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THE IMPACT OF AN EXPERT SYSTEM ON A PROFESSIONAL ACCOUNTING ORGANIZATION

By

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ABSTRACT

THE IMPACT OF AN EXPERT SYSTEM ON A PROFESSIONAL ACCOUNTING ORGANIZATION

By

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The objective of this research was to identify the changes that occurred in a professional accounting organization when an expert system was introduced. The system of interest was Coopers & Lybrand's ExperTAX. The perspective of the investigation was that of the organization. To provide structure for the investigation, exploratory hypotheses of potential changes were developed using the interactive perspective framework proposed by Markus [1984] as a guide. The interactive perspective framework suggests that the changes found in the features of an organization (Technology, Structure, Culture, and Politics) after the introduction of a system are a function of the design features of the system.

Three Coopers & Lybrand field offices served as separate case sites in an embedded, multiple case study design. Evidence was gathered from two departments (audit and tax) and three levels (staff, manager, and partner) at each site. Five sources of information were used: (1) interviews with Coopers & Lybrand personnel at each site, (2) descriptions from published articles written by the developers and designers of ExperTAX, (3) archival evidence, (4) documents, and (5)

observation. The major source of evidence was the personal interviews with the Coopers & Lybrand personnel. Analysis of the evidence was conducted on both an intra and inter-office basis.

The analysis of the evidence indicated that changes related to the introduction of ExperTAX did occur. However, the majority of the changes were associated with not only the design features of the system, but also with the implementation strategy and the guidelines issued for the use of the system. Additionally, some of the potential changes suggested by the interactive perspective framework were not found.

To my family whose love and support has seen me through both sad and joyful times,
especially
My sons, Nicholas Andrew and Adam Matthew Faust,
who are wise beyond their years,
and
My parents, James A. and Sylvia H. Trewin

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Introduction and Summary of Research

1.1 Motivation

The potential for using expert systems to support decision making in a professional environment has been recognized by academia, private industry, and government. Attempts have been made to build and implement expert systems in many different areas (e.g., medicine, manufacturing, geology, anthropology, and law enforcement). The success of these efforts has been mixed.

In accounting, the development and use of expert systems are in the early stages. Most of the expert systems research to date has been limited to areas of shallow reasoning[1]. There are many unexplored ill-structured and complex decision areas that may lend themselves to the use of expert systems. These include both shallow reasoning projects such as Coopers & Lybrand's ExperTAX and deep reasoning projects such as TAXMAN [McCarty 1977].

The development of an expert system requires a significant investment in both time and money. In the case of ExperTAX, Coopers & Lybrand incurred development costs of

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[1]. Shallow reasoning is based on paired associations. Deep reasoning is based on causal analysis. While the goal of deep reasoning projects is to capture an expert's deep reasoning process, it is often difficult if not impossible to do so. Shallow reasoning is generally adequate for many problems [McCarthy and Outslay 1988].

almost $1 million dollars and 7,000 hours [Newquist 1987]. However, the costs, while still high, appear to be declining. Hardware and software manufacturers are responding to the growing interest in artificial intelligence and expert systems by providing a wider variety of products and reduced prices [Needham 1987].

Even though the time and money costs may be declining, the development of an expert system still requires considerable resources. In addition, there are other concerns about artificial intelligence (AI) and expert systems. One concern involves the effects of the technology on the organization. In a paper presented at the 1987 Arthur Young Professors' Roundtable, Benbasat and Nault [1988] note that "[t]here is a lack of studies that investigate how ... [expert] systems influence the organizations in which they are installed." They further state that "... in the ES [expert system] field we encounter new tools which are not tested by practical use, comparative evaluation, or user opinion" [Benbasat and Nault 1988 p. 294].

There has been considerable research into the problems encountered when information systems and decision support systems are introduced into organizations. However, the majority of this research has investigated the problems from the perspective of the users or the designers. Neither of these perspectives reveals the full story of how the system

affects the organization. None of the prior research has investigated the impact of an expert system.

The objective of this research was to explore, from an organizational perspective, the effects of the introduction of an expert system on a professional accounting organization. It serves as a starting point for discovering the effects of the introduction of an expert system into a professional accounting environment both at the macro and micro-levels. Identifying these effects should help analysts design systems better adapted to the organization and to their stated purposes. Such systems should also be more successful in terms of performance of the task for which they were designed, acceptance by the users, and cost effectiveness.

1.2 Expert Systems in Accounting

Most of the academic research and development effort in expert systems in accounting has focused on audit decision making. Areas such as materiality assessments [Steinbart 1987], internal control evaluations [Gal 1985; Meservy 1985; Meservy, Bailey, and Johnson 1986], EDP auditing [Messier and Hansen 1986], and audit evidence evaluation [Denna 1987] have been explored. In tax, there have been very few published academic research efforts to date (see McCarty 1977, Michaelsen 1981, Michaelsen 1987). The products of these academic efforts generally have not been adopted by

practitioners. However, more tax applications have been successfully placed into use.

Beginning in the early 1980's, public accounting firms and the U.S. government allocated resources for the development of expert systems. The Internal Revenue Service (IRS) embraced expert system technology. After considering several strategies for the development of artificial intelligence (AI) applications, the IRS set up an AI lab within the Service to develop expert systems and to train IRS personnel in computer programming and AI. By the end of 1988, the Service had twelve expert systems at various stages of development from feasibility studies to completed systems in the testing phase. Additionally, ideas for several other systems were under consideration [Morris 1988].

At the same time in public accounting, firms developed and implemented expert systems both for internal use and for their clients. Expert systems are in use in auditing, tax, consulting, and computer support for tasks such as audit work program development, internal controls evaluation, corporate and individual tax planning, financial planning, expert systems development for clients, and software development [Needham 1987, Brown 1988, Brown 1991].

1.3 Summary of Research

This research used a case study approach to identify the changes that occurred in three Coopers & Lybrand field offices after the introduction of an expert system, ExperTAX. ExperTAX replaced a manually completed questionnaire that was used to identify (1) issues related to the client's tax accrual, and (2) issues and opportunities to consider for tax planning. The tasks affected by the change from the manual system to ExperTAX were performed by two departments, tax and audit, within each field office. The primary source of evidence for this research was interviews with Coopers & Lybrand personnel who had experience with both the manual system and the expert system. Markus' [1984] interactive perspective framework was used as a guide for the investigation of the effects of the introduction of ExperTAX.

The interactive perspective framework suggested that changes might occur in the technology, culture, structure, and politics of the field offices. Although changes in the technology, culture, and structure of the field offices were identified, not all of the changes suggested by the interactive perspective framework for these three organizational features were found. Further, no changes in the politics within the field offices were identified.

How an organization changes after the introduction of an expert system is not only a result of the system itself

but also of decisions made about its use and the extent and importance of the task it changes both to those who perform the task and to the organization as a whole. Some of the changes that occurred after the introduction of ExperTAX were a result of the guidelines issued for its use. For example, the guidelines required that ExperTAX be completed by an auditor and a tax person working together. The manual system had no such requirement and was generally completed by an auditor working alone. Additionally, the task changed by the introduction of ExperTAX represented only a small part of the overall functions of the tax and audit departments. Therefore, the effect of the change in that task was also limited.

The remainder of this study is organized as follows: expert systems are defined and discusses and previous research is reviewed in chapter 2; the research questions are identified and discussed and exploratory hypotheses are developed in chapter 3; the research design, site selection, and problems encountered in the research are described in chapter 4; the findings of the research are analyzed in chapter 5; and the contributions and implications of the research are presented in chapter 6.

