maintenance. The clerk responsible for the accounts receivable subsidiary ledger also prepares and mails out the monthly statements to customers.

Write-off approval. Write-offs of receivables are reviewed and approved by the credit manager.

Receivable confirmation by client. Accounts receivable are not confirmed during the year by an employee independent of the accounts receivable and cash functions.

Sales approval. Sales orders are shipped upon receipt from salesmen without approval by the credit manager.

Given the background data in the booklet and the information in Situation  3  above, indicate your planned extent of application of the following procedures in determining the propriety and collectibility of accounts receivable.

Audit Procedures	Planned Extent of Application
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as uncollectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet date	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

Based on the booklet information and that provided in Situation  3  above, evaluate the quality of internal control over accounts receivable using the following six-point scale:

extremely    very    substantial    some    not quite    adequate  
           weak    weak    weakness    weakness    adequate    to strong

Why? \_\_\_\_\_.

Situation: 4.

Receiving report support. Credits for returned merchandise are not supported and approved by a receiving report.

Separation of billing function and subsidiary ledger maintenance. Accounts receivable subsidiary ledger is maintained by a clerk other than the one who prepares and mails out monthly statements to customers.

Write-off approval. Write-offs of receivables are reviewed and approved by the credit manager.

Receivable confirmation by client. Accounts receivable are not confirmed during the year by an employee independent of the accounts receivable and cash functions.

Sales approval. Sales orders are shipped upon receipt from salesmen without approval by the credit manager.

Given the background data in the booklet and the information in Situation 4 above, indicate your planned extent of application of the following procedures in determining the propriety and collectibility of accounts receivable.

Audit Procedures	Planned Extent of Application
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as uncollectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet date	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

Based on the booklet information and that provided in Situation 4 above, evaluate the quality of internal control over accounts receivable using the following six-point scale:

extremely      very      substantial      some      not quite      adequate  
 weak          weak          weakness      weakness      adequate      to strong

Why? \_\_\_\_\_.

Situation: 5.

-----  
Receiving report support. Credits for returned merchandise are not supported and approved by a receiving report.

Separation of billing function and subsidiary ledger maintenance. The clerk responsible for the accounts receivable subsidiary ledger also prepares and mails out the monthly statements to customers.

Write-off approval. Write-offs of receivables are reviewed and approved by the credit manager.

Receivable confirmation by client. Accounts receivable are not confirmed during the year by an employee independent of the accounts receivable and cash functions.

Sales approval. All sales orders are approved by the credit manager before shipment.

-----  
 Given the background data in the booklet and the information in Situation 5 above, indicate your planned extent of application of the following procedures in determining the propriety and collectibility of accounts receivable.  
 -----

Audit Procedures	Planned Extent of Application
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as uncollectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet date	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

-----  
 Based on the booklet information and that provided in Situation 5 above, evaluate the quality of internal control over accounts receivable using the following six-point scale:

extremely    very    substantial    some    not quite    adequate  
           weak    weak    weakness    weakness    adequate    to strong

Why? \_\_\_\_\_.

PLEASE REMEMBER TO VERBALIZE

ALL THOUGHTS !!

Situation:  6 .

-----  
Receiving report support. Credits for returned merchandise are supported and approved by a receiving report.

Separation of billing function and subsidiary ledger maintenance. The clerk responsible for the accounts receivable subsidiary ledger also prepares and mails out the monthly statements to customers.

Write-off approval. Write-offs of receivables are reviewed and approved by the credit manager.

Receivable confirmation by client. Accounts receivable are confirmed during the year by an employee independent of the accounts receivable and cash functions.

Sales approval. Sales orders are shipped upon receipt from salesmen without approval by the credit manager.

-----  
 Given the background data in the booklet and the information in Situation  6  above, indicate your planned extent of application of the following procedures in determining the propriety and collectibility of accounts receivable.  
 -----

Audit Procedures	Planned Extent of Application
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as uncollectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet date	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

-----  
 Based on the booklet information and that provided in Situation  6  above, evaluate the quality of internal control over accounts receivable using the following six-point scale:

extremely    very    substantial    some    not quite    adequate  
 weak        weak    weakness    weakness    adequate    to strong

Why? \_\_\_\_\_.



Situation: 7.

Receiving report support. Credits for returned merchandise are supported and approved by a receiving report.

Separation of billing function and subsidiary ledger maintenance. The clerk responsible for the accounts receivable subsidiary ledger also prepares and mails out the monthly statements to customers.

