THE IMPACT OF AN EXPERT SYSTEM AS A DECISION AID ON LEARNING DURING THE AUDIT PROCESS: AN EMPIRICAL TEST

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PREFACE

A study was conducted to examine the impact of the use of an expert system as a decision aid on the ability of the auditor to learn from experience. The methodology employed a laboratory setting which provided measurements of the effectiveness and efficiency of the decision making process before and after the use of an expert system, a conventional decision aid, or no decision aid for training.

The study provided information on the use of consensus as a surrogate for accuracy in accounting studies. In addition, the learning attributable to outcome feedback and task properties feedback in a realistic decision making environment was explored.

I wish to express my sincere gratitude to all the people who assisted me in this research and during my studies at Oklahoma State University. In particular, I would like to express my appreciation to my committee chairman, Dr. Patrick Dorr, and my accounting member, Dr. James Groff for their assistance and encouragement throughout the program. They have willingly read the many drafts of this research, provided insightful comments, and offered intelligent guidance during the entire project. In addition, they have been a constant source of support. I would also like to thank Dr. Dorr and Dr. Groff for allowing me to conduct the study in their classes.

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CHAPTER I

THE RESEARCH PROBLEM

Introduction

The decision making process during the course of an audit has proven to be well suited to the use of decision aids. Regression and other statistical techniques have been applied to sample size determination, analytic review and sample analysis (Deakin and Granof, 1974; Kinney, 1978 and 1979; Stringer, 1979). In addition, many large accounting firms currently make use of some form of manual or computerized decision support aid during various phases of the audit.

Two recent developments have had and will continue to have a profound effect on the overall audit function and specifically the use of decision aids during the audit decision making process. The first development is the increased competitiveness of the audit environment. Increased competitiveness has led to an emphasis on the effective and efficient use of time. The second development is the technological advancements in computer hardware and software which have resulted in the rapid expansion of computers into the business community. These developments have increased the need for auditors to keep abreast of new computer technologies and incorporate them into the audit process whenever feasible if they are to remain competitive in today's environment.

In 1983, the American Accounting Association (AAA) Audit Section's technical committee issued its first report on the impact of information technology on auditing. The report recognized the fact that the auditing profession had been slow to integrate computer technology into the performance of an audit, but went on to indicate that it is imperative for auditing practitioners and researchers to cooperate in utilizing new technologies in redesigning the audit practice (AAA Audit Section Report, 1983).

One fairly recent development in computer technology that is having a tremendous impact on decision making is expert or knowledge-based systems. Expert systems are interactive computer programs that use the knowledge obtained from experts to solve problems in a relatively narrow area of expertise. They are one result of artificial intelligence research, which is concerned with developing computer systems to solve problems that would normally be associated with human intelligence (Harmon and King, 1985). Expert systems differ from more traditional decision aids in that they provide a suggested solution. Even so, they should be considered as yet another type of decision aid, intended to provide assistance to the decision maker who will ultimately make the critical decisions (Bailey, et al., 1986).

Overall interest in expert systems is apparent from the amount of current literature dealing with the subject as well as the recent appearance of commercial systems generation software, commonly referred to as expert system shells, and commercial expert systems. Various research groups have built successful expert systems in the areas of medical diagnosis and treatment, chemical structure analysis, geological exploration, computer configuration, and computer fault diagnosis.

While business use of expert systems is not as advanced as in the physical sciences, businesses are becoming increasingly involved in expert system research, with over half the companies in the Fortune 500 actively pursuing expert systems development (Newquist, 1986). Many large banks, including New York's Chase Manhattan Bank, are either implementing expert systems or involved in expert systems research (Friis, 1985).

Interest in expert systems in auditing is evidenced by the amount of research being conducted by both academicians and accounting firms. Numerous accounting firms and individual researchers have already built successful prototypes of expert systems, and many other firms and individuals are actively involved in research in this area. The University of Southern California Audit Symposiums held in 1984 and 1985 included papers dealing with expert systems and the 1986 Symposium was devoted to expert systems and audit judgment. The AAA Audit Sections' Report (1983) specifically mentions expert systems as an important area for research.

Research Objective

The preponderance of the research to date on expert systems in the auditing environment has been directed towards the development of systems. This research is proving to be relatively successful and the use of expert systems in auditing appears to be assured. The actual role expert systems will play and the impact of their use has just begun to be explored. Borthick (forthcoming) points out that research is needed in several areas, including the extent to which the use of an expert system will improve decision quality and create learning

efficiencies. Research into the learning efficiencies associated with the use of expert systems should provide important information that needs to be considered when the systems are being developed, implemented, and used in practice.

The primary objective of this research is to examine the learning efficiencies that occur with the use of an expert system as a decision aid during the audit process. This objective stems from a desire to determine whether the use of an expert system as a decision aid during the course of an audit will also provide training to the user. The research project addresses the following research question:

> Will the use of an expert system as a decision aid during the audit process affect the experiential learning process that is necessary for audit decision making?

This research question addresses the impact of the use of an advanced type of decision aid on the way the auditor learns decision making skills (acquires skills) that are necessary for making the types of decisions fundamental to the performance of every audit. The next section explains the importance of this research question.

Importance of the Problem

Since the early 1970's, the auditor's professional judgment has been the subject of considerable research. The primary objective of this research has been to improve the decision making ability of the auditor, which is most often defined as improved consistency or improved consensus (Joyce and Libby, 1982). The majority of this literature falls under the heading of human information processing and is intended to serve two basic purposes; (1) to lead to improvements in the auditor's decision making ability and (2) to add to the basic knowledge

of human decision processes (Libby and Lewis, 1982). One outgrowth of this research has been the development of decision aids.

Studies have been undertaken to explore the effect of experience on audit judgment. (Ashton and Kramer, 1980; Hamilton and Wright, 1981; Biggs and Mock, 1980). The consensus among experienced auditors was found to be higher than for inexperienced auditors. While the fact that experienced auditors make decisions differently than do inexperienced auditors has been fairly well established, work to determine how the decision making process changes i.e. what learning takes place, has just begun (Waller and Felix, 1984a and 1984b; Gibbins, 1984). Joyce and Libby (1982) point out the importance of learning in a profession as dynamic as auditing.

The topic of learning[1] takes on new importance with the introduction of advanced decision aids in the form of expert systems, to the audit process. At present, the major emphasis of research in auditing expert systems is the development of systems to aid the staff auditor in the field. Accounting firms traditionally consider the time an individual spends as a staff auditor as a training ground for advancement in the firm. Even thought the major thrust of this research has been on development of decision aids, nearly all the researchers indicate that the use of expert systems during the audit should result in increased learning. McKee (1986, p. 43) states that "conceivably, the overall training process could be accelerated with the use of expert

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[1] Although many different definitions of learning exist, a functional definition will be employed throughout this paper, i.e. learning is considered to take place and can be measured by improved performance and/or decreased time to make decisions, and is considered to be the equivalent of skill acquisition.

systems that provide recommendations against which developing auditors could test their judgments."

While expert systems developers argue that the use of expert systems will improve learning others foresee possible problems with their use. The concern is that the use of expert systems might interfere with the process the auditor goes through to become experienced. As Baab (1986) points out

> The auditor must not lose the ability to judge. Judgment comes with the experience of going through the thought process of establishing a proper allowance 50 times rather than pressing a button 50 times and accepting the answer (p. 186).

The extensive use of expert systems in accounting firms (or any other business) will have long range socio-economic implications. The job functions of various members of the firm may be altered by the use of expert systems. This change in job function doesn't necessarily have to be bad, but there is always the danger of deskilling (Chamot, 1984). Deskilling occurs when jobs that once required individuals to understand large quantities of information can be performed by individuals with limited actual knowledge but access to the information via the computer.

No research has been conducted to date on the impact of expert systems use on the staff level auditor which would provide support for either of the viewpoints discussed above. The high cost of expert system development and the commitment of both time and resources required make it imperative that research be undertaken to provide some insight into the types of learning efficiencies that will actually occur when expert systems are used. The present research seeks to provide a first step in filling this void by investigating the impact of the use of an expert system as a decision aid during the audit process on the

ultimate ability of the auditor to make the kind of audit decisions that are considered crucial.

Many accounting firms are currently involved in research projects aimed at the development of expert systems. The results of research into the impact of the use of expert systems should prove useful during the development phase as well as in the actual implementation and use of expert systems. Addressing these issues in a timely fashion wll allow firms to incorporate knowledge of any learning efficiencies into the development and implementation of expert systems.

Strategy transformation theory provides an understanding of the way an individuals' decision making strategies change through experience and provides the theoretical basis for this research project. The hypotheses generated from strategy transformation theory were tested in a lab study involving the evaluation of internal controls over factory payroll. To provide a richer understanding of the research question, demographic data was collected on the subjects and their attitudes towards the decision aids was examined.

The remainder of this dissertation is divided into five chapters. Chapter two reviews the relevant literature on expert systems, decision aids, and human information processing research into internal control evaluations. Chapter three describes the theoretical framework underlying this research and sets forth the hypotheses to be tested. Chapter four presents the methodology and research design used to conduct this research. The results of the analysis are presented in Chapter five. A summary of the conclusions of the study as well as the limitations appear in Chapter six.

CHAPTER II

REVIEW OF LITERATURE

Introduction

One of the most important goals of auditing research is to improve decision making. In 1977, the American Accounting Association Committee on Human Information Processing listed three basic strategies for improving the quality of human decisions:

(1) The information set upon which such decisions are based may be altered.
(2) The ability of decision makers to use information may be improved.
(3) Formal models of human decision making may be constructed.

The first strategy emphasizes the information itself while the second strategy emphasizes the education, training, and experience of the decision maker. The third strategy emphasizes the use of formal models to supplement or replace the human decision maker. Strategy two recognizes the need to examine the affects of training and experience, while strategy three has fostered the development of different types of decision aids to assist the auditor and to improve the consistency of his/her judgment. The present study examines the impact of strategy three on strategy two, i.e. the effect of the use of a decision aid on an auditor's training and experience.

A multidisciplinary approach to the literature review is required since the purpose of this study is to examine the impact of the use of

an expert system on the auditor's ability to learn to make decisions. The first section of the literature review will provide an overview of expert systems and discuss current research on expert systems within the auditing domain. The second section will examine the relevant human information processing research on internal control evaluation, feedback and learning, and the impact of decision aids on learning.

Expert Systems

Expert Systems an Overview.

Decision support systems (DSS) is a term given to the broad group of systems that support the decision making process of the user. While the modern concept of a decision support system is a system that is computerized, manual (paper and pencil) systems could also be considered as a type of decision support system. The main function of expert systems in auditing is to provide a tool for the decision maker and in this regard expert systems can be considered as an advanced type of decision support system.[1]

Since the area of expert systems is relatively new multiple definitions and terminology exist. A brief discussion of the definition of expert systems and the characteristics of relevance to this research should help eliminate possible confusion. An expert system is a computer program which uses expert knowledge to attain high levels of performance in a narrow problem domain. Expert systems are one outcome

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[1] Since the definition of a decision support system (DSS) and an expert system (ES) are both still being debated, arguments for considering an ES to be a DSS exist (see for example Bailey, et al. 1986) and arguments for considering an ES to be different than a DSS exist (see Turban and Watkins 1986).

of artificial intelligence research. Artificial intelligence research is concerned with developing computer systems, consisting of both hardware and software, to solve problems that would normally require human intelligence. Edward Feigenbaum of Stanford University has provided the following explanation:

> ...an expert system is an intelligent computer program that uses knowledge and inference procedures to solve problems that are difficult enough to require significant human expertise for their solution. Knowledge necessary to perform at such a level, plus the inference procedures used, can be thought of as a model of the expertise of the best practitioners of the field.
>
> The knowledge of an expert system consists of facts and heuristics. The "facts" constitute a body of information that is widely shared, publicly available, and generally agreed upon by experts in a field. The "heuristics" are mostly private, little-discussed rules of good judgment (rules of plausible reasoning, rules of good guessing) that characterize expert-level decision making in the field (Harmon and King, 1985, p. 5).

Expert systems developed to date can be divided into two major categories, problem solving and training. Problem solving expert systems can be further subdivided into categories based on the problem solving activity they perform. These subcategories include systems designed for interpretation, prediction, diagnosis, design, planning, monitoring, debugging, or control. Expert systems designed for training or instruction attempt to identify weaknesses in the student's behavior and provide feedback that will allow the student to correct the weaknesses (Waterman, 1986). Expert systems work to date in auditing falls under the problem solving construct.

An expert system differs from more traditional decision support systems in several important ways. First, expert systems query the user for input whereas in a conventional decision support system, the user queries the system (Turban and Watkins, 1986). The sequence of the

questions to the user is based on internal weights and may not follow the actual decision making process of the expert. This is due to the fact that many expert systems do not attempt to duplicate the decision making process of the human expert, instead they strive to produce the same result as the expert (McKee, 1986). The expert system then provides a suggested solution (evaluation) to the user. In conventional decision support systems, the user or the user in conjunction with the system arrives at the solution. The solution provided by the expert system can be reached with less than absolute certainty, that is, the system could provide a suggested solution with the degree of certainty associated with it.

Expert systems also differ from more traditional decision support aids by placing emphasis on knowledge itself rather than formal reasoning methods and algorithmic solutions. Expert systems are sometimes referred to as knowledge based systems because of this emphasis. They utilize symbolic representation, symbolic inference, and heuristic search to arrive at problem solutions. Another way in which expert systems differ from conventional decision support system is that they can make mistakes since they perform like experts, following heuristic process rather than mathematical algorithms (Hayes-Roth, et al., 1986).

Researchers, both in academia and in public accounting firms, have actively pursued the use of expert systems in various areas of accounting. While both auditing and tax have proved well suited for expert systems applications only the research related to auditing will be discussed here. One of the major goals of much of the expert system research in auditing has been to develop systems that will make the same

evaluation or come to the same conclusion as the expert. Other, more recent, research has concentrated on simulating the decision making process of the expert. This research is strongly rooted in cognitive psychology and is providing some insight into the decision making process of auditors.

Expert Systems in Practice.

The Big Eight accounting firms are becoming increasingly involved in expert systems research. The research being conducted by public accounting firms is typically motivated by a desire to provide an expert system which will aid in the decision making process of the user and not by a desire to simulate the actual decision making process of the expert. The Audit Research Group of Peat, Marwick, Mitchell & Co. has contracted with consultant William Wright to develop an expert system (Willingham, et al., 1986). The system will assist the auditor in the estimation of the dollar amount of the uncollectible reserve for the bank's portfolio of loans. The one major requirement for the development of this system was that it be developed in a microcomputer environment using commercially available expert system shells. Peat, Marwick, Mitchell & Co. has found overwhelming approval for this research within the firm and is currently involved in feasibility studies to identify other areas in audit programming and planning that will be adaptable to expert system development.

Delloite, Haskins, and Sells is presently using ControlPlan, an expert systems like program, during the evaluation of internal accounting control (Stewart, 1986). Delloite, Haskins, and Sells is currently developing a comprehensive, integrated audit support system

called AuditPlus. AuditPlus will be developed using artificial intelligence techniques and will incorporate new audit tools including expert systems. The system is being developed to run on the IBM PC so it will be available to assist the auditor in the field.

While Price Waterhouse is not using expert systems at the present time, they have announced the formation of a Technology Assessment Centre. The primary role of the Centre will be the exploration of artificial intelligence with special emphasis on expert systems (Bertholdt, 1986).

Arthur Young has specifically designated expert systems as one of its software growth areas. Arthur Young, in conjunction with research groups at MIT, is in the process of developing expert systems for group decision making, the managing of corporate executives, information sharing, and application management. One objective of this research is to develop expert systems that can be marketed to clients as strategic tools. (Kologziej, 1986).

Expert Systems Research.

Auditing academicians have been active in the investigation of the role of expert systems in auditing. TICOM (The Internal Control Model) was one of the earliest attempts to use artificial intelligence techniques in an auditing context (Bailey, et al., 1985). While TICOM is not an expert system, it is a computer-based analytic tool based on the artificial intelligence concepts of knowledge representation and graph simplification. TICOM is designed as a decision support aid to assist the auditor in designing, analyzing, and evaluating internal control systems. The auditor can use TICOM to model the information

system and then use the query ability to evaluate the system of internal control.

One of the first expert systems in auditing, EDP-EXPERT, was created by Hansen and Messier (1982). The system was built to provide decision support for the EDP auditor, an area well suited to expert system development because of the complex and dynamic nature of the computer systems being audited, and also because of the limited number of qualified and experienced EDP auditors. EDP-EXPERT was developed using the rule-based expert system software shell AL/X. The initial knowledge base was developed using what Johnson (1983) refers to as reconstructed methods. This involves the use of available references, i.e. textbooks and/or firm manuals, to construct the basic knowledge structure. One computer audit specialist served as the expert and provided the weights and feedback to complete the system (Hansen and Messier, 1986).

EDP-EXPERT has been investigated using seventeen auditors attending a computer audit training session. The subjects were asked to make evaluations of internal control for a case situation prior to using EDP-EXPERT, and after using EDP-EXPERT. The evaluation EDP-EXPERT provided for each subject was also recorded. The evaluations made before the use of EDP-EXPERT were not correlated to the evaluations made by EDP-EXPERT, but they were correlated to the evaluations made after the use of the system. The evaluations made after the use of EDP-EXPERT were most highly correlated with the evaluations made by EDP-EXPERT, providing support to the contention that the use of EDP-EXPERT did have an impact on the subjects' evaluations (Hansen and Messier, 1986).

Expert systems are also being developed to model the auditor's going-concern judgment. Biggs and Selfridge (1986) chose the going-concern judgment because it requires a high level of expertise, it involves a high risk for auditors if an error is made, expansion to the more general analytical review should be possible, and it provides one of the few areas in auditing where known evaluation criteria exist. The GC-X (Going-Concern Expert) system was programmed in LISP and operates on a VAX 11/780 computer. The knowledge base was obtained through interviews with several experts (partners and managers from a Big Eight accounting firm).

Dillard and Mutchler (1986) have also begun work on an expert system for the going concern opinion decision. The domain specific knowledge was gathered from three audit partners using verbal protocol analysis. The protocols of two of the auditors were used as the basic data base, while the protocol of the third was held out to be used for system validation. The project is in the very early developmental stage and is directed more towards the development of a model and the generation of hypotheses than towards testing and evaluation.

AUDITOR (Dungan and Chandler, 1985) was developed to assist the professional auditor in the estimation of the dollar amount of a client's uncollectible accounts receivable. The system is based on a version of AL/X which runs on microcomputers. The knowledge for the system was obtained from four practicing auditors who also assisted during the refinement of the system. AUDITOR was validated by both open book and blind procedures. Under open book procedures, the auditor doing the evaluation is aware of the source of the judgment (AUDITOR or human) and has access to the actual judgments made by the auditors on

the job. The blind procedure does not provide any information about the source of the judgment. AUDITOR was rated acceptable in over 90% of both the open book and blind evaluations.

The evaluation of internal controls also appears to be well suited to expert systems. The recent competition among audit firms has resulted in firms modifying their audit approach and relying more heavily on internal control to increase efficiency. An expert system in this area could provide much needed expertise for those members of the audit team who lack adequate experience and/or knowledge. Grudnitski (1986) used the EMYCIN shell to develop a prototype system that offers advice about the effectiveness of an accounting application's internal controls. The knowledge of ICES (Internal Control Expert System) was built from entry-level auditor training materials and is limited to the Sales and Accounts Receivable cycle.

Meservy, et al. (1986) also explored the area of internal control evaluation and expert systems. Their approach is strongly rooted in cognitive psychology and is concerned with modeling the problem solving characteristics of the auditor rather than building a problem solver. One auditor from a major accounting firm served as the primary subject for the development and tuning of the model. The primary subject and six other auditors assisted in the validation of the model.

Steinbart (1987) used the construction of a rule-based expert system to study planning-stage materiality judgments. The purpose of the study was to determine the impact of various types of information on planning-stage materiality judgments, the construction of the expert system provided the vehicle to elicit this information. The initial production system (prototype) called AUDITPLANNER was developed from

audit training manuals. The refinements to the system were made using the knowledge of one auditor from a major public accounting firm. During a series of interactive sessions the auditor was able to provide assistance in the modification of AUDITPLANNER. Six experienced auditors from the same accounting firm used the modified system to make judgments about thirteen companies. In a post-questionnaire, five out of six of these auditors indicated that the system should be useful as a decision aid and that they would use it as a training device for subordinates.

The extent of research into expert systems in auditing is evidence of the interest of academia and public accounting firms in expert system development and use in the auditing domain. With continued improvements in expert system technology, the use of expert systems in auditing should continue to expand. It is therefore, of extreme importance that research into the impact of expert systems usage be undertaken.

Human Information Processing Research in Auditing

Research in human information processing has provided insight into the decision making process of the auditor (for a complete review see: Joyce and Libby, 1982; Libby, 1981; and Libby and Lewis, 1982). Human information processing research of relevance to this paper includes studies of internal control evaluation, effect of feedback on learning, and effect of decision aids on learning.

Internal Control.

Internal controls have been studied within different areas of human information processing, but the majority of the work has utilized the

lens model framework. The lens model framework has proven useful in policy capturing studies, achievement and learning studies, and judgment accuracy studies (Libby and Lewis, 1982). The lens model (Brunswick, 1952) provides a method of identifying many of the characteristics of judgment under uncertainty. The model views the judge as making a decision based on available information (cues) about an event (criterion event) that is not directly observable. The relationship of the cues to the criterion event and to the judges response are not always clear.

One of the first auditing studies to utilize the concepts of the lens model was performed by Ashton (1974). Sixty-three auditors from four different firms made evaluations of the internal control systems for payroll using a six-point scale. Thirty-two cases were generated from a 1/2 fractional replication of a 2^6 analysis of variance. The auditors relied most heavily on the two separation of duties factors in forming their judgments. In addition to the information about the factors used, the study provided information on the consensus between auditors. Since no measure of the accurate response was available, the consensus between auditors was used as a surrogate. The auditors' evaluations exhibited a relatively high between judge consensus, with a correlation of .70.

Ashton and Kramer (1980) used the same cases as Ashton (1974) to evaluate the affects of experience on the ability to make internal control evaluations. Students and auditors were required to make evaluations in identical tasks. The students were less predictable than the auditors and they also placed less emphasis on internal control. The consensus among the students was .66, slightly lower than that of the auditors.

The work of Ashton (1974) was replicated and extended by Ashton and Brown (1980). They added two cues relating to the rotation of duties and the use of background inquiries for new employees to the Ashton (1974) cases to produce a more complex judgment task. The order in which the cues were presented was also varied, but order was found to have no impact on the outcome. In this study thirty-one auditors with from one to three years experience evaluated 128 principle cases from a 1/2 replication of a 2^8 analysis of variance and 32 repeat cases. The results were virtually identical to that of Ashton (1974).

Hamilton and Wright (1981) modified the Ashton (1974) study to investigate the impact of experience on internal control judgments. The subjects in the experiment were seventeen auditors, with varying levels of experience, from one office of a national public accounting office. The more experienced auditors were found to have higher consensus than the less experienced auditors. Consistent with the previous studies, separation of duties was found to be the most important factor in the internal control judgments.

The auditor's evaluation of internal controls has also been studied using protocol analysis. Protocol analysis is one method of obtaining information about the predecisional behavior of decision makers. Biggs and Mock (1983) investigated the decision processes of four experienced auditors in the evaluation of internal controls over a company's revenue cycle. Due to the inherent limitations of protocol analysis this study is descriptive in nature. One of the major benefits from this study was the evaluation of internal control in a more realistic setting.

Feedback and Learning.

The method or type of feedback has been shown to impact the decision makers achievement and learning. Studies of feedback in the psychology literature typically fall under the heading of multiple cue probability learning (MCPL) studies. Multiple cue probability learning studies are characterized by (1) artificial or non-meaningful tasks, ones where the subjects background will provide no assistance, (2) prespecified cue relationships which the subjects are to learn, and (3) learning which results from the subject being provided with feedback (reinforcement) after each trial (Hammond, 1971).

Feedback can be classified as outcome, task properties, cognitive, and lens model. Outcome feedback occurs when subjects are given the correct answer immediately after each trial. Task properties feedback provides subjects with information about the task itself and often takes the form of statistical information about the relationship between the cues and the correct answer. Cognitive feedback provides the subjects with information about their decision making strategy and often takes the form of statistical information about the relationship of the cues and their responses. Lens model feedback consists of a combination of cognitive and task properties feedback. Outcome feedback alone has tended to result in slow or inefficient learning and in some cases actually decrease learning. Cognitive feedback alone has not been very successful in improving learning, but task properties feedback and lens model feedback have proven to be equally effective.

A variation on the multiple cue probability learning studies has provided insight in accounting. The most significant departure from the psychology studies is that of a meaningful or realistic task. One of

the first studies (Harrell, 1977) examined the impact of task properties and outcome feedback on the ability of 75 Air Force officers to evaluate the performance of training wings. In this study, task properties feedback was operationalized as a statement of organizational policy and outcome feedback was operationalized as the evaluation made by their immediate supervisor. Five groups were formed by combining the different forms of feedback; (1) no feedback, (2) task properties feedback only, (3) task properties feedback and agreeing outcome feedback, (4) task properties feedback and non-agreeing outcome feedback, and (5) task properties feedback and random outcome feedback. Groups two and five performed in a similar manner, group three performed closest to the organizational policy, and group four ignored the task properties feedback and performed in agreement with their immediate superior. These results are not consistent with those of the earlier psychological studies.

Ashton (1981) also examined the impact of different types of feedback in a product pricing decision based on three cues. His study used two levels of feedback:; (1) task properties feedback which instructed the subject to weight each cue evenly, and (2) what was referred to as general properties feedback which consisted of textbook information on pricing. There was no significant difference in performance due to feedback group. One explanation for this was that prior to the analysis of the thirty cases for the study the subjects were presented with thirty similar cases and the pricing decision for them. This could be considered as initial outcome feedback. Another explanation is that the optimal rule of equal weighting of the three cues would tend to be the default rule (Libby, 1981).

Another study of multiple cue probability learning involved the prediction of corporate bond ratings based on an analysis of relevant ratios. The levels of feedback in this study were (1) cognitive feedback consisting of summary measures of performance, i.e. summary hit rates, (2) cognitive feedback consisting of correlations between each cue and the subjects evaluation, (3) task properties feedback consisting of correlations between each cue and the rating by Moody's (actual evaluation), and (4) lens model feedback which consisted of all three types of feedback given above. The first two feedback levels had no effect on learning, while the last two feedback levels had a strong impact on achievement during the early sessions but leveled out by the latter sessions. These results appear fairly consistent with the psychological literature, but outcome feedback was not considered.

Waller and Felix (1984b) argue that auditors' self-perception of their judgment ability may well impact their ability to learn from experience and their reliance on decision aids. They performed a study to examine the factors that effect the auditor's self-perception of their judgment ability. The experiment consisted of auditors making internal control judgments. The two independent variables manipulated were the feedback variable and the base rate for reliable outcomes. The results of the study supported the hypothesis that "self-perceived judgment ability depends on the positive hit rate when outcome feedback is available only if a favorable judgment has been made" (Waller and Felix, 1984a, p. 644).

Accounting studies have departed from the typical multiple cue probability learning study in the use of more realistic situations. The results, however, have not always been consistent. The role of outcome

feedback in a realistic setting is unclear and also the impact of task properties feedback has not always been as successful as in the psychology literature. Even though the studies conducted in accounting involved more realistic decisions, they have still dealt with only a very small number of cues.

Learning and Decision Support Systems.

Auditing firms have invested considerable time and money in the development of techniques aimed at improving audit judgment (Boritz, 1985). Typically these techniques include the addition of some form of structure to relatively unstructured tasks, i.e. the use of decision support systems or decision aids.[2] While the initial justification for the use of decision aids is the improvement of audit judgment, it is often argued that decision aids will facilitate learning. Because of the scarcity of relevant research into the use of decision aids and learning in an auditing setting, research in other disciplines will also be discussed.

Mock (1969) was one of the first to examine the effects of changes in the information structure on the decision maker. He used a lab setting to conduct an experiment that required businessmen and students to reach decisions in a relatively structured environment concerning production quantities, advertising purchases and input mix. In this particular setting, students were found to provide satisfactory surrogates for business decision makers. The independent variable was

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[2] No distinction is made in this research between decision aids and decision support systems, as used here they both refer any process, manual or computerized, that provides support or assistance to the user during the decision making process.

the information structure which consisted of either current (real-time) or lagged (batch) data. Subjects who used current data were found to outperform subjects who used lagged data, although neither group performed as well as the optimal theoretical model which was based on the concept of rational profit maximization. Learning trends were measured by changes in the percentages of achieved performance to optimal performance. The role of information in learning and control was noted. Both information structures were found to facilitate learning, with the majority of the learning occurring in the first three periods. The study highlighted the need to identify the relevant psychological variables of the decision maker to provide a fuller understanding of the role of information in both learning and control.

The experiment discussed above provided the data for further analysis of some of the questions raised in and about the original paper (Mock, et al., 1972). The difference between information structures, decision approaches of decision makers, and learning patterns were addressed. A factual definition of learning was used, with learning being defined as

> ...changes in choice behavior, being measured both by changes in the length of time a subject takes to make a choice, and by increases in profits or decreases in costs associated with his decision choice (ceteris paribus) (Mock, et al., 1972, p. 133).

The difference in learning from the different information structures and the different approaches to decision making (heuristic vs. analytic) were tested. No significant differences in learning were found due to either information structure or decision style.

Lucas and Nielsen (1980) also employed a factual definition of learning in a logistics management game designed to examine the effect

of mode of presentation, amount of information, and experience. Subjects participated in two sessions scheduled approximately one week apart and learning was measured as the rate of profit increase in session two minus the rate of profit increase in session one. Subjects who used CRT terminals were found to have higher rates of profit increase than subjects who used teletypes. This was believed to be due to the fact that CRT terminals are quieter, quicker, and easier to use than teletypes. The research design provided the experimental group with adequate information about the game but deprived the control group of information. No significant difference in learning was found due to differences in amount of information presented. The availability of graphics in addition to tabular information did not improve learning. The subjects came from three groups with differing experience; MBA students, practicing engineers, and executives. Experience was found to have a significant effect on learning, with the MBA students exhibiting the least learning and the practicing engineers exhibiting the most learning between sessions. The MBA students may have exhibited the least learning because they were more accustomed to this type of task and thus performed well in the early session.

The impact of an information system on decision maker learning has been studied within a competitive decision making environment (Chorba and New, 1980). Learning was measured as the improvement of performance, i.e., the ability to identify a successful strategy. The experiment consisted of a simulated production-marketing environment and subjects were required to make decisions concerning price, product quality, production level, and marketing effort. The independent variable was the amount of information available; minimal,

comprehensive, or available at a cost per item. Several findings concerning learning are of interest. Decision makers were able to more quickly identify a successful strategy if allowed to select their own data rather than have it provided. In other words, allowing a decision maker to select his own data, under economic constraints, tends to stimulate learning. Even decision makers who were found to be relatively unsuccessful became more selective in data use as they gained experience.

Research on learning and decision aids has often utilized a factual definition, i.e. some measure of increased performance. Support has been found for the proposition that the use of decision aids improves learning while those decision aids are being used. The ability to choose your own information has also been shown to enhance learning.

The review of the relevant literature in the area of human information processing and in the area of expert systems highlights some important points. THe use of expert systems in auditing appears to be assured based on the amount of research and extent of the development work that is being done. Expert systems development has been the subject of considerable debate and research, but the impact of the use of these systems has been virtually ignored. The research into human information processing has also been somewhat limited in the areas of feedback and learning, as well as decision aids and learning. The results of the existing research support the contention that while decision aids are being used learning improves, but the question of learning once the decision aids are removed has not been adequately addressed. The results of the studies on feedback are inconclusive.

The interaction between the decision aid being used and the type of feedback available has not been adequately explored.

The next chapter will develop the theoretical framework for this research.

CHAPTER III

THEORETICAL FRAMEWORK

Expert Decision Making in Auditing

The conduct of an audit involves the auditor in a complex, multidimensional decision making process requiring expertise on his/her part. During an auditor's years of experience, a network of knowledge is acquired that enables him/her to acquire this expertise. This experience based knowledge serves as the framework and is fundamental to the performance of professional judgment (Waller and Felix, 1984a).

Prior auditing research has dealt, for the most part, with the examination of the decision making process of the expert auditor (cf. (Joyce, 1976; Lewis, 1980). Work has begun, however, on research into how the novice auditor obtains expertise. Gibbins (1984) has set forth propositions about the psychological modeling that occurs when professional judgments form and decisions are made in accounting. These propositions examine the interaction between the task environment being experienced and the psychological processes of the decision maker (judge). Waller and Felix (1984a) have provided some preliminary work on the integration of the psychological literature on learning and auditing. The next section will explore some of the psychological differences in decision making between experts and novices. A theory will then be discussed which provides a basis for understanding the way experience enables the novice decision maker to become an expert.

Expert vs Novice Decision Makers

An expert is "a person who, because of training and experience, is able to do things the rest of us cannot" (Johnson, 1983, p. 78). While both experts and novices have been found to use the same form of reasoning, experts are typically able to solve difficult problems in less time and more accurately than novices (Johnson, et al., 1981). Larkin, et al. (1980) have identified several differences in the decision making process of experts and novices that help explain this difference in problem solving ability. One of the major areas of difference lies in the perceptual knowledge of experts. Not only does an expert know a great deal more than a novice, he/she is able to rapidly recall items that are relevant to the problem. This ability to recall the relevant items is not attributable to mental superiority, but to the memory phenomena called chunking. A chunk is "any stimulus that has become familiar from previous repeated exposure and hence is recognizable as a single unit." (Larkin, et al., 1980, p. 208) Since short term memory has a limited capacity, four to seven items (Miller, 1956), the ability of experts to chunk information enables them to have quicker access to much larger amounts of information than do novices.

Another way in which experts differ from novices is in the representation of dynamic situations in memory. The expert is able to have a more abstract representation in memory which allows (1) quicker determination of the appropriate approach to the problem, (2) the identification of the relevant items in the problem and representation of them in a uniform way for all parts of the problem, and (3) the reduction of the amount of information that must be attended to at one time (Larkin, et al., 1980).

Einhorn (1974) has identified three criteria indicative of expert judgment in complex decision making environments. These three criteria all relate to how the expert judge deals with the available information or cues. A complex decision making environment exists when multiple cues are present that need to be combined into a global judgment or decision. The first criterion for expert judgment is that the expert judge should be able to reproduce his/her judgments consistently. This is often referred to as intrajudge reliability, i.e. the judge should be able to reproduce his measurements of the cues. Construct validity, the second criterion, refers to the fact that the cues measured by the expert judge should provide explanatory power. Those cues with minimal explanatory power should be given little consideration in the judgment process. The third criterion is that the expert judge should be relatively free of judgmental bias. Judgmental bias can occur when a judge overvalues (undervalues) all decisions of a similar type. In this situation the judge would have a preconceived positive (negative) perception of the outcome. At this point, it is clear that differences do exist between experts and novices. With this in mind, a theory will be discussed which provides guidance as to the process a novice goes through to become an expert.