Chapter 2

Literature Review

2.1 Expert Systems

The term "expert system" has several definitions. "Expert systems can be considered an instance of a decision support system" [Davis and Olson 1985 p. 375]. Sowa, on the other hand, groups expert systems into three categories - - classification, design, and decision support[1] - - and states that "[d]ecision support is the most promising application for expert systems" [Sowa 1984 p. 284].

Expert systems are a product of artificial intelligence (AI) research, a discipline that deals with "...the representation of knowledge, learning and human thought" [Shank 1984]. AI has two objectives: (1) to improve understanding of human cognition, and (2) to improve the potential of the computer as a tool for problem solving [Davis and Olson p. 254]. Expert systems attempt to satisfy both objectives.

An expert system is a computer application that mimics the decision process of a human expert or group of experts

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1. Classification expert systems include those such as disease diagnosis expert systems, which group large amounts of data into different classification or categories and often give the solution as a range of possibilities. Design expert systems use exact reasoning to search for a combination of structures that will satisfy a specific goal. Decision support expert systems are those that provide alternatives, make predictions, and solve problems [Sowa 1984].

by using knowledge representation and inference procedures elicited from the human expert(s) to arrive at a decision. Sowa [1984] states that expert systems have three features in common: (1) existence of recognized human experts in the field, (2) expert knowledge that is quantifiable, and (3) knowledge that can be expressed in declarative form.

Expert systems are built such that the knowledge base that contains the experts' knowledge and inference procedures is separate from the procedural operations, or inference engine, of the system. This separation makes the maintenance and updating of the system easier and faster than for traditional information systems. It also allows the system to grow and change more easily as its area of expertise changes. Expert systems also have the capability of examining and explaining their reasoning by going through the decision rules, or inference chain, used to arrive at a particular decision. Although traditional data processing systems are used for "well-structured problems," expert systems are best used for "ill-structured problems."[2] In short, an expert system attempts to solve an ill-structured problem using both numeric and symbolic reasoning processes, to explain how that solution was reached, and to grow and change quickly as the environment changes.

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[2]. Newell (1969) defines a well-structured problem as one that has a well defined objective function, can be described numerically, and can be solved using algorithms. An ill-structured problem is one that fails to meet any one of the criteria for a well-structured problem.

Once an expert system has been developed for a problem, persons with limited knowledge and experience should be able to use the system to assist them in their decision making. Theoretically, the quality of these decisions is intended to approach that of the decisions made by experts. The explanatory capabilities of expert systems should enable users to learn from the system as well. In this way, "ESs [expert systems] change the nature of expertise in a firm, which in turn changes tasks, responsibilities and power relationships" [Sviokla 1986 p. 5].

2.2 Impact of Information Systems and Decision Support Systems

Research investigating the introduction of an information system has focused primarily on the negative impact of resistance by the intended users and documented the reasons for such resistance. "Resistance" is a term that has been used to describe diverse activities, ranging from non-use of the system for any reason to violence and sabotage.

The reasons documented for resistance are equally diverse. Markus [1984] described a situation in which a new word processing system was not used. The designer viewed this as resistance, while the users thought the placement of the system in an area removed from their general work area was inconvenient. Pettigrew [1972], Bariff and Galbraith

[1978], Bjorn-Andersen and Pedersen [1980], and Markus and Pfeffer [1983] all described situations in which the new information system realigned the power structure of the organizations into which the systems were introduced.

Pettigrew [1972], in a case study of a single firm's decision to make a large capital investment, focused on the power inherent in information. The ability to control both subordinates' and superiors' access to information pertinent to the decision gave the "gatekeeper" - - the controller of the information - - tremendous power to influence the outcome of the decision process.

Bariff and Galbraith [1978] looked at the impact of information systems from three perspectives - (1) the vertical relationships between organization members, (2) the horizontal relationships between organization members, and (3) the relationship between the information systems group and other groups. They found that the impact of information systems on the structure of the organization, which includes features such as the number of levels of management, the span of control, and the level of decision making, was inconclusive. Power could be shifted either upward or downward. However, from the subordinate-superior perspective, an information system caused an upward shift for three reasons. First, it reduced the amount of data that was collected and related by subordinates, not allowing them to manipulate the information or hold some back.

Second, it provided a faster and a redundant information flow. Finally, the information system revealed informal decision making practices and assumptions to superiors. This last result is also called "restriction of psychological space of free movement" (see discussion of Argyris [1971], below).

For horizontal relationships, equal access to the same data tended to equalize the power between groups. However, if one group had more access to information or controlled other groups' access, there was a power shift toward the group with greater access or control. From the third perspective, as more tasks were incorporated into the IS group, power tended to shift from the user groups to the IS group.

The purpose of the Bjorn-Andersen and Pedersen research was to investigate changes in management structure with the introduction of a production planning and control information system. Specifically, they were interested in the degree of power exerted in the decision-making process, the methods used to exert that power, and the change in power and methods after the introduction of the information system.

Bjorn-Andersen and Pedersen focused on four power concepts taken from political science - (1) the general influence of a person both over other people and over the outcome of the decision process, (2) the resources available

to the person, (3) the methods used to exert the influence, and (4) the amount of influence the person has over his own job. In a case study of three assembly plants of one manufacturing firm, Bjorn-Andersen and Pedersen found that, with the introduction of the planning and control system, the power of the direct users, as defined by the first three concepts, increased while the general influence and the resources available to the indirect users decreased. The amount of influence held by the direct and indirect users over their own jobs decreased.

Markus and Pfeffer [1983] suggested that neglecting the existing power and political structure when designing an information system will increase the potential for resistance or failure of the system. Using case studies and previously reported research, they found support for this hypothesis. Additionally, based on these studies, they concluded that systems that do not conform to the existing culture, goals, and technological ideals of the organization will also be met with resistance or failure.

Argyris [1971] felt that resistance to information systems is caused by four psychological factors. First, with the use of an information system, previously informal, covert practices may come under the scrutiny and control of management, resulting in a "restriction of the psychological space of free movement" that creates feelings of restricted choice, pressure, and psychological failure. Second, the

manager, instead of evaluating his own decisions, submits them to the system for evaluation. This also leads to feelings of psychological failure and can put the manager in a "double bind" (that is, if the manager uses the system, he will succeed as a manager and fail as a human being; if he does not use it, he will fail as a manager and succeed as a human being). Third, with the introduction of a management information system, greater value is placed on the use of valid information and technical competence rather than on the formal power structure. The informal power structure will change and may give upper level managers feelings of decreased essentiality. That is, they are no longer essential to the selection, implementation, and successful outcome of a course of action. Also, power among groups and departments will tend to equalize with management's insistence on cooperation and sharing of information between formerly competitive groups and departments. Argyris' fourth factor is that use of an information system may require a manager to change his style of thinking. Intuitive thinking is necessary under conditions of incomplete information, but, with the availability of increased information, the manager is required to think in more complex terms and to recognize the interrelationship of the information presented to him.

Some researchers have suggested ways to reduce resistance to a new system. However, Ives and Olson [1984],

in a review of the user involvement literature, concluded that there are few strong theories supporting user involvement in information system development and that the research does not demonstrate the benefits of user involvement.