Write-off approval. Write-offs of receivables are reviewed and approved by the controller.

Receivable confirmation by client. Accounts receivable are not confirmed during the year by an employee independent of the accounts receivable and cash functions.

Sales approval. All sales orders are approved by the credit manager before shipment.

Given the background data in the booklet and the information in Situation 7 above, indicate your planned extent of application of the following procedures in determining the propriety and collectibility of accounts receivable.

Audit Procedures	Planned Extent of Application
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as uncollectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet date	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

Based on the booklet information and that provided in Situation 7 above, evaluate the quality of internal control over accounts receivable using the following six-point scale:

extremely      very      substantial      some      not quite      adequate  
 weak          weak          weakness      weakness      adequate      to strong

Why? \_\_\_\_\_.

Situation: 8.

Receiving report support. Credits for returned merchandise are not supported and approved by a receiving report.

Separation of billing function and subsidiary ledger maintenance. The clerk responsible for the accounts receivable subsidiary ledger also prepares and mails out the monthly statements to customers.

Write-off approval. Write-offs of receivables are reviewed and approved by the controller.

Receivable confirmation by client. Accounts receivable are not confirmed during the year by an employee independent of the accounts receivable and cash functions.

Sales approval. Sales orders are shipped upon receipt from salesmen without approval by the credit manager.

Given the background data in the booklet and the information in Situation 8 above, indicate your planned extent of application of the following procedures in determining the propriety and collectibility of accounts receivable.

Audit Procedures	Planned Extent of Application
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as uncollectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet date	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

Based on the booklet information and that provided in Situation 8 above, evaluate the quality of internal control over accounts receivable using the following six-point scale:

extremely    very    substantial    some    not quite    adequate  
 weak    weak    weakness    weakness    adequate    to strong

Why? \_\_\_\_\_.

Situation:   9  .

Receiving report support. Credits for returned merchandise are not supported and approved by a receiving report.

Separation of billing function and subsidiary ledger maintenance. The clerk responsible for the accounts receivable subsidiary ledger also prepares and mails out the monthly statements to customers.

Write-off approval. Write-offs of receivables are reviewed and approved by the credit manager.

Receivable confirmation by client. Accounts receivable are not confirmed during the year by an employee independent of the accounts receivable and cash functions.

Sales approval. Sales orders are shipped upon receipt from salesmen without approval by the credit manager.

Given the background data in the booklet and the information in Situation   9   above, indicate your planned extent of application of the following procedures in determining the propriety and collectibility of accounts receivable.

Audit Procedures	Planned Extent of Application
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as uncollectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet date	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

Based on the booklet information and that provided in Situation   9   above, evaluate the quality of internal control over accounts receivable using the following six-point scale:

extremely      very      substantial      some      not quite      adequate  
                   weak      weak      weakness      weakness      adequate      to strong

Why? \_\_\_\_\_.

Situation: 10.

Receiving report support. Credits for returned merchandise are not supported and approved by a receiving report.

Separation of billing function and subsidiary ledger maintenance. The clerk responsible for the accounts receivable subsidiary ledger also prepares and mails out the monthly statements to customers.

Write-off approval. Write-offs of receivables are reviewed and approved by the controller.

Receivable confirmation by client. Accounts receivable are not confirmed during the year by an employee independent of the accounts receivable and cash functions.

Sales approval. All sales orders are approved by the credit manager before shipment.

Given the background data in the booklet and the information in Situation 10 above, indicate your planned extent of application of the following procedures in determining the propriety and collectibility of accounts receivable.

Audit Procedures	Planned Extent of Application
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as uncollectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet date	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

Based on the booklet information and that provided in Situation 10 above, evaluate the quality of internal control over accounts receivable using the following six-point scale:

extremely      very      substantial      some      not quite      adequate  
                   weak      weak      weakness      weakness      adequate      to strong

Why? \_\_\_\_\_.

PLEASE REMEMBER TO VERBALIZE

ALL THOUGHTS !!

Situation: 11.

Receiving report support. Credits for returned merchandise are not supported and approved by a receiving report.

Separation of billing function and subsidiary ledger maintenance. Accounts receivable subsidiary ledger is maintained by a clerk other than the one who prepares and mails out monthly statements to customers.

Write-off approval. Write-offs of receivables are reviewed and approved by the credit manager.

Receivable confirmation by client. Accounts receivable are confirmed during the year by an employee independent of the accounts receivable and cash functions.

Sales approval. Sales orders are shipped upon receipt from salesmen without approval by the credit manager.