Strategy Transformation Theory

Much of the current research in auditing addresses the question of 'what' information is used. Cognitive science allows the examination of the question of 'how' information is used. Dillard (1984) offers four levels of behavioral decision making which can be examined in answering the question of 'how' information is used. The top level of behavioral

decision making is to specify how knowledge representations are modified in order to increase capabilities. This level refers to the identification of operators that "when applied to an initial knowledge state will result in that knowledge state being modified in such a way that new knowledge is acquired or that decision making processes become more sophisticated" (Dillard, 1984, p. 344). Gibbins (1984) discusses this same concept although he uses the term 'template' to refer to the memory structure that serves as a guide to the responses and judgment processes that have been experienced. He proposes that the characteristics of these templates are shaped by experience in the form of the history of judgmental demands and the performance feedback. Gibbins also proposes that these templates reside in long-term memory. Since long-term memory is an active structure, this proposition would seem to support the contention that the templates are affected by experience.

One fundamental difference between expert and novice decision making appears to be caused by the experts ability to take fundamental strategies (templates) that have been taught and through practice modify these into more efficient and powerful procedures. These resulting expert strategies may be too complex to be taught themselves, therefore the only method of acquiring them is through experience. A strategy refers to the "structures or rules that underlie performance on cognitive tasks" (Kail and Bisanz, 1980, p. 229).

Strategy transformation theory provides a basis for understanding the modification of strategies that occurs as the result of practice in the decision making process. Strategy transformation theory seeks to explain how people modify their strategies through experience (Neches

and Hayes, 1978). Strategy transformation theory has been observed, analyzed, and studied experimentally in a complex sequence generation task which involved arithmetic and symbolic manipulations. The applications of strategy transformation theory appear to be quite general.

Different types of strategy transformation have been identified within various decision making constructs. The three types that are of primary relevance to a multiple cue decision making task are unit building, reduction to rule, and deletion of unnecessary parts. The decision making process during the course of an audit would fall under the heading of multiple cue decision making tasks.

Unit building is very similar to the chunking discussed above. It allows the combination of groups of operations into a set that can be accessed as a single unit. Klahr and Wallace (1976) refer to these groups of operations as consistent sequences of actions. This should provide for greater efficiency by increasing the ease with which strategies can be recalled or reconstructed. Elements that were previously recalled individually can now be grouped to form a unit and recalled as one "element".

Reduction to a rule allows a procedure to be replaced with a rule describing its results. This rule is constructed through the experience of observing constant relations within ordered sets of results or across the pairs of inputs and results. Like unit building, it should provide for improved efficiency of decision making. Reduction to a rule allows the decision maker to recall the rule rather than having to recall all the separate procedures involved.

Deletion of unnecessary parts simplifies the flow of control by eliminating nonessential operations. The flow of control of a strategy can be thought of as the path the decision maker follows in making a particular decision. One method of eliminating nonessential operations is through the examination of procedures. Patterns which are found to be invariant between different settings are often unnecessary to the decision making process. General knowledge may also be used to determine the operations to delete. Deletion of unnecessary parts should also improve the efficiency of the decision making process by eliminating the need to examine elements or data that are of no relevance to the decision being made. Through practice, the decision maker is able to determine the operations that are minimally sufficient to solve the problem at hand (Neisser, 1964).

These three categories of strategy transformation are closely related to Flavell's (1972) stabilization category. Flavell posited five relationships concerning cognitive development. One of these, modification, states that an initial item (concept, skill) can be extended in one of three ways; differentiation, generalization, or stabilization. Differentiation refers to an item's range of application being divided among several more specialized items. Generalization occurs when an item's range is broadened. Stabilization derives from both differentiation and generalization and results in the increased efficiency in utilizing an item. One of the main differences between strategy transformation theory and Flavell's categories is that Flavell describes types of change(s) between two states while strategy transformation theory includes both types of change(s) and the processes involved in those changes.

All three of these strategy transformations will result in more efficient and effective decision making by reducing or combining the information (cues) that the decision maker has to address. Strategy transformation theory is based on the assumption that the transformations occur as the result of experience, i.e. practice making decisions. The ability of the decision maker to identify relevant cues and eliminate unnecessary information from the decision making process are an inherent part of strategy transformation theory.

Statement of Hypotheses

Decision aids, whether expert systems or more conventional types, are designed to aid the decision maker during the decision making process. In addition, some types of decision aids are considered to be valuable training aids. Decision aids are considered beneficial in directing the attention of the user to the relevant information needed to make decisions. If decision aids are successful as training aids, individuals who use decision aids during training (the time they are practicing making decisions) should exhibit more strategy transformation than individuals who do not use decision aids during training. This leads to the first hypothesis

Hol: Learning (strategy transformation) from the use of a decision aid equals learning (strategy transformation) when no decision aid is used.

Hal: Learning (strategy transformation) from the use of a decision aid is not equal to learning (strategy transformation) when no decision aid is used.

Expert systems are an advanced type of decision aid and are developed to help facilitate the decision making process of the user. One additional benefit that is offered by the developers is that they

provide training in the decision making process because they lead the user through the decision making process and highlight the important information to consider during that process. This is offered as a distinct advantage of using expert systems as opposed to more conventional types of decision aids. If expert systems are successful in providing training, then individuals who use expert systems during the training process should exhibit more strategy transformation than individuals who use more conventional types of decision aids. This leads to the second hypothesis:

Ho2: Learning (strategy transformation) from the use of an expert system equals learning (strategy transformation) when a conventional decision aid is used.

Ha2: Learning (strategy transformation) from the use of an expert system is not to equal learning (strategy transformation) when a conventional decision aid is used.

One feature that is present in many expert systems is the ability to explain why they reached a specific conclusion or evaluation. This explanatory capability is typically at the option of the user, that is the user requests an explanation whenever desired. The availability of this explanatory capability is often listed as an important feature of an expert system which should provide improved training for the user. This leads to the third hypothesis:

Ho3: Learning (strategy transformation) from the use of an expert system with explanatory capability equals learning (strategy transformation) when an expert system with no explanatory capability is used.

Ha3: Learning (strategy transformation) from the use of an expert system with explanatory capability is not to equal learning (strategy transformation) when an expert system with no explanatory capability is used.

In addition to the decision aids, one other aspect of research into learning in a multidimensional or multiple cue setting that must be

considered is the type of feedback the subjects receive. As discussed in Chapter II, the method or type of feedback an individual receives after making a decision has been shown to impact the decision makers' achievement and learning. This has been explored in both the psychology and accounting literature dealing with multiple cue probability learning. Four types of feedback are typically identified in the literature, outcome feedback, task properties feedback, cognitive feedback, and lens model feedback. Outcome feedback consists of only the correct answer, task properties feedback consists of information about the task itself, cognitive feedback consists of information about the decision making process of the judge, and lens model feedback consists of a combination of cognitive and task properties feedback.

The psychology literature has shown fairly consistent results when examining the impact of feedback in an unrealistic decision making environment. The accounting studies have explored a more realistic decision making environment, but the results have been inconclusive and often inconsistent with the psychology studies. The major inconsistencies have occurred with regard to outcome feedback and task properties feedback. The psychology studies have found that outcome feedback alone resulted in little or no learning, while task properties feedback alone resulted in a significant amount of learning. The combination of task properties and outcome feedback has resulted in limited learning. The accounting studies have been inconclusive with regard to outcome feedback and task properties feedback. Subjects have ignored task properties feedback when it contradicts outcome feedback (Harrell, 1977), and prior outcome feedback has been found to have an impact on the learning that occurs (Ashton, 1981).

While the major thrust of the current research is on the impact of decision aids, the type of feedback the subjects receive is an important consideration and the inconclusive results from the accounting studies indicates a need to conduct further research into the issue of feedback in a realistic decision making setting. Based on the limited studies to date, it would appear that more learning (strategy transformation) should occur from a combination of agreeing outcome feedback and task properties feedback than occurs from outcome feedback alone. This leads to the fourth hypothesis:

Ho4: Learning (strategy transformation) from task properties and outcome feedback equals learning (strategy transformation) when only outcome feedback is available.

Ha4: Learning (strategy transformation) from task properties and outcome feedback is not equal to learning (strategy transformation) when only outcome feedback is available.

The attitude of the decision makers toward the use of an expert system is also examined. People are often hesitant to relinquish part of their decision making responsibilities to a computer (Goldsmith and Schvaneveldt, 1984). The premise of expert systems use, as is true of any decision aid, is that they will be 'used' by the decision maker. The attitudes of the users could have a significant impact on the effectiveness of their use. Demographic data about the decision makers is also collected.

The next chapter will describe the methodology that was used in conducting this research project.

CHAPTER IV

METHODOLOGY

Overview

The research questions were investigated in a laboratory study analyzing a multiple cue judgment task dealing with the evaluation of internal control over factory payroll. Upper level accounting students at Oklahoma State University served as surrogates for entry level auditors. The study was conducted in the microcomputer laboratories in the College of Business, which provided an isolated and controlled environment for the study.

Research Design

The research design was a 4 x 2 complete factorial analysis of variance (ANOVA) with a pre-test and post-test measure (refer to Figure 1. for an overview of the factorial design). The two treatments were decision aid (DA) with four levels and feedback (FB) with two levels. The four levels of the decision aid were no decision aid (control group), questionnaire, expert system with no explanatory capability, and expert system with explanatory capability. The control group did not use any type of decision aid during the training (experience gathering) sessions. The conventional decision aid was operationalized as an internal control questionnaire, since most accounting firms use some type of questionnaire in the accumulation of information about a

company's internal control. For a more complete understanding of the impact of an expert system, two types of expert systems were developed, one with an explanatory capability and one without an explanatory capability.

MAIN EFFECTS:

Decision Aid (DA)

levels: 1) No Decision Aid (Control Group)
2) Questionnaire
3) Expert System without Explanatory capability
4) Expert System with Explanatory capability

Feedback (FB)

levels: 1) evaluation only
2) evaluation and statement of major control weakness

INTERACTION EFFECTS

Decision Aid x Feedback (DA x FB)

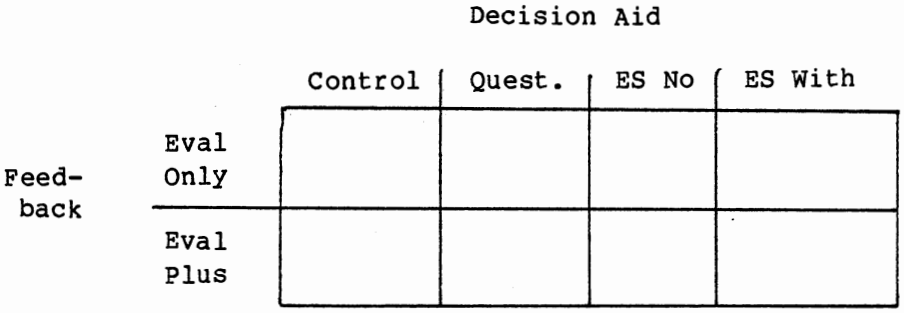

Figure 1. Experimental Design

The two levels of feedback employed in this study were outcome feedback only and a combination of outcome feedback and task properties

feedback. Outcome feedback was operationalized as the response of the expert and consisted of only the evaluation made by the expert. The combination of outcome feedback and task properties feedback consisted of the evaluation made by the expert (outcome feedback) and a statement of the major internal control weakness in the scenario (a form of task properties feedback). The minimal research on feedback in a realistic accounting setting has provided inconsistent results which have at times contradicted those of the psychology studies. The design of this study provides a more realistic setting than has been used previously and should help provide some additional insight. The feedback levels were also chosen to be as realistic as possible within the confines of the experimental design.

The four major hypotheses developed in Chapter III were tested using the analysis of variance design. The 4 x 2 complete factorial arrangement of treatments made it possible to test all the hypotheses and also test for possible interactions between the treatments. The hypotheses will be restated using the operationalized independent variables (treatments) and expanded where appropriate for the addition of two classes of expert systems.

Hypothesis one as stated earlier, examines the impact of a decision aid versus no decision aid. Since three types of decision aids were developed this hypothesis can be subdivided into three parts.

Hol: Learning (strategy transformation) from the use of a decision aid equals learning (strategy transformation) when no decision aid is used.

Hal: Learning (strategy transformation) from the use of a decision aid is not equal to learning (strategy transformation) when no decision aid is used.

Ho1.1: Learning (strategy transformation) from the use of a questionnaire equals learning (strategy transformation) when no decision aid is used.

Ho1.2: Learning (strategy transformation) from the use of an expert system with no explanatory capability equals learning (strategy transformation) when no decision aid is used.

Ho1.3: Learning (strategy transformation) from the use of an expert system with explanatory capability equals learning (strategy transformation) when no decision aid is used.

The second hypothesis examines the difference in strategy transformation that results from the use of different types of decision aids. The hypothesis is stated in terms of the difference between a conventional decision aid (questionnaire) and an expert system. Again this hypothesis can be subdivided due to the development of two types of expert systems.

Ho2: Learning (strategy transformation) from the use of an expert system equals learning (strategy transformation) when a conventional decision aid is used.

Ha2: Learning (strategy transformation) from the use of an expert system is not equal to learning (strategy transformation) when a conventional decision aid is used.

Ho2.1: Learning (strategy transformation) from the use of an expert system with no explanatory capability equals learning (strategy transformation) when a questionnaire is used.

Ho2.2: Learning (strategy transformation) from the use of an expert system with explanatory capabilities will equals learning (strategy transformation) when a questionnaire is used.

The third hypothesis does not need restatement.

Ho3: Learning (strategy transformation) from the use of an expert system with explanatory capability equals learning (strategy transformation) when an expert system with no explanatory capability is used.

Ha3: Learning (strategy transformation) from the use of an expert system with explanatory capability is not to equal learning (strategy transformation) when an expert system with no explanatory capability is used.

The fourth hypothesis will be restated to allow for the operationalization of the feedback variables.

Ho4: Learning (strategy transformation) from feedback consisting of the evaluation of the expert and a statement of the major internal control weakness equals learning (strategy transformation) when only the evaluation of the expert is available.

Ha4: Learning (strategy transformation) from feedback consisting of the evaluation of the expert and a statement of the major internal control weakness is not equal to learning (strategy transformation) when only the evaluation of the expert is available.

The dependent variables used in the study can be divided into three categories; accuracy, time, and consensus. Strategy transformation theory posits that the decision making process should become more effective and more efficient as strategy transformation occurs. The dependent measures were chosen in an attempt to measure these two areas.

Effectiveness of decision making can be viewed as a measure of the quality or accuracy of the decision. If a measure of the accurate decision is available, then the most valid measure of effectiveness is a comparison of the subject's decision with the accurate decision. In this study a measure of the accurate decision exists, i.e. the evaluation of the expert. Accuracy was chosen as the category of dependent variable to test the effectiveness of the decision making process.

The other aspect of strategy transformation theory is that the decision making process becomes more efficient as strategy transformation occurs. As the decision maker becomes more efficient, the number of cues that need to be examined is reduced and internal

rules of the decision making process are developed. The result is that the time taken to make the decision should decrease. Time taken to make the decision was chosen as the measure of the efficiency of the decision making process.

Frequently in auditing research, no measure of the accurate decision exists. In these situations, the consensus between the decision makers is computed and used as the dependent variable. This study provides a unique setting to explore the use of consensus as a surrogate for accuracy since a true measure of accuracy exists. Consensus will thus be included as a third category of dependent variable. A further discussion and clarification of these measures is provided in the results chapter.

Subjects

Much of the current literature on audit judgment considers the decision making process of experienced auditors. The current research differs from previous studies in that it examines the impact of a decision aid (expert system) on the ability of an auditor to learn to make decisions. The use of this type of decision aid would typically involve the entry level or staff auditor. Thus student subjects who have received adequate background instruction in internal control concepts were deemed to be appropriate surrogates. The subjects consisted of upper level accounting students enrolled in Accounting Information Systems at Oklahoma State University. The structure of this course is such that the concepts of internal control and the accounting cycles are covered in depth during the first half of the semester. The study was conducted during the last half of the semester to insure that

the subjects were adequately versed in internal control concepts as well as familiar with the various accounting cycles.

The study was included in the course syllabus as a special project worth fifty points out of 500 total points possible for the course. Students were informed that the fifty points would be allocated based on their participation and the quality of the evaluations they were able to make by the end of the study. At the conclusion of the study the students were informed that they would receive credit based on participation only. Since the study involved scheduled times outside normal classroom hours, students were given the option of writing a paper if work or commuting prohibited them from participating. No students chose to take advantage of this option. Because this research was designed to assist in the understanding of the evaluation of internal control concepts and because it allowed the students to have hands on experience with an expert system, it was considered appropriate and beneficial for the Accounting Information Systems classes.

The use of human subjects at Oklahoma State University necessitates the approval of the College of Business Research and Publications Committee and also requires that written consent be obtained from participants. In order to comply with these requirements, the students were clearly informed that they were taking part in a research study and the type and extent of the tasks they would have to perform. They were not informed of the actual hypotheses to be tested, nor were they informed of the different experimental groups to which subjects had been assigned. Appendix B contains examples of the test instrument used by the student subjects, including a copy of the statement made to the students before the study began and the consent form.

The study involved students in five sections of Accounting Information Systems taught by two instructors. Two hundred and fifteen students initially enrolled for the course and were randomly assigned to treatment groups for the study. Fifteen students dropped the course, seven students did not complete one or more of the sessions, and two students had problems with their diskettes which invalidated their responses. This resulted in 191 students completing the study with usable results. Table I provides a summary of the demographics of the students involved in the research. The students were requested to complete the demographic questionnaire, but were not mandated to do so. Some students did not return their forms or did not answer all questions, thus the numbers in Table I do not add up to 191. There is no reason to believe that the students who did not respond comprised any special group or that their responses would have been significantly different than those represented in the table.

TABLE I

SUBJECT DEMOGRAPHIC INFORMATION

	AGE					
	Below 23		From 24 to 28		Above 28	
	Female	Male	Female	Male	Female	Male
Average Gradepoint	3.23	2.98	3.22	2.95	3.20	2.85
% Who Own Computers	12%	23%	33%	25%	00%	00%
Ave. No. of Computer Classes Taken	1.07	1.28	1.33	1.33	1.00	1.13
No. of Subjects in Each Category	69	74	6	12	4	8

The upper level accounting students at Oklahoma State University were believed to be representative of entry level auditors. Oklahoma State University has an AACSB accredited School of Accounting and a nationally recognized undergraduate program. The graduates are placed with all Big Eight CPA firms nationwide and typically perform well on the CPA exam. There appears no clear basis to assume that the students would differ markedly from students in other well recognized programs, nor from students accepting entry level positions with major accounting firms.

Experimental Task

The experimental task consisted of the evaluation of twenty-nine scenarios (cases) dealing with the adequacy of internal control over payroll. Subjects were asked to put themselves in the position of the auditor in charge of the evaluation of internal control over factory payroll, one of the accounting cycles being audited. The subjects were presented with background information about the company and an organization chart that would apply to all scenarios. They were presented with a narrative description of internal control for a specific scenario and asked to evaluate the adequacy of internal control on a scale of 0 to 100. An evaluation of zero would represent total absence of controls and an evaluation of one hundred would indicate presence of all possible controls. An evaluation of fifty would indicate a medium level of controls. The information about each scenario was presented in narrative format to insure that the subjects were not biased towards particular cues. Previous studies of internal control have provided the information about each case (scenario) in a

list format which only provides the information or cues the experimenter determines to be important. Providing the information in narrative format allows the subjects to select the information (cues) that he/she determines to be relevant to the decision.

The research project consisted of five one-hour sessions conducted during a five-week time frame. During the first session, the student subjects evaluated five scenarios (cases) dealing with internal control without the use of a decision aid and without receiving any feedback. The subjects evaluated eight scenarios each during sessions two through four, which were considered the training sessions. During these sessions, the students used an assigned decision aid to assist them in their evaluation and received feedback after making and entering their evaluation. The last session was similar to the first session with no decision aid and no feedback (refer to Table II for the layout of the study). The student subjects evaluated the same five scenarios as in the first session, however, the order of presentation was randomized. The analysis of the subjects' evaluations was performed on the first and last sessions only. No attempt was made to analyze the evaluations made during the training sessions. When the subjects had completed all five sessions, they were asked to complete an attitudinal questionnaire and were then debriefed.

The number of scenarios to be evaluated was dictated by the length of the sessions. It was determined that one hour was the maximum amount of time that students should be required to evaluate scenarios to avoid fatigue and boredom. In addition, there were constraints on the length of time the computer laboratories could be scheduled. Based on the one hour time constraint and the time performance in the pretest, five

scenarios was determined to be the optimum number of scenarios for students to evaluate during the first session. It was also determined that once they were familiar with the background information, the requirements of the project, the format of the sessions, and the use of the computer to enter their responses, they should be able to complete eight scenarios during the one-hour time frame. The results of the study indicated that the students did have adequate time to complete the required number of scenarios.

TABLE II

LAYOUT OF STUDY

	Pre-Test Session 1	Treatments Sessions 2-4	Post-Test Session 5
Control	5*	8	5
Questionnaire	5	8	5
Expert System With Exp.	5	8	5
Expert System Without Exp.	5	8	5

* Number of scenarios evaluated.

All sessions were conducted in the two micro-computer laboratories housed in the College of Business. These laboratories contain forty computers each and were reserved for two hours on Monday and two hours on Tuesday during the course of the study. Students signed up for one one-hour session during each week for the first four weeks. Students

were not allowed to attend more than one session during a week. They were encouraged to attend at the same time and place each week for their own convenience, but were not required to do so. Three lab monitors were present during each of these sessions to answer questions concerning procedure and assist in the use of the computer. The last session was conducted during the scheduled class time for each of the five sections. Students were told that they were to meet in the computer lab for class on that day, but were not informed of the content of the final session, i.e. that they would be making a final series of evaluations without the use of a decision aid. The students were not informed of the requirements of the last session to reduce the likelihood that they would study and/or prepare for the last session outside of the experimental setting.

During each session, the subjects received a booklet which contained background information about a small manufacturing company, a partial organization chart and the scenarios to be evaluated (see Appendix B). The students entered all their evaluations of internal control on microcomputers. A user-friendly BASIC program prompted the student for the evaluation, recorded the evaluation, and also collected information on the time taken to make each evaluation (Appendix E contains copies of all the BASIC programs). During sessions two through four, the feedback was presented on the computer terminal after the subject entered their evaluation. The feedback was presented to the subject as information coming from the partner in charge of the overall company audit, an auditor with many years experience who was a recognized expert in the field.

The evaluation of internal control was chosen because it met the following criteria; (1) it requires expertise and is an important element of the audit process and (2) it can be classified as a semi-structured audit task. First, the evaluation of internal control is "a problem involving the expertise of well-trained auditors and is a requirement of every audit performed by CPAs." (Meservy, et al., p. 45). An evaluation of internal control is required in every audit to determine the reliance to be placed on the system and the extent of the testing to be performed. A semi-structured judgment task, where some guidelines are available, but judgment is still required was considered appropriate to this research. A structured task requires little or no judgment and is therefore inappropriate, while a totally unstructured task would be beyond the scope of this study. The evaluation of internal control is considered to be a semi-structured judgment task that has been found to differ significantly between novices and experts (Abdolmohammadi and Wright, 1987). Established guidelines are available for the evaluation of internal control, for example auditing pronouncements and firm developed internal control checklists. Even though these guidelines are available, the judgment of the auditor is still a very important element in the actual evaluation of internal control. The auditor must be able to assimilate all the information about a company's internal control and make an evaluation.

Development of Test Instrument

Important elements (cues) of internal control over payroll were obtained from an analysis of CONTROLPLAN by Deloitte Haskins & Sells. After a review of current auditing texts and input from auditing

faculty, a list of twenty-five cues was determined to represent the most important elements of internal control over payroll (see Appendix A for a complete list of the cues). Fifty scenarios were then developed by manipulating the levels of the cues. The emphasis in this research was on the development of scenarios that were realistic in nature, therefore, no attempt was made to obtain a complete factorial arrangement of the cues. In addition, the large number of cues involved would have required a prohibitive number of scenarios. These scenarios were first pretested on three Ph.D. students and a member of the faculty at Oklahoma State University and appropriate revisions were made. The fifty scenarios were then submitted to an audit manager of a Big Eight accounting firm for evaluation. The audit manager has had eight years of audit experience and was very interested in the research project.

The audit manager was asked to evaluate each scenario using a scale of 0 to 100 as discussed above. In addition to the evaluation, he was also asked to indicate the major internal control weakness(es) in each scenario. To help insure the accuracy of his evaluation, he was advised to work at his own speed, take breaks whenever necessary, go back to previous scenarios if he believed his evaluation should be revised, and to use any resource materials at his disposal. After the evaluation of all fifty scenarios, the audit manager was asked to rank elements of the payroll cycle as to their impact over internal control. Appendix C contains the test instrument specific to the expert. The items that were identical to those presented to the student subjects were not duplicated in Appendix C (see Appendix B). The audit manager's evaluations and comments were used as feedback during the study and were also used to develop the expert systems. To provide the appropriate

number of scenarios for the subjects to evaluate during the five sessions, twenty-nine scenarios were selected from the fifty evaluated by the audit manager to present to the student subjects. The twenty four scenarios evaluated during the three training sessions were chosen to provide an adequate representation of the different levels of the twenty five cues. The selection of the five scenarios for the first and last sessions was dictated by a desire to provide an adequate representation of the cues and to provide a relatively even distribution of the evaluations made by the expert. The five scenarios selected consisted of two that the expert had evaluated above fifty, two that the expert had evaluated below fifty, and one that was approximately fifty. The range of evaluations made by the expert was selected to fall between twenty-five and seventy-five.

Development of Decision Aids

The decision aid treatment had four levels; expert system with no explanatory capability, expert system with an explanatory capability, questionnaire, and control group (no decision aid). Since the major research question addresses the impact of the use of an expert system, it was hoped that the introduction of two types of expert system would provide more insight into this question.

Questionnaire.

The questionnaire was developed based on the format of CONTROLPLAN which is similar to other internal control questionnaires. The format follows the different elements of the payroll cycle. It does not specifically ask for separation of duties, but should highlight the

individuals performing the different functions. The questionnaire was modified to fit the list of cues used to develop the scenarios (see Appendix B for a copy of the questionnaire). The subjects assigned to the questionnaire group had questionnaires included with their booklets of scenarios. They were instructed to read the scenario, complete the questionnaire, and then make their evaluation of internal control.

Expert Systems.

Since the major thrust of this research was on the impact of an expert system and not on the actual development of a workable prototype, it was considered appropriate to use a commercially available expert system shell for the development phase. Once the decision to use a commercially available shell was made, the following criteria were established to help in the selection of the appropriate shell. The first criterion was that the shell run on an IBM or compatible microcomputer without a hard disk, this allowed the study to be conducted using the facilities in the College of Business computer laboratories.

Expert system shells or development packages currently on the market can be divided into two basic categories, rule-based and example driven. The second criterion was that the shell be example driven rather than rule-based. Rule-based systems typically require that the rules be entered in an IF-THEN-ELSE format. To enter the rules, the expert must be able to identify and verbalize the decision making process and the system developer must then convert this process into a series of IF-THEN-ELSE rules. Systems developed using rule-based shells need rigorous validation before they can be implemented. The difficulty

encountered in prior studies in soliciting the rules from experts, the problems with validation, and the focus of this study all predicated the selection of a shell that could reduce these problems and led to the decision to use an example driven system..

An example based shell, often called induction based, "takes a series of examples that describe a problem and turns those examples into a set of rules that solve the problem." (Thompson and Thompson, 1987, p.21). To use an example based shell it is necessary to identify the important elements or factors in the decision, the levels of those factors, and then solicit from an expert the outcome or result from each pertinent combination of the factors. The combination of factors becomes one example that is entered into the expert system shell. Example based systems must also be subjected to rigorous validation if they are to be used for examples (cases) other than those that were used to develop the system. In this research, only the examples used to develop the system were used, so the system always provided the evaluation of the expert and the validation process could be bypassed.

The third criterion was that the expert system shell be well supported, well documented, and used either by the private sector or for other academic expert systems research. This requirement was important because of the recent introduction of a number of expert systems shells into the market place. A newly released shell may have undetected bugs or not perform on a par with the advertised claims. The desire was to use a shell that had been validated through prior use and hopefully avoid these problems.

The fourth criterion was the ability of the expert system shell to interface with other programming languages. As stated earlier, the

evaluations of the subjects and the feedback was presented using a user-friendly BASIC program. It was mandatory that the expert system shell provide the capabilities of interfacing with the BASIC program so subjects using the expert system could enter their evaluations and obtain feedback in same format as the other subjects.

The last criterion was that the shell provide the capabilities for explanation of the rules followed in making the evaluation. Although not a major segment of this research question, it was believed that the availability of an explanatory capability would provide a more realistic setting.

1st-Class, by Programs in Motion, was selected as the development system, i.e. shell package, since it met all the criteria listed above. It is an example based shell, runs on an IBM PC, has explanatory capabilites, and interfaces with other programs. In addition, 1st-Class is in Version 3, so it has already been updated and modified. Although 1st-Class is just beginning to be used for research, it is widely used in practice. Dupont has entered into a site license agreement with 1st-Class, one of the first site licensing agreements for a PC based shell.

A brief outline of the steps involved in the development of an expert system using 1st-Class will be presented and then the development of the system for this project will be discussed. 1st-Class is menu driven, providing different screens during the development process. All information is entered into 1st-Class using a spreadsheet like interface. The development process consists of five distinct phases, identification of definitions, entering of examples, development of the rule, testing of the resulting expert system advisor, and development of a friendly interface for the user of the expert system.

The first phase, identification of definitions, consists of entering the factors, levels of the factors, and possible results on the definitions screen. lst-Class can handle up to thirty-one factors with thirty-two levels each in each knowledge base, but a chaining mechanism allows knowledge bases to be linked together which allows lst-Class to handle an unlimited numbers of factors and levels in each expert system. The factors are the important elements or cues relating to a particular decision. Once these factors have been identified and entered, the possible levels of these factors must be identified and entered. All possible results (conclusions, evaluations, or outcomes) for an example are identified and entered next.

Once all the definitions are entered the developer can proceed to phase two which involves entering the examples. An example is simply a combination of the different levels of the cues. To enter an example, the appropriate level of each cue is entered and then the corresponding result is selected. The result for the example should have been solicited from the appropriate expert. The chaining capability allows for an unlimited number of examples. lst-Class also allows the developer to specify the weight attached to each example.

The next phase is the development of the rules. lst-Class provides four different methods of rule development. The first two methods, optimization and left-right use a decision tree as the inference structure. The decision tree is inferred from the examples that have been entered. Optimization provides a decision tree which minimizes the number of questions to which the user must respond. Left-right produces a decision tree that uses the left most factor (on the definitions screen) as the start of the rule. The developer can indicate which

factors are of most importance by placing them on the left. Once the rules have been generated, the developer can examine, test, and/or change the rule if necessary. The last two methods, match and customize do not use the decision tree inference structure. Match queries the user about all possible factors and then provides the result that corresponds (matches) to that combination of factor levels. No rules are developed when match is selected. Customize allows the developer to enter the rules, using this feature turns lst-Class into a rule-based system.

The fourth phase of the development involves running the expert system (lst-Class refers to this as the Advisor) to validate the system. The last phase consists of developing a user friendly interface for the ultimate user of the expert system. lst-Class allows for the entry of text so that questions, possible responses, and explanations can be presented in an English like format.

Once the system is developed, lst-Class provides a run-time package that enables the expert system to be accessed through a batch file or the autoexec file. The rule that was developed has been saved in compiled form, so the expert system is extremely quick. The expert system developed using lst-Class queries the user through a series of multiple-choice type screens that request the selection of the correct response. Once all the necessary questions have been answered, the suggested solution to the problem is presented on what lst-Class refers to as the advice screen. The run-time package also includes a help screen, to assist the user in running the expert system.

The development of the expert system with no explanatory capability followed the phases described above. The resulting expert system was

then expanded to include an explanatory capability. During the development phases the expert system with no explanatory capability was referred to as PAYROLL and the expert system with explanatory capability was referred to as PAYPLUS. Since subjects were not informed of the two types of expert systems being used, both expert systems were referred to as PAYROLL during the course of the experiment.

The twenty-five cues specified above in the discussion of the development of the test instrument were used as the factors in the definitions phase (see Appendix A for a complete list of the cues and levels). lst-Class considers the result as a factor so the resulting expert system consisted of twenty-six factors. Each factor could be identified in lst-Class using an eight character name, made up of letters and/or the underline symbol (_). The factor names for each of the twenty-five factors (cues) were entered into lst-Class using the definitions screen. As an example, one cue identified above is 'Who has authority to sign payroll checks', the factor name for this cue that was entered into lst-Class was 'SGN_CHK'. Appendix D contains examples of all the different screens used to develop the expert systems and also the different screens that were presented to the student subjects when they ran the expert system. lst-Class automatically provides the factor name 'RESULT' for the results factor.

Once the factor name for each cue had been entered, the levels of the factors were entered. Again the information discussed above in the development of the test instrument was used. The levels identified for the cues were used as the levels for the factors. In the case of a factor (cue) that asks for the individual performing a certain function, such as SGN_CHK, all possible individuals were entered as levels. The

factor SGN_CHK will be used as an example. The levels for SGN_CHK are presented with the explanation in parenthesis; CASHIER (Cashier), SUPV (Supervisor), INT_AUD (internal auditor), PERS (Personnel Department), PAY_CLK (Payroll Clerk), COST_CLK (Cost Distribution Clerk), GEN_LEDG (General Ledger Clerk), ACC_PAY (Accounts Payable Clerk), TIME (Timekeeping).

The scenarios developed above were used as examples. The scenarios were developed using different levels of the different cues. This process is identical to the process of identifying or developing examples for an example driven expert system. Thus in the development of the expert system, each scenario became an example. The examples were entered on the examples screen by identifying the different levels of each cue (factor) in a scenario (example). The evaluation made by the audit manager for each scenario was entered as the result for that scenario. Equal weight was given to all examples (scenarios) since there was no basis to assume that any scenario was more or less significant than any other scenario.

The methods of soliciting the decision making process of the expert and the tools available at the present time to build expert systems make it extremely difficult to cope with conflicting decision making strategies that are present when multiple experts are used. The use of one expert for systems development insures the consistency of the rules developed (Steinbart, 1987). Steinbart (1987) used the knowledge of one expert auditor to develop an expert system to explore the materiality decision. Hansen and Messier (1986) used protocol analysis to solicit rules from a number of EDP audit specialists but were unable to generate workable IF-THEN rules and therefore based their expert system on the

expertise of one individual EDP audit specialist. Meservy, et al. (1986) developed a prototype expert system for the evaluation of internal control by using one expert auditor to generate the rule and six other auditors to test the resulting system. The current research was based on the expertise of one individual auditor because of the strong desire to have a consistent rule.

The rule method chosen for this research was the left-right method to allow for control over the importance of the various cues. The order of importance was determined from the information gathered from the audit manager after he had completed the evaluation of the scenarios. The audit manager was presented with the different areas of the payroll cycle and asked to indicate the impact of a weakness in any of these areas on the overall internal control evaluation. The audit manager's ranking of these areas was used to determine the importance of the different areas of the payroll cycle and thus their placement on the definitions screen. As was indicated above, the left-right method allows the developer to identify the important factors by placing those on the left of the definitions screen. Appendix D contains the decision tree that represents the rule that was generated by the left-right method.