Other researchers have recognized that problems with a system often arise from different points of view [Bostrom and Heinen 1977; Markus 1984]. Designers may call non-use or misuse of their system "resistance" without considering the effects the system design or the implementation process have on the users of the system. From this perspective, a system that has been properly designed to accomplish its intended task can be used by rational people. Therefore, problems with the system can be traced to the users, not the system. One solution to resistance, as so perceived, is to change the mindset of the user, either through additional training or the use of incentives.

Users, on the other hand, may not be as concerned with the intent of the system as they are with whether or not it is "useful."

> This frame of mind heightens their awareness of system operating quirks or needless steps that appear to have been designed expressly to save work for the computer or the programmer. It is not surprising that users tend to focus on the hassles of system use as the major system related problems [Markus 1984 pp.5-6].

Users' solutions to "hassles" may be to (1) design a better system without regard to cost/benefit tradeoffs, (2) change

the features causing the hassles even if it means upgrading and enhancing the system every time new technology becomes available, or (3) not use the system at all. Users may not consider that the system is the best available given the technology and resources, nor are they likely to consider that there may be a purpose for the system other than to produce what an individual user or group of users needs. In addition, what one group of users may consider a hassle, another group of users may consider a benefit.

A third perspective is that of the organization. The organizational perspective in information systems is based on the systems theory of organizations. This theory views the organization as a system (or whole) made up of subsystems (or parts such as the social system and the technological system). It predicts that changes in, or impacts on, one subsystem will affect other subsystems and the organization as a whole [Huse 1975]. Researchers such as Lucas [1975], Bostrom and Heinen [1977], and Markus [1984] suggest that the organizational perspective is the appropriate perspective from which to investigate the effects of the introduction of an information system.

Lucas [1975] proposed and tested a descriptive model of information systems that incorporated several classes of organizational behavior variables focusing on three "crucial" ones - (1) user attitudes and perceptions, (2) use of the system, and (3) performance.

> The goal of the model is to [provide some understanding of] why information systems have failed and to suggest actions to prevent their continued failure [Lucas 1975 p. 6].

In five separate studies using an exploratory field study approach, 16 propositions about the relationships among the three classes of variables were tested. These studies involved more than 2,000 subjects from 16 firms in 6 industries. In addition, one laboratory experiment using MBA candidates and executives was conducted. The propositions tested dealt with a variety of issues such as (1) the influence of the policies of the information systems department and the implementation of those policies on the technical quality of the system and on users' attitudes toward it, (2) the effect of past interactions between the users and the information systems department on the attitudes of users and their perceptions of the quality of the system, (3) the effect of users' attitudes and perceptions on the level of use of the system, (4) the effect of differing decision styles on the level of use, and (5) the interaction among user performance, the type of information provided by the system, and the use of the system.

Lucas found that the policies of the information systems department, their implementation, and the technical quality of the system all affect the users' attitudes and perceptions. He also found that favorable user attitudes

and perceptions of both the system and the information systems department were associated with high levels of use. Further, there was support for the classification of information into two categories - problem-finding and problem-solving. For a system to be successful, it must provide relevant information to the user. Lucas concluded,

> Concentration on the technical aspects of the system and a tendency to overlook organizational behavior problems and users are the reasons most information systems fail [Lucas 1975 p. 2].

Bostrom and Heinen [1977] introduced a systems design philosophy - - Socio-Technical Systems Design (STS) - - based on a view of the organization as a combination of two independent but related interacting parts. The two parts are the social system - - consisting of the structural, cultural, and political features of the organization - - and the technical system - - consisting of the methods and knowledge used to perform tasks within the organization. The information system is an intervention into the existing organizational structure. Although the system will undoubtedly cause changes, as will any new method or tool, Bostrom and Heinen contend that basic computer-related technology itself is neutral. The changes that occur and the system's success or failure depend entirely on what features are incorporated into the system and on how those features and the information gathered from the system are used.

Bostrom and Heinen identified seven conditions that lead to unsuccessful designs. The first condition involves system designers who unconsciously held theories about human nature and organizations. The term "system designers" includes not only the systems analysts and designers but also anyone who has input into the design of the system (i.e. management). Bostrom and Heinen discussed two theories of human nature. Theory X simply states that people want order, specific boundaries, and to be told what to do, and Theory Y states that people want flexibility and will take responsibility for their own actions and achievements. Based on the methods and techniques of systems design, systems designers subscribe to Theory X even though there is considerable evidence to the contrary.

Condition 2 concerns the designers' view of who is responsible for the desired change. Designers feel that, in line with Theory X, the users (i.e., management users) do not want to take responsibility for the change but want to be told what to do. Also, users must give up some responsibility for the design because they are not experts and cannot specify the technical details and components of the system. Thus, designers must assume that responsibility. However, designers often design the systems based on optimization of technical goals such as cost and speed without regard to other possible goals.

The limited viewpoint of the system designer is the focus of conditions 3, 4, 5, 6, and 7. Conditions 3 and 4 refer to an overemphasis on the technical aspects of the information system at the expense of the social system of the organization. Condition 3 refers to an overemphasis on the tasks the system is designed to perform (i.e., data processing or decision making) without regard for the changes that occur in the interpersonal behavior of the individual users involved. Condition 4 concerns emphasizing optimization of the technical system (i.e., providing "better information for management" or "greater efficiency") without understanding that the technical system and the social system are separate but related and it is not necessary to denigrate the social system to enhance the technical system.

Failure to include all users in the design considerations is the focus of Condition 5. System designers often neglect those users who have the most interaction with the system in favor of the users who ultimately use the output from the system. Just as the system has more impact on the jobs of the everyday user, these users have more impact on the success of the system.

Condition 6 focuses on the assumption of traditional system design that there is an instantaneous jump from a static state without the system to a new static state that includes the system. Traditional design also assumes a

completely rational organization without political agendas and/or informal power structures. Therefore, designers do not consider the effects of the system on a dynamic, political organization.

The last condition concerns the methods used to solicit the information necessary to design systems and effect changes within organizations. System designers use only technical system change technologies and do not consider change technologies available from behavioral science.

Each of the conditions discussed above is symptomatic of a design perspective that does not consider the organization as a whole. Therefore, the STS design approach requires that the designer become aware of these conditions and the underlying assumptions that give rise to them.

> What is needed is a more realistic view of organizations embedded in a solid design methodology through which various interventions can be integrated into effective change programs [Bostrom and Heinen 1977 p. 30].

Markus [1984] states that both the information system and the organization have features that interact with each other. The interaction may or may not cause changes in the organization. When changes occur, they sometimes occur in areas of the organization seemingly unrelated to the system. Even unintended changes in unexpected parts of the organization may not cause problems. However, it is possible that the interaction between the features of the

system and those of the organization may cause resistance and/or hassles. If that is the case, focusing on the impacts will allow solutions to be found that will bring the "... system and setting into alignment with each other" [Markus 1984, p. 12]. Markus calls this perspective the "interactive perspective."

The interactive perspective was developed from research using case studies to construct a systems theory of organizations that included (1) a recognition that many practices within organizations are not common to all organizations but are organization specific, (2) a focus on the relationships among entities as opposed to a focus on each entity separately, and (3) a complete analysis not only of the causes but also of the outcomes of interactions [Markus 1979, 1984].