Given the background data in the booklet and the information in Situation 11 above, indicate your planned extent of application of the following procedures in determining the propriety and collectibility of accounts receivable.

Audit Procedures	Planned Extent of Application
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as uncollectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet date	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

Based on the booklet information and that provided in Situation 11 above, evaluate the quality of internal control over accounts receivable using the following six-point scale:

extremely    very    substantial    some    not quite    adequate  
 weak        weak        weakness    weakness    adequate    to strong

Why? \_\_\_\_\_.

Situation: 12.

Receiving report support. Credits for returned merchandise are supported and approved by a receiving report.

Separation of billing function and subsidiary ledger maintenance. The clerk responsible for the accounts receivable subsidiary ledger also prepares and mails out the monthly statements to customers.

Write-off approval. Write-offs of receivables are reviewed and approved by the credit manager.

Receivable confirmation by client. Accounts receivable are not confirmed during the year by an employee independent of the accounts receivable and cash functions.

Sales approval. All sales orders are approved by the credit manager before shipment.

Given the background data in the booklet and the information in Situation 12 above, indicate your planned extent of application of the following procedures in determining the propriety and collectibility of accounts receivable.

Audit Procedures	Planned Extent of Application
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as uncollectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet date	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

Based on the booklet information and that provided in Situation 12 above, evaluate the quality of internal control over accounts receivable using the following six-point scale:

extremely      very      substantial      some      not quite      adequate  
weak      weak      weakness      weakness      adequate      to strong

Why? \_\_\_\_\_.

Situation: 13.

Receiving report support. Credits for returned merchandise are not supported and approved by a receiving report.

Separation of billing function and subsidiary ledger maintenance. Accounts receivable subsidiary ledger is maintained by a clerk other than the one who prepares and mails out monthly statements to customers.

Write-off approval. Write-offs of receivables are reviewed and approved by the controller.

Receivable confirmation by client. Accounts receivable are confirmed during the year by an employee independent of the accounts receivable and cash functions.

Sales approval. All sales orders are approved by the credit manager before shipment.

Given the background data in the booklet and the information in Situation 13 above, indicate your planned extent of application of the following procedures in determining the propriety and collectibility of accounts receivable.

Audit Procedures	Planned Extent of Application
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as uncollectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet date	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

Based on the booklet information and that provided in Situation 13 above, evaluate the quality of internal control over accounts receivable using the following six-point scale:

extremely      very      substantial      some      not quite      adequate  
 weak          weak          weakness      weakness      adequate      to strong

Why? \_\_\_\_\_.



Situation: 14.

Receiving report support. Credits for returned merchandise are supported and approved by a receiving report.

Separation of billing function and subsidiary ledger maintenance. Accounts receivable subsidiary ledger is maintained by a clerk other than the one who prepares and mails out monthly statements to customers.

Write-off approval. Write-offs of receivables are reviewed and approved by the credit manager.

Receivable confirmation by client. Accounts receivable are confirmed during the year by an employee independent of the accounts receivable and cash functions.

Sales approval. All sales orders are approved by the credit manager before shipment.

Given the background data in the booklet and the information in Situation 14 above, indicate your planned extent of application of the following procedures in determining the propriety and collectibility of accounts receivable.

Audit Procedures	Planned Extent of Application
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as uncollectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet date	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

Based on the booklet information and that provided in Situation 14 above, evaluate the quality of internal control over accounts receivable using the following six-point scale:

extremely      very      substantial      some      not quite      adequate  
 weak          weak          weakness      weakness      adequate      to strong

Why? \_\_\_\_\_.

Situation: 15.

Receiving report support. Credits for returned merchandise are not supported and approved by a receiving report.

Separation of billing function and subsidiary ledger maintenance. Accounts receivable subsidiary ledger is maintained by a clerk other than the one who prepares and mails out monthly statements to customers.

Write-off approval. Write-offs of receivables are reviewed and approved by the controller.

Receivable confirmation by client. Accounts receivable are not confirmed during the year by an employee independent of the accounts receivable and cash functions.

Sales approval. Sales orders are shipped upon receipt from salesmen without approval by the credit manager.

Given the background data in the booklet and the information in Situation 15 above, indicate your planned extent of application of the following procedures in determining the propriety and collectibility of accounts receivable.

Audit Procedures	Planned Extent of Application
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as uncollectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet date	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

Based on the booklet information and that provided in Situation 15 above, evaluate the quality of internal control over accounts receivable using the following six-point scale:

extremely      very      substantial      some      not quite      adequate  
 weak          weak          weakness      weakness      adequate      to strong

Why? \_\_\_\_\_.