The validation of the rule was not required in this particular situation since only the examples (scenarios) used to develop the expert system were used to run the expert system. The next step consisted of entering text so that the expert system was easy to use and readily understandable. 1st-Class provides a text editing screen which was used to enter complete sentences for the questions and possible responses. The results screen was edited to clearly identify the result. The

results screen was also expanded to give the student subject two options once the result had been viewed. The student subject could run the expert system again by entering Y, this would take the subject through the system again from the start. If the subject was ready to enter his/her evaluation, he/she was instructed to press the F2 key. This invoked the BASIC program which asked for the evaluation and after the evaluation was entered provided the feedback from the partner in charge of the overall company audit. When the subject had completed the process of entering the evaluation and viewing the feedback he/she was requested to press the return key which returned control to the expert system. The subject could then run the expert system for the next scenario.

The steps outlined above were followed in developing the expert system with no explanatory capability. This expert system was then expanded to include an explanatory capability. Expert systems can provide one or both of two types of explanatory capability. One type consists of the ability to answer why-type questions during the running of the expert system. This type of explanatory capability would allow the user to ask why a particular question was asked or why particular information was requested. The other type of explanatory capability consists of the ability to explain the steps that were followed in arriving at the suggested result. This type of explanatory capability allows the user to not only see the suggested result (evaluation), but also view the process or rules the expert system used to determine that result. 1st-Class only provides the mechanism necessary for providing the second type of explanatory capability, so the expert system with

explanatory capability in this research project consisted of the ability to explain the rules followed to determine a result or evaluation.

The explanatory capability consisted of the availability of an additional screen that described the rule that was followed to obtain the result. The explanatory screen could be accessed from the results screen. The results screen described above was expanded to include three options; run the system again, enter your evaluation, or view the rules. The first two options were identical to those discussed above. The third option was to view the rules used to determine the evaluation that had just been presented. The subject was instructed to press the PgDn key to view the rules. The rules presented were those that were generated by the left right method and were identical to those in the decision tree. The rules were edited to provide a format that was easy to read. The subjects were allowed to access the explanation, but were not required to do so. This is consistent with the explanatory capability of expert systems in practice. There was no mechanism available for recording information on the actual usage of the explanations screen.

The results of this study are presented in Chapter 5.

CHAPTER V

RESULTS

Introduction

The research design consisted of a complete 2 x 4 factorial arrangement of treatments. Analysis of variance models were computed for each of the different categories of dependent variables (accuracy, time, and consensus). These models provide the tests for the hypotheses generated in Chapter III and expanded in Chapter IV. The analysis of the dependent variables for accuracy and time indicate a highly significant decision aid treatment effect with the two expert systems groups outperforming the control group and the questionnaire group. The feedback treatment was not significant for any of the dependent measures tested. The results of the analysis of consensus were in conflict with those for accuracy and time, indicating that the control group and the questionnaire group were significantly more consistent than either of the two expert systems groups. This appears to have been due to the non- expert systems groups anchoring on the medium level of fifty.

To facilitate the discussion of the analysis of variance, the statistical tests employed and the impact of the cell sizes will be discussed first. The actual dependent variables used for each category will be clarified and the results of the analysis of variance for each of these variable will be discussed next. The results will then be discussed in relation to the specific hypothesis tested. The results

from the attitudinal questionnaire will also be presented.

Statistical Tests and Cell Sizes

Subjects were randomly assigned to treatment combinations at the beginning of the semester to provide for even cell sizes. However, due to loss of subjects during the course of the study the resulting cell sizes were unequal as indicated in Table III. The loss of subjects was random, i.e. the loss was not due to the experimental treatments, and the resulting cell sizes were not markedly uneven.[1]

The analysis of variance provides an F-test to determine if the means of the treatments are significantly different from one another. In this analysis the decision aid treatment has four levels so if the F-test indicates a significant difference further tests need to be performed to determine which means differ. Measures of the differences between individual means in an analysis of variance design are referred to as multiple comparisons. Duncan's multiple range test was used to test the difference between the treatment levels. When cell sizes do not differ markedly, the Duncan method may be adapted for multiple comparisons. (Winer, 1971) Duncan's multiple range test allows alpha to increase as the number of means involved in the comparison increases. This controls the type I error rate for the comparisons but results in an increase in the probability of an experiment-wise type I error. Equation (1) provides the equation for the critical range between means. Note that the range will increase as the number of steps between means

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[1] The analysis was performed using the SAS procedure GLM which makes the necessary adjustments for unequal cell sizes. SAS is a registered trademark of SAS Institute Inc., Cary, N.C. Release 5.16 was used for all the analysis performed.

being tested increases.

$$d = q_p \times \text{sqrt}\ (\ MSE / n\ ) \qquad (1)$$

Where:

d = distance or critical range between two means
q = studentized range statistic with $\alpha_p = 1-(1-\alpha)^{p-1}$
p = number of steps the two means are apart on an ordered scale
n = the harmonic mean (see equation 2)
MSE = Mean Square Error

For a design with unequal cell sizes the harmonic mean rather than the arithmetic mean is used for the analysis of multiple comparisons [Winer, 1971].

$$n = \frac{x}{\sum_{c=1}^{x} \frac{1}{y_c}} \qquad (2)$$

Where:

c = treatment cell
x = number of treatment cells
y = number of subjects in cell c
c = 1 to x

TABLE III

NUMBER OF SUBJECTS IN EACH CELL

Decision Aid Group	Feedback Group: Evaluation Only	Feedback Group: Evaluation Plus	Total
Control	25	23	48
Questionnaire	22	25	47
Expert System No Explanation	23	27	50
Expert System With Explanation	23	23	46
Total	93	98	191

Overview

The same five scenarios were evaluated during the last session as were evaluated during the first session, however the order of presentation was randomized. The scenarios will be referred to as scenario 1 through scenario 5, which serves to identify the scenarios not describe the order of their presentation. Two types of data were collected on each evaluation during the first and last session, the actual response made and the time taken to reach that response.

The length of the study resulted in a lapse of four weeks between the first and last session. During that three week training period the subjects evaluated a total of twenty-four scenarios in three separate training sessions. The time-frame of the study, the number of scenarios evaluated, and the randomization of the presentation of the scenarios between the first and last session should have prevented the subjects from becoming aware of the fact that they were evaluating the same scenarios during the first and last sessions. Discussions with subjects during the debriefing session supported this contention. In the unlikely event that subjects were aware that they were evaluating scenarios they had evaluated earlier, no real detriment to the study should exist since they received no feedback during either the first or last session.

Due to the design of this study, the dependent variables for accuracy and time were analyzed from two perspectives. One perspective consists of examining the dependent variables for the last session only. Since the subjects were randomly assigned to the first session, any significant differences occurring in the last session should have resulted from the treatments. An analysis of the last session only will

provide a measure of the differences in treatment groups after the subjects had received all the training. Another perspective for examining the dependent variables consists of looking at the change between the first and last session for each individual subject. This should provide a measure of the improvement in performance that occurred between the first and last session. It should also eliminate the impact of any individual differences in ability at the start of the study.

Accuracy of Subjects' Responses

Two measures of accuracy were tested under each of the perspectives discussed above, the mean absolute error and the mean absolute relative error. The accuracy of a subject's individual evaluation was determined by comparing it with the evaluation made by the expert, i.e. the audit manager. The evaluations made by the expert for the five scenarios are presented in Table IV. One of the criteria for selecting the five scenarios to be used for the first and last sessions was that the evaluations made by the audit manager for the scenarios lie within the range of twenty-five to seventy-five. The subjects could make an evaluation between zero and one hundred, so the range selected allowed the subjects' evaluations to be either above or below the expert's evaluation.

TABLE IV

EXPERT'S EVALUATIONS

SCENARIO	1	2	3	4	5
EVALUATION	70	40	65	30	25

Absolute Error.

The mean absolute error (MAE) was the first measure of accuracy evaluated. The mean absolute error for the last session and the difference in mean absolute error between the last and the first session were both examined.

$$MAE_s = [\sum_{i=1}^{5} ABS(EV_{ei} - EV_{si})] / 5 \quad (3)$$

Where:

MAE_s = Mean absolute error for subject s
EV_{ei} = Evaluation of expert for scenario i
EV_{si} = Evaluation of subject s for scenario i
ABS = Absolute Value

The absolute error was selected as the measure of accuracy since no a priori reason existed for viewing a positive error as more or less severe than a negative error. The use of the actual signed error as the dependent variable would have allowed a subject's positive and negative errors to cancel each other out which would have resulted in a mean error that was lower than the actual error incurred[2].

The average for the five scenarios was used on the assumption that evaluations from the five scenarios were of a similar character and could be averaged. To test the validity of this assumption a multiple analysis of variance (MANOVA) was computed using the absolute errors from the five scenarios as the five dependent variables. The result of the multiple analysis of variance was in total agreement with the results of the analysis of variance, supporting the assumptions made above. To provide further assurance, two other multiple analysis of

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[2] An ANOVA was run using the actual signed difference as the dependent variable and as predicted the resulting errors were much smaller and the results were highly inconsistent.

variance models were tested, one using the five errors and the five times as dependent variables and one using the mean absolute error and the average time as dependent variables. The multiple analysis of variance models were computed for the last session only and for the difference between the last and first sessions. The results of these six multiple analysis of variance models also supported the findings from the analysis of variance.[3]

The mean absolute error was examined under the first perspective discussed above, i.e. examining only the last session. The initial results of the analysis of mean absolute error indicated a marginally significant interaction effect. The analysis resulted in an F-value for the decision aid by feedback interaction of 2.52 with 3,190 degrees of freedom and a probability 0.06. Since no interaction was present when the mean raw error was used as the dependent variable, the interaction in this analysis was only marginally significant, and since no a priori reason existed to assume that an interaction would occur, this interaction was explored further.

An examination of the individual mean absolute errors for each treatment group identified possible outliers in the questionnaire and control groups. Winsorization, with g = 2, was applied to the raw mean absolute errors of the questionnaire group and control group. Winsorization at g = 2 consists of replacing the two highest values in the sample with the third highest value and replacing the two lowest values being with the third lowest [Winer, 1971]. The analysis based on the winsorized data did not have a significant interaction effect, but

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[3] MANOVAs were computed for all the dependent variables in the same fashion as indicated above. Results of the MANOVAs were in agreement with the ANOVAs for all measures.

behaved consistently with the unwinsorized data in all other respects. The analysis of variance for the winsorized data is presented in Table V. The overall model was highly significant, with the decision aid treatment being highly significant. The feedback treatment was not significant.

TABLE V

ANALYSIS OF VARIANCE TABLE FOR MEAN ABSOLUTE ERROR
LAST SESSION ONLY

SOURCE	DF	SUM OF SQUARES	F. VALUE	PR > F
MODEL	7	1003.0817	4.12	0.0003
DA	3	780.9463	7.49	0.0001
FB	1	18.8189	0.54	0.4629
DA*FB	3	203.3165	1.95	0.1233
ERROR	183	6363.8452		
CORR. TOTAL	190	7366.9269		
			R-SQUARE	0.1362

Duncan's Multiple Range Test was computed for the decision aid treatment groups to determine which means differed. It is important to remember that the mean absolute error is a measure of error, so the smaller the mean the more accurate the response. Table VI presents the results of the Duncan's Multiple Range Test for the decision aid treatment groups. The two expert systems groups outperformed both the

control group and the questionnaire group. There was, however, no significant difference between the two expert systems groups and there was no significant difference between the control group and the questionnaire group.

The feedback treatment was not significant, but an examination of the means for the two feedback groups should be informative. The group receiving only outcome feedback had a mean of 22.0645 while the group receiving both outcome feedback and task properties feedback had a mean of 21.3755. The means, while not significantly different, are in the assumed direction. The group receiving both outcome feedback and task properties feedback had a lower error rate (higher accuracy) than the group that received only outcome feedback.

TABLE VI

DUNCAN'S MULTIPLE RANGE TEST FOR MEAN ABSOLUTE ERROR
DECISION AID TREATMENT MEANS
LAST SESSION ONLY

DUNCAN GROUPING*	MEAN	N	DECISION AID
A	23.796	47	QUESTIONNAIRE
A	23.692	48	CONTROL
B	19.739	46	EXPERT SYSTEM WITH EXPL
B	19.664	50	EXPERT SYSTEM NO EXPL

HARMONIC MEAN OF CELL SIZES=47.70

*MEANS WITH SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT .05 LEVEL

NUMBER OF MEANS	2	3	4
CRITICAL RANGE	2.39876	2.5223	2.6019

The difference in mean absolute error between the sessions was also analyzed, i.e. the second perspective discussed above. The difference in mean absolute error provides a measure of the improvement in accuracy that occurred from the first session to the last session. This was computed as the difference between the mean absolute error for the last session and the mean absolute error for the first session for each subject. This analysis uses change in the error as the dependent variable, therefore, a negative mean would indicate decreased error (improved accuracy) whereas a positive mean would represent increased error, decreased accuracy. The analysis of variance model for difference in mean absolute error is presented in Table VII.

$$DIFFMAE_s = MAE_{sl} - MAE_{sf} \quad (4)$$

Where:

$DIFFMAE_s$ = Difference in MAE for subject s
MAE_{sl} = MAE for subject s during last session
MAE_{sf} = MAE for subject s first session

TABLE VII

ANALYSIS OF VARIANCE TABLE FOR MEAN ABSOLUTE ERROR DIFFERENCE BETWEEN SESSIONS

SOURCE	DF	SUM OF SQUARES	F. VALUE	PR > F
MODEL	7	1495.9637	3.35	0.0022
DA	3	1313.8755	6.86	0.0002
FB	1	6.1793	0.10	0.7560
DA*FB	3	175.9090	0.92	0.4329
ERROR	183	11678.9318		
CORR. TOTAL	190	13174.8955		
			R-SQUARE	0.1135

These results are consistent in all respects with those of the analysis of the mean absolute error for the last session only. The overall model is significant and the decision aid treatment is significant. Again, the Duncan's Multiple Range Test was computed for the decision aid treatment means to determine which means differed, these means are presented in Table VIII.

TABLE VIII

DUNCAN'S MULTIPLE RANGE TEST FOR MEAN ABSOLUTE ERROR
DECISION AID TREATMENT MEANS
DIFFERENCE BETWEEN SESSIONS

DUNCAN GROUPING*	MEAN	N	DECISION AID
A	1.567	48	CONTROL
A	0.902	47	QUESTIONNAIRE
B	-3.152	46	EXPERT SYSTEM WITH EXPL
B	-4.568	50	EXPERT SYSTEM NO EXPL

HARMONIC MEAN OF CELL SIZES=47.70

*MEANS WITH SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT .05 LEVEL

NUMBER OF MEANS	2	3	4
CRITICAL RANGE	3.2494	3.4170	3.5248

Significantly more improvement in accuracy occurred in the two expert systems groups than in either the control group or the questionnaire group. There was no significant difference between the two expert systems groups and there was no significant difference between the control group and the questionnaire group. Since the means

from the control group and the questionnaire group were positive, indicating higher accuracy in the first session than in the last session, they were examined further to see if a decrease in learning really occurred. The means, although positive, were not significantly different from zero at the .05 level, indicating that accuracy was relatively unchanged between the first and last session for the control group and the questionnaire group.

The feedback treatment was not significant. An examination of the means of the two groups indicates that they are again in the assumed direction. The group receiving only outcome feedback had a mean of negative 1.090 while the group receiving both outcome feedback and task properties feedback had a mean of negative 1.576. This indicates that both groups exhibited improved accuracy (decreased error) with the group receiving the combination of feedback performing slightly better.

Absolute Relative Error.

Another measure of accuracy that was evaluated was the mean absolute relative error (MARE). The absolute relative error for each scenario is the absolute error adjusted by the evaluation made by the expert. The absolute relative error scales the errors by the expert's evaluation. This measure was developed to examine whether the size of the expert's evaluation affected the error and the statistical results.

$$MARE_s = \left[\sum_{i=1}^{5} ABS(EV_{ei} - EV_{si}) / EV_{ei} \right] / 5 \qquad (5)$$

Where:

$MARE_s$ = Mean absolute relative error for subject s
EV_{ei} = Evaluation of expert for scenario i
EV_{si} = Evaluation of subject s for scenario i

The mean absolute relative error for the last session only was examined first. The initial results of the analysis of mean absolute relative error also resulted in a slightly significant interaction term, at the 0.08 level, and again the winsorization method was applied. The resulting analysis of variance is presented in Table IX. The results of this measure of accuracy are consistent with those for the mean absolute error. The overall model is highly significant and the decision aid treatment is also highly significant.

TABLE IX

ANALYSIS OF VARIANCE TABLE FOR MEAN ABSOLUTE RELATIVE ERROR
LAST SESSION ONLY

SOURCE	DF	SUM OF SQUARES	F. VALUE	PR > F
MODEL	7	0.8226	4.89	0.0001
DA	3	0.7165	9.93	0.0001
FB	1	0.0002	0.01	0.9194
DA*FB	3	0.1058	1.47	0.2249
ERROR	183	4.4001		
CORR. TOTAL	190	5.2227		
			R-SQUARE	0.1575

Duncan's Multiple Range Test was again computed on the decision aid treatment means. Table X presents the results from the Duncan analysis. The mean absolute relative error is also a measure of error, so the smaller the mean the less the error or the greater the accuracy. The

two expert systems groups again outperformed both the control group and the questionnaire group. There was no significant difference between the two expert systems groups and no significant difference between the control group and the questionnaire group. The feedback treatment was not significant and an examination of the feedback means indicated that the two groups were virtually identical.

TABLE X

DUNCAN'S MULTIPLE RANGE TEST FOR MEAN ABSOLUTE RELATIVE ERROR
DECISION AID TREATMENT MEANS
LAST SESSION ONLY

DUNCAN GROUPING*	MEAN	N	DECISION AID
A	0.5993	47	QUESTIONNAIRE
A	0.5878	48	CONTROL
B	0.4906	46	EXPERT SYSTEM WITH EXPL
B	0.4578	50	EXPERT SYSTEM NO EXPL

HARMONIC MEAN OF CELL SIZES=47.70

*MEANS WITH SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT .05 LEVEL

NUMBER OF MEANS	2	3	4
CRITICAL RANGE	0.0631	0.06632	0.0684

The difference in the mean absolute relative error between the two sessions was also tested. Again this should provide a measure of the increase in accuracy (decrease in error) that occurs due to the treatments.

$$DIFFMARE_s = MARE_{sl} - MARE_{sf} \quad (6)$$

Where:
$DIFFMARE_s$ = Difference in MARE for subject s
$MARE_{sl}$ = MARE for subject s during last session
$MARE_{sf}$ = MARE for subject s during first session

The difference in mean absolute relative error is computed as the difference between the mean absolute relative error for the last session minus the mean absolute relative error for the first session for each subject. The results of the analysis of variance for the difference in mean absolute relative error is presented in Table XI.

TABLE XI

ANALYSIS OF VARIANCE TABLE FOR MEAN ABSOLUTE RELATIVE ERROR DIFFERENCE BETWEEN SESSIONS

SOURCE	DF	SUM OF SQUARES	F. VALUE	PR > F
MODEL	7	1.3003	3.77	0.0008
DA	3	1.1959	8.09	0.0001
FB	1	0.0064	0.13	0.7192
DA*FB	3	0.0979	0.66	0.5761
ERROR	183	9.0170		
CORR. TOTAL	190	10.3173		
			R-SQUARE	0.1260

This analysis is consistent with all the previous tests. The model is significant and the decision aid treatment is highly significant. Duncan's Multiple Range Test was again computed and the two expert

systems groups had a significantly greater improvement in accuracy (decrease in error) than the control group and the questionnaire group. Table XII presents the results. Due to the computation of relative error, all means were very small and were tested to determine if they were significantly different from zero. The means of the two expert systems groups were significantly different from zero at the .05 level, while the means of the control group and the questionnaire group were not significantly different from zero at the .05 level. The feedback treatment was not significant and again an examination of the means indicated that they were virtually identical.

TABLE XII

DUNCAN'S MULTIPLE RANGE TEST FOR MEAN ABSOLUTE RELATIVE ERROR
DECISION AID TREATMENT MEANS
DIFFERENCE BETWEEN SESSIONS

DUNCAN GROUPING*	MEAN	N	DECISION AID
A	0.0211	48	CONTROL
A	0.0146	47	QUESTIONNAIRE
B	-0.1110	46	EXPERT SYSTEM WITH EXPL
B	-0.1599	50	EXPERT SYSTEM NO EXPL

HARMONIC MEAN OF CELL SIZES=47.70

*MEANS WITH SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT .05 LEVEL

NUMBER OF MEANS	2	3	4
CRITICAL RANGE	0.0902	0.0949	0.0979

The results of the analysis of the mean absolute error and the mean

absolute relative error under both of the perspectives were consistent. These results of the analysis of the last session only support the conclusion that both expert systems groups achieved higher accuracy during the last session than did either the control group or the questionnaire group. The results of the analysis of the difference between the last session and the first session indicate that the two expert systems groups improved accuracy at a significantly higher level than either the control group or the questionnaire group. None of the tests indicated a significant difference between the two expert systems groups, nor was there a significant difference between the questionnaire group and the control group. The feedback treatment was not significant for any of the measures, but where a difference in means was present it was in the assumed direction, i.e. the group receiving task properties feedback and outcome feedback performed slightly better than the group that received only outcome feedback.

Time for the Subjects' Responses

The dependent variable used to measure the efficiency of the subjects' evaluations was time measured in minutes. The time taken to reach the evaluation for each scenario was recorded during the first and last session. Both the time during the last session and also the difference in time between the last and first session were tested. The mean time (MTIME) for each subject was used as the dependent variable based on the same assumptions as were made above in using mean error. In addition to the multiple analysis of variance models discussed above, a model was tested using the times from the five scenarios as the five dependent variables. The results were consistent with those reported

below for the analysis of variance.

$$MTIME_s = \left(\sum_{i=1}^{5} TIME_{si} \right) / 5 \qquad (7)$$

Where:

$MTIME_s$ = Mean Time for Subject s

$TIME_{si}$ = Time for subject s to evaluate scenario i

The first analysis examined the mean time for the last session only. This should provide an indication as to whether the time during the last session differed due to the treatments received during the training sessions. The analysis of variance for the mean time during the last session is presented below in Table XIII. The overall model is significant at the .0484 level, which is a lower significance than was found for the accuracy measure, but still highly significant. The decision aid treatment was again the only significant treatment in the model.

TABLE XIII

ANALYSIS OF VARIANCE TABLE FOR MEAN TIME
LAST SESSION ONLY

SOURCE	DF	SUM OF SQUARES	F. VALUE	PR > F
MODEL	7	7.1969	2.07	0.0484
DA	3	6.3766	4.29	0.0059
FB	1	0.0336	0.07	0.7948
DA*FB	3	0.7866	0.53	0.6629
ERROR	183	90.7061		
CORR. TOTAL	190	97.9029		
			R-SQUARE	0.0735

Duncan's Multiple Range Test was again computed to test for difference in means for the decision aid treatment groups. The results indicate that the two expert systems groups were more efficient (took less time) than the control group and the questionnaire group. However, the questionnaire group was not significantly different from the expert system group with explanatory capability nor was it significantly different from the control group. However, the control group was significantly different from both of the expert systems groups. This is evident in Table XIV from the overlapping of the identifying letters for the questionnaire group.

TABLE XIV

DUNCAN'S MULTIPLE RANGE TEST FOR MEAN TIME
DECISION AID TREATMENT MEANS
LAST SESSION ONLY

DUNCAN GROUPING*	MEAN	N	DECISION AID
A	2.5767	48	CONTROL
AB	2.3089	47	QUESTIONNAIRE
B	2.1799	46	EXPERT SYSTEM WITH EXPL
B	2.0973	50	EXPERT SYSTEM NO EXPL

HARMONIC MEAN OF CELL SIZES=47.70

*MEANS WITH SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT .05 LEVEL

NUMBER OF MEANS	2	3	4
CRITICAL RANGE	0.2863	0.3011	0.3106

The difference in time between the last session and the first

session was examined next. The difference in mean time (DMTIME) was computed as the mean time for the last session minus the mean time for the first session for each subject. This should provide a measure of the improvement in efficiency that occurred between the two sessions. Table XV presents the results of the analysis of variance for the difference in mean times. The model for the difference in mean time was only marginally significant, at the .0991 level. The decision aid treatment was significant at only the .0913 level.

TABLE XV

ANALYSIS OF VARIANCE TABLE FOR MEAN TIME DIFFERENCE BETWEEN SESSIONS

SOURCE	DF	SUM OF SQUARES	F. VALUE	PR > F
MODEL	7	13.3639	1.75	0.0991
DA	3	7.1373	2.19	0.0913
FB	1	1.7990	1.65	0.2002
DA*FB	3	4.4277	1.36	0.2578
ERROR	183	199.1985		
CORR. TOTAL	190	212.5625		
			R-SQUARE	0.0629

Even though the decision aid treatment was not significant at the 5% level, Duncan's analysis was performed to see if the means followed the same trend as that found in the prior tests. An analysis of the results of Duncan's Multiple Range Test (see Table XVI) indicate that

the two expert systems groups improved their efficiency (decreased the time) more than the other two groups. No differences were significant at the .05 level as were apparent from the results of the analysis of variance.

TABLE XVI

DUNCAN'S MULTIPLE RANGE TEST FOR MEAN TIME
DECISION AID TREATMENT MEANS
DIFFERENCE BETWEEN SESSIONS

DUNCAN GROUPING*	MEAN	N	DECISION AID
A	-1.1193	47	QUESTIONNAIRE
A	-1.1370	48	CONTROL
A	-1.4277	46	EXPERT SYSTEM WITH EXPL
A	-1.5693	50	EXPERT SYSTEM NO EXPL

HARMONIC MEAN OF CELL SIZES=47.70

*MEANS WITH SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT .05 LEVEL

NUMBER OF MEANS	2	3	4
CRITICAL RANGE	0.4243	0.4463	0.4603

The lack of strong significance for the measure of difference in time was examined further. An examination of the times for the first session and the times for the last session sheds some light on this result. The mean time for all subjects during the first session was 3.6 minutes while the mean time for all subjects during the last session was only 2.3 minutes. This difference in the overall mean time for all subjects is significant at the .0001 level. In addition, the mean time for every treatment combination group improved significantly between the

two sessions, indicating that improvement in time occurred for all groups between the first and last session. It would appear that the magnitude of the difference in times between first and last sessions for the groups is sufficient to offset the differences between groups during the last session.

The analysis of time during the last session and improvement in time from the first to the last session is basically consistent with that for accuracy. The decision aid treatment was significant for the last session examined alone. The control group exhibited the least efficiency (had the longest mean time) with the questionnaire group being slightly more efficient followed by the expert systems with no explanatory capability and the expert systems group with explanatory capability. The two expert systems groups were significantly more efficient than the control group, but only the expert system with no explanatory capability was significantly more efficient than the questionnaire group. The feedback treatment was not significant. The analysis of the difference in times between sessions resulted in a marginally significant decision aid treatment. The order of the four groups was the same as in the analysis of the last session only indicating that the same trend existed.

Consensus of Subjects' Responses

Numerous auditing studies have used between judge consensus as the dependent variable in lieu of a valid measure of accuracy. Since a measure of accuracy exists in this study and has already been analyzed, the results from an examination of between judge consensus can be compared with the results of the analysis of the measures of accuracy.

This provides a unique opportunity to explore the validity of the use of consensus as a surrogate for accuracy.

The between subject (judge) consensus was computed for every pair of subjects within a treatment combination. Each subject's evaluations to the five scenarios formed a vector of responses. The Pearson Product Moment Correlation (r) was computed between the vectors of each pair of subjects within a treatment combination. This produced eight correlation matrices, one for each treatment combination. The lower diagonal of the resulting correlation matrices are provided in Appendix F. The average correlation was computed for each matrix (treatment combination). Due to the breadth of the response scale used in this study (between 0 and 100), the individual correlations ranged from highly positive to highly negative and the resulting correlations were relatively low. Table XVII presents information on these correlations.

TABLE XVII

CORRELATIONS BY TREATMENT GROUP FOR THE LAST SESSION

DA	FB	N	MEAN CORRELATION	MINIMUM VALUE	MAXIMUM VALUE
CONTROL	EVAL ONLY	300	0.355	-0.917	0.977
CONTROL	EVAL PLUS	253	0.432	-0.641	0.996
QUEST.	EVAL ONLY	231	0.415	-0.636	0.990
QUEST.	EVAL PLUS	300	0.286	-0.953	0.984
ES NO EX	EVAL ONLY	253	0.031	-0.978	0.979
ES NO EX	EVAL PLUS	351	0.086	-0.985	0.997
ES WITH	EVAL ONLY	253	0.087	-0.973	0.977
ES WITH	EVAL PLUS	253	0.137	-0.928	0.988

The next step is the comparison of these matrices to determine whether consensus differed between treatment groups. The average correlation computed above was used as the dependent variable in an analysis of variance model. Table XVIII presents the results of this analysis. The overall model was significant and the decision aid treatment was significant. The feedback treatment was not significant. This would appear to be consistent with the findings from the examination of accuracy. There is only one observation per cell, so the interaction term is used as the error term to test the model and no test is available to determine if an interaction is present.

TABLE XVIII

ANALYSIS OF VARIANCE TABLE FOR BETWEEN SUBJECT CONSENSUS
LAST SESSION ONLY

SOURCE	DF	SUM OF SQUARES	F. VALUE	PR > F
MODEL	4	0.1694	9.30	0.0487
DA	3	0.1691	12.38	0.0339
FB	1	0.0004	0.08	0.7950
ERROR	3	0.0137		
CORR. TOTAL	7	0.1831		
			R-SQUARE	0.9254

Duncan's Multiple Range Test was computed to determine which means were significantly different (see Table XIX). The control group and the

questionnaire group exhibited significantly more consensus between subjects than either of the two expert systems groups. These results were in direct conflict with those for accuracy.

The above analysis used average correlation as the dependent variable. The distribution for correlations is not normal and may therefore bias the results obtained above. To test this an additional analysis was performed. All the correlations computed above were transformed using FIsher's z(r) transformation. Applying this transformation to correlation coefficients will yield quantities that are approximately normally distributed (Johnson and Wichern, 1982). The analysis described above was repeated using the transformed correlations. While the resulting means were slightly different, the results of the analysis were consistent with those described above.

$$\text{Fisher's } z(r) = 1/2 \log [(1 + r) / (1 - r)] \qquad (8)$$

Where:

$z(r)$ = z transformation of r

r = Pearson Product Moment Correlation

The analysis of the dependent variables for accuracy indicated that the control group and the questionnaire group did not increase their accuracy due to the training sessions and that they were significantly less accurate than the two expert systems groups. The analysis of variance model for consensus, however, indicated that these two groups were significantly more consistent than the expert systems groups. These seemingly inconsistent findings were explored further.

Since the control group and the questionnaire group did not significantly improve their accuracy, one possible reason for improved consensus could be an anchoring effect. In many judgment tasks, the judge makes evaluations by starting with an initial value and then

adjusting that value to yield the final response. The anchoring effect occurs when the adjustment is not sufficient. The initial value may be indicated to the judge in a variety of ways; by the wording of the problem, by some partial computation that the judge performs, or by previous experience (Tversky and Kahneman, 1974).

TABLE XIX

DUNCAN'S MULTIPLE RANGE TEST FOR CONSENSUS BETWEEN SUBJECTS
DECISION AID TREATMENT MEANS
LAST SESSION ONLY

DUNCAN GROUPING*	MEAN	N	DECISION AID
A	0.3932	1	CONTROL
A	0.3505	1	QUESTIONNAIRE
B	0.1120	1	EXPERT SYSTEM WITH EXPL
B	0.0628	1	EXPERT SYSTEM NO EXPL

*MEANS WITH SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT AT .05 LEVEL

NUMBER OF MEANS	2	3	4
CRITICAL RANGE	0.2145	0.2153	0.2153

The response scale used in this study ranged from zero to one hundred, with a stated medium of fifty. A strong possibility exists that the subjects in the control group and the questionnaire group anchored on the medium level of fifty. An evaluation of the subjects raw evaluations was performed to test the possibility that an anchoring effect occurred.

$$MEV_s = \left(\sum_{i=1}^{5} EV_{si} \right) / 5 \qquad (8)$$

Where:

MEV_s = Mean evaluation for subject s

EV_{si} = Evaluation of scenario i by subject s

The mean evaluation for the five scenarios was computed for each subject by averaging their responses to the five scenarios. The mean evaluation for each treatment group for the first session and the last session are presented in Table XX. The distance between each mean and fifty was computed and this distance was tested to determine if it was significant.

TABLE XX

MEAN EVALUATION BY SESSION

DA	FB	N	FIRST SESSION MEAN	FIRST SESSION DISTANCE FROM 50	LAST SESSION MEAN	LAST SESSION DISTANCE FROM 50
CONTROL	EVAL ONLY	25	48.99	-1.01	51.17	+1.17
CONTROL	EVAL PLUS	23	48.87	-1.13	52.19	+2.19
QUEST.	EVAL ONLY	22	46.52	-3.48	51.14	+1.14
QUEST.	EVAL PLUS	25	47.62	-2.38	52.82	+2.82*
ES NO EX	EVAL ONLY	23	47.96	-2.04	38.35	-11.65**
ES NO EX	EVAL PLUS	27	48.13	-1.87	44.03	-5.97**
ES WITH	EVAL ONLY	23	51.37	+1.37	44.87	-5.13*
ES WITH	EVAL PLUS	23	52.59	+2.59	46.43	-3.57*

* significantly different from 50 at .05 level
** significantly different from 50 at .005 level

An analysis of the first session indicates that none of the means

is significantly different from fifty. During the last session all four of the expert systems groups had means which were significantly different from fifty while only the questionnaire group with evaluation plus feedback was significantly different from fifty. When the analysis above was performed on the four decision aid treatment groups which had not been divided into feedback levels, neither the control group nor the questionnaire group were found to be significantly different from fifty during either the first or the last session. This analysis indicates that during the first session (before any training) all groups were anchoring on fifty. At the end of the training sessions (during the last session) the expert systems groups appeared to have made a sufficient adjustment but the control group and the questionnaire group had not. These results provide support to the assumption that the control groups and the questionnaire groups tended to anchor around fifty.

Analysis of First Session

The subjects were randomly assigned to treatment groups at the beginning of the semester, therefore no significant differences between treatment groups should exist at the first session. To provide assurance that this statement was true all of the dependent variables for accuracy, time, and consensus were examined for the first session alone. The analysis of variance for mean absolute error for the first session had an F-value of 0.73 and was not significant. Neither the decision aid treatment, the feedback treatment, nor the interaction was significant. The analysis of variance for mean absolute relative error for the first session was also examined. The computed F-value was 0.52

which was not significant. None of the treatments were found to be significant. The analysis of the time for the first session also resulted in no significant model or treatment effects. In addition to the analysis of variance models, multiple analysis of variance models were also computed. Multiple analysis models were computed using individual absolute errors as the dependent variables, using individual absolute relative errors as the dependent variables, and using individual times as the dependent variables. The results of the multiple analysis of variance models were in total agreement with those of the analysis of variance. These results provide support for the assumption that the assignment of subjects to treatment groups was random.