The interactive perspective compares four interacting features - - technology, structure, culture, and politics - - of the organization with those of the system to identify potential impacts. Technology is represented by the methods and knowledge used to perform the tasks of the organization. Structure is the chain of command or the formal lines of authority and responsibility within the organization. Culture encompasses the informal rules and relationships among individuals and groups. Politics is the method of negotiation among individuals and groups within the organization (especially those with different interests and

power). The kinds of impacts that a system will have on the organization and its features depends on the system's classification.

Although the Markus framework is not the only one that proposes or uses the organizational perspective, it was presented within an accounting system environment and included implementations that were directly related to accounting problems. Therefore, it is the framework used in this research.

2.3 The Interactive Perspective Framework

The interactive perspective framework can be used in two ways: (1) to predict the likely impacts of a system on a specific organization, and (2) to identify the impacts that have occurred with the introduction of the system. Use of the framework entails three steps.

First, the system of interest is classified based on its function within the organization. There are five types of systems: (1) operational, (2) monitoring and control, (3) planning and decision, (4) communications, and (5) inter-organizational.

1. An operational system structures work. The task involved is generally physical but may include some degree of intellectual effort. In structuring the task, an operational system rationalizes or reorganizes the work, introducing new methods and procedures. The quantity and quality of input should become more predictable and the output should become more consistent because the system

routinizes the work (or makes the process by which the work is performed uniform).

2. A monitoring and control system can evaluate and motivate the performance of individuals, work groups, departments, or divisions. Depending on its specific purpose, the system may provide measures of goals and standards of performance, monitor actual performance, compare actual performance with the goal or standard, communicate an evaluation of the comparison, and determine the rewards based on the evaluation and company policies.

3. Planning and decision systems support intellectual processes and activities. These systems are capable of, among other things, drawing conclusions from evidence and determining appropriate courses of action given the information available. This is accomplished through the use of models and manipulation of data. Decision support systems and expert systems fall into this classification.

4. A communication system has as its main purpose the facilitation of the transmission of information. Video conferencing systems and computer-based messaging systems are examples of communications systems. The interaction of the characteristics of the organization with the procedures of the system and the media used for actual communication will determine the impacts of the system.

5. An inter-organizational system facilitates transactions between and among separate entities. Examples of such systems include automatic teller machines and systems that allow agents such as music and department stores to sell tickets for concerts and athletic events to the public. As with the communications systems, the procedures that structure the transactions and the media used to process them are the features that will interact with the entities.

System Type	Design Features	Organizational Features
Operational	Work Rationalization Work Routinization	Work force composition Job design Organizational structure Organizational culture
Monitoring and Control	Standards, Measures, Evaluation, Feedback, Reward	Job Design Organizational culture
Planning and Decision	Models Data Manipulation	Work force composition Job design Organizational structure Organizational culture
Communication	Communication procedures Communication media	Spatial and temporal factors Communication channels and networks
Interorganizational	Procedures and Media used for interorganizational transactions	Relations with customers, suppliers, and/or competitors

Source: Adapted from Markus [1984]

Figure 1

System Type and Related Design and Organizational Features

It is not uncommon for a system to fall into more than one classification. Figure 1 summarizes the system classifications, the relevant design features, and the related organizational features.

After the system has been classified, the second step is to investigate the organizational features related to the system's classification. Each feature should be described both before and after the introduction of the system to determine if it has changed, if it is in the process of changing, and how it has changed. It is important to study every level and group within the organization that may be affected by the system in order to understand each point of view. In the event that a system falls into more than one classification, all the organizational features related to all of its classifications must be investigated.

The third step in the framework is to identify the impacts of the system on the organization using the system classification and the results of the investigation of the design features. Figure 2 lists some likely impacts for each type of system. However, the impacts that occur are situation-specific. Therefore, it is possible that not all the impacts listed will be found while others, not listed, may be found. A complete analysis of the impacts includes analysis at the individual level, at the department or subunit level, and at the level of the organization as a whole. This research attempts to identify all the changes

System Type	Likely Impact
Operational	Job opportunities and career prospects
	Job content and job satisfaction
	Horizontal structure
	Social interaction patterns
Monitoring and Control	Autonomy and control
	Organizational psychology
	Organizational performance
Planning and Decision	Job opportunities and career prospects
	Job content and job satisfaction
	Decision making
	Power structure
	Politics
Communication	Location of work
	Geographic dispersion
	Communication participants
Interorganizational	Interorganizational dependence
	Basis of competition in industry

Source: Adapted from Markus [1984]

Figure 2

System Type and Likely Impacts

that have occurred in the organization during the period in which the subject system was introduced and placed in wide scale use.

This chapter defined expert systems and summarized the previous literature on the organizational impacts of information systems and decision support systems. The next chapter identifies the research objective, provides background on the processes used to collect tax accrual and tax planning data before and after the introduction of ExperTAX (including the motivation for the change), and identifies the exploratory hypotheses to be as a basis for determining the impacts of the introduction of the system.

Chapter 3

Research Questions

3.1 Research Objective

The objective of this research is to investigate, from an organizational perspective, the impact of the introduction of an expert system, ExperTAX, on the organizational environment of a national public accounting firm, Coopers & Lybrand.

Any change in the way a task is performed or a decision is made is likely to affect not only the individual who performs the task or makes the decision but also, directly or indirectly, any individual or group that interacts with the person directly affected by the change. The organizational perspective looks at the impact of the change on at least three levels, 1) the level of those directly affected, 2) the level of those who interact with those directly affected, and 3) the level of the organization as a whole.

The impact associated with the introduction of an expert system includes both expected and/or intended changes and unexpected and/or unintended changes. The designers, knowing what they want to accomplish, may have planned for those changes that were expected but, because of a lack of data or research, may not have been aware of all the changes that might occur.

This is an exploratory case study. As such, the

discussion focuses on what happened. Although possible reasons for the impacts are discussed, definitive explanations for them are not an objective of this research. This research is intended to be a starting point for the investigation of the impacts of expert systems on accounting organizations.

3.2 Why ExperTAX ?

ExperTAX was chosen as the subject system for several reasons. First, it is used by two separate departments within the organization. Its use may have direct impacts on both departments, on their relationship with each other, and on their relationships with other features of the organization. Very little research has investigated the role of systems in cross-departmental relationships [Markus 1984]. Additionally, the environment in which ExperTAX is used is more complex, providing a richer research opportunity than that provided by a system used by only one department.

Second, of the expert systems widely used in the United States by professional accounting organizations (that is, not international tax expert systems), ExperTAX is among those that have been in place the longest. Organizations with newer systems may not be fully utilizing their systems yet. Therefore, these newer systems and their organizations were not appropriate subject systems to investigate.

Finally, ExperTAX is the best publicly documented expert system. Articles have been published about its

development and construction [Shpilberg, Graham, and Schatz 1986, Shpilberg and Graham 1986, and Graham 1987] and its maintenance [Schatz, Strahs, and Campbell 1987]. It has also been the subject of a Harvard Business School Management Case Study [Sviokla 1988]. The publicly available information about ExperTAX serves as an additional source of evidence - - a check against what is found in the study itself.

3.3 Tax Accrual and Planning Questionnaire

The Tax Accrual and Planning Questionnaire (TAPQ) was a manually completed, paper questionnaire and checklist developed by the Coopers & Lybrand National Tax Office for use in the audit process. As its name implies, the TAPQ had two functions. First, it was to provide relevant information for the determination of the tax accrual. The tax accrual determination identifies differences between income for tax and financial statement purposes, and explains the differences between statutory and effective tax rates.