PLEASE REMEMBER TO VERBALIZE

ALL THOUGHTS !!

Situation: 16.

Receiving report support. Credits for returned merchandise are supported and approved by a receiving report.

Separation of billing function and subsidiary ledger maintenance. Accounts receivable subsidiary ledger is maintained by a clerk other than the one who prepares and mails out monthly statements to customers.

Write-off approval. Write-offs of receivables are reviewed and approved by the controller.

Receivable confirmation by client. Accounts receivable are confirmed during the year by an employee independent of the accounts receivable and cash functions.

Sales approval. Sales orders are shipped upon receipt from salesmen without approval by the credit manager.

Given the background data in the booklet and the information in Situation 16 above, indicate your planned extent of application of the following procedures in determining the propriety and collectibility of accounts receivable.

Audit Procedures	Planned Extent of Application
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as uncollectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet date	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

Based on the booklet information and that provided in Situation 16 above, evaluate the quality of internal control over accounts receivable using the following six-point scale:

extremely      very      substantial      some      not quite      adequate  
 weak          weak          weakness      weakness      adequate      to strong

Why? \_\_\_\_\_.

Situation: 17.

Receiving report support. Credits for returned merchandise are not supported and approved by a receiving report.

Separation of billing function and subsidiary ledger maintenance. Accounts receivable subsidiary ledger is maintained by a clerk other than the one who prepares and mails out monthly statements to customers.

Write-off approval. Write-offs of receivables are reviewed and approved by the credit manager.

Receivable confirmation by client. Accounts receivable are not confirmed during the year by an employee independent of the accounts receivable and cash functions.

Sales approval. All sales orders are approved by the credit manager before shipment.

Given the background data in the booklet and the information in Situation 17 above, indicate your planned extent of application of the following procedures in determining the propriety and collectibility of accounts receivable.

Audit Procedures	Planned Extent of Application
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as uncollectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet date	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

Based on the booklet information and that provided in Situation 17 above, evaluate the quality of internal control over accounts receivable using the following six-point scale:

extremely      very      substantial      some      not quite      adequate  
weak      weak      weakness      weakness      adequate      to strong

Why? \_\_\_\_\_.

Situation: 18.

Receiving report support. Credits for returned merchandise are supported and approved by a receiving report.

Separation of billing function and subsidiary ledger maintenance. Accounts receivable subsidiary ledger is maintained by a clerk other than the one who prepares and mails out monthly statements to customers.

Write-off approval. Write-offs of receivables are reviewed and approved by the credit manager.

Receivable confirmation by client. Accounts receivable are not confirmed during the year by an employee independent of the accounts receivable and cash functions.

Sales approval. Sales orders are shipped upon receipt from salesmen without approval by the credit manager.

Given the background data in the booklet and the information in Situation 18 above, indicate your planned extent of application of the following procedures in determining the propriety and collectibility of accounts receivable.

Audit Procedures	Planned Extent of Application
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as uncollectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet date	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

Based on the booklet information and that provided in Situation 18 above, evaluate the quality of internal control over accounts receivable using the following six-point scale:

extremely      very      substantial      some      not quite      adequate  
 weak      weak      weakness      weakness      adequate      to strong

Why? \_\_\_\_\_.

Situation: 19.

Receiving report support. Credits for returned merchandise are supported and approved by a receiving report.

Separation of billing function and subsidiary ledger maintenance. Accounts receivable subsidiary ledger is maintained by a clerk other than the one who prepares and mails out monthly statements to customers.

Write-off approval. Write-offs of receivables are reviewed and approved by the credit manager.

Receivable confirmation by client. Accounts receivable are confirmed during the year by an employee independent of the accounts receivable and cash functions.

Sales approval. Sales orders are shipped upon receipt from salesmen without approval by the credit manager.

Given the background data in the booklet and the information in Situation 19 above, indicate your planned extent of application of the following procedures in determining the propriety and collectibility of accounts receivable.

Audit Procedures	Planned Extent of Application
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as uncollectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet date	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

Based on the booklet information and that provided in Situation 19 above, evaluate the quality of internal control over accounts receivable using the following six-point scale:

extremely      very      substantial      some      not quite      adequate  
 weak      weak      weakness      weakness      adequate      to strong

Why? \_\_\_\_\_.

Situation: 20.