Summary and Results for Hypotheses

The analysis discussed above examined each of the dependent variables separately. To provide an overall analysis a summary of the results of the tests of the dependent variables will be presented. These results will then discussed in terms of the specific hypotheses as stated in Chapter IV.

An analysis of variance model was developed and tested for each of the dependent variables for the first session alone, the last session alone, and the difference between the last and first session. The computed F-Value for each of these models along with the significance probability (PR > F) for all the models are presented in Table XXI. None of the models was significant for the first session only. The models for all the dependent variables were significant for the last session only. All models except difference in time were highly

significant for the difference between last and first session.

The first session will not be included in further summary, since no significant model effect or treatment effect was found for any of the dependent variables. The decision aid treatment was highly significant for all the other models except difference in time between the last and first session which was only marginally significant. The feedback treatment was not significant for any of the analysis. The analysis with respect to the decision aid treatment are summarized in Table XXII.

TABLE XXI

SUMMARY OF RESULTS OF MODELS TESTED

	DEPENDENT VARIABLE							
	MAE		MARE		TIME		CONSENSUS	
SESSION	F	PR > F	F	PR > F	F	PR > F	F	PR > F
FIRST	0.73	0.6496	0.52	0.8169	0.81	0.5769	1.07	0.4983
LAST	4.12	0.0003	4.89	0.0001	2.07	0.0484	9.30	0.0487
DIFFERENCE	3.35	0.0022	3.77	0.0008	1.75	0.0991		

TABLE XXII

SUMMARY OF DECISION AID TREATMENT

	DEPENDENT VARIABLE							
	MAE		MARE		TIME		CONSENSUS	
SESSION	F	PR > F	F	PR > F	F	PR > F	F	PR > F
LAST	7.49	0.0001	9.93	0.0001	4.28	0.0059	12.38	0.0338
DIFFERENCE	6.66	0.0002	8.09	0.0001	2.19	0.0912		

The results can now be discussed with reference to the specific hypothesis. Hypothesis one examined the impact of the use of a decision aid during the training phase versus no decision aid on learning (strategy transformation) that occurs. Hypothesis one was broken down into three sub-hypotheses to incorporate the three types of decision aids that were included in the study. Hypothesis 1.1 examined the impact of the use of a questionnaire. This hypothesis was not rejected for any of the measures examined. No difference in accuracy, time, or consensus was found between the control group (no decision aid) and the questionnaire group. Hypotheses 1.2 and 1.3 examined the impact of the use of an expert system with no explanatory capability and the use of an expert system with explanatory respectively versus no decision aid. All the measures examined led to the rejection of both of these hypotheses. The two expert systems groups were significantly different from the control group in terms of accuracy, time, and consensus. The expert systems groups were significantly more accurate and significantly more efficient than the control group. However, they were significantly less consistent than the control group.

The second set of hypotheses examined the impact of an expert system as a decision aid versus a more conventional type of decision aid on the strategy transformation that occurs. Hypothesis 2.1 identifies the expert system as one with no explanatory capability while hypothesis 2.2 identifies the expert system as one with explanatory capability. Hypotheses 2.1 and 2.2 were rejected on all the measures of accuracy, time, and consensus. The two expert systems groups were significantly more accurate and took less time than the questionnaire group. The questionnaire group, however, exhibited higher consensus than the expert

systems groups.

Hypothesis 4 examined the difference in strategy transformation (learning) between an expert system with no explanatory capability and an expert system with explanatory capability. This hypothesis was not rejected for any of the dependent measures. No difference was found between the two types of expert systems.

The fourth hypothesis addressed the question of type of feedback and explored the difference in strategy transformation between the group receiving only outcome feedback and the group receiving both outcome feedback and task properties feedback. This hypothesis was not rejected for any of the measures. It should be noted that the direction of the differences, while no significant, indicated the group receiving the combination of feedback performed better than the group receiving only outcome feedback.

Subject Attitudes

The attitudes of the subjects to the study and their respective decision aids were examined through the use of an exit questionnaire (see Appendix B for a copy of the questionnaire). The results of the questionnaire are presented in Table XXIII. The overall attitude of the subjects to all aspects of the experiment was favorable, in fact all groups indicated that a project of this type should become a part of all systems courses. All subjects believed that they had learned more about internal control as a result of the study, however, the groups receiving a combination of feedback were in stronger agreement with this statement. The groups using the expert systems found them enjoyable, easy to use, and felt that they made the decision process

easier. They indicated that they accepted the advice from the expert system in making their evaluation. There was no real difference in responses between the two expert systems groups.

Chapter VI presents the conclusions based on the research completed and the results discussed above. It also contains suggestions for future research.

TABLE XXIII

EXIT QUESTIONNAIRE

	CONTROL				QUESTIONNAIRE			
	EVAL ONLY		EVAL PLUS		EVAL ONLY		EVAL PLUS	
	N	MEAN	N	MEAN	N	MEAN	N	MEAN
Q1 SCENARIOS EASY TO READ	24	-0.83	23	-0.91	21	-1.24	25	-1.08
Q2 INCREASED KNOWLEDGE OF IC	24	-0.54	23	-1.09	22	-0.64	25	-1.12
Q3 COMPUTERS MAKE ME NERVOUS	24	1.33	23	0.91	21	1.24	25	0.68
Q4 LEARNING EXPERIENCE	24	-0.75	23	-0.87	22	-0.68	25	-0.76
Q5 WORTH MORE POINTS	24	-0.04	23	-0.17	22	-0.23	24	-0.08
Q6 LONGER DURATION	24	0.08	23	-0.04	22	-0.55	25	-0.08
Q7 WASTE OF TIME	24	0.88	23	1.13	22	1.32	25	1.16
Q8 LESS UNDERSTANDING OF IC	24	1.08	23	1.26	22	1.14	25	1.24
Q9 PART OF EVERY SYSTEMS COURSE	24	-0.54	23	-0.96	22	-0.91	25	-0.48
Q10 USE OF CASES HELPFUL FOR IC	24	-0.92	23	-1.09	22	-1.00	25	-0.96
Q11 ENJOY COMPUTERS	24	-1.25	23	-0.78	22	-1.14	25	-0.60
Q12 TRIED TO MATCH PARTNER	24	-0.13	23	-0.35	22	-0.27	25	-0.20
Q13 TOO MANY SCENARIOS	24	1.00	23	0.83	22	0.45	25	0.38
Q14 ALL COURSES COMPUTER	24	-0.21	23	-0.17	20	-0.65	24	-0.28
QUESTIONNAIRE:								
Q22 HELPFUL	NA	NA	NA	NA	20	-1.10	25	-0.76
Q23 TOOK TOO MUCH TIME	NA	NA	NA	NA	20	0.50	25	0.08
Q24 WERE TOO DIFFICULT	NA	NA	NA	NA	20	1.20	25	0.96
Q25 MADE CASES EASIER	NA	NA	NA	NA	20	-0.95	25	-0.60

	ES NO EXPL				ES WITH EXPL			
	EVAL ONLY		EVAL PLUS		EVAL ONLY		EVAL PLUS	
	N	MEAN	N	MEAN	N	MEAN	N	MEAN
Q1 SCENARIOS EASY TO READ	23	-1.09	23	-1.04	23	-1.09	26	-1.23
Q2 INCREASED KNOWLEDGE OF IC	23	-0.65	23	-1.00	23	-1.04	26	-1.27
Q3 COMPUTERS MAKE ME NERVOUS	23	0.43	23	0.91	23	0.52	26	0.65
Q4 LEARNING EXPERIENCE	23	-0.65	23	-0.91	23	-0.78	26	-1.08
Q5 WORTH MORE POINTS	23	-0.04	22	0.18	23	0.17	26	0.08
Q6 LONGER DURATION	23	-0.26	23	-0.43	22	0.05	26	0.08
Q7 WASTE OF TIME	23	1.04	23	1.30	23	1.30	25	1.27
Q8 LESS UNDERSTANDING OF IC	23	1.04	23	1.48	23	1.52	26	1.35
Q9 PART OF EVERY SYSTEMS COURSE	23	-0.78	22	-0.91	23	-0.78	26	-0.81
Q10 USE OF CASES HELPFUL FOR IC	23	-0.78	23	-1.17	23	-1.26	26	-1.00
Q11 ENJOY COMPUTERS	23	-0.87	23	-0.74	23	-0.57	26	-0.46
Q12 TRIED TO MATCH PARTNER	23	0.09	23	0.22	23	-0.13	26	-0.31
Q13 TOO MANY SCENARIOS	23	0.74	23	0.83	23	0.43	26	0.69
Q14 ALL COURSES COMPUTER	22	-0.50	23	-0.39	23	-0.17	26	-0.04
EXPERT SYSTEM:								
Q15 EASY TO USE	23	-1.48	23	-1.52	23	-1.30	26	-1.31
Q16 LIKE TO LEARN MORE	23	-0.87	23	-0.83	23	-0.39	26	-0.77
Q17 NOT ENJOYABLE	23	0.83	23	0.87	23	0.96	26	0.73
Q18 ACCEPTED ITS ADVICE	23	-0.35	23	-0.39	23	-0.39	26	-0.62
Q19 MADE EVAL. EASIER	22	-1.00	23	-1.04	23	-0.83	26	-0.85
Q20 GOOD DECISION AID	23	-0.87	23	-0.74	23	-0.78	26	-0.77
Q21 GOOD TRAINING AID	23	-0.48	23	-0.48	23	-0.83	26	-0.50

(SA = -2 A = -1 N = 0 D = 1 SD = 2)

CHAPTER VI

CONCLUSIONS

Overview

The purpose of this research was to examine the learning efficiencies that occur with the use of an expert system as a decision aid during the audit process. This purpose was derived from the desire to provide insight into the debate over the effect of an expert system as a decision aid on the training the staff auditor receives during the conduct of an audit. Those who support the viewpoint that the use of an expert system in a realistic setting will also provide training to the user argue that the ability of an expert system to query the user for important information and to explain the logic followed to arrive at a conclusion will improve training. Those who question this viewpoint argue that the user may become dependent on the expert system as the decision maker and rely on the expert system's recommendation rather than actually going through the decision making process.

The methodology employed a laboratory study using 191 students enrolled in Accounting Information Systems at Oklahoma State University as surrogates for staff level auditors. The experiment was conducted in the computer laboratories housed in the College of Business Administration. The theoretical foundation for the research was derived from strategy transformation theory which provides a basis for understanding the modification of strategies (structures or rules) that

occurs as the result of practice in making decisions.

The research design consisted of a complete 4 x 2 factorial arrangement of treatments with a pre-test post-test measure. The two treatments were decision aid with four levels and feedback with two levels. The four levels of the decision aid treatment were no decision aid (control group), questionnaire, expert system with no explanatory capability, and expert system with explanatory capability. The two feedback levels were outcome feedback only and a combination of task properties and outcome feedback. Outcome feedback consisted of the evaluation made by the partner in charge of the overall company audit and the combination of task properties and outcome feedback consisted of the outcome feedback described above and a statement describing the major internal control weakness in the scenario. The three categories of dependent variables, accuracy, time, and consensus, were tested for the post-test and for the difference between the pre-test and post-test.

The experimental task consisted of the evaluation of internal control over factory payroll which was described to the subjects as one portion of the audit of a small manufacturing company. The scenarios for each evaluation were presented to the subjects in narrative format and the evaluations and the time taken to make the each evaluation were recorded on a BASIC program. The subjects evaluated five scenarios during the pre-test and the same five scenarios during the post-test without the use of any type of decision aid and without receiving any feedback. The practice or experience in making internal control evaluations, i.e. training, consisted of three one-hour sessions each held one week apart. During these sessions, the subjects evaluated a total of twenty-four scenarios while using the decision aid and

receiving the type of feedback indicated by their treatment group.

No significant difference was found between the expert system group with explanatory capability and the expert system group with no explanatory capability for any of the dependent variables. Both expert systems groups performed significantly better than the questionnaire group and the control group based on an analysis of time and accuracy for both the post-test and the difference between the pre-test and the post-test. The two expert systems groups did, however, exhibit significantly lower consensus than the other two groups. The questionnaire group did not perform significantly different than the control group for any of the measures tested. No significant difference was attributable to the feedback treatment.

Departures From Prior Research

This research differed from prior studies in several important aspects. First, prior research into expert systems has dealt, for the most part, with the development of the expert system rather than the decision making ability of the user. When prior studies have considered the decision making ability of the user, they have examined the impact on decision making ability while the expert system is being used as a decision aid, not after it has been used. The current research project explored the impact of an expert system on the user's ability to make decisions after the expert system had been used in an experience gathering or training situation. Thus the focus of this research is on the long-run impact of expert systems use not the quality of decisions during their use.

Prior research into audit judgment has examined the difference

between novice and expert auditors but has tended to ignore the process the novice goes through to become experienced. This research differs from these earlier studies by exploring the experiential learning process as it relates to decision aids. Rather than examining the difference between novice and expert auditors, this research examines a novice auditor going through the process of becoming experienced.

Third, the development and presentation of cases (scenarios) in this research differed from that found in prior studies. The cases used in this research were much more realistic and contained more cues than those used in prior studies. Prior research into audit decision making has tended to use factorial arrangements of cues for the development of cases which enables the researcher to identify the specific cues used in the decision making process. The current research was not dependent on a factorial arrangement of treatments since the purpose was not directed at identifying which cues the subjects used, instead the development of cases was motivated by the desire to provide a more realistic setting for the subjects to evaluate. Another difference from many prior studies was in the presentation of the information in the cases. This study presented the cases in a narrative format which did not specifically identify separate cues but required the subjects to determine which information in the case should be considered in making the evaluation. Prior studies have presented the information about the cues in a list format which clearly identifies the limited number of cues.

Limitations

This research is subject to the criticism that it may lack external

validity, i.e., that the results are not generalizable. One of the major attributes of this study which may affect the external validity is the use of student subjects as surrogates for auditors. This issue was addressed in the methodology section and is not believed to be as serious as in other studies since this study seeks to investigate the impact of the decision aid on the staff level auditor. The staff level is an entry level position and upper level accounting majors should have approximately the same background as entry level auditors. Another aspects of the subjects used in this study is that they were not selected randomly, but were selected because of their enrollment in a specific class. Lack of random selection of subjects can bias the results, but the type of class used and the characteristics of the university these students attend should reduce the impact of the nonrandom selection.

Another limitation of this study was the type of questionnaire used. The questionnaire used in this research was designed to contain the same cues (factors) as the expert system and was developed from the list of cues in Appendix A. The resulting questionnaire was somewhat simplistic and was not designed to mirror those used in practice. The questionnaire took the form of a checklist which was designed to provide the user with a mechanism for identifying the particular individuals involved and the types of controls in place. This type of questionnaire does not provide any guidance as to the controls that should have been in place. The type of questionnaire used may have biased the results.

Significance and Suggestions for Future Research

One of the major findings of this study was that the groups that

used the expert system (with or without explanatory capability) performed significantly better than the control group. After using the expert system as a decision aid, the subjects became more accurate and more efficient than the control group. This provides support for the contention that the use of an expert system during the audit process will result in greater strategy transformation (improved learning) than would have occurred if no type of decision aid were present.

In addition, the subjects who used expert systems during training performed better than the subjects who used the questionnaire for training. This result holds for a checklist type of questionnaire. Further research should be undertaken to determine if a more refined type of questionnaire would alter these results.

Another significant finding was that no difference in performance resulted from the use of an expert system with explanatory capability versus an expert system with no explanatory capability. One of the arguments supporting the benefits of an expert system as a training aid is that the ability to explain its logic should improve learning. The results of this study did not support that argument. The explanatory capability in the expert system used in this research was not forced on the subjects but was available for their use, which mirrors the systems used in practice. No method was available to determine the extent to which the subjects took advantage of this capability. Two possible explanations exist for the lack of difference in performance, either the rules did not improve the strategy transformation that occurred or the subjects did avail themselves of the explanatory capability. Future research is needed to determine which of the explanations discussed above actually explains the lack of difference in performance. Research

of this type should provide information for future developers as to the placement and availability of explanations of the rules followed to achieve the result. If the subjects do exhibit improved strategy transformation (learning) when they are forced to view the explanation of the rules then systems should be developed with this in mind and/or users should be instructed to use the explanations.

Consensus has been used in many accounting studies as a surrogate for accuracy when no measure of the accurate response existed. The design of the current study includes an accurate response and therefore provides an opportunity to explore the use of consensus as a surrogate for accuracy. The results of the analysis for consensus in this study raise questions about its use as a surrogate for accuracy since the use of consensus as a surrogate for accuracy in this study would have reversed the results reported above. The groups that exhibited the most accuracy exhibited the lowest consensus, while the groups that exhibited the least accuracy exhibited the highest consensus. A further examination indicated that the groups that did not exhibit high or improved accuracy tended to anchor on the mid-point. This result raises serious questions about the use of consensus as a surrogate for accuracy. Research should be undertaken to determine if this anchoring might have been present in prior studies. If this research supports the results obtained in this study, it may well be that consensus is not a surrogate for accuracy, but instead is an indication of lack of knowledge.

Another departure from previous studies using accuracy as the dependent measure was in the response scale. Studies of consensus tend to use a very limited response scale and report a fairly high level of

consensus. In fact, it has often been posited that auditors have a very high consensus based on the results of these studies. When a broad response scale was used, the consensus was extremely low. It would seem reasonable to assume that a more realistic setting would require the auditor to chose from a wide range of responses. Therefore, the current study could be more indicative of the actual consensus of auditors. If this is true and actual consensus is low, then it follows that the use of consensus as a surrogate for accuracy may be questionable.

The results of this study did not find any significant difference due to the type of feedback that was received. In fact, the learning from both groups was relatively low. This is fairly consistent with the psychology studies which found little learning from outcome feedback alone and little learning when outcome feedback was combined with task properties feedback. More research is needed into the learning that results from different types of feedback in realistic settings. This study was limited to an analysis of outcome and task properties feedback, cognitive feedback and lens model feedback should also be explored in a realistic setting.

This research pointed out some distinctive differences in strategy transformation based on the type of decision aid used during the experience gathering sessions. Future research should seek to explain this difference more clearly. Protocol analysis conducted before and after the experience gathering sessions should provide valuable information on the changes to the actual decision making process and provide insight into the specific strategies that were affected. Another area of expansion to the current study would be to conduct field research using actual staff auditors in a longer training session.

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APPENDIXES

APPENDIX A

CUES AND LEVELS

The following is a list of the cues and the levels of the cues that were used to develop the scenarios presented to the expert and the subjects. The order of the cues, within the major headings below, were randomized in the cases to guard against an order effect.

CUES	LEVELS	
	HIGH CONTROL	LESS CONTROL
PREVIOUS EVALUATION		
1. Last Year's Evaluation of internal control over payroll.	Positive	Negative
AUTHORIZATION/TERMINATION OF EMPLOYMENT		
2. Initial authorization for employment and initial pay rate	Personnel	Other*
3. Changes in Pay Rate	Personnel	Other
4. Employee termination approved by	Personnel	Other
INITIAL RECORDING OF TIME WORKED		
5. Timeclock used	Yes	No, recorded manually
6. Jobcards approved by supervisor	Yes	No
7. Overtime authorized	Supervisor	Other
8. Jobcards compared to hours on timecards	Timekeeping	Other
RECORDING PAYROLL TRANSACTIONS		
9. Prepare paychecks and payroll register	Payroll	Other
10. Post earnings to individual records	Payroll	Other
11. Prepare payroll distribution voucher and check payroll register	Accounts Pay	Other

12.	Compare payroll register and distribution summary	General Ledger	Other
13.	Prepare Labor Distribution Summary form jobcards	Cost Dist. Cl.	Other

PAYMENT AND DISTRIBUTION OF WAGES

14.	Unsigned Checks	Controlled	Not Controlled
15.	Check Signing Machine	Yes	No
16.	Imprest Payroll Bank Account	Yes	No
17.	Sign Payroll Checks	Cashier	Other
18.	Distributes Payroll Checks	Cashier	Other
19.	Responsible for unclaimed Payroll Checks	Cashier	Other

CONTROLS

20.	Distribute Payroll on Surprise Basis	Yes	No, scheduled
21.	(20) Performed by	Internal Auditor	Other
22.	Compare Payroll With Budget/Last Year	Yes	No
23.	(22) Performed by	Internal Auditor	Other
24.	Investigate employee complaints about pay	Yes	No
25.	(24) performed by	Internal Auditor	Other

* The category Other indicates one of the other employees. All possible employees are listed below.

Factory Employee	Payroll Clerk
Factory Supervisor	Cost Distribution Clerk
Personnel	General Ledger Clerk
Internal Auditor	Accounts Payable Clerk
Cashier	Timekeeping

Violation of segregation of duties will occur if the same individual is responsible for more than one of the tasks above that should be separated, i.e. signing payroll checks and preparing payroll register.

APPENDIX B

DOCUMENTS PERTAINING TO STUDENT SUBJECTS

Statement Made to Classes

The Special Project will consist of a series of evaluations of internal control. It will require four hours participation outside of class. You will sign up for four one-hour sessions at the end of class. The project will require no outside work, all that is required of you is to attend the hours you sign up for and during those sessions, work to the best of your ability. No outside information or studying will improve your performance, the only thing that will improve performance is the quality of the time you spend in the sessions.

The reason that I am the project leader is that this is part of my dissertation. Because of that it is necessary for you to sign a consent form to participate. These are the forms that are being distributed now. Please read them carefully before you sign. Note that you may withdraw from this special project if it causes you any undue distress. It should be made clear that this project is worth 50 points and no credit will be awarded if you do not complete all phases. If you do have to withdraw, you will be required to complete an alternate assignment to earn the 50 points. Please complete all the blanks on the consent form and return it to me at the end of class if you agree to participate.

Individual students have been randomly assigned to different groups. Each group will receive different information concerning internal control during the four one-hour sessions. All evaluation of your performance will be done based on the performance of other students in your group only. You will not be compared to individuals who are members of other groups.

The individual student data sheets are being distributed now. Please take a moment to examine them. Note that your name is on your sheet, so make sure you have the correct sheet. The next item of information is the assigned project number. It is important that you remember this number, it will identify you for all sessions. This sheet also provides a space for you to record the time and the location of the sessions you sign up for. Important -- you are to keep your individual student data sheet, do not lose them. They provide your assigned project number and a record of when and where to attend the sessions.

The last group of sheets are the sign-up sheets for the sessions. Make sure that you sign up for four hours, one each week. The top of each sheet indicates the date, the time , and the location.

My name, office number, and phone numbers are on your sign up sheet if any questions arise. If you know of anyone who is absent today, I would appreciate it if you would provide them with my Name and Office Number.

Example of Consent Form

ACCOUNTING 3603
SPECIAL PROJECT

Informed Consent By Subjects in Experiment

I, _____, have carefully
(please print your name)

_____ and fully understand the
(read; listened to; read and listened to;
please insert the appropriate response)

instructions for this experiment. I am aware of the time involved and of the credit I will be given and how my grade will be determined. I give my consent to serve as a subject in this experiment. I am aware that I can ask questions or terminate the experiment at any point. I am also aware that termination on my part will not result in any detriment. If I do not participate or if I terminate my participation before completion of the experiment I realize that I will receive no credit and will have to complete an alternate assignment.

_____
Signature

_____
Date

_____
Student I.D. Number

_____
Telephone Number

Example of Demographic Questionnaire

ACCTG 3603
INFORMATION QUESTIONNAIRE

1. Name _____ 2. Student I.D._____

3. Classification_____ 4. Major _____

5. Age _____ 6. Sex _____ 7. GradePoint _____

8. Previous Computer Related Classes:

	Semester taken	Grade	taken at OSU	taken elsewhere
a. Intro to DP	_____	_____	_____	_____
b. COBOL	_____	_____	_____	_____
c. FORTRAN	_____	_____	_____	_____
d. MIS	_____	_____	_____	_____
e. Management of Information Processing	_____	_____	_____	_____
f. Business Systems Analysis	_____	_____	_____	_____
g. other-list				
	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____

9. Do you own a computer? Yes No

If yes, is it: PC or Compatible? Yes No
Apple Yes No
Other - Please identify _____

10. For the following types of software, please indicate your degree of proficiency:

	None	Novice	Intermediate	Expert
a. Wordprocessing	_____	_____	_____	_____
b. Spreadsheet	_____	_____	_____	_____
c. Database	_____	_____	_____	_____
d. SAS	_____	_____	_____	_____
e. IFPS	_____	_____	_____	_____
f. Expert Systems	_____	_____	_____	_____

11. Please define the following two terms (this will not be graded, it is asked merely to determine how familiar you are with these two topics)

a. Artificial Intelligence

b. Expert Systems

Example of Complete Test Instrument for First Session

ACCOUNTING 3603
SPECIAL PROJECT
SPRING 1987

SESSION 1

READ THE INFORMATION BELOW NOW AND FOLLOW THE DIRECTIONS!!!!!!!!!!

MAKE SURE THAT THIS IS THE COMPUTER YOU SIGNED UP FOR AND THAT THE DISKETTE HAS YOUR ASSIGNED PROJECT NUMBER. THE SIGN-UP SHEET IS ON THE FRONT DOOR IF YOU NEED TO DOUBLE CHECK. IF THERE ARE ANY QUESTIONS, PLEASE ASK THE PROCTOR.

PLEASE FILL IN THE INFORMATION BELOW.

NAME_____

ASSIGNED PROJECT NUMBER _____DATE _____

AS SOON AS YOU ARE CONFIDENT THAT YOU ARE AT THE RIGHT COMPUTER AND THAT YOU HAVE THE CORRECT DISKETTE YOU MAY BEGIN. FOLLOW ALL DIRECTIONS CAREFULLY.

INSERT THE DISKETTE INTO DRIVE A AND TURN THE COMPUTER ON.

PLEASE ENTER THE NECESSARY INFORMATION AT THE PROMPTS. USE CAPITAL LETTERS FOR ALL ENTRIES. (TO BE SAFE, TURN ON THE CAPS LOCK NOW)

THIS IS THE FIRST SESSION SO ENTER FIRST WHEN REQUESTED.

IT IS IMPORTANT THAT YOU FOLLOW ALL DIRECTIONS CAREFULLY. IF YOU HAVE ANY QUESTIONS PLEASE ASK THE PROCTOR FOR ASSISTANCE.

THE COMPUTER WILL PROMPT YOU TO OPEN THIS BOOKLET AND READ THE INTRODUCTION. PLEASE WAIT TO OPEN THE BOOKLET UNTIL PROMPTED TO DO SO.

DURING THIS SESSION YOU WILL BE ASKED TO EVALUATE FIVE (5) SCENARIOS DEALING WITH INTERNAL CONTROL. IT IS IMPORTANT THAT YOU ALLOCATE YOUR TIME SO THAT YOU ARE ABLE TO COMPLETE ALL FIVE SCENARIOS.

PLEASE FEEL FREE TO MAKE ANY MARKS OR NOTATIONS ON THIS BOOKLET THAT YOU MIGHT FIND HELPFUL.

***** WHEN YOU HAVE COMPLETED THIS SESSION YOU SHOULD RETURN *****
***** THIS BOOKLET AND YOUR DISKETTE TO THE PROCTOR *****
***** AS YOU LEAVE THE ROOM *****
***** YOU WILL NOT RECEIVE CREDIT FOR THIS SESSION UNLESS *****
***** YOUR DISKETTE AND BOOKLET ARE RETURNED *****

INTRODUCTION: PLEASE READ THIS INTRODUCTION CAREFULLY BEFORE YOU BEGIN. REFER BACK TO THESE REMARKS WHENEVER YOU NEED.

For purposes of this project, assume that you are the auditor in charge of the evaluation of internal control over factory payroll for the Small Manufacturing Company, a company which has been audited by your firm for the last three years. Assume that the evaluation of factory payroll will be done separately from the other aspects of the company. Factory payroll is paid weekly and all factory workers are hourly wage earners.

Following this introduction is a partial organization chart which has already been updated during the current audit. The cashier has responsibility for cash in conjunction with aspects of the company other than factory payroll. Remember that this is an evaluation of only factory payroll, assume that the controls over the other areas of the company will not impact this evaluation. The supervisor performs the functions that would commonly be associated with a factory supervisor. All other individuals on the organization chart perform no major functions other than those specified in each scenario.

A number of independent scenarios are presented which provide information about the internal control over factory payroll. In all scenarios, the notice of employment, pay rate change, and termination is sent to the individual who has responsibility for preparing the factory payroll register and the paychecks. All controls that are in existence in the company are stated in the scenario. All controls stated are assumed to be working as indicated. You are to evaluate the internal control over factory payroll using this introductory information, the organization chart, and the information provided in each scenario.

Please remember, that while the introductory remarks and the organization chart apply to all scenarios, each scenario should be evaluated independently. Read the scenario and enter your evaluation on the computer before you proceed to the next scenario. Follow the prompts on the computer screen and enter the information when requested. Please follow all directions carefully.

This session will consist of the evaluation of five (5) different scenarios. This should be readily accomplished within the hour allotted, but allocate your time so you complete all five scenarios.

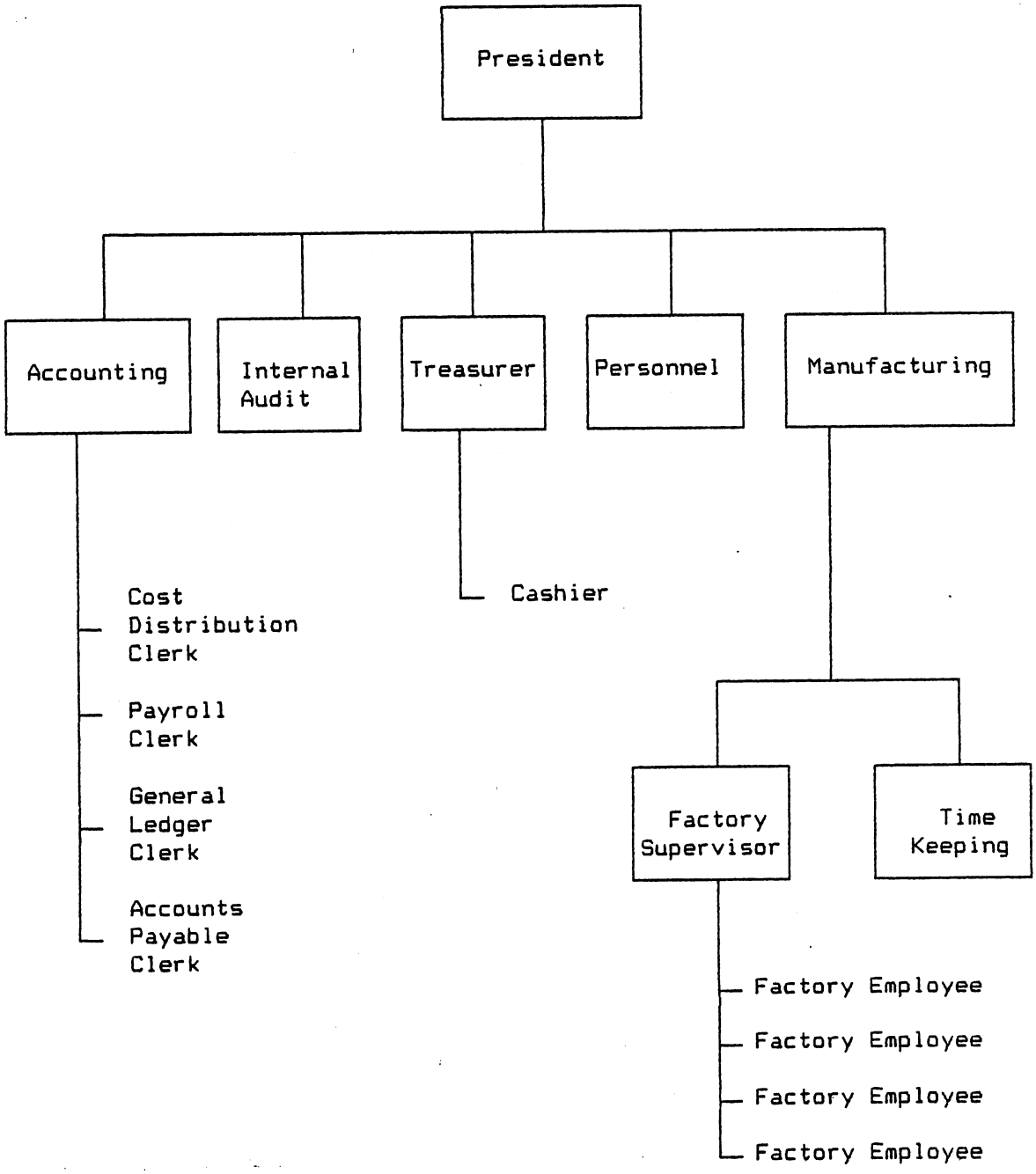
Your evaluation of internal control over factory payroll should be made on a scale of 0 to 100, with 0 indicating total absence of controls and 100 indicating that every possible control is present and working properly. An evaluation of 50 would indicate a medium level of control. When asked for your evaluation of internal control over factory payroll, you should enter a number between 0 and 100.

Examine the organization chart now. Make sure you understand the background information before you start on the first scenario.

IMPORTANT: Read each scenario and enter your evaluation before proceeding to the next scenario. Do not return to a scenario once it has been evaluated.

SMALL MANUFACTURING COMPANY

Partial Organization Chart
(for Payroll cycle)



SCENARIO 1

The internal auditor distributes the payroll on the first of every month as a control measure. The internal auditor regularly compares the amount of the payroll with the budgeted figure and investigates any significant differences. All employee complaints about their pay are handled by the internal auditor.

During last year's audit, the evaluation of internal control over factory payroll was determined to be strong (i.e. above 50 on a scale of 0 to 100).

The payroll clerk prepares the paychecks and the payroll register using the hours from the timecards and the current pay rate. The payroll clerk then posts the information to the individual earnings records. Timekeeping checks the payroll register and prepares the payroll distribution voucher. Using the information from the jobcards, timekeeping prepares the labor distribution summary. The general ledger clerk is responsible for comparing the payroll register and the labor distribution summary and reconciling any differences.

The company does not use a check signing machine and all unsigned checks are not tightly controlled. Factory payroll is paid from the company's only bank account. The cashier has responsibility for signing the checks after she thoroughly examines the payroll distribution voucher. The personnel department distributes the payroll checks. Any unclaimed payroll checks are retained by the personnel department.

Employees manually record their starting and stopping times on timecards. The factory employees record the time on each job on jobcards which are approved by the supervisor. Any overtime worked is authorized by the supervisor. At the end of each work week, the total hours from the timecards are compared with total hours on the jobcards by timekeeping.

Factory employees are hired by the personnel department which determines the appropriate pay rate. The personnel department sends notice of employment and the pay rate to the payroll clerk. All changes in pay rate are authorized by the personnel department. When factory employees terminate their employment, they must complete a form and submit it to the personnel department which notifies the payroll clerk.

SCENARIO 2

During last year's audit, the evaluation of internal control over factory payroll was determined to be weak (i.e. below 50 on a scale of 0 to 100).