The TAPQ's second function was to provide information for use in tax planning, i.e., identifying opportunities to lower total tax liability within the context of the client's overall business goals for current and future tax years.

The TAPQ did not ask for specific numbers or calculate the actual tax liability. Rather, it was concerned with matters of policy, e.g., "Did the client use the FIFO method of inventory for the past tax year?" Each question was

answered by checking a box labeled "Yes", "No", or "NA." For some questions, additional information could be written down. Generally, the questionnaire was filled out by a staff auditor either at the client's place of business or in the Coopers & Lybrand office.

When the staff auditor was finished, an audit manager and a tax manager, either together or independently, reviewed the questionnaire conducting a tax accrual analysis and identifying tax planning issues in the process. Any significant issues and opportunities were reviewed further by more experienced personnel, such as tax and audit partners. The TAPQ was required to be completed by the client's year end. Generally, it was completed within the last two weeks of the client's year as part of the year-end audit work.

Although the process appeared straightforward (see Figure 3), it was actually quite complex. The questionnaire contained 19 pages of detailed instructions and 58 pages of questions (1986 version), and was perceived by the audit and tax staffs as a long and complicated document.

> Whenever possible, less senior people were assigned to collect client data on tax accruals - - to minimize the cost to the client. [Sviokla 1988 p. 6]

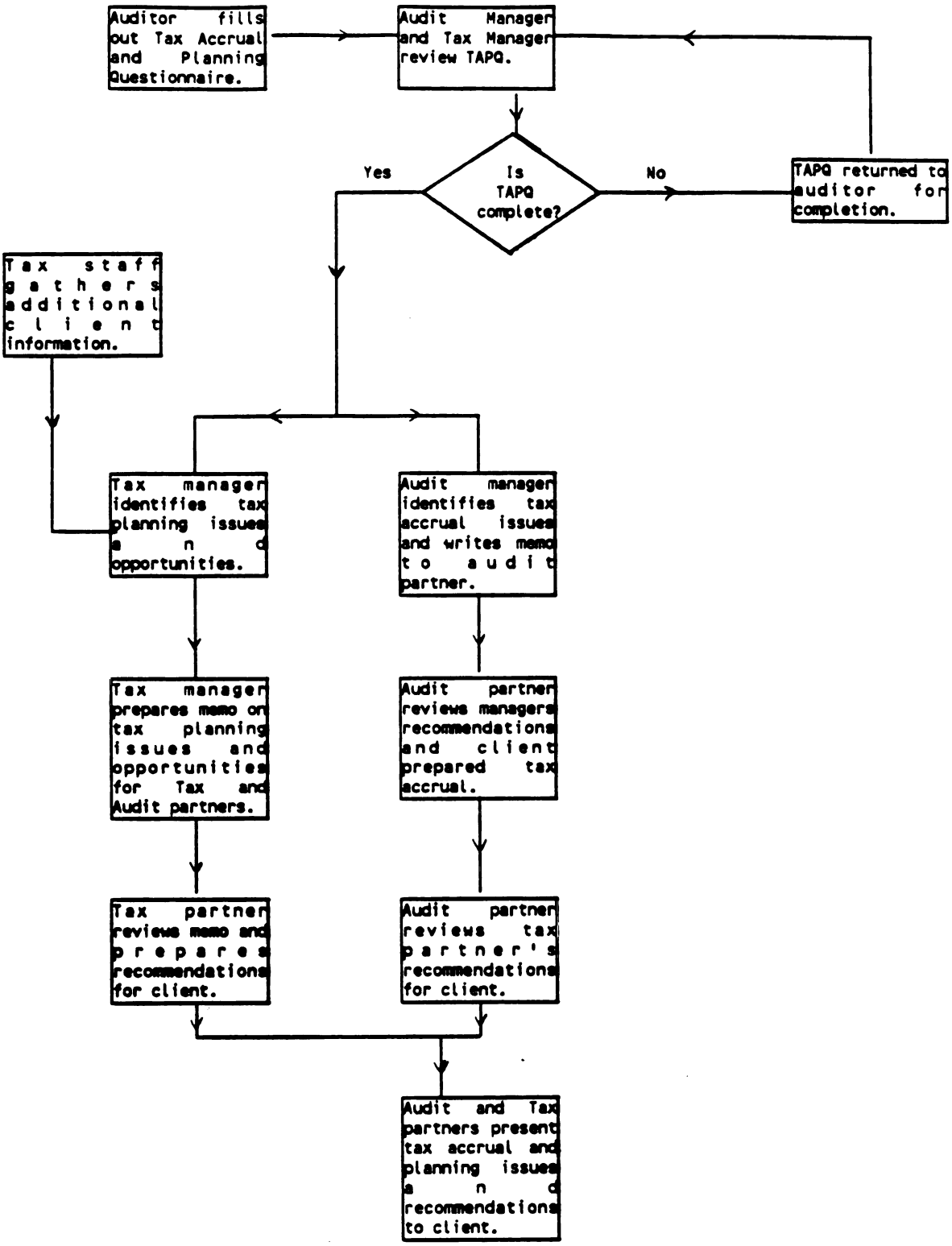

Figure 3

Tax Accrual and Planning Process Using TAPQ

Many of the questions used for tax planning purposes were beyond the scope of knowledge and experience of the auditor who filled out the questionnaire and often appeared to have no direct relevance to the audit task. Additionally, the questionnaire provided no explanation of the complex tax issues involved. Therefore, the staff auditors assigned to the task of filling out the questionnaire were often not fully aware of the importance of the data collected.

For these reasons, there were often some questions left unanswered and incomplete questionnaires were given to the audit and tax managers for review. For tax planning, even a completed TAPQ did not provide all the necessary information. Without complete information, determining the tax accrual and identifying relevant tax planning issues and opportunities were difficult if not impossible. Therefore, it was often necessary to return to the client both to complete the questionnaire and/or to answer additional questions not included in the questionnaire [Shpilberg, Graham and Schatz 1986, Sviokla 1988].

The time necessary to properly complete the TAPQ ranged from four to five hours for a first year client to one to two hours for a continuing client with an experienced staff auditor [various interviews]. Occasionally, the previous year's TAPQ was used to complete the current year's, both because of time constraints and the perceived unimportance of the questionnaire to the audit function [various interviews].

After the TAPQ was completed, the tax accrual computation was made. As discussed above, the tax planning analysis could not be done without more time and investigation to answer follow-up questions not included on the questionnaire. The timing of such tax planning was important. The questionnaire had to be completed and evaluated so that any plans could be implemented in a timely manner, frequently before the tax year-end. The process of analyzing the TAPQ for planning opportunities required significant time and expertise, and the number of people with such expertise was limited. The tax staff felt the TAPQ tended to simplify and standardize a complex task that differed from one client to another [Shpilberg and Graham 1986].

3.4 ExperTAX

3.4.1 Motivation for a Change

There were two motivations for converting to a different method of determining the tax accrual and identifying tax planning opportunities. The first was the problems encountered with the use of the TAPQ - - "the practical realities [that] limit[ed] the efficiency of the process" [Shpilberg and Graham 1986 p. 76]. Specifically, the realities were:

(1) the length and perceived complexity of the TAPQ by the staff auditors,
(2) the perceived irrelevance of (at least part of) the task by the staff auditors,
(3) the time required to gather additional information and to review that information

for tax planning purposes,
(4) the actual timing of the task, and
(5) the tax staff's perception that the questionnaire standardized the tax planning process.