-----  
Receiving report support. Credits for returned merchandise are supported and approved by a receiving report.

Separation of billing function and subsidiary ledger maintenance. Accounts receivable subsidiary ledger is maintained by a clerk other than the one who prepares and mails out monthly statements to customers.

Write-off approval. Write-offs of receivables are reviewed and approved by the controller.

Receivable confirmation by client. Accounts receivable are confirmed during the year by an employee independent of the accounts receivable and cash functions.

Sales approval. All sales orders are approved by the credit manager before shipment.

-----  
 Given the background data in the booklet and the information in Situation 20 above, indicate your planned extent of application of the following procedures in determining the propriety and collectibility of accounts receivable.  
 -----

Audit Procedures	Planned Extent of Application
A. Confirmation of accounts receivable	_____ hours
B. Review of accounts written off as uncollectible	_____ hours
C. Review of cash collections of accounts receivable subsequent to balance sheet date	_____ hours
D. Determination of adequacy of allowance for uncollectible accounts	_____ hours
E. Review of year-end sales cutoff	_____ hours

-----  
 Based on the booklet information and that provided in Situation 20 above, evaluate the quality of internal control over accounts receivable using the following six-point scale:

extremely weak	very weak	substantial weakness	some weakness	not quite adequate	adequate to strong
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Why? \_\_\_\_\_.



Thank you for completing the decision cases. After completing the post-test questionnaire, please mail the following to me in the self-addressed stamped envelope that has been provided:

- information booklet
- decision cases
- tapes
- post-test questionnaire

Again thank you for your participation in this study. You will be notified concerning your particular brain dominance along with the results of this study.

**APPENDIX H**

**POST-TEST QUESTIONNAIRE**

## POST-TEST QUESTIONNAIRE

Please provide the following information.

1. Have you ever audited a tire wholesaler?
2. Do you consider yourself an industry specialist?
  - (a) If yes, what industry?
3. Compared with other auditors, how do you view your willingness to accept risks? (circle one)
 

Much more willing.....	1
More willing.....	2
As willing as most.....	3
Less willing.....	4
Much less willing.....	5
4. Compared with other auditors in similar engagements, do you feel you tend to perform more or less extensive audit tests? (circle one)
 

Much more extensive.....	1
More extensive.....	2
As extensive as most.....	3
Less extensive.....	4
Much less extensive.....	5
5. Based upon your audit program planning experience, do you tend to underestimate or overestimate the time required to actually complete the work you have planned? (circle one)
 

Considerably overestimate....	1
Overestimate.....	2
Accurately estimate.....	3
Underestimate.....	4
Considerably underestimate...	5
6. For your last five audit engagements, briefly describe the type of firm audited (e.g., savings and loan institution, automobile dealership, etc.) List the most recent engagement first.
 

1.	_____.
2.	_____.
3.	_____.
4.	_____.
5.	_____.

7. How representative of actual audit engagements did you find the experiment? (circle one)

Very unrepresentative.....1  
 Unrepresentative.....2  
 Representative.....3  
 Very representative.....4

8. Would you have found additional information helpful in completing the situation?

(a) If yes, please identify.

9. Please rank the five factors manipulated in the 36 situations according to how important each was in arriving at your time estimates. (Use a scales of 1 to 5 with 1 being the most important.)

a. Receiving report support.....      .  
 b. Separation of billing function  
 and subsidiary ledger maintenance....      .  
 c. Write-off approval.....      .  
 d. Receivable confirmation by client....      .  
 e. Sales approval.....      .

10. How interesting did you find this experiment? (circle one)

Very dull.....1  
 Dull.....2  
 Interesting.....3  
 Very interesting.....4

11. How long did it take you to complete the 20 situations?        hour(s)        minutes
12. Did you find it difficult to verbalize your thought processes?
13. What percentage of your total thought processes do you feel you actually verbalized, (i.e. 100%, 62%, 20%, etc.)?
14. If you have any comments about the experiment and/or experimental materials, please record them here.
15. Would you like a written summary of the results?

THANK YOU FOR YOUR COOPERATION.