Factory employees are hired by the supervisor who determines the appropriate pay rate. Notice of employment is sent to the personnel department which notifies the accounts payable clerk. All changes in pay rate are authorized by the personnel department. When factory employees terminate their employment, they must complete a form and submit it to the personnel department which notifies the accounts payable clerk.

Employees manually record their starting and stopping times on timecards. The factory employees record the time on each job on jobcards. Any overtime worked is authorized by the supervisor. At the end of each work week, the total hours from the timecards are compared with total hours on the jobcards by timekeeping.

The accounts payable clerk prepares the paychecks and the payroll register using the hours from the timecards and the current pay rate. The accounts payable clerk then posts the information to the individual earnings records. The payroll clerk checks the payroll register and prepares the payroll distribution voucher. Using the information from the jobcards, the payroll clerk prepares the labor distribution summary. The payroll clerk is responsible for comparing the payroll register and the labor distribution summary and reconciling any differences.

The company does not use a check signing machine, nor does it tightly control all unsigned checks. An imprest payroll bank account is used for the factory payroll. The cashier has responsibility for signing the checks after she thoroughly examines the payroll distribution voucher. The cashier distributes the payroll checks. Any unclaimed payroll checks are retained by the cashier.

The internal auditor distributes the payroll on the first of every month as a control measure. All employee complaints about their pay are handled by the internal auditor.

SCENARIO 3

During last year's audit, the evaluation of internal control over factory payroll was determined to be strong (i.e. above 50 on a scale of 0 to 100).

Employees manually record their starting and stopping times on timecards. The factory employees record the time on each job on jobcards which are approved by the supervisor. Any overtime worked is authorized by the cashier. At the end of each work week, the total hours from the timecards are compared with total hours on the jobcards by timekeeping.

The company does not use a check signing machine, but tightly controls all unsigned checks. Factory payroll is paid from the company's only bank account. The cashier has responsibility for signing the checks. The cashier distributes the payroll checks. Any unclaimed payroll checks are turned over to the accounts payable clerk.

Factory employees are hired by the cashier who determines the appropriate pay rate. Notice of employment and the pay rate is sent to the personnel department which notifies the accounts payable clerk. All changes in pay rate are authorized by the supervisor. When factory employees terminate their employment, they must complete a form and submit it to the internal auditor who notifies the accounts payable clerk.

The internal auditor periodically distributes the payroll on a surprise basis. The cashier regularly compares the amount of the payroll with the budgeted figure and investigates any significant differences. All employee complaints about their pay are handled by the accounts payable clerk.

The accounts payable clerk prepares the paychecks and the payroll register using the hours from the timecards and the current pay rate. The payroll clerk then posts the information to the individual earnings records. The accounts payable clerk checks the payroll register and prepares the payroll distribution voucher. Using the information from the jobcards, the payroll clerk prepares the labor distribution summary. The cashier is responsible for comparing the payroll register and the labor distribution summary and reconciling any differences.

SCENARIO 4

The payroll clerk prepares the paychecks and the payroll register using the hours from the timecards and the current pay rate. The payroll clerk then posts the information to the individual earnings records. The accounts payable clerk checks the payroll register and prepares the payroll distribution voucher. Using the information from the jobcards, the cost distribution clerk prepares the labor distribution summary. The general ledger clerk is responsible for comparing the payroll register and the labor distribution summary and reconciling any differences.

Factory employees are hired by the personnel department which determines the appropriate pay rate. The personnel department sends notice of employment and the pay rate to the payroll clerk. All changes in pay rate are authorized by the personnel department. When factory employees terminate their employment, they must complete a form and submit it to the personnel department which notifies the payroll clerk.

During last year's audit, the evaluation of internal control over factory payroll was determined to be weak (i.e. below 50 on a scale of 0 to 100).

The internal auditor distributes the payroll on the first week of every month as a control measure.

Employees manually record their starting and stopping times on timecards. The factory employees record the time on each job on jobcards. Any overtime worked is authorized by the supervisor. At the end of each work week, the total hours from the timecards are compared with total hours on the jobcards by timekeeping.

The company does not use a check signing machine nor does it tightly control all unsigned checks. Factory payroll is paid from the company's only bank account. The cashier has responsibility for signing the checks. The cashier distributes the payroll checks. Any unclaimed payroll checks are retained by the cashier.

SCENARIO 5

The internal auditor periodically distributes the payroll on a surprise basis. The supervisor regularly compares the amount of the payroll with the budgeted figure and investigates any significant differences. All employee complaints about their pay are handled by the supervisor.

Employees record their starting and stopping times by inserting their timecards in the timeclock located near the factory entrance. The factory employees record the time on each job on jobcards. Any overtime worked is authorized by timekeeping. At the end of each work week, the total hours from the timecards are compared with total hours on the jobcards by timekeeping.

The company does not use a check signing machine and all unsigned checks are not tightly controlled. Factory payroll is paid from the company's only bank account. The cashier has responsibility for signing the checks. The payroll clerk distributes the payroll checks. Any unclaimed payroll checks are turned over to the cashier.

Factory employees are hired by the supervisor who determines the appropriate pay rate. Notice of employment is sent to the personnel department which notifies the payroll clerk. All changes in pay rate are authorized by the personnel department. When factory employees terminate their employment, they must complete a form and submit it to the personnel department which notifies the payroll clerk.

During last year's audit, the evaluation of internal control over factory payroll was determined to be weak (i.e. below 50 on a scale of 0 to 100).

The payroll clerk prepares the paychecks and the payroll register using the hours from the timecards and the current pay rate. The cost distribution clerk then posts the information to the individual earnings records. The cost distribution clerk checks the payroll register and prepares the payroll distribution voucher. Using the information from the jobcards, the cost distribution clerk prepares the labor distribution summary. The general ledger clerk is responsible for comparing the payroll register and the labor distribution summary and reconciling any differences.

Example of Cover Page for Sessions Two, Three, and Four

ACCOUNTING 3603
SPECIAL PROJECT
SPRING 1987

SESSION 2*

READ THE INFORMATION BELOW NOW AND FOLLOW THE DIRECTIONS!!!!!!!!!!

MAKE SURE THAT THIS IS THE COMPUTER YOU SIGNED UP FOR AND THAT THE DISKETTE HAS YOUR ASSIGNED PROJECT NUMBER. THE SIGN-UP SHEET IS ON THE FRONT DOOR IF YOU NEED TO DOUBLE CHECK. IF THERE ARE ANY QUESTIONS NOW OR ANY TIME DURING THE SESSION, PLEASE ASK THE PROCTOR.

PLEASE FILL IN THE INFORMATION BELOW.

NAME_____PROJECT NUMBER_____

DATE_____

AS SOON AS YOU ARE CONFIDENT THAT YOU ARE AT THE RIGHT COMPUTER AND THAT YOU HAVE THE CORRECT DISKETTE YOU MAY BEGIN. FOLLOW ALL DIRECTIONS CAREFULLY.

INSERT THE DISKETTE INTO DRIVE A AND TURN THE COMPUTER ON.

PLEASE ENTER THE NECESSARY INFORMATION AT THE PROMPTS. USE CAPITAL LETTERS FOR ALL ENTRIES. (TO BE SAFE, TURN ON THE CAPS LOCK NOW)

THIS IS THE SECOND* SESSION SO ENTER SECOND* WHEN REQUESTED.

THE COMPUTER WILL PROMPT YOU TO OPEN THIS BOOKLET AND READ THE INTRODUCTION. PLEASE WAIT TO OPEN THE BOOKLET UNTIL PROMPTED.

***DURING THIS SESSION YOU WILL EVALUATE EIGHT (8) SCENARIOS ***

***** WHEN YOU HAVE COMPLETED THIS SESSION YOU SHOULD RETURN *****
***** THIS BOOKLET AND YOUR DISKETTE TO THE PROCTOR *****
***** AS YOU LEAVE THE ROOM *****
***** YOU WILL NOT RECEIVE CREDIT FOR THIS SESSION UNLESS *****
***** YOUR DISKETTE AND BOOKLET ARE RETURNED *****

IMPORTANT: Read each scenario and enter your evaluation before proceeding to the next scenario. Do not return to a scenario once it has been evaluated.

*Adjusted for third and fourth session.

Example of Introduction for Sessions Two, Three, and Four

THE INTRODUCTION AND ORGANIZATION CHART ARE THE SAME AS IN THE LAST SESSION. PLEASE REVIEW THEM TO MAKE SURE YOU ARE FAMILIAR WITH THE BACKGROUND MATERIAL.

* ONCE YOU HAVE MADE AND ENTERED YOUR EVALUATION OF A SCENARIO, YOU WILL BE PROVIDED WITH THE EVALUATION MADE BY THE PARTNER IN CHARGE OF THE OVERALL COMPANY AUDIT. TAKE A MOMENT TO CONSIDER ANY DIFFERENCES BETWEEN YOUR EVALUATION AND THE EVALUATION OF THE PARTNER BEFORE YOU PROCEED TO THE NEXT SCENARIO.

For purposes of this project, assume that you are the auditor in charge of the evaluation of internal control over factory payroll for the Small Manufacturing Company, a company which has been audited by your firm for the last three years. Assume that the evaluation of factory payroll will be done separately from the other aspects of the company. Factory payroll is paid weekly and all factory workers are hourly wage earners.

Following this introduction is a partial organization chart which has already been updated during the current audit. The cashier has responsibility for cash in conjunction with aspects of the company other than factory payroll. Remember that this is an evaluation of only factory payroll, assume that the controls over the other areas of the company will not impact this evaluation. The supervisor performs the functions that would commonly be associated with a factory supervisor. All other individuals on the organization chart perform no major functions other than those specified in each scenario.

A number of independent scenarios are presented which provide information about the internal control over factory payroll. In all scenarios, the notice of employment, pay rate change, and termination is sent to the individual who has responsibility for preparing the factory payroll register and the paychecks. All controls that are in existence in the company are stated in the scenario. All controls stated are assumed to be working as indicated. You are to evaluate the internal control over factory payroll using this introductory information, the organization chart, and the information provided in each scenario.

Please remember, that while the introductory remarks and the organization chart apply to all scenarios, each scenario should be evaluated independently. Read the scenario and enter your evaluation on the computer before you proceed to the next scenario. Follow the prompts on the computer screen and enter the information when requested. Please follow all directions carefully.

Your evaluation of internal control over factory payroll should be made on a scale of 0 to 100, with 0 indicating total absence of controls and 100 indicating that every possible control is present and working properly. An evaluation of 50 would indicate a medium level of control. When asked for your evaluation of internal control over factory payroll, you should enter a number between 0 and 100.
**

The introduction presented above was for the control group with only evaluation feedback. The areas identified by * and ** would include the following information for the other treatment groups.

Control Group with Evaluation plus statement as to control weakness.

* ONCE YOU HAVE MADE AND ENTERED YOUR EVALUATION OF A SCENARIO, YOU WILL BE PROVIDED WITH THE EVALUATION AND A STATEMENT OF THE MAJOR INTERNAL CONTROL WEAKNESS(ES) MADE BY THE PARTNER IN CHARGE OF THE OVERALL COMPANY AUDIT. TAKE A MOMENT TO CONSIDER ANY DIFFERENCES BETWEEN YOUR EVALUATION AND THE EVALUATION OF THE PARTNER BEFORE YOU PROCEED TO THE NEXT SCENARIO.

** Same as above

Questionnaire Group (The same two feedback statements were used)

** TO ASSIST YOU IN YOUR EVALUATION, AN INTERNAL CONTROL QUESTIONNAIRE HAS BEEN PROVIDED FOR EACH SCENARIO. USE THE INFORMATION IN THE SCENARIO TO COMPLETE THE QUESTIONNAIRE, THEN MAKE YOUR EVALUATION.

Expert Systems Groups (The same two feedback statements were used)

** TO ASSIST YOU IN YOUR EVALUATION, YOU HAVE ACCESS TO AN EXPERT SYSTEM CALLED PAYROLL ADVISOR. YOU SHOULD HAVE A SEPARATE INSTRUCTION SHEET THAT WILL EXPLAIN WHAT AN EXPERT SYSTEM IS AND HOW TO USE IT. IF YOU DO NOT HAVE THE INSTRUCTIONS OR IF YOU HAVE ANY QUESTIONS, PLEASE ASK THE PROCTOR.

Example of Internal Control Questionnaire

INTERNAL CONTROL QUESTIONNAIRE

1. Last year's evaluation of internal control:_____

2. Hiring and pay rate authorized by:..... _____

3. Changes in pay rate authorized by:..... _____

4. Employee termination form submitted to:... _____

5. Timeclock used:..... _____

6. Jobcards used:_____
   If yes, approved by:..... _____

7. Overtime approved by:..... _____

8. Jobcards compared to timecards:_____
   If yes, by whom:..... _____

9. Preparation of paychecks and payroll register performed by:..... _____

10. Earnings posted to individual records by: _____

11. Preparation of payroll distribution voucher, check of payroll register performed by: _____

12. Labor distribution summary prepared by:.. _____

13. Comparison of labor distribution summary and payroll register performed by:..... _____

14. Check signing machine used:..... _____

15. Blank (unsigned) checks tightly controlled:_____

16. Responsibility for signing checks:..... _____

17. Imprest payroll bank account used:..... _____

18. Payroll checks distributed by:..... _____

19. Responsibility for unclaimed checks:... _____

20. Payroll distributed on a surprise basis:_____
    If yes, by whom:..... _____

21. Payroll compared to budgeted figure:_____
    If yes, by whom:..... _____

22. Payroll complaints investigated:_____
    If yes, by whom:..... _____

Example of Cover Page for Last Session

ACCOUNTING 3603
FINAL SESSION

NAME _____

PROJECT NUMBER _____

PLEASE READ THE FOLLOWING INSTRUCTIONS NOW. FOLLOW ALL INSTRUCTIONS CAREFULLY!!

During this final session you will evaluate five (5) scenarios. These scenarios are based on the same background information and organization chart as before but again the scenarios are different. During this final session you will not have the benefit of any decision aid nor will you receive any feedback. You should use what you have learned about internal control over the payroll cycle during the four previous sessions to evaluate the scenarios.

THIS SESSION IS EXTREMELY IMPORTANT, ** THE EVALUATIONS THAT YOU MAKE TODAY ARE THE MOST IMPORTANT EVALUATIONS SO MAKE SURE YOU DO THE BEST JOB OF EVALUATING THE SCENARIOS THAT YOU CAN. Also be sure to follow directions carefully (press the return key BEFORE you begin reading the scenario).

Insert your disk and turn on the computer now. Enter the required information, follow all directions, and then evaluate the scenarios.

PLEASE FOLLOW THE DIRECTIONS IN THIS BOOKLET CAREFULLY!!!!!!!

Example of Exit Questionnaire

POST-QUESTIONNAIRE

Read each question and circle the response that best represents your feelings about that statement.

PLEASE BE AS HONEST AND AS ACCURATE AS POSSIBLE (this questionnaire will not be evaluated until after final grades are determined, so please be as honest as you can). If you have any comments or concerns that you would like to share that are not addressed in this questionnaire, please feel free to write them down or stop by and discuss them with Ms. Eining or your instructor.

Where SA = Strongly Agree
A = Agree
N = Neutral
D = Disagree
SD = Strongly Disagree

ALL STUDENTS SHOULD ANSWER THESE QUESTIONS:

1.	The scenarios were easy to read and understand	SA	A	N	D	SD
2.	My knowledge of internal control improved because of this project.	SA	A	N	D	SD
3.	Working with computers makes me nervous	SA	A	N	D	SD
4.	The project was a definite learning experience	SA	A	N	D	SD
5.	The project should have been worth more fifty points	SA	A	N	D	SD
6.	The project would have been more beneficial had it lasted longer (answer based on the learning, not your desire to participate for more than four hours)	SA	A	N	D	SD
7.	This project was a total waste of my time	SA	A	N	D	SD
8.	I understand less about internal control concepts than I did before I started this project	SA	A	N	D	SD
9.	Projects of this type should become a part of every systems course	SA	A	N	D	SD
10.	The use of cases was helpful in understanding the components of internal control	SA	A	N	D	SD
11.	I enjoy working with computers	SA	A	N	D	SD

12. I viewed the feedback from the partner in charge as the correct evaluation and one that I should attempt to match SA A N D SD

13. I think that the number of scenarios that we were asked to evaluate was too large SA A N D SD

14. I believe all courses should require projects that use the computer. SA A N D SD

ANSWER THE FOLLOWING QUESTIONS IF YOU USED THE EXPERT SYSTEM PAYROLL ADVISOR DURING THE SESSIONS:

15. The expert system PAYROLL ADVISOR was easy to use (after the initial training session) SA A N D SD

16. I would like to learn more about expert systems. SA A N D SD

17. I did not enjoy using PAYROLL ADVISOR SA A N D SD

18. I accepted PAYROLL ADVISOR's recommendations SA A N D SD

19. Using PAYROLL ADVISOR made it easier to evaluate the scenarios. SA A N D SD

20. I think PAYROLL ADVISOR makes a good decision aid SA A N D SD

21. PAYROLL ADVISOR would be useful as a training device than as a decision aid SA A N D SD

ANSWER THE FOLLOWING QUESTIONS IF YOU USED A QUESTIONNAIRE DURING THE SESSIONS:

22. I found the questionnaires helpful in determining my evaluation. SA A N D SD

23. The questionnaires took too much time to complete SA A N D SD

24. The questionnaires were difficult to complete SA A N D SD

25. Completing the questionnaires made the cases easier to understand SA A N D SD

Example of Instructions Provided to Expert Systems Groups

INSTRUCTIONS FOR EXPERT SYSTEM

An expert system is a type of advanced decision aid. It will ask you for information and then provide you with a suggested evaluation. You should remember that it is a decision aid and use its suggested evaluation as one of the items you consider when you are asked to make your own evaluation.

The expert system, PAYROLL ADVISOR, is very user friendly. You do not have to have any special programming knowledge to use it. The following instructions should enable you to successfully use PAYROLL ADVISOR.

** When you have finished reading the introductory screens you will be asked to press return to enter the expert system. A screen will appear that has background information on the software package that was used to construct this expert system. Just follow the directions and press any key to enter PAYROLL ADVISOR.

** The expert system will ask you for information about the scenario that you are evaluating. To enter your response you can use either the up/down arrow key or the space bar to move the cursor. When the cursor highlights the correct response, press the return key. The system will then ask you for another response. You should continue until the system provides you with its suggested solution.

FOLLOW THE STEPS BELOW FOR EACH SCENARIO:

STEP 1. Read the scenario carefully.
STEP 2. Run the expert system using the information from the scenario.
STEP 3. Fully consider the evaluation and/or any information provided by the expert system. *Note: if you have made an error or if you want to see the questions again you can rerun the expert system. Please feel free to run the expert system as many times as you like for each scenario.
STEP 4. Use your knowledge of internal control, the advice from PAYROLL ADVISOR, and the information presented to determine your evaluation of the scenario.
STEP 5. When you are ready to make your evaluation you should move the cursor to the line with F2 on it and then press the F2 key. This will take you to the screen where you can enter your evaluation. *Note: you may want to write the information from the expert system on your booklet before you exit that screen.
STEP 6. Take a moment to fully consider any and all information that is presented to you after you enter your evaluation. Again you may want to write down information on your booklet.

Repeat the above steps for all scenarios. Remember you have to evaluate a eight scenarios during this session.

Don't be concerned if your neighbor is working at a different speed. He/she may be receiving different information or a different decision aid. DO NOT DISCUSS THE INFORMATION YOU HAVE RECEIVED WITH OTHER STUDENTS.

Example of Instructions Provided to Control Group

INSTRUCTIONS (for control group)

FOLLOW THE STEPS BELOW FOR EACH SCENARIO:

STEP 1. Read the scenario carefully.
STEP 2. Try to identify the individuals responsible for the various activities and any controls that are in place. You may want to make notes on the scenario to help in your understanding.
STEP 4. Use your knowledge of internal control and the information provided to determine your evaluation of the scenario.
STEP 5. Enter your evaluation of internal control.
STEP 6. Take a moment to fully consider any and all information that is presented to you after you enter your evaluation. You may want to write down information on your booklet.

Repeat the above steps for all scenarios. Remember you have to evaluate eight scenarios this session.

Don't be concerned if your neighbor is working at a different speed. He/she may be receiving different information. DO NOT DISCUSS THE INFORMATION YOU HAVE RECEIVED WITH OTHER STUDENTS.

Example of Instructions Provided to Questionnaire Group

INSTRUCTIONS FOR QUESTIONNAIRE

FOLLOW THE STEPS BELOW FOR EACH SCENARIO:

STEP 1. Read the scenario carefully.
STEP 2. Complete the questionnaire using the information from the scenario. Feel free to use abbreviations if you desire.
STEP 3. Take a moment to consider the information in the questionnaire. Remember, a questionnaire is a type of decision aid that should help you identify the relevant information.
STEP 4. Use your knowledge of internal control, the information provided, and the questionnaire to determine your evaluation of the scenario.
STEP 5. Enter your evaluation of internal control.
STEP 6. Take a moment to fully consider any and all information that is presented to you after you enter your evaluation. You may want to write down information on your booklet.

Repeat the above steps for all scenarios. Remember you have to evaluate eight scenarios this session.

Don't be concerned if your neighbor is working at a different speed. He/she may be receiving different information or a different decision aid. DO NOT DISCUSS THE INFORMATION YOU HAVE RECEIVED WITH OTHER STUDENTS.

APPENDIX C

DOCUMENTS SPECIFIC TO SOLICITATION OF INFORMATION FROM EXPERT

Example of Introduction Page

INTRODUCTION: PLEASE READ THIS INTRODUCTION CAREFULLY BEFORE YOU BEGIN. REFER BACK TO THESE REMARKS WHENEVER YOU NEED.

For purposes of this experiment, assume that you are the auditor in charge of the evaluation of internal control over factory payroll for the Small Manufacturing Company, a company which has been audited by your firm for the last three years. Assume that the evaluation of factory payroll will be done separately from the other aspects of the company. Factory payroll is paid weekly and all factory workers are hourly wage earners.

Following this introduction is a partial organization chart which has already been updated during the current audit. The cashier has responsibility for cash in conjunction with aspects of the company other than factory payroll. The supervisor performs the functions that would commonly be associated with a factory supervisor. All other individuals on the organization chart perform no major functions other than those specified in each scenario.

A number of independent scenarios are presented which provide information about the internal control over factory payroll. In all scenarios, the notice of employment, pay rate change, and termination is sent to the individual who has responsibility for preparing the factory payroll register and the paychecks. All controls that are in existence in the company are stated in the scenario. Using the organization chart and the information provided in each scenario, please provide your evaluation of the internal control over payroll.

Please remember, that while the organization chart applies to all scenarios, each scenario should be evaluated independently.

Your evaluation should be made on a scale of 0 to 100, with 0 indicating total absence of controls and 100 indicating that every possible control is present and working properly. An evaluation of 50 would indicate a medium level of control.

After each scenario you are also asked to provide a statement as to the major internal control weakness.

Please work at your own speed and take breaks whenever necessary. You may go back to scenarios if you need to reevaluate a decision. You may also use any reference material or information that would help you make the most appropriate evaluation.

Please feel free to make any marks or notations on the scenarios as needed. Every effort has been taken to make the scenarios clear and unambiguous. If this effort has not been entirely successful and you consider some aspect to be unclear and make an assumption on which you base your evaluation, please note that assumption. You can do this by simply writing the assumption on the scenario itself.

Example of Evaluation Page

EVALUATION OF SCENARIO 1

BASED ON THE INFORMATION PROVIDED IN THIS SCENARIO, THE INFORMATION IN THE INTRODUCTION, THE ORGANIZATION CHART, AND YOUR KNOWLEDGE OF INTERNAL CONTROL, PLEASE INDICATE YOUR EVALUATION OF THE INTERNAL CONTROL OVER FACTORY PAYROLL:

My evaluation is _____ (between 0 and 100)

(If you are unsure of the scale, please reread the introduction)

If your evaluation of internal control over factory payroll was below 100, please indicate the major internal control weakness that should be addressed to strengthen control. If you believe that two or more major internal control weaknesses of approximately the same magnitude exist i.e. you are unable to identify only one major weakness, please list them.

Last Page Expert Completed

PLEASE COMPLETE THIS PAGE WHEN YOU ARE FINISHED WITH ALL THE SCENARIOS.

1. AREAS OF PAYROLL CYCLE

The following is a list of six areas of the payroll cycle. A weakness in internal control could exist in any or all of these areas. Please rank the following from 1 to 6 to indicate the impact of a weakness in a particular area to the overall evaluation of internal control. A 1 would indicate that a weakness in this particular area would be the most significant in weakening overall internal control. A 6 would indicate that a weakness in this particular area would have the least impact on overall internal control.

_____ Authorization for employment, pay rate, and termination.

_____ Initial recording of time worked

_____ Recording payroll transactions

_____ Payment and distribution of wages

_____ Presence of internal auditor who performs control function over payroll

_____ Last years evaluation of internal control

2. INTERNAL CONTROL

Please list the five most important controls over factory payroll, for a company similar to the one described in the scenarios. Be as specific as possible and list the controls in order of importance.

_____

_____

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_____

APPENDIX D

1ST-CLASS SCREENS AND RULE

Sample Development Screens

Definition Screens

```
new_Factor, new_Value, edit_Text, Change, Activate, Move, Delete
       Files  Definitions  Examples  Methods  Rule  Advisor
[F1=Help]       26 Factors in PAYPLUS              [F9=Files] [F10=Examples]
```

SGN_CHK	DIST_CHK	CHK_MCH	UNS_CHK	IMP_ACCT	UNC_CHK
CASHIER	CASHIER	YES	YES	YES	CASHIER
SUPV	SUPV	NO	NO	NO	SUPV
INT_AUD	INT_AUD				INT_AUD
PERS	PERS				PERS
PAY_CLK	PAY_CLK				PAY_CLK
COST_CLK	TIME				TIME
GEN_LEDG	ACC_PAY				ACC_PAY
ACC_PAY	COST_CLK				COST_CLK
TIME	GEN_LEDG				GEN_LEDG

```
new_Factor, new_Value, edit_Text, Change, Activate, Move, Delete
       Files  Definitions  Examples  Methods  Rule  Advisor
[F1=Help]       26 Factors in PAYPLUS              [F9=Files] [F10=Examples]
```

POST_EARN	DIST_VOUCH	LB_DISTSM	LB_PAYREG	LASTYR	RESULT
SUPV	SUPV	SUPV	SUPV	STRONG	S1
TIME	TIME	TIME	TIME	WEAK	S2
INT_AUD	INT_AUD	INT_AUD	INT_AUD		S3
PERS	PERS	PERS	PERS		S4
PAY_CLK	PAY_CLK	PAY_CLK	PAY_CLK		S5
COST_CLK	COST_CLK	COST_CLK	COST_CLK		S6
ACC_PAY	ACC_PAY	ACC_PAY	ACC_PAY		S7
GEN_LEDG	GEN_LEDG	GEN_LEDG	GEN_LEDG		S8
CASHIER	CASHIER	CASHIER	CASHIER		T1
					T2
					T3
					T4

Example Screens

new_Example, Replicate, Change, Activate, Move, Delete
Files Definitions Examples Methods Rule Advisor
[F1=Help] 41 Examples in PAYPLUS [F9=Definitions] [F10=Methods]
weights--)

		SGN_CHK	DIST_CHK	CHK_MCH	UNS_CHK	IMP_ACCI	UNC_CHK
)	1:	CASHIER	CASHIER	YES	YES	YES	CASHIER
	2:	PAY_CLK	CASHIER	YES	YES	YES	CASHIER
	3:	CASHIER	CASHIER	NO	YES	NO	CASHIER
	4:	CASHIER	CASHIER	YES	YES	YES	CASHIER
	5:	INT_AUD	CASHIER	YES	NO	NO	CASHIER
	6:	CASHIER	INT_AUD	NO	NO	NO	INT_AUD
	7:	CASHIER	CASHIER	YES	YES	YES	CASHIER
	8:	CASHIER	CASHIER	YES	YES	YES	CASHIER
	9:	CASHIER	CASHIER	NO	NO	NO	CASHIER
	10:	CASHIER	CASHIER	YES	YES	YES	CASHIER
	11:	TIME	CASHIER	NO	YES	NO	CASHIER
	12:	CASHIER	CASHIER	NO	NO	NO	CASHIER
	13:	CASHIER	CASHIER	YES	YES	YES	SUPV
	14:	INT_AUD	INT_AUD	YES	YES	NO	INT_AUD
	15:	PAY_CLK	CASHIER	YES	YES	YES	CASHIER
	16:	SUPV	SUPV	YES	NO	NO	SUPV
	17:	SUPV	SUPV	YES	NO	YES	CASHIER
	18:	CASHIER	CASHIER	NO	YES	YES	PERS
	19:	CASHIER	CASHIER	YES	YES	YES	CASHIER

new_Example, Replicate, Change, Activate, Move, Delete
Files Definitions Examples Methods Rule Advisor
[F1=Help] 41 Examples in PAYPLUS [F9=Definitions] [F10=Methods]

		DIST_VOUCH	LB_DISTSM	LB_PAYREG	LASTYR	RESULT	Weight
)	1:	ACC_PAY	COST_CLK	GEN_LEDG	WEAK	S1	[1.00]
	2:	COST_CLK	COST_CLK	GEN_LEDG	WEAK	S2	[1.00]
	3:	ACC_PAY	COST_CLK	GEN_LEDG	WEAK	S3	[1.00]
	4:	ACC_PAY	COST_CLK	GEN_LEDG	STRONG	S4	[1.00]
	5:	ACC_PAY	COST_CLK	GEN_LEDG	WEAK	S5	[1.00]
	6:	ACC_PAY	COST_CLK	GEN_LEDG	STRONG	S6	[1.00]
	7:	ACC_PAY	COST_CLK	GEN_LEDG	STRONG	S7	[1.00]
	8:	PAY_CLK	COST_CLK	ACC_PAY	STRONG	T1	[1.00]
	9:	ACC_PAY	COST_CLK	GEN_LEDG	STRONG	S8	[1.00]
	10:	ACC_PAY	COST_CLK	GEN_LEDG	STRONG	T2	[1.00]
	11:	PAY_CLK	COST_CLK	COST_CLK	WEAK	T3	[1.00]
	12:	ACC_PAY	COST_CLK	GEN_LEDG	WEAK	T4	[1.00]
	13:	ACC_PAY	COST_CLK	GEN_LEDG	STRONG	T5	[1.00]
	14:	PAY_CLK	COST_CLK	GEN_LEDG	WEAK	T6	[1.00]
	15:	ACC_PAY	COST_CLK	GEN_LEDG	STRONG	T7	[1.00]
	16:	GEN_LEDG	ACC_PAY	ACC_PAY	STRONG	T8	[1.00]
	17:	ACC_PAY	COST_CLK	GEN_LEDG	WEAK	F1	[1.00]
	18:	ACC_PAY	COST_CLK	GEN_LEDG	STRONG	F2	[1.00]
	19:	ACC_PAY	COST_CLK	COST_CLK	WEAK	F3	[1.00]

Rule

1st-Class is an example based expert system shell which builds a rule from a series of examples of past occurrences or decisions. The process of building or inducing a rule from past events requires inductive logic. The rule developed by 1st-Class takes the form of a decision tree. 1st-Class was written in Micro Pascal and Macro Assembler (Thomas, 1986).

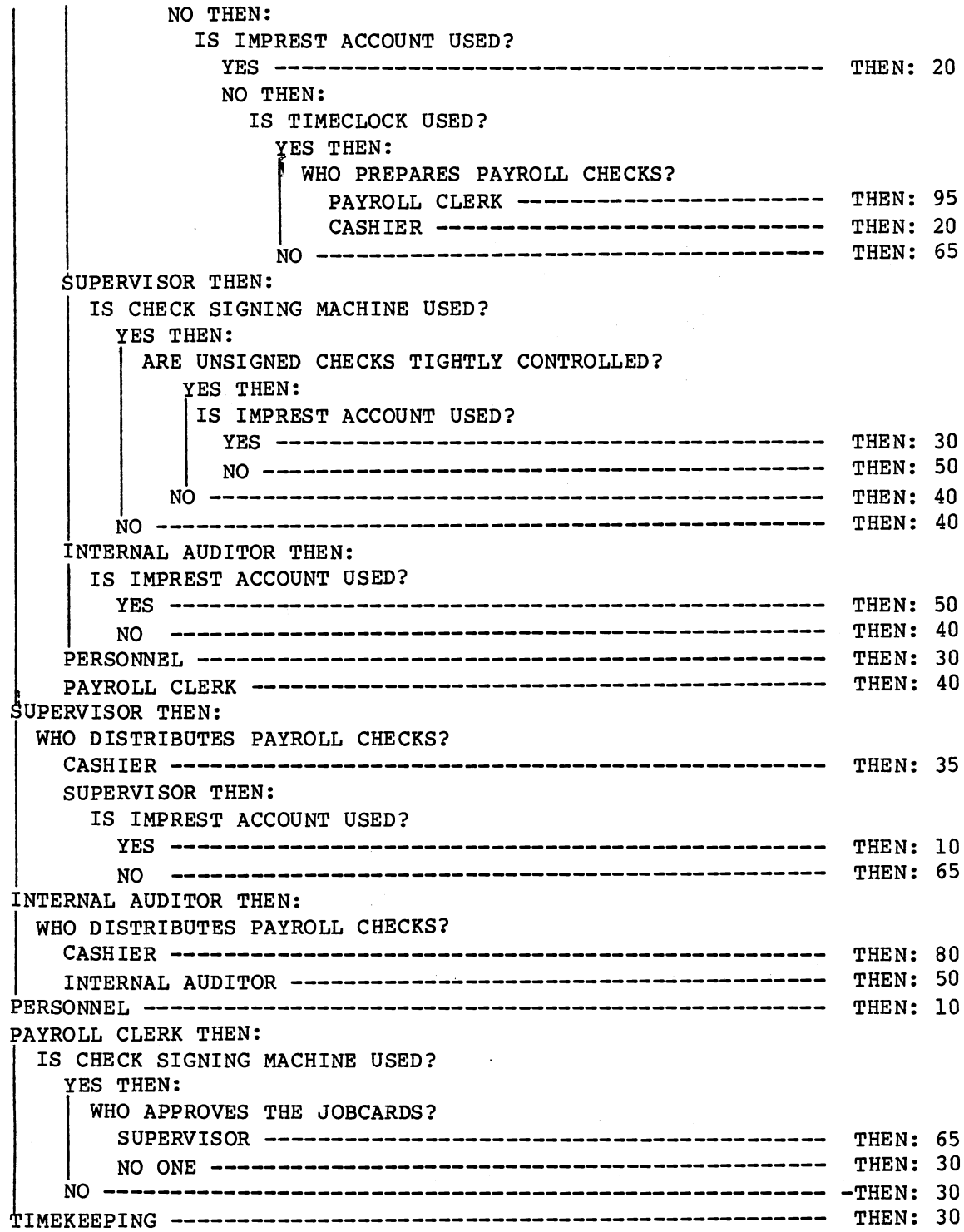
1st-Class uses the Iterative Dichotmiser version 3 (ID3) algorithm developed by R. Quinlan (1983) to generate the rule. The ID3 algorithm provides a mechanism for classifying objects based on a fixed collection of properties or attributes (factors). It uses an iterative process to develop a decision tree with the minimum number of nodes. The attribute with the most classification ability is selected as the root of the decision tree. The iterative process is then repeated for the resulting branches to determine the attribute with most classification ability. This process is repeated until the decision tree is complete.