The second motivation for the change from the TAPQ was Coopers & Lybrand's goal to increase their use of information technology for both internal and external applications. In moving toward this goal, key audit managers were asked to identify potential areas for changes. The tax accrual area was selected as one that was both "technically feasible" and significantly valuable for the client [Sviokla 1988].

The original intent of the project was merely to streamline the tax accrual process, but as the project progressed, the feasibility and desirability of including the tax planning process became apparent. The final result was ExperTAX, an integrated, data gathering and decision making system "... intended to increase the effectiveness of the entire audit-tax team" [Sviokla 1988 p. 9].

3.4.2 Implementation of ExperTAX

In the late summer and early fall of 1986, after development and initial testing, ExperTAX was pilot tested in four Coopers & Lybrand field offices on a total of 40 engagements. In November of 1986, following the pilot tests, an informational meeting was held in Chicago to introduce the system to "orientation teams" from the filed offices. These teams were to return to their offices and hold orientation

sessions for their personnel in November and December of 1986.

An internal marketing campaign for use in conjunction with the orientation sessions was developed to promote ExperTAX to field office partners and personnel. Included in the marketing campaign and orientation materials were a slide show, a demonstration disk, a video tape, instructions on how to use ExperTAX, training aids, and promotional materials such as pennants and posters. The purpose of the slide show and video tape was 1) to introduce ExperTAX (what it is and how it was developed), 2) to explain the benefits, strategic implications and the firm's policies for its use, 3) to communicate management's commitment to the use of ExperTAX and the need for team spirit when using the system, and 4) to promote enthusiasm for the system.

> The roll out strategy for ExperTAX [was] based on the strong belief that it should not be positioned as just another software program. [ExperTAX Orientation Program materials]

In addition to the marketing campaign, a staff member in each field office was appointed to act as a liaison between field office personnel and the Coopers & Lybrand field office. The duties of the ExperTAX liaison included promoting the use of ExperTAX and communicating any problems or concerns local office personnel had regarding the system.

During the first "busy season" after its introduction, 1986-1987, each field office partner was to use ExperTAX for

determining the tax accrual for at least one client. For the 1987-88 busy season, use of ExperTAX became mandatory for use on possible clients, i.e., all manufacturing and service industry clients. As modules were developed for other types of clients (insurance, banking, and oil and gas), use of ExperTAX became mandatory for them also.

Data collection with ExperTAX was expected to be a team effort with at least one member each from the tax and audit staffs. There were several reasons that Coopers & Lybrand insisted on the team approach. First, the auditor works closely with the client throughout the year and, therefore, has first hand knowledge of the day to day workings of the client. The tax member brings in-depth knowledge of the tax law. The team approach should allow the ExperTAX team to complete the data collection process with greater efficiency. For example, the system allows the data collector to skip questions for which the answer is unknown. However, the sequence of the questions asked is based on the client's situation as defined by those questions already answered. One unanswered question may result in a long chain of questions that must be answered later. Subsequently answered questions may also render previously answered question chains irrelevant and unnecessary. Using an audit-tax team allows most, if not all, questions to be answered as they arise.

Second, the team approach forces Coopers and Lybrand tax and audit personnel to work together on a face-to-face

basis, thereby fostering a cooperative relationship between the staffs. Additionally, after working with ExperTAX, each member of the team knows at least one member of the other staff. If, in the course of other engagements, problems or questions arise outside their own expertise, a team member may feel more comfortable calling on someone he knows and has worked with for help.

3.4.3 Technical Aspects of ExperTAX

ExperTAX is a rule-based expert system made up of four major components - - an inference engine, a user interface, a knowledge-base, and a knowledge-base maintenance system. The inference engine contains the rules of logic that determine how the knowledge base is applied. For example, it is the inference engine that determines the order of the questions based on the answers to previous ones.

The user interface controls the system's interaction with the user, i.e., the screens and keyboards and the generation of output. The intent with ExperTAX was to make the system menu driven and very "user-friendly" so that little or no initial training would be necessary (see Figure 4).

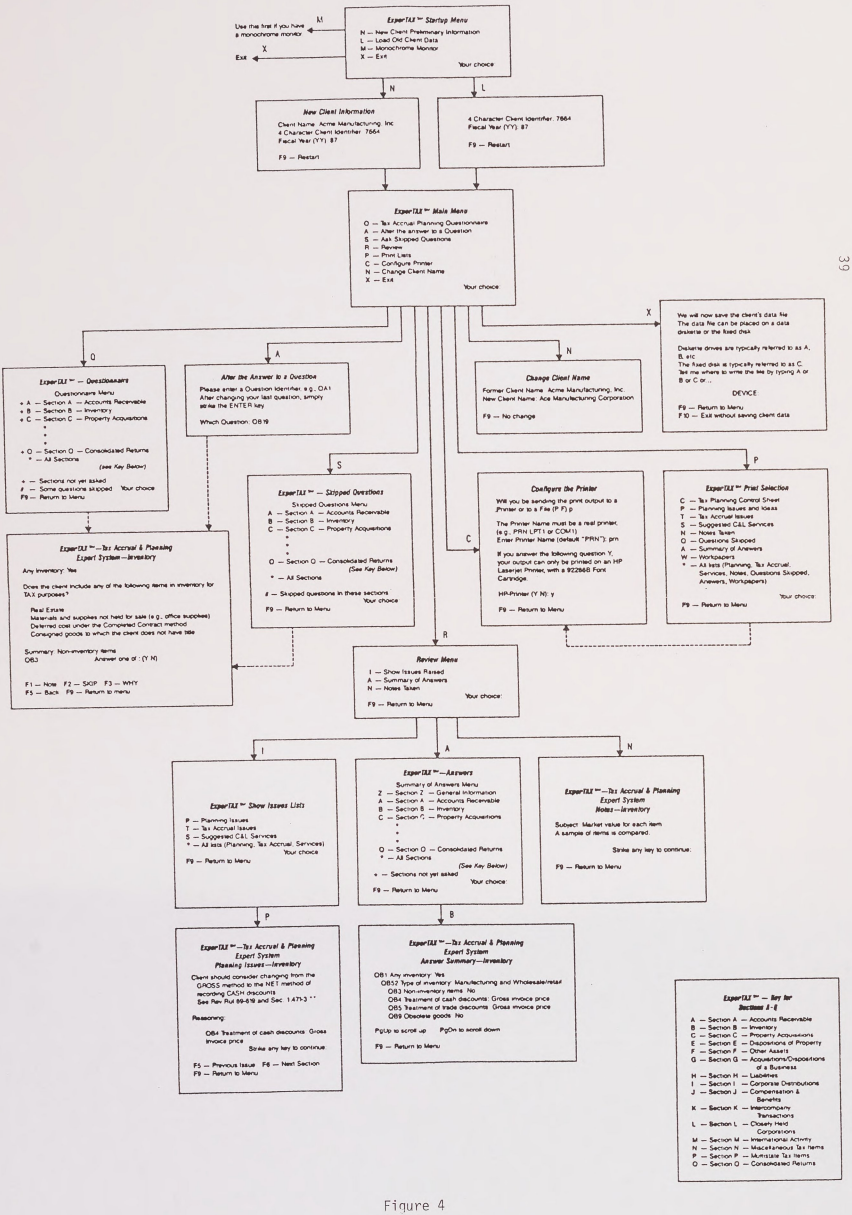

Figure 4

ExperTAX Menus

The knowledge base contains all the expertise of the system - - the rules, frames, and facts. ExperTAX's knowledge base was developed using more than 30 Coopers & Lybrand senior audit and tax experts. It contains more than 3,000 frames and rules in 16 topic areas.