**APPENDIX I**

**TABULATION OF SUBJECT'S TASK PERFORMANCE**

TABLE V  
TABULATION OF SUBJECT'S PERFORMANCE OF TASK

-----  
**Subject:** A **Time Taken:** 150 minutes  
**Brain Dominance:** 1133 ISTJ left  
**Job Title:** Manager  
**Audit Experience:** 11 years  
**Transcribed:** 6318 words  
273 sentences  
 -----

	Number of Operators	Percent of Total
<b>Task Structuring Operators</b>		
Set Goal	0	0.0%
<b>Information Acquisition Operators</b>		
Information Search	127	21.2
Information Retrieval	10	1.7
Algebraic Calculation	0	0.0
<b>Analytical Operators</b>		
Assumption	5	0.8
Conjecture	1	0.2
Comparison	35	5.9
Evaluation	130	21.7
Generate Query	29	4.8
Logical Support	15	2.5
<b>Action Operators</b>		
Decision	91	15.2
Generate Alternative	9	1.5
Temporary Decision	14	2.3
Decision Rule	1	0.2
Other Decisions	20	3.3
<b>Other Operators</b>		
Unrelated Comments	38	6.4
Personal Preferences	3	0.5
Reciting	65	10.9
Disagreement	4	0.7
Missing Information	<u>1</u>	<u>0.2</u>
<b>TOTAL</b>	<u>598</u>	<u>100.0</u>

**Subject's Comments:**

Subject states that he, "has a tendency to like patterns and consistency in my treatment of things." [p. 16 of transcriptions]

**Observations:**

    Anchors and adjusts.  
 Did not provide protocols for case 12.

TABLE VI  
TABULATION OF SUBJECT'S PERFORMANCE OF TASK

-----  
**Subject:** B **Time Taken:** 105 minutes  
**Brain Dominance:** 2211 ENTJ whole  
**Job Title:** Senior  
**Audit Experience:** 5 years  
**Transcribed:** 7790 words  
275 sentences  
 -----

	Number of Operators	Percent of Total
<b>Task Structuring Operators</b>		
Set Goal	0	0.0
<b>Information Acquisition Operators</b>		
Information Search	82	14.8
Information Retrieval	8	1.4
Algebraic Calculation	2	0.4
<b>Analytical Operators 10</b>		
Assumption	10	1.8
Conjecture	3	0.5
Comparison	13	2.3
Evaluation	131	23.6
Generate Query	7	1.3
Logical Support	12	2.2
<b>Action Operators</b>		
Decision	79	14.2
Generate Alternative	16	2.9
Temporary Decision	2	0.4
Decision Rule	4	0.7
Other Decisions	13	2.3
<b>Other Operators</b>		
Unrelated Comments	78	14.0
Personal Preferences	7	1.3
Reciting	83	15.0
Disagreement	0	0.0
Missing Information	<u>5</u>	<u>0.9</u>
<b>TOTAL</b>	<u>555</u>	<u>100.0</u>

**Subject's Comments:**

"I think this is a catch or a hitch." Makes comments about getting the "right" answer. Is concerned about "consistencies."

"I'm going to go back and check for consistency."

**Observations:**

Uses heuristic of anchoring. Doesn't verbalize thoughts as much but seems to express what he is "doing" rather than what he is "thinking." Finally starts to verbalize thoughts. Always concerned about time.





TABLE VIII

## TABULATION OF SUBJECT'S PERFORMANCE OF TASK

-----  
**Subject:** F **Time Taken:** 120 minutes  
**Brain Dominance:** 1123 ESTJ left  
**Job Title:** Senior  
**Audit Experience:** 5 years  
**Transcribed:** 1833 words  
76 sentences  
 -----

	Number of Operators	Percent of Total
<b>Task Structuring Operators</b>		
Set Goal	0	0.0
<b>Information Acquisition Operators</b>		
Information Search	20	28.6
Information Retrieval	2	2.9
Algebraic Calculation	1	1.4
<b>Analytical Operators</b>		
Assumption	2	2.9
Conjecture	0	0.0
Comparison	1	1.4
Evaluation	25	35.7
Generate Query	0	0.0
Logical Support	1	1.4
<b>Action Operators</b>		
Decision	0	0.0
Generate Alternative	2	2.9
Temporary Decision	0	0.0
Decision Rule	0	0.0
Other Decisions	1	1.4
<b>Other Operators</b>		
Unrelated Comments	7	10.0
Personal Preferences	1	1.4
Reciting	5	7.1
Disagreement	1	1.4
Missing Information	<u>1</u>	<u>1.5</u>
<b>TOTAL</b>	<u>70</u>	<u>100.0</u>

**Subject's Comments:**

**Observations:**

Never verbalized the actual decision. Limited comments to those concerning only the case. Set up a lotus sheet to examine cases. Anchor and adjustment.