1st-Class offers to methods of inductively developing rules based on examples, the optimize method and the left-right method. The optimize method develops the most compact decision tree possible based on the examples used. Only the factors that have discriminating power are included in the decision tree, factors that are redundant or irrelevant are eliminated from the decision tree. The left-right method functions similarly to the optimize method except that the developer is able to select the root of the decision tree by placing that factor at the left of the definitions screen. This allows the developer to have some input on which factors are more or less important and often results in a decision tree that is more consistent with the situation.

The decision tree for this research was developed using the left-right method. This method was chosen due to the desire to use as much information from the expert as possible in the construction of the expert system. The expert had been requested to rank the different areas of the payroll cycle as to their impact on internal control. This ranking was used to determine the placement of the factors on the definitions screen.

The decision tree for the expert systems used in this study appears on the following two pages. Because of the number of cues involved (twenty-five) and the limited number of scenarios, not all branches of the tree have outcomes. The current study, however, only considers the branches with outcomes (results) since only the examples used to develop the expert system were used as scenarios when running the expert system. Therefore, the branches without outcomes were not included in the rule presented below.

```
WHO SIGNS PAYROLL CHECKS?
 CASHIER  THEN:    105
  WHO DISTRIBUTES PAYROLL CHECKS?
    CASHIER  THEN:
     IS CHECK SIGNING MACHINE USED?
       YES THEN:
        ARE UNSIGNED CHECKS TIGHTLY CONTROLLED?
          YES  THEN:
           IS IMPREST ACCOUNT USED?
             YES THEN:
              WHO MAINTAINS UNSIGNED CHECKS?
                CASHIER THEN:
                 IS TIMECLOCK USED?
                   YES  THEN:
                    WHO COMPARES JOBCARDS AND TIMECARDS?
                      TIMEKEEPING  THEN:
                       IS PAYROLL DISTRIBUTED SURPRISE?
                         YES  THEN:
                          WHO HIRES?
                            PERSONNEL ------------  THEN: 100
                            INTERNAL AUDIT --------  THEN: 90
                         NO    THEN:
                           WHO DISTRIBUTES AS CONTROL?
                             SUPERVISOR ------------  THEN: 10
                             NO ONE ----------------  THEN: 90
                       SUPERVISOR ------------------  THEN: 90
                       PERSONNEL -------------------  THEN: 100
                   NO   THEN:
                     WHO APPROVES JOBCARDS?
                       SUPERVISOR ------------------  THEN: 80
                       NO ONE THEN:
                         WHO APPROVES OVERTIME?
                           PAYROLL CLERK ----------  THEN: 30
                           GENERAL LEDGER CLERK ---  THEN: 80
                SUPERVISOR ---------------------------  THEN: 60
              NO THEN:
                IS TIMECLOCK USED?
                  YES ------------------------------  THEN: 80
                  NO -------------------------------  THEN: 50
           NO ----------------------------------------  THEN: 35
       NO THEN:
         ARE UNSIGNED CHECKS TIGHTLY CONTROLLED?
           YES  THEN:
             IS IMPREST ACCOUNT USED?
               YES THEN:
                 WHO MAINTAINS UNSIGNED CHECKS?
                   CASHIER ------------------------  THEN: 95
                   PERSONNEL ----------------------  THEN: 50
               NO -----------------------------------  THEN: 10
```


NO THEN:
IS IMPREST ACCOUNT USED?
YES ---------- THEN: 20
NO THEN:
IS TIMECLOCK USED?
YES THEN:
WHO PREPARES PAYROLL CHECKS?
PAYROLL CLERK ---------- THEN: 95
CASHIER ---------- THEN: 20
NO ---------- THEN: 65
SUPERVISOR THEN:
IS CHECK SIGNING MACHINE USED?
YES THEN:
ARE UNSIGNED CHECKS TIGHTLY CONTROLLED?
YES THEN:
IS IMPREST ACCOUNT USED?
YES ---------- THEN: 30
NO ---------- THEN: 50
NO ---------- THEN: 40
NO ---------- THEN: 40
INTERNAL AUDITOR THEN:
IS IMPREST ACCOUNT USED?
YES ---------- THEN: 50
NO ---------- THEN: 40
PERSONNEL ---------- THEN: 30
PAYROLL CLERK ---------- THEN: 40
SUPERVISOR THEN:
WHO DISTRIBUTES PAYROLL CHECKS?
CASHIER ---------- THEN: 35
SUPERVISOR THEN:
IS IMPREST ACCOUNT USED?
YES ---------- THEN: 10
NO ---------- THEN: 65
INTERNAL AUDITOR THEN:
WHO DISTRIBUTES PAYROLL CHECKS?
CASHIER ---------- THEN: 80
INTERNAL AUDITOR ---------- THEN: 50
PERSONNEL ---------- THEN: 10
PAYROLL CLERK THEN:
IS CHECK SIGNING MACHINE USED?
YES THEN:
WHO APPROVES THE JOBCARDS?
SUPERVISOR ---------- THEN: 65
NO ONE ---------- THEN: 30
NO ---------- THEN: 30
TIMEKEEPING ---------- THEN: 30

Sample Output Screens

1st-Class queries the user through a series of multiple-choice screens. The user moves the cursor to highlight the correct response and then presses the return key. The first questions are always those on the top of the rule, but the order of all later questions is driven by the response to the previous question. Three sample question screens are presented below. Once 1st-Class has obtained all the necessary responses to its queries, it provides the user with advice, or a suggested evaluation. An example of an advice screen along with the explanation that the subject could view are provided below.

<u>Sample question screens</u>

```
[F1=Help]          1st-CLASS Advisor for PAYROLL                    [Esc=Stop]

WHO HAS RESPONSIBILTIY FOR SIGNING THE PAYROLL CHECKS?

IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM;
:CASHIER                                                                    :
:FACTORY SUPERVISOR                                                         :
:INERNAL AUDITOR                                                            :
:PERSONNEL DEPARTMENT                                                       :
:PAYROLL CLERK                                                              :
:COST DISTRIBUTION CLERK                                                    :
:GENERAL LEDGER CLERK                                                       :
:ACCOUNTS PAYABLE CLERK                                                     :
:TIMEKEEPING                                                                :
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM<
```

```
[F1=Help]          1st-CLASS Advisor for PAYROLL                    [Esc=Stop]

WHO HAS RESPONSIBILTIY FOR SIGNING THE PAYROLL CHECKS?

IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM;
:CASHIER                                                                    :
:FACTORY SUPERVISOR                                                         :
:INERNAL AUDITOR                                                            :
:PERSONNEL DEPARTMENT                                                       :
:PAYROLL CLERK                                                              :
:COST DISTRIBUTION CLERK                                                    :
:GENERAL LEDGER CLERK                                                       :
:ACCOUNTS PAYABLE CLERK                                                     :
:TIMEKEEPING                                                                :
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM<
```

```
[F1=Help]          1st-CLASS Advisor for PAYROLL                    [Esc=Stop]

IS A CHECK SIGNING MACHINE BEING USED?

IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM;
:YES                                                                        :
:NO                                                                         :
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM<
```

Sample advisor screens

```
[F1=Help]          1st-CLASS Advisor for PAYROLL                    [Esc=Stop]

THE ADVICE FROM THE EXPERT SYSTEM:  PAYROLL ADVISOR APPEARS BELOW:

I=============================================================================;
:THE SUGGESTED EVALUATION OF INTERNAL CONTROL IS:    80                      :
:                                                                            :
:YOU NOW HAVE THREE CHOICES:                                                 :
:      1. VIEW THE RULE(S) THE EXPERT SYSTEM USED TO DETERMINE THIS          :
:         EVALUATION:  PRESS THE  PgDn  KEY                                  :
:                           or                                               :
:      2. RUN THE EXPERT SYSTEM AGAIN:      ENTER    Y                       :
:                           or                                               :
:      3. ENTER YOUR EVALUATION OF THE SCENARIO: MOVE THE CURSOR TO THE LINE :
:           BELOW MARKED F2 AND THEN PRESS THE  F2  KEY                      :
:       (This takes you to the screen where you can enter your evaluation.)  :
:                                                                            :
:   F2                                                                      :
:                                                                            :
:                                                                            :
:                                                                            :
:                                                                            :
=============================================================================  , PgDn, or End
```

```
[F1=Help]          1st-CLASS Advisor for PAYROLL                    [Esc=Stop]
I=============================================================================  , PgUp, or Home
:                                                                            :
:RULES FOLLOWED TO GET THIS EVALUATION:                                      :
:                                                                            :
:IF CASHIER SIGNS THE PAYCHEKCS AND                                          :
:  IF CASHIER DISTRIBUTES THE PAYCHECKS AND                                  :
:    IF CHECK SIGNING MACHINE IS USED AND                                    :
:      IF UNSIGNED CHECKS TIGHTLY CONTROLLED AND                             :
:        IF IMPREST PAYROLL ACCOUNT USED AND                                 :
:          IF CASHIER MAINTAINS UNCLAIMED CHECKS AND                         :
:            IF TIMECLOCK NOT USED BUT                                       :
:              IF SUPERVISOR APPROVES JOBCARDS     THEN                      :
:                                                                            :
:EVALUATION OF INTERNAL CONTROL IS :   80                                    :
:                                                                            :
:PRESS THE PgUp  KEY TO GO BACK TO FIRST SCREEN.                             :
=============================================================================(
```