The knowledge base maintenance system is used to maintain and update the system's expertise as the outside environment changes. Although ExperTAX was ready for introduction in the early fall of 1986, the passage of the Tax Reform Act of 1986 delayed its introduction until November 1986. It was the knowledge base maintenance system that allowed ExperTAX to be introduced so quickly after a major change in the tax law. ExperTAX is designed for use with IBM-PC and IBM compatible computers.

3.4.4 Using ExperTAX

At present, ExperTAX replaces the TAPQ for Coopers & Lybrand manufacturing, service industry, insurance, and oil and gas clients. There is also an ExperTAX module in use for exempt organizations that concentrates on hospitals and institutions of higher education.

ExperTAX (see Figure 5) is intended to be completed by a team comprised of an auditor and a member of the tax staff. Often, client personnel are included in the data collection process as well. However, they may not enter data into the system.

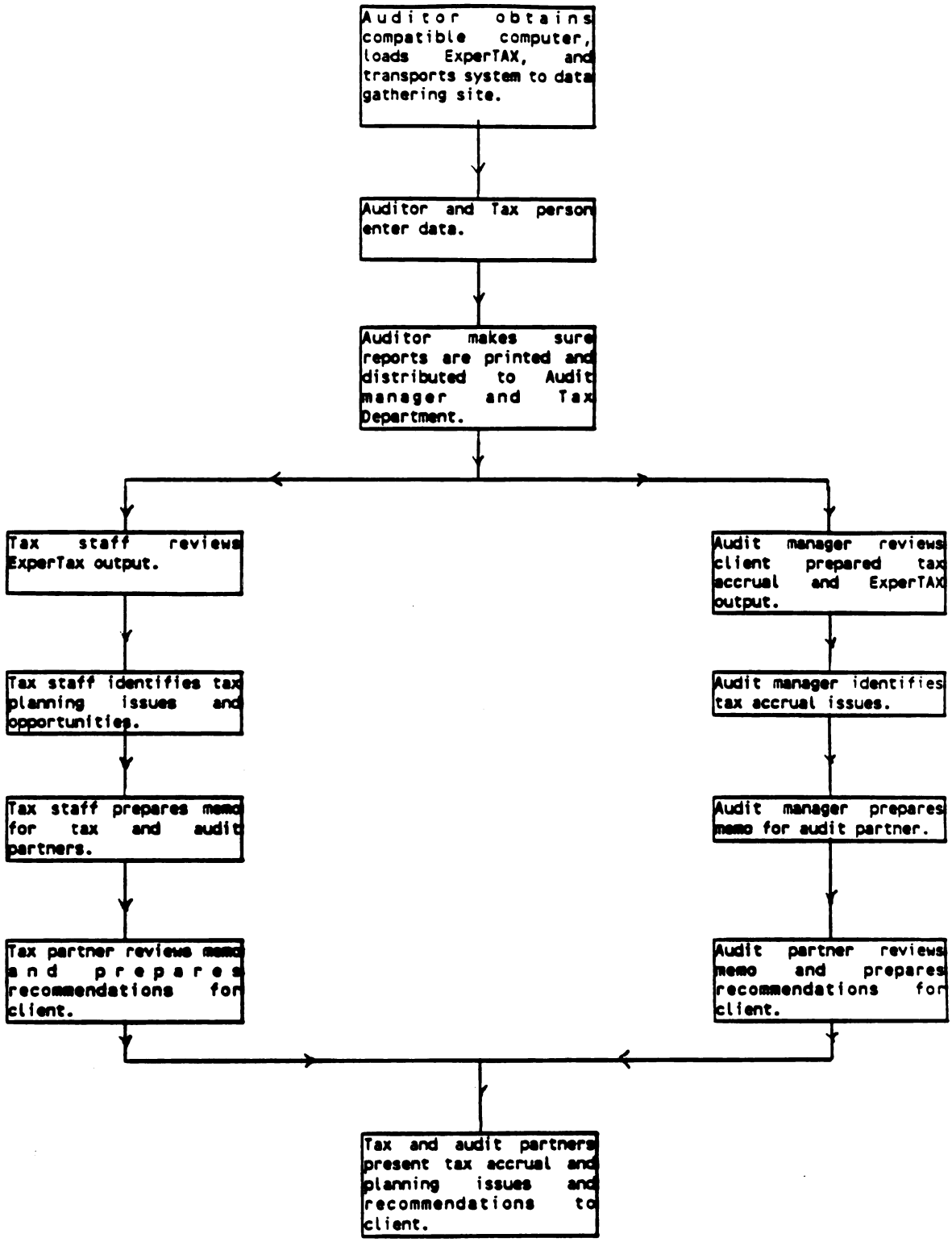

Figure 5

Tax Accrual and Planning Process Using ExperTAX

Before data can be collected, one member of the team (generally the audit staff member) obtains a compatible computer, loads the ExperTAX disks, and transports the system to the data collection location. This location can be either the client's office or the Coopers & Lybrand office.

After ExperTAX is set up, the data gathering team inputs client data, beginning with basic information such as the business form used by the client, the type of business, and whether cash or accrual accounting is used. ExperTAX serves as a guide throughout the data collection process asking only relevant questions based on the answers to previous questions. Because of the structure of the system, it is able to explain why a particular question is being asked and the relevance of the question to the client's situation. It also identifies areas that need clarification and may request additional information. The system allows the user to skip questions for which the answer is unknown or presently unavailable and keeps track of all unanswered questions.

Once all the data is collected, the system is returned to the Coopers & Lybrand office and reports are printed out. The reports generated by ExperTAX include a list of all questions asked with their answers, a list of all asked but unanswered questions, "marginal" notes made by the data collection team, ExperTAX's identification of tax planning issues and opportunities with explanations of their relevance, summaries of all the reports generated, and an executive

summary.

The reports generated by the system are reviewed by a member of the tax staff, who writes a memo outlining the tax planning issues and opportunities for the tax and audit partners. The output is also reviewed by an auditor, generally a manager, who looks at the questions and answers for tax accrual purposes. ExperTAX does not prepare the tax accrual for the client. It identifies, as it does for the tax planning process, issues to consider in reviewing the client-prepared tax accrual determination.

3.5 Classification of ExperTAX

Using the interactive perspective framework classifications, ExperTAX can be classified as both an "operational system" and a "planning and decision system." An operational system reorganizes work by introducing different ways to accomplish that work. It also attempts to control the quantity and quality of input in order to increase the consistency of output. The replacement of TAPQ by ExperTAX reorganized the task of gathering the tax accrual and tax planning information. ExperTAX attempts to control the quantity and quality of input by asking only pertinent questions, by providing for marginal notes to explain special circumstances, and by allowing the data collector to ask for the reasons for any question.

A planning and decision system uses models for the analysis of data. The decision process used by ExperTAX is based on the expertise of a group of experienced accounting and tax professionals. ExperTAX facilitates the collection of the tax accrual and tax planning information and analyzes that information in order to identify tax accrual and tax planning issues along with reasons for their identification.