TABLE IX  
TABULATION OF SUBJECT'S PERFORMANCE OF TASK

-----  
**Subject:** H **Time Taken:** 135 minutes  
**Brain Dominance:** 1112 ESTJ whole  
**Job Title:** Partner  
**Audit Experience:** 12 years  
**Transcribed:** 3500 words  
137 sentences  
 -----

	Number of Operators	Percent of Total
<b>Task Structuring Operators</b>		
Set Goal	0	0.0
<b>Information Acquisition Operators</b>		
Information Search	27	13.9
Information Retrieval	2	1.0
Algebraic Calculation	0	0.0
<b>Analytical Operators</b>		
Assumption	1	0.5
Conjecture	0	0.0
Comparison	14	7.2
Evaluation	91	47.0
Generate Query	0	0.0
Logical Support	6	3.1
<b>Action Operators</b>		
Decision	16	8.2
Generate Alternative	1	0.5
Temporary Decision	0	0.0
Decision Rule	1	0.5
Other Decisions	20	10.3
<b>Other Operators</b>		
Unrelated Comments	5	2.6
Personal Preferences	0	0.0
Reciting	9	4.6
Disagreement	1	0.6
Missing Information	<u>0</u>	<u>0.0</u>
<b>TOTAL</b>	<u>194</u>	<u>100.0</u>

**Subject's Comments:**

**Observations:**

Seldom verbalizes in complete sentences. Does not verbalize final decisions. Anchors and adjusts.

TABLE X  
TABULATION OF SUBJECT'S PERFORMANCE OF TASK

-----  
 Subject: I Time Taken: 140 minutes  
 Brain Dominance: 1221 ENTP whole  
 Job Title: Senior  
 Audit Experience: 5 years  
 Transcribed: 1944 words  
                   102 sentences  
 -----

	Number of Operators	Percent of Total
<b>Task Structuring Operators</b>		
Set Goal	0	0.0
<b>Information Acquisition Operators</b>		
Information Search	40	24.7
Information Retrieval	1	0.6
Algebraic Calculation	1	0.6
<b>Analytical Operators</b>		
Assumption	0	0.0
Conjecture	0	0.0
Comparison	2	1.2
Evaluation	72	44.4
Generate Query	2	1.2
Logical Support	10	6.2
<b>Action Operators</b>		
Decision	1	0.6
Generate Alternative	1	0.7
Temporary Decision	1	0.7
Decision Rule	0	0.0
Other Decisions	11	6.8
<b>Other Operators</b>		
Unrelated Comments	7	4.3
Personal Preferences	0	0.0
Reciting	13	8.0
Disagreement	0	0.0
Missing Information	<u>0</u>	<u>0.0</u>
<b>TOTAL</b>	<u>162</u>	<u>100.0</u>

**Subject's Comments:**

"It is difficult to verbalize all thoughts."  
 [p. 4 of transcriptions]

**Observations:**

Verbalizes very few thoughts  
 Relies on comparisons, i.e. anchors and adjusts.



TABLE XII

## TABULATION OF SUBJECT'S PERFORMANCE OF TASK

-----  
**Subject:** L **Time Taken:** 135 minutes  
**Brain Dominance:** 1122 ISTJ whole (left)  
**Job Title:** Partner  
**Audit Experience:** 8 years  
**Transcribed:** 3072 words  
                   115 sentences  
 -----

	Number of Operators	Percent of Total
<b>Task Structuring Operators</b>		
Set Goal	0	0.0
<b>Information Acquisition Operators</b>		
Information Search	5	4.0
Information Retrieval	0	0.0
Algebraic Calculation	1	0.8
<b>Analytical Operators</b>		
Assumption	2	1.6
Conjecture	1	0.8
Comparison	2	1.6
Evaluation	48	38.1
Generate Query	2	1.5
Logical Support	7	5.6
<b>Action Operators</b>		
Decision	21	16.7
Generate Alternative	2	1.5
Temporary Decision	0	0.0
Decision Rule	2	1.5
Other Decisions	3	2.4
<b>Other Operators</b>		
Unrelated Comments	5	4.0
Personal Preferences	2	1.6
Reciting	23	18.3
Disagreement	0	0.0
Missing Information	<u>0</u>	<u>0.0</u>
<b>TOTAL</b>	<u>126</u>	<u>100.0</u>

**Subject's Comments:**

**Observations:**

Uses a "plus and minus" system to evaluate each case.  
 Utilizes comparisons, i.e. anchors and adjusts. Does  
 not verbalize thoughts while making the decision.  
 Makes the decision and then describes what has been  
 done.