APPENDIX E

BASIC PROGRAMS

```
10 REM  Program Name "INTRO"
20 REM This program provides the initial screen that
30 REM the subjects see when they load their disk.  During the first
40 REM session asks for their name, student I.D., and their project
50 REM number.  At latter sessions presents this information so
60 REM they can make sure they have the right diskette.
70 REM
80 REM It then checks to see which sessions they have completed and
90 REM sets the check file for the current session.  This is to prevent them
100 REM from entering a session before they have completed all prior sessions.
110 REM They are then presented with the selection screen where they enter the
120 REM session they are attending.
130 REM
140 REM If the first four sessions have been completed, they will automatically
150 REM go to the basic program for the last session.
160 REM
170 REM Variable names used in this program are:
180 REM         N$    Student's Name
190 REM         ID$   Student's I.D. number
200 REM         NUM$  Student's assigned project number
210 REM         FST$  EMPTY before first  session  FIRST  after.
220 REM         SEC$  EMPTY before second session  SECOND after.
230 REM         THD$  EMPTY before third  session  THIRD  after.
240 REM         FTH$  EMPTY before fourth session  FOURTH after.
250 CLS
260 OPEN "introdt" FOR INPUT AS #1
270 INPUT #1,N$,ID$,NUM$
280 CLOSE
290 IF N$="noname" GOTO 310 ELSE GOTO 470
300 PRINT:PRINT
310 INPUT "PLEASE ENTER YOUR NAME"; N$
320 PRINT
330 INPUT "PLEASE ENTER YOUR STUDENT I.D. NUMBER";ID$
340 PRINT
350 INPUT "PLEASE ENTER THE NUMBER ASSIGNED TO YOU FOR THIS PROJECT";NUM$
360 PRINT:PRINT:PRINT
370 PRINT "PLEASE TAKE A MOMENT TO MAKE SURE THAT THE INFORMATION YOU HAVE "
380 PRINT "ENTERED IS CORRECT.       IF THE INFORMATION IS CORRECT PLEASE "
390 PRINT "ENTER YES AT THE PROMPT.  IF THE INFORMATION IS NOT CORRECT "
400 PRINT "PLEASE ENTER NO AT THE PROMPT.  BE SURE TO USE CAPITAL LETTERS."
410 INPUT "IS THE INFORMATION CORRECT";ANS$
420 IF ANS$="YES" GOTO 430 ELSE GOTO 310
430 OPEN "introdt" FOR OUTPUT AS #1
440 WRITE #1,N$,ID$,NUM$
450 CLOSE #1
460 GOTO 530
470 PRINT "THIS DISKETTE IS ASSIGNED TO  " N$
480 PRINT  "PROJECT NUMBER " NUM$
490 PRINT:PRINT:PRINT:PRINT
500 PRINT "CHECK TO BE SURE THAT THIS IS YOUR DISKETTE.  IF YOU DO NOT HAVE"
510 PRINT "THE RIGHT DISKETTE NOTIFY THE PROCTOR NOW." :PRINT:PRINT
520 INPUT "IF THIS IS YOUR DISKETTE, PLEASE PRESS THE RETURN  ( <---' ) KEY";R$
530 CLS
```

```
540 OPEN "CHECK1" FOR INPUT AS #2
550 INPUT #2,FST$
560 CLOSE #2
570 IF FST$="EMPTY" GOTO 700 ELSE GOTO 580
580 OPEN "CHECK2" FOR INPUT AS #3
590 INPUT #3,SEC$
600 CLOSE #3
610 IF SEC$="EMPTY" GOTO 700 ELSE GOTO 620
620 OPEN "CHECK3" FOR INPUT AS #4
630 INPUT #4,THD$
640 CLOSE #4
650 IF THD$="EMPTY" GOTO 700 ELSE GOTO 660
660 OPEN "CHECK4" FOR INPUT AS #5
670 INPUT #5,FTH$
680 CLOSE #5
690 IF FTH$="EMPTY" GOTO 700 ELSE GOTO 790
700 PRINT:PRINT:PRINT
710 PRINT "AT THE  A)  PROMPT BELOW   YOU SHOULD ENTER THE CORRECT RESPONSE AND"
720 PRINT "PRESS RETURN":PRINT:PRINT:PRINT
730 PRINT "FIRST  - ENTER FIRST BELOW IF THIS IS THE VERY FIRST SESSION."
740 PRINT:PRINT
750 PRINT "SECOND - ENTER SECOND IF THIS IS THE SECOND SESSION.":PRINT:PRINT
760 PRINT "THIRD  - ENTER THIRD IF THIS IS THE THIRD SESSION.":PRINT:PRINT
770 PRINT "FOURTH - ENTER FOURTH IF THIS IS THE FOURTH SESSION.":PRINT:PRINT
780 SYSTEM
790 RUN"LAST.BAS"
```

```
10 REM Program Name  "SCREEN"
20 REM This program is the selection screen that appears if subjects
30 REM have selected a session out of order.
40 CLS
50 PRINT:PRINT:PRINT
60 PRINT "YOU HAVE MADE AN ERROR.  PLEASE TRY AGAIN.  ENTER THE CORRECT RESPONSE
"
70 PRINT "AT THE PROMPT BELOW."
80 PRINT "IF YOU HAVE ANY QUESTIONS, PLEASE CONTACT THE PROCTOR.":PRINT:PRINT
90 PRINT "FIRST  - ENTER FIRST BELOW IF THIS IS THE VERY FIRST SESSION."
100 PRINT:PRINT
110 PRINT "SECOND - ENTER SECOND BELOW IF THIS IS THE SECOND SESSION.":PRINT:PRI
NT
120 PRINT "THIRD  - ENTER THIRD BELOW IF THIS IS THE THIRD SESSION.":PRINT:PRINT
130 PRINT "FOURTH - ENTER FOURTH BELOW IF THIS IS THE FOURTH SESSION.":PRINT:PRI
NT
140 SYSTEM
```

```
10 REM Program Name "FIRST"
20 REM This program collects the data for the first session.  The subject
30 REM is requested to press return before starting to read a scenario,
40 REM this starts the timer.  When the subject enters his/her evaluation
50 REM the program records both the evaluation and the time taken to reach
60 REM that evaluation.  This program is the same for all treatment groups.
70 REM
80 REM The program sets CHECK1 which indicates that the first session has
90 REM been attended.
100 REM
110 REM Variable names used in this program are:
120 REM          FST$     EMPTY before this session FIRST after
130 REM          D$       Date of this session
140 REM          STIME$   Time of this session
150 REM          NUM$     Student's assigned project number
160 REM          R$       Holds until return is pressed
170 REM          E1$      Evaluation for scenario 1 (same for 2 -5 )
180 REM          T1$      Time for scenario 1 (same for 2 - 5 )
190 CLS
200 OPEN "CHECK1" FOR OUTPUT AS #1
210 FST$="FIRST"
220 WRITE #1,FST$
230 OPEN "FDATA" FOR OUTPUT AS #2
240 PRINT "WELCOME TO THE FIRST SESSION."
250 PRINT "PLEASE FOLLOW ALL DIRECTIONS CAREFULLY:  IF YOU HAVE ANY QUESTIONS"
260 PRINT "DURING THIS SESSION, PLEASE ASK THE PROCTOR FOR ASSISTANCE."
270 PRINT:PRINT:PRINT:PRINT
280 PRINT "PLEASE ENTER THE APPROPRIATE INFORMATION WHEN REQUESTED.  WHEN YOU"
290 PRINT "HAVE ENTERED THE INFORMATION PRESS THE RETURN  ( '(--' ) KEY."
300 PRINT:PRINT:PRINT:PRINT
310 INPUT "ENTER YOUR ASSIGNED PROJECT NUMBER";NUM$
320 D$=DATE$:STIME$=TIME$
330 CLS
340 PRINT
350 PRINT "MAKE SURE THAT YOU HAVE ENTERED THE REQUIRED INFORMATION ON THE COVER
"
360 PRINT "OF THE BOOKLET.":PRINT
370 PRINT "OPEN THE BOOKLET:  READ THE INTRODUCTION CAREFULLY AND EXAMINE"
380 PRINT "THE ORGANIZATION CHART.  MAKE SURE YOU FULLY UNDERSTAND THE "
390 PRINT "INSTRUCTIONS BEFORE YOU PROCEED.":PRINT
400 PRINT "YOU MAY REFER BACK TO THE INTRODUCTION AND THE ORGANIZATION CHART"
410 PRINT "AT ANY TIME DURING THE SESSION.":PRINT
420 PRINT "EACH SCENARIO IS TO BE EVALUATED SEPARATELY.  YOU SHOULD READ AND"
430 PRINT "EVALUATE EACH SCENARIO BEFORE YOU START ON THE NEXT SCENARIO."
440 PRINT:PRINT
450 PRINT "YOU WILL BE ASKED TO EVALUATE FIVE SCENARIOS DURING THIS SESSION."
460 PRINT:PRINT
470 PRINT  "PRESS THE RETURN KEY WHEN YOU ARE READY TO BEGIN READING SCENARIO 1"
480 PRINT "     (NOTE -- IT IS IMPORTANT THAT YOU PRESS RETURN BEFORE YOU BEGIN
"
490 INPUT "     READING SCENARIO 1 !!!)";R$
500 TIME$="00.00"
510 CLS
```

```
520 PRINT "READ SCENARIO 1 AND USE THE INFORMATION PROVIDED AND YOUR KNOWLEDGE O
F "
530 PRINT "INTERNAL CONTROL CONCEPTS TO EVALUATE THE INTERNAL CONTROL "
540 PRINT
550 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0  "
560 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
570 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
580 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT:PRINT
590 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO 1 IS";E1$
600 T1$=TIME$
610 PRINT
620 PRINT:
630 INPUT "PRESS RETURN WHEN YOU ARE READY TO BEGIN READING SCENARIO 2";R$
640 CLS
650 TIME$="00:00"
660 PRINT "READ SCENARIO 2 AND USE THE INFORMATION PROVIDED AND YOUR KNOWLEDGE O
F"
670 PRINT "INTERNAL CONTROL CONCEPTS TO EVALUATE THE INTERNAL CONTROL"
680 PRINT
690 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0"
700 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
710 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION OF"
720 PRINT "50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT:PRINT
730 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO 2 IS";E2$
740 T2$=TIME$
750 PRINT:PRINT
760 INPUT "PRESS RETURN WHEN YOU ARE READY TO BEGIN READING SCENARIO 3";R$
770 TIME$="00.00":CLS
780 PRINT "READ SCENARIO 3 AND USE THE INFORMATION PROVIDED AND YOUR KNOWLEDGE O
F"
790 PRINT "INTERNAL CONTROL CONCEPTS TO EVALUATE THE INTERNAL CONTROL."
800 PRINT
810 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0 "
820 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
830 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
840 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT:PRINT
850 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO 3 IS";E3$
860 T3$=TIME$:PRINT
870 PRINT:INPUT "PRESS THE RETURN KEY WHEN YOU ARE READY TO BEGIN READING SCENAR
IO 4";R$
880 TIME$="00.00":CLS
890 PRINT "READ SCENARIO 4 AND USE THE INFORMATION PROVIDED AND YOUR KNOWLEDGE O
F"
900 PRINT "INTERNAL CONTROL CONCEPTS TO EVALUATE THE INTERNAL CONTROL.":PRINT
910 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0"
920 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
930 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
940 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT:PRINT
950 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO 4 IS";E4$
960 T4$=TIME$:PRINT
970 PRINT
980 INPUT "PRESS RETURN WHEN YOU ARE READY TO BEGIN READING SCENARIO 5";R$
990 TIME$="00.00":CLS
```

```
1000 PRINT "READ SCENARIO 5 AND USE THE INFORMATION PROVIDED AND YOUR KNOWLEDGE
OF"
1010 PRINT "INTERNAL CONTROL CONCEPTS TO EVALUATE THE INTERNAL CONTROL":PRINT
1020 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0"
1030 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY "
1040 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
1050 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF OCNTROL.":PRINT:PRINT:PRINT
1060 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO 5 IS";E5
$
1070 T5$=TIME$:PRINT
1080 PRINT
1090 PRINT "THIS COMPLETES THE FIRST SESSION." :PRINT
1100 PRINT "PLEASE REMOVE YOUR DISKETTE AND TURN THE COMPUTER OFF."
1110 PRINT "PUT YOUR DISKETTE BACK INTO THE PROTECTIVE SLEEVE AND RETURN IT AND"
1120 PRINT "THE BOOKLET TO THE PROCTOR."
1130 WRITE #2,NUM$,D$,STIME$,T1$,E1$,T2$,E2$,T3$,E3$,T4$,E4$,T5$,E5$
1140 CLOSE #2
1150 SYSTEM
```

```
10 REM Program Name "NONSEC"
20 REM This program was used for the non-expert system groups for the second
30 REM session to collect the data and present the feedback.
40 REM The following program was altered for the group receiving only outcome
50 REM feedback by removing all references to the weakness in internal control
60 REM determined by the partner in charge.
70 REM
80 REM This program was adjusted for sessions three and four by including
90 REM the feedback for the scenarios evaluated during those sessions.
100 REM
110 REM This program checks to see if the previous session has been completed
120 REM before the subject can start the current session.
130 REM
140 CLS
150 OPEN "CHECK1" FOR INPUT AS #1
160 INPUT #1,FST$
170 CLOSE #1
180 IF FST$="EMPTY" GOTO 190 ELSE GOTO 200
190 RUN"SCREEN"
200 OPEN "CHECK2" FOR OUTPUT AS #2
210 SEC$="SECOND"
220 WRITE #2,SEC$
230 CLOSE #2
240 OPEN "SECDT" FOR OUTPUT AS #3
250 PRINT "WELCOME TO THE SECOND SESSION:":PRINT
260 PRINT "DURING THIS SESSION YOU WILL BE PROVIDED WITH 8 SCENARIOS. "
270 PRINT:PRINT
280 PRINT "THE BACKGROUND INFORMATION AND THE ORGANIZATION CHART ARE THE SAME"
290 PRINT "AS IN THE FIRST SESSION BUT THE SCENARIOS ARE DIFFERENT."
300 PRINT "YOU SHOULD TAKE A MOMENT TO REVIEW THE INTRODUCTION AND ORGANIZATION"
```

```
310 PRINT "CHART BEFORE YOU CONTINUE.":PRINT
320 PRINT:PRINT:PRINT:PRINT:PRINT
330 INPUT "PRESS THE RETURN KEY TO VIEW THE NEXT SCREEN.                ";R$
340 CLS
350 PRINT:PRINT
360 PRINT "ONCE YOU HAVE MADE AND ENTERED YOUR EVALUATION OF INTERNAL CONTROL,"
370 PRINT "YOU WILL BE PROVIDED WITH THE EVALUATION MADE BY THE PARTNER IN "
380 PRINT "CHARGE OF THE OVERALL COMPANY AUDIT.  YOU WILL ALSO BE PROVIDED WITH
A"
390 PRINT "STATEMENT OF WHAT THE PARTNER IN CHARGE BELIEVES TO BE THE MAJOR CONT
ROL"
400 PRINT "WEAKNESS(ES) IN THE SCENARIO.  BEFORE YOU PROCEED TO THE NEXT SCENARI
O,"
410 PRINT "YOU SHOULD TAKE A MOMENT TO CONSIDER ANY DIFFERENCE BETWEEN YOUR"
420 PRINT "EVALUATION AND THE EVALUATION OF THE PARTNER.  THE PARTNER"
430 PRINT "IN CHARGE OF THIS AUDIT HAS HAD MANY YEARS OF EXPERIENCE IN THE"
440 PRINT "EVALUATION OF INTERNAL CONTROL AND IS CONSIDERED TO BE AN EXPERT IN "
450 PRINT "THIS FIELD." :PRINT:PRINT
460 INPUT "ENTER YOUR ASSIGNED PROJECT NUMBER";NUM$:PRINT
470 INPUT "WHEN YOU ARE READY TO BEGIN READING SCENARIO 1, PRESS THE RETURN KEY"
;R$
480 D$=DATE$:STIME$=TIME$
490 CLS
500 TIME$="00.00"
510 PRINT "READ SCENARIO 1 AND USE THE INFORMATION PROVIDED AND YOUR KNOWLEDGE O
F "
520 PRINT "INTERNAL CONTROL CONCEPTS TO EVALUATE THE INTERNAL CONTROL "
530 PRINT
540 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0  "
550 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
560 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
570 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT:PRINT
580 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO 1 IS";E1$
590 T1$=TIME$
600 PRINT
610 PRINT "THE EVALUATION MADE BY THE PARTNER IN CHARGE WAS  80 "
620 PRINT
630 PRINT "THE MAJOR INTERNAL CONTROL WEAKNESS IS:" :PRINT
640 PRINT "    EMPLOYEES APPROVE THEIR OWN OVERTIME." :PRINT
650 PRINT "TAKE A MOMENT TO CONSIDER ANY DIFFERENCES BETWEEN YOUR EVALUATION AND
 THE"
660 PRINT "EVALUATION OF THE PARTNER IN CHARGE BEFORE YOU PROCEED TO THE NEXT CA
SE"
670 PRINT:
680 INPUT "PRESS RETURN WHEN YOU ARE READY TO BEGIN READING SCENARIO 2";R$
690 CLS
700 TIME$="00:00"
710 PRINT "READ SCENARIO 2 AND USE THE INFORMATION PROVIDED AND YOUR KNOWLEDGE O
F"
720 PRINT "INTERNAL CONTROL CONCEPTS TO EVALUATE THE INTERNAL CONTROL"
730 PRINT
740 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0"
750 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
```

```
760 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION OF"
770 PRINT "50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT
780 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO 2 IS";E2$
790 T2$=TIME$ :PRINT
800 PRINT "THE EVALUATION MADE BY THE PARTNER IN CHARGE WAS  30 ":PRINT
810 PRINT "THE MAJOR INTERNAL CONTROL WEAKNESSES ARE:":PRINT
820 PRINT "     THE COST DISTRIBUTION CLERK PREPARES THE CHECKS AND HANDLES THE
PAYROLL"
830 PRINT "        REGISTER, PAYROLL DISTRIBUTION VOUCHER AND LABOR DISTRIBUTION
 SUMMARY."
840 PRINT "     THE SUPERVISOR DISTRIBUTES CHECKS, HIRES EMPLOYEES, AND HANDLES
THE"
850 PRINT "        TIMECARDS AND THE JOBCARDS.":PRINT
860 PRINT "TAKE A MOMENT TO CONSIDER ANY DIFFERENCES BETWEEN YOUR EVALUATION AND
 "
870 PRINT "THE EVALUATION OF THE PARTNER IN CHARGE BEFORE YOU PROCEED TO THE NEX
T"
880 PRINT "SCENARIO":PRINT:PRINT
890 INPUT "PRESS RETURN WHEN YOU ARE READY TO BEGIN READING SCENARIO 3";R$
900 TIME$="00.00":CLS
910 PRINT "READ SCENARIO 3 AND USE THE INFORMATION PROVIDED AND YOUR KNOWLEDGE O
F"
920 PRINT "INTERNAL CONTROL CONCEPTS TO EVALUATE THE INTERNAL CONTROL."
930 PRINT
940 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0 "
950 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
960 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
970 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT:PRINT
980 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO 3 IS";E3$
990 T3$=TIME$:PRINT
1000 PRINT "THE EVALUATION MADE BY THE PARTNER IN CHARGE WAS  10  " :PRINT
1010 PRINT "THE MAJOR INTERNAL CONTROL WEAKNESS IS:" :PRINT
1020 PRINT "     THE SUPERVISOR PREPARES THE CHECKS,IS RESPONSIBLE FOR HIRING AN
D"
1030 PRINT "     ALSO APPROVES TIMECARDS AND JOBCARDS.":PRINT
1040 PRINT "TAKE A MOMENT TO CONSIDER ANY DIFFERENCES BETWEEN YOUR EVALUATION AN
D "
1050 PRINT "THE EVALUATION MADE BY THE PARTNER IN CHARGE BEFORE YOU PROCEED TO T
HE "
1060 PRINT "NEXT SCENARIO"
1070 PRINT:INPUT "PRESS THE RETURN KEY WHEN YOU ARE READY TO BEGIN READING SCENA
RIO 4";R$
1080 TIME$="00.00":CLS
1090 PRINT "READ SCENARIO 4 AND USE THE INFORMATION PROVIDED AND YOUR KNOWLEDGE
OF"
1100 PRINT "INTERNAL CONTROL CONCEPTS TO EVALUATE THE INTERNAL CONTROL.":PRINT
1110 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0"
1120 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
1130 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
1140 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT:PRINT
1150 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO 4 IS";E4
$
1160 T4$=TIME$:PRINT
```

```
1170 PRINT "THE EVALUATION MADE BY THE PARTNER IN CHARGE WAS  100  " :PRINT
1180 PRINT "THERE WERE NO MAJOR INTERNAL CONTROL WEAKNESSES.":PRINT
1190 PRINT "TAKE A MOMENT TO CONSIDER ANY DIFFERENCES BETWEEN YOUR EVALUATION AN
D "
1200 PRINT "THE EVALUATION OF THE PARTNER IN CHARGE BEFORE YOU PROCEED TO THE "
1210 PRINT "NEXT SCENARIO" :PRINT
1220 INPUT "PRESS RETURN WHEN YOU ARE READY TO BEGIN READING SCENARIO 5";R$
1230 TIME$="00.00":CLS
1240 PRINT "READ SCENARIO 5 AND USE THE INFORMATION PROVIDED AND YOUR KNOWLEDGE
OF"
1250 PRINT "INTERNAL CONTROL CONCEPTS TO EVALUATE THE INTERNAL CONTROL":PRINT
1260 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0"
1270 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY "
1280 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
1290 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF OCNTROL.":PRINT:PRINT:PRINT
1300 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO 5 IS";E5
$
1310 T5$=TIME$:PRINT
1320 PRINT "THE EVALUATION MADE BY THE PARTNER IN CHARGE WAS 80" :PRINT
1330 PRINT "THE MAJOR INTERNAL CONTROL WEAKNESS IS:":PRINT
1340 PRINT "     BLANK CHECKS ARE NOT CONTROLLED AND THE INTERNAL AUDITOR SIGNS
THE"
1350 PRINT "        CHECKS AND DISTRIBUTES THE CHECKS AT HIS DISCRETION.":PRINT
1360 PRINT "TAKE A MOMENT TO CONSIDER ANY DIFFERENCES BETWEEN YOUR EVALUATION AN
D"
1370 PRINT "THE EVALUATION OF THE PARTNER IN CHARGE BEFORE YOU PROCEED TO THE "
1380 PRINT "NEXT SCENARIO":PRINT
1390 INPUT "PRESS RETURN WHEN YOU ARE READY TO BEGIN READING SCENARIO 6";R$
1400 TIME$="00.00":CLS
1410 PRINT "READ SCENARIO 6 AND USE THE INFORMATION PROVIDED AND YOUR KNOWLEDGE
OF"
1420 PRINT "INTERNAL CONTROL CONCEPTS TO EVALUATE THE INTERNAL CONTROL":PRINT
1430 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0"
1440 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
1450 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
1460 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT:PRINT
1470 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO 6 IS";E6
$
1480 T6$=TIME$:PRINT
1490 PRINT "THE EVALUATION MADE BY THE PARTNER IN CHARGE WAS  40  " :PRINT
1500 PRINT "THE MAJOR INTERNAL CONTROL WEAKNESS IS:":PRINT
1510 PRINT "     THE CASHIER PREPARES AND SIGNS THE PAYROLL CHECKS AND ALSO PREP
ARES"
1520 PRINT "        THE PAYROLL REGISTER.":PRINT
1530 PRINT "TAKE A MOMENT TO CONSIDER ANY DIFFERENCES BETWEEN YOUR EVALUATION"
1540 PRINT "AND THE EVALUATION OF THE PARTNER INN CHARGE BEFORE YOU PROCEED TO T
HE"
1550 PRINT "NEXT SCENARIO"
1560 PRINT: INPUT "PRESS RETURN WHEN YOU ARE READY TO BEGIN READING SCENARIO 7";
R$
1570 TIME$="00.00":CLS
1580 PRINT "READ SCENARIO 7 AND USE THE INFORMATION PROVIDED AND YOUR KNOWLEDGE
OF"
1590 PRINT "INTERNAL CONTROL CONCEPTS TO EVALUATE THE INTERNAL CONTROL.":PRINT
```

```
1600 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0"
1610 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
1620 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
1630 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT:PRINT
1640 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO 7 IS";E7
$
1650 T7$=TIME$:PRINT
1660 PRINT "THE EVALUATION MADE BY THE PARTNER IN CHARGE WAS  90 ":PRINT
1670 PRINT "THE MAJOR INTERNAL CONTROL WEAKNESS IS:":PRINT
1680 PRINT "    THERE IS NO INTERNAL AUDIT FUNCTION AND THERE ARE NO BUDGET CONT
ROLS"
1690 PRINT
1700 PRINT "TAKE A MOMENT TO CONSIDER ANY DIFFERENCES BETWEEN YOUR EVALUATION"
1710 PRINT "AND THE EVALUATION OF THE PARTNER IN CHARGE BEFORE YOU PROCEED TO TH
E"
1720 PRINT "NEXT SCENARIO":PRINT
1730 INPUT "PRESS RETURN WHEN YOU ARE READY TO BEGIN READING SCENARIO 8";R$
1740 TIME$="00.00":CLS
1750 PRINT "READ SCENARIO 8 AND USE THE INFORMATION PROVIDED AND YOUR KNOWLEDGE
OF"
1760 PRINT "INTERNAL CONTROL CONCEPTS TO EVALUATE THE INTERNAL CONTROL.":PRINT
1770 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0"
1780 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
1790 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
1800 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT:PRINT
1810 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO 8 IS";E8
$
1820 T8$=TIME$:PRINT
1830 PRINT "THE EVALUATION MADE BY THE PARTNER IN CHARGE WAS  95 ":PRINT
1840 PRINT "THE MAJOR INTERNAL CONTROL WEAKNESS IS:":PRINT
1850 PRINT "     BLANK CHECKS ARE NOT CONTROLLED AND AN IMPREST PAYROLL BANK ACC
OUNT"
1860 PRINT "        IS NOT BEING USED." :PRINT
1870 PRINT "THIS COMPLETES THE SECOND SESSION." :PRINT
1880 PRINT "PLEASE REMOVE YOUR DISKETTE AND TURN THE COMPUTER OFF."
1890 PRINT "PUT YOUR DISKETTE BACK INTO THE PROTECTIVE SLEEVE AND RETURN IT AND"
1900 PRINT "YOUR BOOKLET TO THE PROCTOR."
1910 WRITE #3,NUM$,D$,STIME$,T1$,E1$,T2$,E2$,T3$,E3$,T4$,E4$,T5$,E5$,T6$,E6$,T7$
,E7$,T8$,E8$
1920 CLOSE #3
1930 SYSTEM
```

```
10 REM Program Name "ESSEC"
20 REM This is the first program for the second session for all groups
30 REM using an expert system.  This program is for the group receiving
40 REM both outcome and task properties feedback.  The only alteration for
50 REM the group receiving only outcome feedback is in line  660  .  The
60 REM statement is altered to eliminate reference to the internal control
```

```
70 REM weakness.
80 REM
90 REM This program checks to see if the first session has been completed
100 REM allowing the subject to start this session.
110 REM
120 REM This program presents an explanation of what the subject is to
130 REM do during this session.  The returns control to the batch program
140 REM which will allow the subject to enter the second session and run
150 REM the expert system.
160 REM
170 REM
180 REM This program is adapted for the third and fourth sessions.  It
190 REM checks at the start of each session to see that the previous
200 REM session has been completed.
210 REM
220 CLS
230 OPEN "CHECK1" FOR INPUT AS #1
240 INPUT #1,FST$
250 CLOSE #1
260 IF FST$="EMPTY" GOTO 270 ELSE GOTO 280
270 RUN"SCREEN"
280 OPEN "CHECK2" FOR OUTPUT AS #2
290 SEC$="SECOND"
300 WRITE #2,SEC$
310 CLOSE #2
320 OPEN "COUNT2" FOR OUTPUT AS #3
330 COUNT=0
340 WRITE #3,COUNT
350 CLOSE #3
360 PRINT:PRINT "WELCOME TO THE SECOND SESSION:":PRINT :PRINT
370 PRINT "DURING THIS SESSION YOU WILL BE PROVIDED WITH 8 SCENARIOS."
380 PRINT:PRINT
390 PRINT "THE BACKGROUND INFORMATION AND THE ORGANIZATION CHART ARE THE SAME"
400 PRINT "AS IN THE FIRST SESSION BUT THE SCENARIOS ARE DIFFERENT."
410 PRINT "YOU SHOULD TAKE A MOMENT TO REVIEW THE INTRODUCTION AND ORGANIZATION"
420 PRINT "CHART BEFORE YOU CONTINUE.":PRINT:PRINT
430 PRINT:PRINT:PRINT:PRINT
440 PRINT "WHEN YOU HAVE COMPLETED YOUR REVIEW AND ARE READY TO VIEW"
450 INPUT "THE NEXT SCREEN PRESS THE RETURN KEY          ";R$
460 CLS:PRINT
470 PRINT "DURING THIS SESSION YOU WILL BE BE PROVIDED WITH AN EXPERT SYSTEM TO
ASSIST"
480 PRINT "YOU IN YOUR EVALUATION OF INTERNAL CONTROL.  AN EXPERT SYSTEM IS AN"
490 PRINT "ADVANCED DECISION AID THAT WAS BUILT USING THE KNOWLEDGE FROM AN EXPE
RT AUDTIOR."
500 PRINT "THE EXPERT SYSTEM WILL ASK YOU QUESTIONS ABOUT THE SCENARIO AND WILL
THEN"
510 PRINT "PROVIDE YOU WITH A SUGGESTED EVALUATION OF THE SCENARIO.  ":PRINT
520 PRINT
530 PRINT "YOU SHOULD HAVE AN INSTRUCTION SHEET THAT DISCUSSES HOW TO USE THE EX
PERT"
540 PRINT "SYSTEM.  PLEASE STOP AND READ IT NOW.  IT IS VERY IMPORTANT THAT YOU"
550 PRINT "FOLLOW THE DIRECTIONS.  REFER BACK TO THE INSTRUCTION SHEET AT ANY TI
ME."
```

```
560 PRINT:PRINT
570 PRINT "YOU SHOULD GO THROUGH THE FOLLOWING STEPS FOR EACH SCENARIO:"
580 PRINT "1.  READ THE SCENARIO CAREFULLY."
590 PRINT "2.  RUN THE EXPERT SYSTEM USING THE INFORMATION FROM THE SCENARIO"
600 PRINT "3.  RUN THE EXPERT SYSTEM AGAIN IF YOU DESIRE (THIS IS ESPECIALLY "
610 PRINT "    IMPORTANT IF YOU THINK YOU HAVE MADE AN ERROR)."
620 PRINT "4.  USE YOUR KNOWLEDGE OF INTERNAL CONTROL, THE INFORMATION IN THE
630 PRINT "    SCENARIO, AND THE ADVISE FROM THE EXPERT SYSTEM TO DETERMINE WHAT
"
640 PRINT "    YOU BELIEVE IS THE CORRECT EVALUATION OF THE SCENARIO."
650 PRINT
660 INPUT "PRESS RETURN TO VIEW THE NEXT SCREEN.";R$
670 CLS
680 PRINT "ONCE YOU HAVE MADE AND ENTERED YOUR EVALUATION OF INTERNAL CONTROL YO
U "
690 PRINT "YOU WILL BE PROVIDED WITH THE EVALUATION MADE BY THE PARTNER IN CHARG
E"
700 PRINT "OF THE OVERALL COMPANY AUDIT.  YOU WILL ALSO BE PROVIDED WITH A"
710 PRINT "STATEMENT OF WHAT THE PARTNER IN CHARGE BELIEVES TO BE THE MAJOR CONT
ROL"
720 PRINT "WEAKNESS(ES) IN THE SCENARIO.  BEFORE YOU PROCEED TO THE NEXT SCENARI
O,"
730 PRINT "YOU SHOULD TAKE A MOMENT TO CONSIDER ANY DIFFERENCE BETWEEN YOUR"
740 PRINT "EVALUATION AND THE EVALUATION OF THE PARTNER.  THE PARTNER"
750 PRINT "IN CHARGE OF THIS AUDIT HAS HAD MANY YEARS OF EXPERIENCE IN THE "
760 PRINT "EVALUATION OF INTERNAL CONTROL AND IS CONSIDERED TO BE AN EXPERT"
770 PRINT "IN THIS FIELD.":PRINT:PRINT:PRINT:PRINT
780 PRINT "WHEN YOU ARE READY TO BEGIN READING SCENARIO 1, PRESS THE RETURN KEY"
790 INPUT "THIS WILL START THE EXPERT SYSTEM CALLED PAYROLL.";R$
800 TIME$="00.00"
810 SYSTEM
```

```
10 REM Program Name "ESSECDT"
20 REM This is the program which will recorded the information from the second
30 REM session and provided feedback to the subject.  The version of this
40 REM program presented to the group receiving only outcome feedback was
50 REM altered so no reference to a statement on internal control weakness
60 REM was present.  No differce existed between expert systems groups.
70 REM
80 REM The first part of the program is the counter which makes sure that the
90 REM right feedback is given for the scenario being evaluated.
100 REM
110 REM This program was altered for sessions three and four by including
120 REM the feedback for the scenarios evaluated in those sessions.
130 REM
140 CLS
150 OPEN "COUNT2" FOR INPUT AS #1
160 INPUT #1,COUNT
170 CLOSE #1
```

```
180 IF COUNT=0 THEN GOTO 300  ELSE GOTO 190
190 IF COUNT=1 THEN GOTO 590    ELSE GOTO 200
200 IF COUNT=2 THEN GOTO 890    ELSE GOTO 210
210 IF COUNT=3 THEN GOTO 1170   ELSE GOTO 220
220 IF COUNT=4 THEN GOTO 1430   ELSE GOTO 230
230 IF COUNT=5 THEN GOTO 1710   ELSE GOTO 240
240 IF COUNT=6 THEN GOTO 1990  ELSE GOTO 250
250 IF COUNT=7 THEN GOTO 2270  ELSE GOTO 260
260 PRINT "YOU HAVE ALREADY EVALUATED ALL EIGHT SCENARIOS FOR THIS SESSION."
270 PRINT "PRESS RETURN TO GO BACK TO THE EXPERT SYSTEM AND THEN ENTER N  "
280 INPUT "TO EXIT THE EXPERT SYSTEM AND RETURN TO THE A).       ";R$
290 SYSTEM
300 D$=DATE$:STIME$=TIME$
310 OPEN "SECDT" FOR OUTPUT AS #3
320 PRINT "USE THE INFORMATION PROVIDED, THE ADVISE FROM THE EXPERT SYSTEM"
330 PRINT "AND YOUR KNOWLEDGE OF INTERNAL CONTROL CONCEPTS TO EVALUATE"
340 PRINT "THE SCENARIO.":PRINT
350 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0  "
360 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
370 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
380 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT:PRINT
390 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO 1 IS";E1$
400 T1$=TIME$
410 WRITE #3,STIME$,D$,E1$,T1$
420 CLOSE #3
430 COUNT=COUNT+1
440 OPEN "COUNT2" FOR OUTPUT AS #11
450 WRITE #11,COUNT
460 CLOSE #11
470 PRINT
480 PRINT "THE EVALUATION MADE BY THE PARTNER IN CHARGE WAS  80 "
490 PRINT
500 PRINT "THE MAJOR INTERNAL CONTROL WEAKNESS IS:" :PRINT
510 PRINT "    EMPLOYEES APPROVE THEIR OWN OVERTIME." :PRINT
520 PRINT "TAKE A MOMENT TO CONSIDER ANY DIFFERENCES BETWEEN YOUR EVALUATION AND
 THE"
530 PRINT "EVALUATION OF THE PARTNER IN CHARGE BEFORE YOU PROCEED TO THE NEXT CA
SE"
540 PRINT:
550 PRINT "PRESS RETURN WHEN YOU ARE READY TO BEGIN READING SCENARIO 2"
560 PRINT "PRESSING THE RETURN KEY WILL TAKE YOU BACK TO THE EXPERT SYSTEM"
570 INPUT "YOU CAN THEN ENTER Y TO USE THE EXPERT SYSTEM FOR THE NEXT SCENARIO."
;R$
580 TIME$="00:00":SYSTEM
590 CLS
600 OPEN "SECDT" FOR APPEND AS #4
610 PRINT "USE THE INFORMATION PROVIDED, THE ADVISE FROM THE EXPERT SYSTEM"
620 PRINT "AND YOUR KNOWLEDGE OF INTERNAL CONTROL CONCEPTS TO EVALUATE"
630 PRINT "THE SCENARIO.":PRINT
640 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0"
650 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
660 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION OF"
670 PRINT "50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT
```

```
680 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO 2 IS";E2$
690 T2$=TIME$ :PRINT
700 WRITE #4,E2$,T2$
710 CLOSE #4
720 COUNT=COUNT+1
730 OPEN "COUNT2" FOR OUTPUT AS #12
740 WRITE #12,COUNT
750 CLOSE #12
760 PRINT "THE EVALUATION MADE BY THE PARTNER IN CHARGE WAS  30 ":PRINT
770 PRINT "THE MAJOR INTERNAL CONTROL WEAKNESSES ARE:":PRINT
780 PRINT "     THE COST DISTRIBUTION CLERK PREPARES THE CHECKS AND HANDLES THE
PAYROLL"
790 PRINT "        REGISTER, PAYROLL DISTRIBUTION VOUCHER AND LABOR DISTRIBUTION
 SUMMARY."
800 PRINT "     THE SUPERVISOR DISTRIBUTES CHECKS, HIRES EMPLOYEES, AND HANDLES
THE"
810 PRINT "        TIMECARDS AND THE JOBCARDS.":PRINT
820 PRINT "TAKE A MOMENT TO CONSIDER ANY DIFFERENCES BETWEEN YOUR EVALUATION AND
 "
830 PRINT "THE EVALUATION OF THE PARTNER IN CHARGE BEFORE YOU PROCEED TO THE NEX
T"
840 PRINT "SCENARIO":PRINT:PRINT
850 PRINT "PRESS RETURN WHEN YOU ARE READY TO BEGIN READING SCENARIO 3"
860 PRINT "PRESSING THE RETURN KEY WILL TAKE YOU BACK TO THE EXPERT SYSTEM."
870 INPUT "YOU CAN THEN ENTER  Y TO RUN THE EXPERT SYSTEM FOR THE NEXT SCENARIO"
;R$
880 TIME$="00.00":SYSTEM
890 CLS
900 OPEN "SECDT" FOR APPEND AS #5
910 PRINT "USE THE INFORMATION PROVIDED, THE ADVISE FROM THE EXPERT SYSTEM "
920 PRINT "AND YOUR KNOWLEDGE OF INTERNAL CONTROL CONCEPTS TO EVALUATE"
930 PRINT "THE SCENARIO.":PRINT
940 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0 "
950 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
960 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
970 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT:PRINT
980 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO 3 IS";E3$
990 T3$=TIME$:PRINT
1000 WRITE #5,E3$,T3$
1010 CLOSE #5
1020 COUNT=COUNT+1
1030 OPEN "COUNT2" FOR OUTPUT AS #13
1040 WRITE #13,COUNT
1050 CLOSE #13
1060 PRINT "THE EVALUATION MADE BY THE PARTNER IN CHARGE WAS  10  " :PRINT
1070 PRINT "THE MAJOR INTERNAL CONTROL WEAKNESS IS:" :PRINT
1080 PRINT "     THE SUPERVISOR PREPARES THE CHECKS,IS RESPONSIBLE FOR HIRING AN
D"
1090 PRINT "     ALSO APPROVES TIMECARDS AND JOBCARDS.":PRINT
1100 PRINT "TAKE A MOMENT TO CONSIDER ANY DIFFERENCES BETWEEN YOUR EVALUATION AN
D "
1110 PRINT "THE EVALUATION MADE BY THE PARTNER IN CHARGE BEFORE YOU PROCEED TO T
HE "
1120 PRINT "NEXT SCENARIO"  :PRINT
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1130 PRINT "PRESS THE RETURN KEY WHEN YOU ARE READY TO BEGIN READING SCENARIO 4"
1140 PRINT "PRESSING THE RETURN KEY WILL TAKE YOU BACK TO THE EXPERT SYSTEM."
1150 INPUT "YOU CAN THEN ENTER  Y TO RUN THE EXPERT SYSTEM FOR THE NEXT SCENARIO
";R$
1160 TIME$="00.00":SYSTEM
1170 CLS
1180 OPEN "SECDT" FOR APPEND AS #6
1190 PRINT "USE THE INFORMATION PROVIDED, THE ADVISE OF THE EXPERT SYSTEM"
1200 PRINT "AND YOUR KNOWLEDGE OF INTERNAL CONTROL CONCEPTS TO EVALAUTE"
1210 PRINT "THE SCENARIO.":PRINT
1220 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0"
1230 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
1240 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
1250 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT:PRINT
1260 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO 4 IS";E4
$
1270 T4$=TIME$:PRINT
1280 WRITE #6,E4$,T4$
1290 CLOSE #6
1300 COUNT=COUNT+1
1310 OPEN "COUNT2" FOR OUTPUT AS #14
1320 WRITE #14,COUNT
1330 CLOSE #14
1340 PRINT "THE EVALUATION MADE BY THE PARTNER IN CHARGE WAS  100  " :PRINT
1350 PRINT "THERE WERE NO MAJOR INTERNAL CONTROL WEAKNESSES.":PRINT
1360 PRINT "TAKE A MOMENT TO CONSIDER ANY DIFFERENCES BETWEEN YOUR EVALUATION AN
D "
1370 PRINT "THE EVALUATION OF THE PARTNER IN CHARGE BEFORE YOU PROCEED TO THE "
1380 PRINT "NEXT SCENARIO" :PRINT
1390 PRINT "PRESS RETURN WHEN YOU ARE READY TO BEGIN READING SCENARIO 5"
1400 PRINT "PRESSING THE RETURN KEY WILL TAKE YOU BACK TO THE EXPERT SYSTEM"
1410 INPUT "YOU CAN THE ENTER   Y TO RUN THE EXPERT SYSTEM FOR THE NEXT SCENARIO
";R$
1420 TIME$="00.00":SYSTEM
1430 CLS
1440 OPEN "SECDT" FOR APPEND AS #7
1450 PRINT "USE THE INFORMATION PROVIDED, THE ADVISE FROM THE EXPERT SYSTEM"
1460 PRINT "AND YOUR KNOWLEDGE OF INTERNAL CONTROL CONCEPTS TO EVALUATE"
1470 PRINT "THE SCENARIO.":PRINT
1480 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0"
1490 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY "
1500 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
1510 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF OCNTROL.":PRINT:PRINT:PRINT
1520 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO 5 IS";E5
$
1530 T5$=TIME$:PRINT
1540 WRITE #7,E5$,T5$
1550 CLOSE #7
1560 COUNT=COUNT+1
1570 OPEN "COUNT2" FOR OUTPUT AS #15
1580 WRITE #15,COUNT
1590 CLOSE #15
1600 PRINT "THE EVALUATION MADE BY THE PARTNER IN CHARGE WAS 80" :PRINT
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1610 PRINT "THE MAJOR INTERNAL CONTROL WEAKNESS IS:":PRINT
1620 PRINT "     BLANK CHECKS ARE NOT CONTROLLED AND THE INTERNAL AUDITOR SIGNS
THE"
1630 PRINT "        CHECKS AND DISTRIBUTES THE CHECKS AT HIS DISCRETION.":PRINT
1640 PRINT "TAKE A MOMENT TO CONSIDER ANY DIFFERENCES BETWEEN YOUR EVALUATION AN
D"
1650 PRINT "THE EVALUATION OF THE PARTNER IN CHARGE BEFORE YOU PROCEED TO THE "
1660 PRINT "NEXT SCENARIO":PRINT
1670 PRINT "PRESS RETURN WHEN YOU ARE READY TO BEGIN READING SCENARIO 6"
1680 PRINT "PRESSING THE RETURN KEY WILL TAKE YOU BACK TO THE EXPERT SYSTEM."
1690 INPUT "YOU CAN THEN ENTER Y TO RUN THE EXPERT SYSTEM FOR THE NEXT SCENARIO"
;R$
1700 TIME$="00.00":SYSTEM
1710 CLS
1720 OPEN "SECDT" FOR APPEND AS #8
1730 PRINT "USE THE INFORMATION PROVIDED, THE ADVISE FROM THE EXPERT SYSTEM"
1740 PRINT "AND YOUR KNOWLEDGE OF INTERNAL CONTROL CONCEPTS TO EVALUATE"
1750 PRINT "THE SCENARIO.":PRINT
1760 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0"
1770 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
1780 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
1790 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT:PRINT
1800 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO 6 IS";E6
$
1810 T6$=TIME$:PRINT
1820 WRITE #8,E6$,T6$
1830 CLOSE #8
1840 COUNT=COUNT+1
1850 OPEN "COUNT2" FOR OUTPUT AS #16
1860 WRITE #16,COUNT
1870 CLOSE #16
1880 PRINT "THE EVALUATION MADE BY THE PARTNER IN CHARGE WAS  40  " :PRINT
1890 PRINT "THE MAJOR INTERNAL CONTROL WEAKNESS IS:":PRINT