TABLE XIII

## TABULATION OF SUBJECT'S PERFORMANCE OF TASK

-----  
**Subject:** M **Time Taken:** 125 minutes  
**Brain Dominance:** 1123 ISTJ left  
**Job Title:** Manager  
**Audit Experience:** 7 years  
**Transcribed:** 9504 words  
                   544 sentences  
 -----

	Number of Operators	Percent of Total
<b>Task Structuring Operators</b>		
Set Goal	0	0.0
<b>Information Acquisition Operators</b>		
Information Search	120	22.3
Information Retrieval	11	2.0
Algebraic Calculation	8	1.5
<b>Analytical Operators</b>		
Assumption	3	0.6
Conjecture	5	0.9
Comparison	3	0.6
Evaluation	146	27.2
Generate Query	26	4.8
Logical Support	20	3.7
<b>Action Operators</b>		
Decision	86	16.0
Generate Alternative	6	1.1
Temporary Decision	3	0.7
Decision Rule	18	3.3
Other Decisions	18	3.3
<b>Other Operators</b>		
Unrelated Comments	0	0.0
Personal Preferences	60	11.2
Reciting	0	0.0
Disagreement	<u>4</u>	<u>0.8</u>
Missing Information		
<b>TOTAL</b>	<u>537</u>	<u>100.0</u>

**Subject's Comments:**

**Observations:**

Verbalizes as the subject reads. Tends to verbalize all thoughts. Frequently expresses a lack of understanding concerning the case information. Anchors.



TABLE XV  
TABULATION OF SUBJECT'S PERFORMANCE OF TASK

-----		
Subject: O	Time Taken: 80 minutes	
Brain Dominance: 1121 INTP whole		
Job Title: Manager		
Audit Experience: 7 years		
Transcribed: 7790 words		
256 sentences		
-----		
	Number of Operators	Percent of Total
<b>Task Structuring Operators</b>		
Set Goal	0	0.0
<b>Information Acquisition Operators</b>		
Information Search	34	13.6
Information Retrieval	3	1.2
Algebraic Calculation	5	2.0
<b>Analytical Operators</b>		
Assumption	12	4.8
Conjecture	1	0.4
Comparison	16	6.4
Evaluation	63	25.2
Generate Query	6	2.4
Logical Support	10	4.0
<b>Action Operators</b>		
Decision	43	17.2
Generate Alternative	3	1.2
Temporary Decision	4	1.6
Decision Rule	3	1.2
Other Decisions	12	4.8
<b>Other Operators</b>		
Unrelated Comments	7	2.8
Personal Preferences	0	0.0
Reciting	26	10.4
Disagreement	0	0.0
Missing Information	<u>2</u>	<u>0.8</u>
<b>TOTAL</b>	<u>250</u>	<u>100.0</u>

**Subject's Comments:**

**Observations:**

Difficult to interpret the subject's thought processes. Hard to follow. The sentences are not complete and make little sense. Describes in detail a method of accounts receivable confirmation. Anchors.



TABLE XVI

## TABULATION OF SUBJECT'S PERFORMANCE OF TASK

-----  
**Subject:** P **Time Taken:** 120 minutes  
**Brain Dominance:** 1121 ENTP whole  
**Job Title:** Partner  
**Audit Experience:** 17 years  
**Transcribed:** 2002 words  
735 sentences  
 -----

	Number of Operators	Percent of Total
<b>Task Structuring Operators</b>		
Set Goal	0	0.0
<b>Information Acquisition Operators</b>		
Information Search	16	15.4
Information Retrieval	1	1.0
Algebraic Calculation	4	3.8
<b>Analytical Operators</b>		
Assumption	0	0.0
Conjecture	0	0.0
Comparison	4	3.8
Evaluation	21	20.2
Generate Query	0	0.0
Logical Support	5	4.8
<b>Action Operators</b>		
Decision	21	20.2
Generate Alternative	2	1.9
Temporary Decision	0	0.0
Decision Rule	0	0.0
Other Decisions	2	2.0
<b>Other Operators</b>		
Unrelated Comments	8	7.7
Personal Preferences	2	1.9
Reciting	17	16.3
Disagreement	0	0.0
Missing Information	<u>0</u>	<u>0.0</u>
<b>TOTAL</b>	<u>104</u>	<u>100.0</u>

**Subject's Comments:**

**Observations:**

Did not verbalize thoughts in several situations.  
 Anchors and adjusts.





VITA<sup>2</sup>

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