1900 PRINT "     THE CASHIER PREPARES AND SIGNS THE PAYROLL CHECKS AND ALSO PREP
ARES"
1910 PRINT "        THE PAYROLL REGISTER.":PRINT
1920 PRINT "TAKE A MOMENT TO CONSIDER ANY DIFFERENCES BETWEEN YOUR EVALUATION"
1930 PRINT "AND THE EVALUATION OF THE PARTNER INN CHARGE BEFORE YOU PROCEED TO T
HE"
1940 PRINT "NEXT SCENARIO":PRINT
1950 PRINT "PRESS RETURN WHEN YOU ARE READY TO BEGIN READING SCENARIO 7"
1960 PRINT "PRESSING THE RETURN KEY WILL TAKE YOU BACK TO THE EXPERT SYSTEM"
1970 INPUT "YOU CAN THEN ENTER  Y TO RUN THE EXPERT SYSTEM FOR THE NEXT SCENARIO
";R$
1980 TIME$="00.00":SYSTEM
1990 CLS
2000 OPEN "SECDT" FOR APPEND AS #9
2010 PRINT "USE THE INFORMATION PROVIDED, THE ADVISE FROM THE EXPERT SYSTEM"
2020 PRINT "AND YOUR KNOWLEDGE OF INTERNAL CONTROL CONCEPTS TO EVALUATE"
2030 PRINT "THE SCENARIO.":PRINT
2040 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0"
2050 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
2060 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
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2070 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT:PRINT
2080 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO 7 IS";E7
$
2090 T7$=TIME$:PRINT
2100 WRITE #9,E7$,T7$
2110 CLOSE #9
2120 COUNT=COUNT+1
2130 OPEN "COUNT2" FOR OUTPUT AS #17
2140 WRITE  #17,COUNT
2150 CLOSE #17
2160 PRINT "THE EVALUATION MADE BY THE PARTNER IN CHARGE WAS  90 ":PRINT
2170 PRINT "THE MAJOR INTERNAL CONTROL WEAKNESS IS:":PRINT
2180 PRINT "    THERE IS NO INTERNAL AUDIT FUNCTION AND THERE ARE NO BUDGET CONT
ROLS"
2190 PRINT
2200 PRINT "TAKE A MOMENT TO CONSIDER ANY DIFFERENCES BETWEEN YOUR EVALUATION"
2210 PRINT "AND THE EVALUATION OF THE PARTNER IN CHARGE BEFORE YOU PROCEED TO TH
E"
2220 PRINT "NEXT SCENARIO":PRINT
2230 PRINT "PRESS RETURN WHEN YOU ARE READY TO BEGIN READING SCENARIO 8"
2240 PRINT "PRESSING THE RETURN KEY WILL TAKE YOU BACK TO THE EXPERT SYSTEM"
2250 INPUT "YOU CAN THEN ENTER  Y TO RUN THE EXPERT SYSTEM FOR THE NEXT SCENARIO
";R$
2260 TIME$="00.00":SYSTEM
2270 CLS
2280 OPEN "SECDT" FOR APPEND AS #10
2290 PRINT "USE THE INFORMATION PROVIDED, THE ADVISE FROM THE EXPERT SYSTEM"
2300 PRINT "AND YOUR KNOWLEDGE OF INTERNAL CONTROL CONCEPTS TO EVALUATE "
2310 PRINT "THE SCENARIO.":PRINT
2320 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0"
2330 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
2340 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
2350 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT:PRINT
2360 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO 8 IS";E8
$
2370 T8$=TIME$:PRINT
2380 WRITE #10,E8$,T8$
2390 CLOSE #10
2400 COUNT=COUNT+1
2410 OPEN "COUNT2" FOR OUTPUT AS #18
2420 WRITE #18,COUNT
2430 CLOSE #18
2440 PRINT "THE EVALUATION MADE BY THE PARTNER IN CHARGE WAS  95 ":PRINT
2450 PRINT "THE MAJOR INTERNAL CONTROL WEAKNESS IS:":PRINT
2460 PRINT "     BLANK CHECKS ARE NOT CONTROLLED AND AN IMPREST PAYROLL BANK ACC
OUNT"
2470 PRINT "        IS NOT BEING USED." :PRINT
2480 PRINT "THIS COMPLETES THE SECOND SESSION." :PRINT
2490 PRINT "PRESS RETURN TO GO BACK TO THE EXPERT SYSTEM AND THEN ENTER ".
2500 PRINT "   N  AT THE PROMPT, THIS WILL RETURN YOU THE THE A>"
2510 PRINT "YOU SHOULD THEN REMOVE THE DISKETTE AND TURN THE COMPUTER OFF."
2520 INPUT "BE SURE TO RETURN BOTH THE DISKETTE AND YOUR BOOKLET TO THE PROCTOR.
";R$
2530 SYSTEM
```

```
10 REM Program Name "LAST"
20 REM This is the program to collect the evaluations and the time for the
30 REM last session.
40 REM Variable names used in this program are:
50 REM           NUM$     Student's assigned project number
60 REM           TIME$    Time for this session
70 REM           DATE$    Date for this session
80 REM           E1$      Evaluation for scenario A (same for B - E )
90 REM           T1$      Time for scenario B (same for B - E )
100 CLS
110 OPEN "LDATA" FOR OUTPUT AS #1
120 PRINT "WELCOME TO THE LAST SESSION."
130 PRINT "PLEASE FOLLOW ALL DIRECTIONS CAREFULLY:  IF YOU HAVE ANY QUESTIONS"
140 PRINT "DURING THIS SESSION, PLEASE ASK THE PROCTOR FOR ASSISTANCE."
150 PRINT:PRINT:PRINT:PRINT
160 PRINT "PLEASE ENTER THE APPROPRIATE INFORMATION WHEN REQUESTED.  WHEN YOU"
170 PRINT "HAVE ENTERED THE INFORMATION PRESS THE RETURN  ( (--' ) KEY."
180 PRINT:PRINT:PRINT:PRINT
190 INPUT "ENTER YOUR ASSIGNED PROJECT NUMBER";NUM$
200 D$=DATE$:STIME$=TIME$
210 CLS
220 PRINT
230 PRINT "MAKE SURE THAT YOU HAVE ENTERED THE REQUIRED INFORMATION ON THE COVER
"
240 PRINT "OF THE BOOKLET.":PRINT
250 PRINT "OPEN THE BOOKLET:  READ THE INTRODUCTION CAREFULLY AND EXAMINE"
260 PRINT "THE ORGANIZATION CHART.  MAKE SURE YOU FULLY UNDERSTAND THE "
270 PRINT "INSTRUCTIONS BEFORE YOU PROCEED.":PRINT
280 PRINT "YOU MAY REFER BACK TO THE INTRODUCTION AND THE ORGANIZATION CHART"
290 PRINT "AT ANY TIME DURING THE SESSION.":PRINT
300 PRINT "EACH SCENARIO IS TO BE EVALUATED SEPARATELY.  YOU SHOULD READ AND"
310 PRINT "EVALUATE EACH SCENARIO BEFORE YOU START ON THE NEXT SCENARIO."
320 PRINT:PRINT
330 PRINT  "PRESS THE RETURN KEY WHEN YOU ARE READY TO BEGIN READING SCENARIO A"
340 PRINT "     (NOTE -- IT IS IMPORTANT THAT YOU PRESS RETURN BEFORE YOU BEGIN
"
350 INPUT "     READING SCENARIO A !!!)";R$
360 TIME$="00.00"
370 CLS
380 PRINT "READ SCENARIO A AND USE THE INFORMATION PROVIDED AND YOUR KNOWLEDGE O
F "
390 PRINT "INTERNAL CONTROL CONCEPTS TO EVALUATE THE INTERNAL CONTROL "
400 PRINT
410 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0  "
420 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
430 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
440 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT:PRINT
450 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO A IS";E1$
460 T1$=TIME$
470 PRINT
480 PRINT:
490 INPUT "PRESS RETURN WHEN YOU ARE READY TO BEGIN READING SCENARIO B";R$
500 CLS
510 TIME$="00:00"
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520 PRINT "READ SCENARIO B AND USE THE INFORMATION PROVIDED AND YOUR KNOWLEDGE O
F"
530 PRINT "INTERNAL CONTROL CONCEPTS TO EVALUATE THE INTERNAL CONTROL"
540 PRINT
550 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0"
560 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
570 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION OF"
580 PRINT "50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT:PRINT
590 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO B IS";E2$
600 T2$=TIME$
610 PRINT:PRINT
620 INPUT "PRESS RETURN WHEN YOU ARE READY TO BEGIN READING SCENARIO C";R$
630 TIME$="00.00":CLS
640 PRINT "READ SCENARIO C AND USE THE INFORMATION PROVIDED AND YOUR KNOWLEDGE O
F"
650 PRINT "INTERNAL CONTROL CONCEPTS TO EVALUATE THE INTERNAL CONTROL."
660 PRINT
670 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0 "
680 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
690 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
700 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT:PRINT
710 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO C IS";E3$
720 T3$=TIME$:PRINT
730 PRINT:INPUT "PRESS THE RETURN KEY WHEN YOU ARE READY TO BEGIN READING SCENAR
IO D";R$
740 TIME$="00.00":CLS
750 PRINT "READ SCENARIO D AND USE THE INFORMATION PROVIDED AND YOUR KNOWLEDGE O
F"
760 PRINT "INTERNAL CONTROL CONCEPTS TO EVALUATE THE INTERNAL CONTROL.":PRINT
770 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0"
780 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY"
790 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
800 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF CONTROL.":PRINT:PRINT:PRINT
810 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO D IS";E4$
820 T4$=TIME$:PRINT
830 PRINT
840 INPUT "PRESS RETURN WHEN YOU ARE READY TO BEGIN READING SCENARIO E";R$
850 TIME$="00.00":CLS
860 PRINT "READ SCENARIO E AND USE THE INFORMATION PROVIDED AND YOUR KNOWLEDGE O
F"
870 PRINT "INTERNAL CONTROL CONCEPTS TO EVALUATE THE INTERNAL CONTROL":PRINT
880 PRINT "YOUR EVALUATION SHOULD BE MADE ON A SCALE OF 0 TO 100, WITH 0"
890 PRINT "INDICATING TOTAL ABSENCE OF CONTROLS AND 100 INDICATING THAT EVERY "
900 PRINT "POSSIBLE CONTROL IS PRESENT AND WORKING PROPERLY.  AN EVALUATION"
910 PRINT "OF 50 WOULD INDICATE A MEDIUM LEVEL OF OCNTROL.":PRINT:PRINT:PRINT
920 INPUT "MY EVALUATION OF INTERNAL CONTROL OVER PAYROLL FOR SCENARIO E IS";E5$
930 T5$=TIME$:PRINT
940 PRINT
950 PRINT "PLEASE REMOVE YOUR DISKETTE AND TURN THE COMPUTER OFF."
960 PRINT "PUT YOUR DISKETTE BACK INTO THE PROTECTIVE SLEEVE.":PRINT
970 PRINT "COMPLETE THE LAST SECTION OF THE BOOKLET.":PRINT:PRINT
980 PRINT "WHEN YOU HAVE COMPLETED THE LAST SECTION OF THE BOOKLET, RETURN"
990 PRINT "YOUR DISKETTE AND THE BOOKLET TO THE PROCTOR."
1000 WRITE #1,NUM$,D$,STIME$,T1$,E1$,T2$,E2$,T3$,E3$,T4$,E4$,T5$,E5$
1010 CLOSE #1
1020 SYSTEM
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APPENDIX F

CORRELATION MATRICES

CONTROL GROUP OUTCOME FEEDBACK ONLY

OBS	SUB1	SUB2	SUB3	SUB4	SUB5	SUB6	SUB7	SUB8	SUB9	SUB10	SUB11	SUB12
1	0.531885	.	.	.	.	.	.	.	.	.	.	.
2	-.783884	-.444132	.	.	.	.	.	.	.	.	.	.
3	0.557656	0.95837	-.609426	.	.	.	.	.	.	.	.	.
4	0.520688	0.474853	-.898363	0.694851	.	.	.	.	.	.	.	.
5	-.025231	0.607131	0.350325	0.371615	-.382003	.	.	.	.	.	.	.
6	0.319288	0.844018	-.594598	C.92473	0.75578	0.278176	.	.	.	.	.	.
7	0.898238	0.78685	-0.76408	0.772055	0.55418	0.285965	0.614989	.	.	.	.	.
8	0.373408	-.037247	-.100777	.0384268	0.11383	-.353445	-0.24521	.0170227	.	.	.	.
9	0.820635	0.709327	-.555191	0.638461	0.300572	0.356012	0.364934	0.917535	0.290058	.	.	.
10	0.288445	0.897891	-.108214	0.760873	.0956452	0.881284	0.667892	0.630559	-.315822	0.582776	.	.
11	-.427668	-.175014	0.21782	-.020635	0.163603	-.376821	.0177257	-.551894	0.504421	-.498163	-.374973	.
12	0.297837	0.607897	0.101692	0.368205	-.306038	0.910328	0.220192	0.545628	-.331704	0.614473	0.851137	-.689057
13	0.748455	0.836615	-.617007	0.892257	0.502684	0.507208	0.751566	0.949158	-.058953	0.863883	0.826917	-.443203
14	0.680991	0.851372	-.446388	0.861698	0.342055	0.6471	0.678971	0.885415	-.008321	0.868284	0.882787	-.408838
15	0.490152	0.8757	-.185564	0.712422	.0713656	0.840362	0.556806	0.757735	-.202636	0.761884	0.851448	-0.52852
16	0.834368	0.807824	-.678634	0.805456	0.687582	0.351774	0.710108	0.837071	0.203131	0.802081	0.70224	-.269483
17	0.245782	0.878828	-.267338	0.788154	0.28017	0.743472	0.814224	0.660303	-0.607	0.464328	0.845888	-.386896
18	.0363686	0.841669	0.015705	0.722883	.0881306	0.854786	0.720173	0.424448	-.388587	0.33512	0.852966	-0.16614
19	0.876226	0.814272	-.165614	0.638164	-.013777	0.787688	0.387802	0.748655	.0113467	0.846332	0.878686	-.501161
20	0.814815	0.472885	-.719681	0.601115	0.680082	-.267441	0.369189	0.628092	0.723478	0.68264	.0782081	0.176454
21	-.180204	0.658716	0.148606	0.399161	-.125876	0.835786	0.608332	0.272656	-.770202	0.119517	0.826123	-.449735
22	0.613825	0.468531	-.253634	0.288766	-.107198	0.670608	0.129418	0.738714	-.269068	0.766328	0.613238	-.916602
23	0.748111	0.585828	-.466407	0.458133	0.128956	0.478924	0.302725	0.874238	-.212416	0.850776	0.634435	-.866002
24	-.840168	-.037247	0.62404	-.065874	-.214268	0.322871	0.213773	-.527703	-.632353	-.690138	0.183346	0.280215

OBS	SUB13	SUB14	SUB15	SUB16	SUB17	SUB18	SUB19	SUB20	SUB21	SUB22	SUB23	SUB24	SUB25
1	.	.	.	.	.	.	.	.	.	.	.	.	.
2	.	.	.	.	.	.	.	.	.	.	.	.	.
3	.	.	.	.	.	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.	.	.	.	.	.
5	.	.	.	.	.	.	.	.	.	.	.	.	.
6	.	.	.	.	.	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.	.	.	.	.
11	.	.	.	.	.	.	.	.	.	.	.	.	.
12	.	.	.	.	.	.	.	.	.	.	.	.	.
13	0.85532	.	.	.	.	.	.	.	.	.	.	.	.
14	0.752838	0.876417	.	.	.	.	.	.	.	.	.	.	.
15	0.813934	0.887045	0.848684	.	.	.	.	.	.	.	.	.	.
16	0.800025	0.962362	0.83878	0.782843	.	.	.	.	.	.	.	.	.
17	0.71855	0.818826	0.824667	0.870037	0.566015	.	.	.	.	.	.	.	.
18	0.707358	0.880681	0.751153	0.833347	0.649319	0.835708	.	.	.	.	.	.	.
19	0.802808	0.846324	0.831825	0.867477	0.788801	0.720722	0.71025	.	.	.	.	.	.
20	-.117748	0.535826	0.482918	0.187628	0.738544	.0271745	-.054554	0.30612	.	.	.	.	.
21	0.74568	0.478623	0.524032	0.712595	0.24607	0.872864	0.868158	0.542344	-.456879	.	.	.	.
22	0.858456	0.688405	0.658679	0.780202	0.550226	0.53806	0.3669	0.795829	.0800641	0.47886	.	.	.
23	0.784526	0.80852	0.78598	0.78804	0.709547	0.587425	0.386186	0.801264	0.262188	0.432038	0.971625	.	.
24	-.017468	-.288404	-.247244	-.073769	-.442108	0.284818	0.446891	-.267192	-.723478	0.58326	-.403604	-.472034	.

CONTROL GROUP OUTCOME AND TASK PROPERTIES FEEDBACK

OBS	SUB1	SUB2	SUB3	SUB4	SUB5	SUB6	SUB7	SUB8	SUB9	SUB10	SUB11
1	0.188348	.	.	.	.	.	.	.	.	.	.
2	0.856763	0.578501	.	.	.	.	.	.	.	.	.
3	0.677229	0.356348	0.309756	.	.	.	.	.	.	.	.
4	0.909038	0.182574	0.513651	0.828515	.	.	.	.	.	.	.
5	0.857844	0.657462	0.805681	0.644658	0.789024	.	.	.	.	.	.
6	0.690081	0.126186	0.372025	0.936801	0.907182	0.565204	.	.	.	.	.
7	0.801451	0.736784	0.962837	0.49163	0.860861	0.885625	0.477702	.	.	.	.
8	0.536208	-.095728	0.721166	-.076753	0.484898	0.4682	0.148336	0.528277	.	.	.
9	0.743558	0.828882	0.953429	0.525113	0.800222	0.893674	0.584102	0.868617	0.890851	.	.
10	0.758684	.0807134	0.109138	0.827578	0.817858	0.551616	0.884501	0.261026	-.046359	0.367999	.
11	0.234894	0.242624	0.104148	-.346834	-.177187	0.303463	-.510888	.0767844	0.209032	.0434603	-.208885
12	0.663282	0.407308	.0486818	0.641688	0.469668	0.629123	0.402959	0.239148	-.203163	0.228959	0.733639
13	0.267131	0.641785	0.777668	0.528469	0.626844	0.568832	0.561643	0.840659	0.248795	0.76411	0.202832
14	0.706182	0.757226	0.886568	0.454257	0.632568	0.85924	0.375188	0.946505	0.511585	0.908977	0.300755
15	0.390178	0.251062	0.547417	-.327224	.0828842	0.488764	-.339662	0.427751	0.685452	0.451182	-.272594
16	-.305308	0.706167	-.042794	-.182428	-.485369	.0946286	-.505603	.0820217	-.485121	-.161834	-.328567
17	0.928606	-.123081	0.475644	0.614088	0.821406	0.65361	0.748127	0.447887	0.630405	0.663535	0.7352
18	0.678472	0.549007	0.877365	0.483007	0.760178	0.880765	0.558278	0.869508	0.681116	0.885708	0.308413
19	-.048018	0.872928	0.678944	-.022669	-.030971	0.460328	-.143752	0.722246	0.143107	0.518183	-.338878
20	0.842457	0.288404	0.88517	0.504184	0.868885	0.845731	0.520853	0.842111	0.803415	0.859037	0.442852
21	-.052878	0.444444	0.772667	-.089087	0.121716	0.280673	.0288889	0.687344	0.502571	0.612948	-.380116
22	0.739313	0.614192	0.941832	0.806092	0.807377	0.921181	0.626022	0.975621	0.58343	0.890162	0.427085

OBS	SUB12	SUB13	SUB14	SUB15	SUB16	SUB17	SUB18	SUB19	SUB20	SUB21	SUB22	SUB23
1	.	.	.	.	.	.	.	.	.	.	.	.
2	.	.	.	.	.	.	.	.	.	.	.	.
3	.	.	.	.	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.	.	.	.	.
5	.	.	.	.	.	.	.	.	.	.	.	.
6	.	.	.	.	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.	.	.	.
11	.	.	.	.	.	.	.	.	.	.	.	.
12	0.425343	.	.	.	.	.	.	.	.	.	.	.
13	- 431375	-.051724	.	.	.	.	.	.	.	.	.	.
14	0.356561	0 45966	0.534631	.	.	.	.	.	.	.	.	.
15	0 833692	0.138018	- 068002	0.808137	.	.	.	.	.	.	.	.
16	0 531835	0.30388	- 018346	0.228088	0 227052	.	.	.	.	.	.	.
17	-.013273	0 411645	0.210139	0.480122	0.233682	-.640836	.	.	.	.	.	.
18	0	C.158178	0.809115	0.886806	0.427778	-.145862	0.505488	.	.	.	.	.
19	0.210364	-.050812	0.671866	0.670919	0.394976	0.620084	-.283633	0.569868	.	.	.	.
20	.0601028	0.231518	0.598394	0.815516	0.478344	-.375188	0.828568	0.937772	0.278188	.	.	.
21	-.206878	-.521642	0.785111	0.484843	0.262525	.0138462	-.054707	0.680768	0.786904	0.468048	.	.
22	0203785	0.307897	0.802955	0.826562	0.38217	-.083734	0.628077	0.886064	0.55301	0.82369	0.582695	.

QUESTIONNAIRE GROUP OUTCOME FEEDBACK ONLY

OBS	SUB1	SUB2	SUB3	SUB4	SUB5	SUB6	SUB7	SUB8	SUB9	SUB10	SUB11
1	0.618793	.	.	.	.	.	.	.	.	.	.
2	0.414729	0.980153	.	.	.	.	.	.	.	.	.
3	0.61871	0.852416	0.887743	.	.	.	.	.	.	.	.
4	0.672181	0.405621	0.225708	0.533102	.	.	.	.	.	.	.
5	0.446556	0.700853	0.783615	0.458279	-.028676	.	.	.	.	.	.
6	0.451087	0.687314	0.730347	0.643593	-.109568	0.600904	.	.	.	.	.
7	0.724456	0.547787	0.411248	0.72592	0.643317	.0203133	0.556538	.	.	.	.
8	0.136062	0.804342	0.856557	0.798648	.0576338	0.718521	0.61696	0.188387	.	.	.
9	0.185783	-.034782	-.187665	0.114625	0.815793	-.420161	-.836078	0.200601	-.230616	.	.
10	0.158776	0.837355	0.715641	0.385278	.0381456	0.869245	0.22855	-.242731	0.756372	-.121136	.
11	0.710854	0.891242	0.540649	0.779931	0.940502	0.221986	0.166461	0.716432	0.383413	0.636863	0.25559
12	-.035395	0.781047	0.883412	0.645134	-.146689	0.727945	0.563969	-.008188	0.87425	-.359075	0.790639
13	0.469084	0.477157	0.385522	0.422326	0.772522	0.362963	-.231551	0.137067	0.317172	0.68841	0.593053
14	0.43492	0.968772	0.877641	0.857541	0.327068	0.804165	0.587136	0.337082	0.937162	-.051979	0.807717
15	-.456618	0.156113	0.127602	0.187727	0.25465	-.183308	-.494704	-.255202	0.317734	0.587385	0.297584
16	0.484248	.0884093	-0.06848	0.156323	0.89194	-.108452	-0.48795	0.253459	-.187317	0.909282	.0784063
17	.0533858	0.689352	0.726335	0.518142	0.224834	0.888784	0.10351	-.153619	0.794718	0.136558	0.942507
18	0.800018	0.990492	0.9449	0.865448	0.524798	0.65248	0.639486	0.619263	0.842848	.0759291	0.589133
19	0.437857	0.189486	.03492948	0.47093	0.597711	-.428225	0.233328	0.893413	-.116443	0.378625	-.594861
20	0.243198	0.807376	0.867058	0.922261	0.462832	0.4331	0.410206	0.443545	0.877348	0.220335	0.5587
21	-.074218	0.858416	0.630833	0.354128	.0341746	0.882638	.0342756	-.360982	0.743421	.0271313	0.850873

OBS	SUB12	SUB13	SUB14	SUB15	SUB16	SUB17	SUB18	SUB19	SUB20	SUB21	SUB22
1	.	.	.	.	.	.	.	.	.	.	.
2	.	.	.	.	.	.	.	.	.	.	.
3	.	.	.	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.	.	.	.
5	.	.	.	.	.	.	.	.	.	.	.
6	.	.	.	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.	.	.
11	.	.	.	.	.	.	.	.	.	.	.
12	0.178051	.	.	.	.	.	.	.	.	.	.
13	0.779885	0.208837	.	.	.	.	.	.	.	.	.
14	0.614533	0.861384	0.58088	.	.	.	.	.	.	.	.
15	0.271883	0.318748	0.487275	0.238248	.	.	.	.	.	.	.
16	0.732828	-.328429	0.841226	.0865134	0.340114	.	.	.	.	.	.
17	0.428845	0.79368	0.716864	0.835814	0.588838	0.235702	.	.	.	.	.
18	0.781577	0.706412	0.847762	0.946172	0.186583	0.208716	0.658988	.	.	.	.
19	0.558264	-.307578	-0.02888	-0.03634	-.114383	0.276283	-.424293	0.284097	.	.	.
20	0.710148	0.788464	0.837089	0.88226	0.833864	0.188818	0.73598	0.902385	0.237369	.	.
21	0.228883	0.780886	0.807072	0.73846	0.567804	0.109268	0.976843	0.507345	-.600131	0.613018	.

QUESTIONNAIRE GROUP OUTCOME AND TASK PROPERTIES FEEDBACK

OBS	SUB1	SUB2	SUB3	SUB4	SUB5	SUB6	SUB7	SUB8	SUB9	SUB10	SUB11	SUB12
1	0.863674	.	.	.	.	.	.	.	.	.	.	.
2	0.472466	0.367806	.	.	.	.	.	.	.	.	.	.
3	0.87735	0.112367	-.327327	.	.	.	.	.	.	.	.	.
4	0.466252	0.834866	0.286368	0.201683	.	.	.	.	.	.	.	.
5	0.422677	-.384771	-.118788	0.44785	-.581529	.	.	.	.	.	.	.
6	0.880705	0.872817	0.378267	0.508475	0.821252	0	.	.	.	.	.	.
7	0.898378	0.16334	-0.26434	0.942168	0.130435	0.668894	0.558951	.	.	.	.	.
8	0.511496	0.146006	-.451087	0.884374	0.222587	0.445703	0.481428	0.938045	.	.	.	.
9	0.228419	-0.47114	-.144773	0.70766	-.282887	0.824428	-.024534	0.584343	0.806044	.	.	.
10	0.848683	0.482366	0.607872	0.63801	0.478186	0.334077	0.83561	0.863488	0.538164	0.436051	.	.
11	0.844911	0.58848	0.285714	0.783783	0.572737	0.319438	0.907841	0.783021	0.708866	0.378408	0.856183	.
12	0	0.276956	0.658071	-.884653	0.267238	-.834522	.0832982	-.700349	-.786309	-0.40577	0.0625	-.145404
13	0.788941	0.831848	0.288192	0.678721	0.876141	-.127284	0.964715	0.541736	0.557619	.0957007	0.818497	0.894575
14	0.312348	-.091186	-.059028	.0450835	-.418694	0.758948	.0250078	0.364082	.0788822	-.155531	.0483865	.0885422
15	0	0.123091	0.273807	0.152145	0.436182	-.834522	0.16879	-.147442	.0629026	0.391639	0.291667	0.199205
16	0.648507	0.445861	0.857894	0.124805	0.488907	-.108618	0.605758	.0705525	-.014743	0.226216	0.786124	0.612781
17	0.908446	0.621261	0.478457	0.624281	0.851141	0.137856	0.900311	0.608859	0.544248	0.356887	0.875017	0.959716
18	0.81541	0.586708	0.400855	0.658088	0.89194	.0275658	0.861763	0.577884	0.578348	0.409775	0.928278	0.924588
19	0.280484	0.880705	-.053007	.0539782	0.787736	-.426894	0.643759	0.122058	0.185783	-.641742	0.118262	0.318039
20	0.220326	0.823314	-.208189	0.180808	0.811548	-.456214	0.617408	0.195183	0.308036	-.502877	0.10451	0.333102
21	0.307148	0.370627	-.454363	0.354663	0.16489	0.337463	0.368872	0.558512	0.481788	-.301177	.0485643	0.280227
22	0.187642	-.030773	-.747018	0.684653	-.101365	0.561226	0.158241	0.77407	0.781788	0.230138	0.0625	0.298807
23	0.28874	0.778504	0.836718	-.486648	0.813318	-.472662	0.487849	-.364314	-0.47511	-.797371	0.147347	0.121925
24	0.525879	0.417584	0.875796	0.242893	0.578654	-0.25778	0.572615	.0482692	0.114767	0.341623	0.731709	0.596291

OBS	SUB13	SUB14	SUB15	SUB16	SUB17	SUB18	SUB19	SUB20	SUB21	SUB22	SUB23	SUB24	SUB25
1	.	.	.	.	.	.	.	.	.	.	.	.	.
2	.	.	.	.	.	.	.	.	.	.	.	.	.
3	.	.	.	.	.	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.	.	.	.	.	.
5	.	.	.	.	.	.	.	.	.	.	.	.	.
6	.	.	.	.	.	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.	.	.	.	.
11	.	.	.	.	.	.	.	.	.	.	.	.	.
12	.	.	.	.	.	.	.	.	.	.	.	.	.
13	.0398808	.	.	.	.	.	.	.	.	.	.	.	.
14	-.339532	-.212821	.	.	.	.	.	.	.	.	.	.	.
15	0.375	0.388348	-.825995	.	.	.	.	.	.	.	.	.	.
16	0.632317	0.626363	-.320719	0.803834	.	.	.	.	.	.	.	.	.
17	0.100369	0.815773	-0.1133	0.411037	0.788808	.	.	.	.	.	.	.	.
18	.0773586	0.826367	-0.28016	0.550091	0.782522	0.881991	.	.	.	.	.	.	.
19	-.014783	0.800823	.0146014	-.137873	-.026285	0.26453	0.256155	.	.	.	.	.	.
20	-.148056	0.628829	-.120432	-.017418	-.080857	0.271731	0.301823	0.872289	.	.	.	.	.
21	-.831336	0.237815	0.847573	-.712276	-.478048	.0446557	-.030064	0.83751	0.815422	.	.	.	.
22	-.853125	0.124743	0.483865	-.510417	-.583958	0.028677	.0128928	0.243918	0.330848	0.825593	.	.	.
23	0.685731	0.366087	0.060378	-.079341	0.380501	0.223626	0.147301	0.655472	0.488038	0.118897	-.447708	.	.
24	0.523837	0.875888	-.574898	0.814858	0.945806	0.783648	0.837031	-.015733	.0046348	-.542715	-.515522	0.232218	.

EXPERT SYSTEMS GROUP NO EXPLANATORY CAPABILITY
OUTCOME FEEDBACK ONLY

OBS	SUB1	SUB2	SUB3	SUB4	SUB5	SUB6	SUB7	SUB8	SUB9	SUB10	SUB11
1	-.495729	.	.	.	.	.	.	.	.	.	.
2	-.538537	0.735585	.	.	.	.	.	.	.	.	.
3	-.343415	-.379532	-.697222	.	.	.	.	.	.	.	.
4	0.759763	-.242314	-.382586	-.382586	.	.	.	.	.	.	.
5	.0551039	0.394314	-.049028	-.130744	0.625959	.	.	.	.	.	.
6	-.317812	0.880218	0.344031	-.147442	.0218748	0.683878	.	.	.	.	.
7	0.238958	0.862763	0.153456	-.413684	0.235044	0.455354	0.779117	.	.	.	.
8	0.518525	-.675487	-.704182	0.388514	-.070178	-.590503	-.558512	-.108871	.	.	.
9	0.41782	-.888621	-.871784	0.628828	.0360741	-.437237	-.882724	-.439388	0.882843	.	.
10	0.349045	-0.63078	-.714288	0.559017	-.207908	-.884708	-.494535	-.149191	0.977338	0.894792	.
11	0.731888	-.245009	-.159729	-.589768	0.942552	0.462652	-.130435	0.106243	-.157529	-.075858	-0.32969
12	-.720088	0.883765	0.546489	0.012563	-.287117	0.532181	0.877995	0.416418	-.739456	-.749777	-.618017
13	0.17852	0.254084	0.27031	-.589768	0.720061	0.751809	0.304348	0.185267	-.730362	-0.58158	-.824226
14	0.15795	0.103793	-.354387	0.317735	-.272255	-.201319	0.259463	0.551835	0.633841	0.339522	0.683152
15	0.927374	-0.32692	-.567282	-.223475	0.592383	.0404557	-.106452	0.478963	0.631137	0.424529	0.499704
16	0.479836	-.833504	-.873018	0.64868	0.225919	-.171353	-.515288	-.311616	0.798496	0.960362	0.814051
17	0.474557	-.887023	-.841336	0.557388	-.008164	-.404383	-0.43748	-.081538	0.863517	0.920712	0.974614
18	0.910482	-.512477	-.414022	-.338288	0.435672	-.337683	-.478878	0.166578	0.702935	0.488007	0.538089
19	-.376746	0.625274	.0773566	0.292236	-.449947	0.141595	0.728958	0.644122	.0300541	-.184576	0.153755
20	0.738426	-.641228	-.783368	0.10108	0.868034	0.480628	-.145308	.0424876	0.272442	0.468046	0.197768
21	0.872718	-.182983	-.323842	-.419218	0.462167	-.100901	-.092716	0.544858	0.577457	0.264706	0.426092
22	0.144581	0849861	0.300123	-.342887	-.443868	-0.73884	-.202288	0.233426	0.44876	0284118	0.383482

OBS	SUB12	SUB13	SUB14	SUB15	SUB16	SUB17	SUB18	SUB19	SUB20	SUB21	SUB22	SUB23
1	.	.	.	.	.	.	.	.	.	.	.	
2	.	.	.	.	.	.	.	.	.	.	.	
3	.	.	.	.	.	.	.	.	.	.	.	
4	.	.	.	.	.	.	.	.	.	.	.	
5	.	.	.	.	.	.	.	.	.	.	.	
6	.	.	.	.	.	.	.	.	.	.	.	
7	.	.	.	.	.	.	.	.	.	.	.	
8	.	.	.	.	.	.	.	.	.	.	.	
9	.	.	.	.	.	.	.	.	.	.	.	
10	.	.	.	.	.	.	.	.	.	.	.	
11	.	.	.	.	.	.	.	.	.	.	.	
12	-.377871	.	.	.	.	.	.	.	.	.	.	
13	0.782608	0.233391	.	.	.	.	.	.	.	.	.	
14	-.475883	0.005527	-.891802	.	.	.	.	.	.	.	.	
15	0.488639	-.567548	-.045622	0.508704	.	.	.	.	.	.	.	
16	.0488453	-.848818	-.421808	0.343822	0.485652	.	.	.	.	.	.	
17	-.174255	-.829285	-.893311	0.669292	0.812087	0.897802	.	.	.	.	.	
18	0.473388	-.822876	-.141481	0.304452	0.884277	0.437725	0.577072	.	.	.	.	
19	-.653921	0.63752	-.425808	0.7714	-.010838	-.139274	0.125789	-.313567	.	.	.	
20	0.704185	-.640007	0.368859	-.038911	0.833354	0.659363	0.403182	0.434431	-.344044	.	.	
21	0.428883	-.534324	-.075858	0.507187	0.965181	0.278254	0.488465	0.818645	.0117925	0.403039	.	
22	-.303433	-.284398	-.656294	0.477846	0.28302	-.177088	0.232873	0.513891	0.184570	-.533052	0.519608	

EXPERT SYSTEMS GROUP NO EXPLANATORY CAPABILITY
OUTCOME AND TASK PROPERTIES FEEDBACK

OBS	SUB1	SUB2	SUB3	SUB4	SUB5	SUB6	SUB7	SUB8	SUB9	SUB10	SUB11
1	-.884366	.	.	.	.	.	.	.	.	.	.
2	-0.40886	0	.	.	.	.	.	.	.	.	.
3	.0852435	0.583363	-.054361	.	.	.	.	.	.	.	.
4	-0.30747	-.086421	0.784118	-.117782	.	.	.	.	.	.	.
5	-.426418	0.88348	-.025434	0.780611	-.288252	.	.	.	.	.	.
6	-.728817	0.860073	-.285635	0.186732	-.253898	0.638552	.	.	.	.	.
7	0.207823	0.280593	0.144439	0.783237	-.265581	0.664276	-.138765	.	.	.	.
8	0.467707	-.036084	.0858706	0.630521	0.383482	.0358253	-.393113	0.332607	.	.	.
9	0.475595	-.459627	0.574663	0.229023	0.538746	-.262965	-.837134	0.397146	0.690732	.	.
10	-.207781	0.847883	-.298151	0.870478	-.331278	0.910988	0.629149	0.552091	0.280757	-0.27509	.
11	0.937515	-.644402	-.672602	-.054623	-.489165	-.455908	-.514645	-0.01227	0.272391	0.154315	-.188248
12	.0363896	-.549972	-.260827	-.827557	-.260927	-.655853	-.078836	-.676245	-.748455	-.433341	-.717101
13	-.345834	0.560316	0	0.387245	-.537576	0.789089	0.437291	0.659018	-.431331	-.323183	0.530974
14	-.315244	0.319221	0.226166	0.171581	-0.39579	0.575325	0.195238	0.617146	-.516047	-.144997	0.229267
15	-.110264	0.774139	-.158213	0.860116	-.197766	0.882458	0.452413	0.665439	0.46414	-.038641	0.971203
16	0.159719	0.517549	-.045835	0.98635	-0.18334	0.766295	.0989178	0.864063	0.597614	0.279859	0.826016
17	0	-.495434	0.767836	-0.37732	0.4022	-.347804	-.631273	0.1506	-.178774	0.58045	-.658933
18	-.193327	0.727821	-.277398	0.728184	-.581781	0.9382	0.55875	0.711901	-0.06028	-.338746	0.874848
19	-.133631	0.32476	0.383482	0.506484	-.191741	0.654846	-0.02069	0.882396	-0.0625	0.245854	0.367144
20	0.211728	0.378332	.0450076	0.889402	-.270045	0.725867	-.046138	0.978301	0.441343	0.349005	0.683526
21	-.071428	-.354898	0.573944	-.350446	0.92241	-.608584	-.398137	-0.51631	0.367484	0.500626	-.554109
22	0.319438	0	0.18334	0.522413	-.320844	0.435986	-.346212	0.936673	0.149404	0.447774	0.25813

OBS	SUB12	SUB13	SUB14	SUB15	SUB16	SUB17	SUB18	SUB19	SUB20	SUB21	SUB22	SUB23
1	.	.	.	.	.	.	.	.	.	.	.	.
2	.	.	.	.	.	.	.	.	.	.	.	.
3	.	.	.	.	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.	.	.	.	.
5	.	.	.	.	.	.	.	.	.	.	.	.
6	.	.	.	.	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.	.	.	.
11	.	.	.	.	.	.	.	.	.	.	.	.
12	0.245912	.	.	.	.	.	.	.	.	.	.	.
13	-.361068	-.180764	.	.	.	.	.	.	.	.	.	.
14	-.387804	-.040128	0.838045	.	.	.	.	.	.	.	.	.
15	-0.16894	-.858188	0.467128	0.187827	.	.	.	.	.	.	.	.
16	0	-.894575	0.451087	0.26434	0.824588	.	.	.	.	.	.	.
17	-.228042	0.194625	0514073	0.388596	-.340882	- 284901	.	.	.	.	.	.
18	-.178416	-.482187	0.858028	0.638925	0.820703	0.749306	-0.39083	.	.	.	.	.
19	-.338827	-.442265	0.835704	0.884652	0.438354	0.587514	0.41714	0.863084	.	.	.	.
20	.0150749	-.773282	0 803261	0.498228	0 780881	0.94688	-.032638	0.758365	0.783439	.	.	.
21	-.184882	0	-.806947	-.650191	-.441054	-0.41527	0.331271	-.837751	-.501115	-.514945	.	.
22	.0852885	-.406825	0.644424	0.704907	0.369835	0.642857	0.398862	0.547571	0.896421	0.853361	-.511101	.

EXPERT SYSTEMS GROUP WITH EXPLANATORY CAPABILITY
OUTCOME FEEDBACK ONLY

OBS	SUB1	SUB2	SUB3	SUB4	SUB5	SUB6	SUB7	SUB8	SUB9	SUB10	SUB11
1	-.345194	.	.	.	.	.	.	.	.	.	.
2	0.313361	-.769211	.	.	.	.	.	.	.	.	.
3	-.053847	-.811854	0.313305	.	.	.	.	.	.	.	.
4	-.158841	0.944388	-.628013	-.884686	.	.	.	.	.	.	.
5	-.463457	-.600714	0.53598	0.677278	-.594679	.	.	.	.	.	.
6	-.028388	0.206836	0.19686	-.456306	.0821995	-.265489	.	.	.	.	.
7	-.276088	-.689807	0.410146	0.642866	-.662162	0.922025	-.575388	.	.	.	.
8	-.140625	0.719611	-.893669	-.394377	0.523114	-.739184	0.176777	-.668424	.	.	.
9	-.164978	-0.30748	-.298549	0.747534	-.366519	0.371654	-.829561	0.664448	.0274963	.	.
10	-0.17325	-.856443	0.898338	0.904085	-.877204	0.898899	-.283177	0.825402	-0.883	0.498577	.
11	0.859313	-.608516	0.318141	0.383127	-.432096	-.097641	-0.50871	0.189786	-.309752	0.325296	0.222056
12	-0.84481	-.189039	0.168475	0.458798	-.357673	0.817045	0743808	0.632806	-.288273	0.239101	0.845168
13	0.279508	-.633138	0.834282	0.481621	-.648844	0.882135	-.168114	0.648844	-0.87828	0	0.728442
14	-0.22964	0.638263	-.890765	-.205174	0.618853	-.344881	-0.57735	-.142374	0.612372	0.493915	-0.4546
15	-.133631	0.874733	-.689984	-.748341	0.963123	-.514271	-.188982	-.497096	0.467707	-.137176	-.785172
16	0.167038	-.273354	-.248146	0.498894	-.497096	-.213234	.0377964	-.031068	0.467707	0.411527	0.161467
17	0.467707	-.523278	.0496282	0.556459	-.652438	-.175605	0	.0310685	0.200448	0.333141	0.262779
18	-.220168	-.351323	-.186356	0.765804	-.371412	0.515209	-.858927	0.776155	-.136245	0.879125	0.581799
19	-.489378	-.420725	0.146972	0.714359	-0.4206	0.877338	-.639602	0.84635	-.489956	0.724033	0.780427
20	0.684469	.0881602	-.374724	-.052884	0.188884	-.582841	-.556937	-.249814	0.321037	0.338201	-.374407
21	-.428948	.0888401	-0.38083	0.258041	-.240781	-.075258	0.377964	-0.10874	0.592986	0.181268	.0696523
22	-.473848	-.654112	0.395273	0.85008	-0.75007	0.827202	-0.23516	0.804723	-.523837	0.531638	0.946381

OBS	SUB12	SUB13	SUB14	SUB15	SUB16	SUB17	SUB18	SUB19	SUB20	SUB21	SUB22	SUB23
1	.	.	.	.	.	.	.	.	.	.	.	.
2	.	.	.	.	.	.	.	.	.	.	.	.
3	.	.	.	.	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.	.	.	.	.
5	.	.	.	.	.	.	.	.	.	.	.	.
6	.	.	.	.	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.	.	.	.
11	.	.	.	.	.	.	.	.	.	.	.	.
12	-.594902	.	.	.	.	.	.	.	.	.	.	.
13	0.446856	0.205811	.	.	.	.	.	.	.	.	.	.
14	-.097901	-.203983	-.684653	.	.	.	.	.	.	.	.	.
15	-.288412	-.372501	-.697614	0.763763	.	.	.	.	.	.	.	.
16	0.267048	-.063255	-.298807	0	-0.5	.	.	.	.	.	.	.
17	0.555458	-.224808	0	-.218218	-.642857	0.928571	.	.	.	.	.	.
18	0.296325	0.327466	0.137388	0.443146	-.131369	0.240844	0.186107	.	.	.	.	.
19	-.012051	0.701718	0.421375	0.123081	-.241747	-.120873	-.161165	0.836739	.	.	.	.
20	0.729023	-.831156	-.234404	0.524252	0.336199	0.286158	0.364216	0.242608	-.264708	.	.	.
21	-.408583	0.383044	-.522913	.0136386	-.339286	0.767857	0.517857	.0465266	-.065473	-.276654	.	.
22	-.089124	0.841408	0.520584	-.312297	-.675562	0.160002	0.142224	0.610338	0.847376	-.533441	0.25778	.

EXPERT SYSTEMS GROUP WITH EXPLANATORY CAPABILITY
OUTCOME AND TASK PROPERTIES FEEDBACK

OBS	SUB1	SUB2	SUB3	SUB4	SUB5	SUB6	SUB7	SUB8	SUB9	SUB10	SUB11	SUB12	SUB13
1	-.730888	.	.	.	.	.	.	.	.	.	.	.	.
2	0.366093	-.380001	.	.	.	.	.	.	.	.	.	.	.
3	-.056033	0.189586	-.736058	.	.	.	.	.	.	.	.	.	.
4	-.529873	0.900986	-.711882	0.3669	.	.	.	.	.	.	.	.	.
5	-.424911	0.615267	-.338826	0.720577	0.405262	.	.	.	.	.	.	.	.
6	0.717921	-.788851	0.556228	-.685418	-.787044	-.855002	.	.	.	.	.	.	.
7	0.412328	-.043764	-.243092	-0.18987	0.234772	-.836735	0.367502	.	.	.	.	.	.
8	0.238578	-.383906	-.451202	0	0	-.652051	0.367874	0.701517	.	.	.	.	.
9	-.254875	0.529437	-.581335	0.888048	0.559258	0.818882	-.851064	-.283491	-.412851	.	.	.	.
10	-.107833	-.037808	-0.50617	0.761319	0.345834	0.207535	-.400381	0.182683	0.602804	0.411472	.	.	.
11	0.225995	.0830513	-.238896	-.280224	0.327327	-.686867	0.307081	0.973399	0.684853	-.384326	0.121062	.	.
12	-.062053	-.262474	-0.55219	0.80928	-.056045	0.508662	-0.38931	-.408824	0.145693	0.507942	0.772853	-.509829	.
13	-.851306	0.443351	0.144295	-.373878	0.191118	0.168821	-.320456	-.568343	-.373101	-.146704	-.308444	-.364921	-.165663
14	0.573498	-.245612	-0.2217	0.745868	-.112838	0.443614	-.135264	0	-.094491	0.624188	0.364541	-.215645	0.532312
15	-.565346	0.693395	-.175911	-.427425	0.674453	-.247626	-.206816	0.410252	0.128247	-.197674	-0.17317	0.597073	-.647737
16	-.555678	0.844588	-.728108	0.827765	0.707798	0.883285	-.868571	-0.32715	-.277587	0.927028	0.544383	-.329422	0.557208
17	-.751183	0.715605	-.600374	0.653935	0.685511	0.882585	-.985223	-.488811	-.401478	0.82088	0.387219	-.445032	0.467939
18	.0140083	0.273578	-.023744	-.538462	0.3669	-0.65185	0.276211	0.824463	0.438529	-.458664	-0.19033	0.920737	-.766687
19	-.609361	0.286374	-.619318	0.730769	0.353796	0.766328	-.784107	-.609118	-.164448	0.669891	0.613285	-.585477	0.80928
20	-.804289	0.784863	-.804532	0.700192	0.767509	0.896267	-.883821	-0.33116	-.433881	0.81716	0.343147	-.308941	0.353995
21	-.411826	0.461842	-.318712	0.722141	0.348619	0.897462	-.831257	-.677927	-.850027	0.900534	0.214205	-.712089	0.547181
22	0.66178	-.072493	-.168877	0.506871	.0714286	0.19224	-.011406	0.408057	0	0.482498	0.182524	0.218218	.0867424
23	-.343822	0.279618	-.881507	0.626971	0.642857	0.171457	-.530389	0.31862	0.587614	0.394771	0.922225	0.327327	0.522409
24	0.875848	-.802635	-0.0202	0.181893	-.527232	-.434448	0.598408	0.467407	0.582541	-.212019	0.346074	0.282477	0.284566
25	-0.80361	0.948812	-.588548	0.437014	0.942864	0.833663	-.873763	.0174773	-.311421	0.731441	0.190228	0.085286	-0.04033

OBS	SUB14	SUB15	SUB16	SUB17	SUB18	SUB19	SUB20	SUB21	SUB22	SUB23	SUB24	SUB25	SUB26	SUB27
1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.	.	.	.	.	.
11	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12	.	.	.	.	.	.	.	.	.	.	.	.	.	.
13	.	.	.	.	.	.	.	.	.	.	.	.	.	.
14	-.765677	.	.	.	.	.	.	.	.	.	.	.	.	.
15	0.464821	-.727084	.	.	.	.	.	.	.	.	.	.	.	.
16	0.118364	0.348727	.0094833	.	.	.	.	.	.	.	.	.	.	.
17	0.403521	0.108389	0.117688	0.855244	.	.	.	.	.	.	.	.	.	.
18	-.046747	-.487245	0.809858	-.389836	-.402422	.	.	.	.	.	.	.	.	.
19	0.327231	0.188467	-.218337	0.83588	0.867722	-.683482	.	.	.	.	.	.	.	.
20	0.203508	0.262367	0.142449	0.868844	0.855678	-0.28821	0.72683	.	.	.	.	.	.	.
21	0.173233	0.460428	-.300111	0.886108	0.868804	-.703137	0.786278	0.888667	.	.	.	.	.	.
22	-.891883	0.865482	-.367884	0.17685	-.091401	-.017471	-.200921	0.165948	0.168335	.	.	.	.	.
23	-.127412	0.112938	0.214598	0.597206	0.478857	0.104828	0.55035	0.458357	0.155388	.0714286	.	.	.	.
24	-.866766	0.578562	-.594425	-0.39232	-.613276	-.049082	-.322643	-.545038	-.411658	0.56002	0.082626	.	.	.
25	0.189185	.0392353	0.521868	0.789149	0.785893	0.16388	0.405148	0.893581	0.580304	0.173702	0.446663	-.612365	.	.

VITA

Martha McDonald Eining

Candidate for the Degree of

Doctor of Philosophy

Thesis: THE IMPACT OF AN EXPERT SYSTEM AS A DECISION AID ON LEARNING DURING THE AUDIT PROCESS: AN EMPIRICAL TEST

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