3.6 Exploratory Hypotheses

Although this research was exploratory in nature, structure was provided by the Markus interactive perspective framework. In 3.5, above, ExperTAX was classified as both an operational and a planning and decision system. The exploratory hypotheses were predicted based on these classifications.

Fifteen exploratory hypotheses were developed (Figure 6) - - two concerning productivity; three concerning job opportunities and career prospects; four concerning job content and satisfaction; one each concerning horizontal structure, social interaction, and decision making; two concerning the power structure and politics; and one concerning resistance to the system. Each group is explained in a subsection, below.

Productivity

EH_1: Tax accrual and tax planning data collection productivity has increased since the introduction of ExperTAX.

EH_2: Productivity in the tax accrual and tax planning decision process has increased since the introduction of ExperTAX.

Job Opportunities and Career Prospects

EH_3: Staff auditors who have experience with ExperTAX will perceive themselves to have greater horizontal mobility within the firm than those who do not.

EH_4: Staff auditors who have experience with ExperTAX will perceive themselves to have greater vertical mobility within the firm than those who do not.

EH_5: Decision makers will perceive themselves to have decreased vertical mobility since the introduction of ExperTAX.

Job Content and Job Satisfaction

EH_6: The job content of the staff auditor/ data collector has changed since the introduction of ExperTAX

EH_7: The job satisfaction of the staff auditor/data collector has increased since the introduction of ExperTAX.

EH_8: The job content of the decision maker has changed since the introduction of ExperTAX.

EH_9: The job satisfaction of the decision maker has decreased since the introduction of ExperTAX.

Horizontal Structure

EH_{10}: There has been a change in the pattern of work flow between the audit and tax departments since the introduction of ExperTAX.

Social Interaction

EH_{11}: The level of social interaction between the tax and audit departments has increased since the introduction of ExperTAX. within the firm than those who do not.

Decision Making

EH_{12}: Tax accrual and tax planning decision making has become more centralized since the introduction of ExperTAX.

Power Structure and Politics

EH_{13}: The power of the decision maker has has decreased since the introduction of ExperTAX.

EH_{14}: The power of the audit department with respect to the task of making tax accrual and tax planning decisions has decreased since the introduction of ExperTAX.

Resistance

EH_{15}: Decision makers will be resistant to use of ExperTAX.

Figure 6
Exploratory Hypotheses

3.6.1 Productivity

Productivity is defined as both the time it takes to accomplish a task and the quality of the output of that task. Productivity in data collection should increase for three reasons. First, the data collection process with ExperTAX is a joint effort by audit and tax personnel. The audit member of the team knows the client situation and the technical tax questions that the auditor cannot answer should be handled by the tax member.

Second, data collection should be faster using ExperTAX whether or not a team approach is used because the system determines what questions to ask based on previously answered questions. It also keeps track of all unanswered questions. These features eliminate the time spent by the data collector hunting through the questionnaire for both the next question and skipped questions. ExperTAX should also eliminate the need for a data collector to return to the client to answer skipped questions. Faster and more complete initial data collection should decrease the amount of time necessary to complete the data collection task.

Third, ExperTAX collects more complete information for tax planning purposes. Thus, less time should be spent on additional data collection. By providing explanations for the questions asked, the system should give the staff auditor a better understanding of what information is required. Thus, the quality of the information should

increase.

With respect to an increase in the productivity in decision making, an increase in the quality of input should increase the quality of output. Also, because the system analyzes the raw data and presents the tax accrual decision and tax planning opportunities and the reasoning leading to those opportunities, the decision maker should spend less time sifting through raw data. Therefore, less time should be necessary to determine the appropriate tax accrual figure and tax planning strategies.

EH_1: The perceived productivity in the tax accrual and tax planning data collection process has increased since the introduction of ExperTAX.

EH_2: The perceived productivity in the tax accrual and tax planning decision process has increased since the introduction of ExperTAX.

3.6.2 Job Opportunities and Career Prospects

Accountants in public accounting firms generally begin their careers on the audit staff. They may have had little exposure to taxes in their education, i.e., one class at the undergraduate level. While on the audit staff they may have had little opportunity for hands-on learning about taxes and/or the tax planning process. Without such exposure and the knowledge that comes with it, the tax department may not be interested in recruiting them for, and/or they may have no interest in, the positions available in the tax

department. ExperTAX offers users the opportunity to learn more about taxes and the tax accrual and tax planning processes from the system itself. ExperTAX can explain why specific questions are asked and provide insight into the tax accrual and tax planning processes. With additional knowledge about taxes and the processes, the staff auditor may be both more willing and more able to move from the audit to the tax department. For a staff auditor who stays on the audit staff, exposure to ExperTAX may allow greater insight into the complete picture of the client firm. With more knowledge and greater insight the career opportunities of the staff auditor should increase.

EH_3: Staff auditors who have experience with ExperTAX will perceive themselves to have greater horizontal mobility within the firm than those who do not.

EH_4: Staff auditors who have experience with ExperTAX will perceive themselves to have greater vertical mobility within the firm than those who do not.

With the use of ExperTAX, the expertise of the decision maker becomes less valuable. The system identifies tax accrual issues and tax planning issues and opportunities along with the reasoning behind them. The decision maker now verifies the decisions reached by the system. Since the decisions made by the decision makers before the introduction of ExperTAX were reviewed at a higher level,

very little additional time would be necessary for the review of the system's decisions. Therefore, the role of the decision maker could be considered redundant in this context.

EH_5: Decision makers will perceive themselves as having decreased vertical mobility since the introduction of ExperTAX.

3.6.3 Job Content and Job Satisfaction

With the adoption of any new technology, the skills necessary for the performance of the related task change and the content of the job changes. The implementation of ExperTAX constitutes the adoption of a new technology. The skills necessary to collect the tax accrual and tax planning data have changed. Where before the staff auditor had to search through a bulky questionnaire to gather data or to keep track of unanswered questions, this process is now computerized.

EH_6: The job content for the staff auditor collecting the tax accrual and tax planning data has changed since the introduction of ExperTAX.

ExperTAX, with its ability to explain the reasoning behind the question asked, adds understanding and coherence to the task of collecting the tax accrual and tax planning data. Though the importance of the task of data collection

has not changed, the perceived importance should increase with increased understanding. Increased understanding of the task itself and insight into its place in the tax accrual and tax planning process should increase the staff auditor's job satisfaction.

EH_7: The job satisfaction of the staff auditor collecting the tax accrual and tax planning data has increased since the introduction of ExperTAX.

With the introduction of ExperTAX, the task of the decision maker is no longer to analyze the data and determine the tax accruals and the tax planning opportunities. The decision maker now reviews the decisions made by the system. Not only has the content of the job changed, but the decision maker is also deprived of an opportunity to perform a thoughtful and creative task. Decision flexibility may be lost because the decision maker's decisions can be compared to the system's analysis. Additionally, the decision maker may feel less essential to the firm since expertise developed over a long time is now available to those with less experience and knowledge [Argyris 1971]. All these factors work together to decrease the job satisfaction of the decision maker.

EH_8: The job content of the decision maker has changed since the introduction of ExperTAX.

EH_9: The job satisfaction of the decision maker has decreased since the introduction of ExperTAX.

3.6.4 Horizontal Structure and Social Interaction

ExperTAX allows more complete tax planning data to be collected. Additionally, the tax accrual and tax planning data can be collected more quickly than before the introduction of ExperTAX. These two advantages of ExperTAX, plus the use of the team approach to collect the data, should change both the pattern of work flow and the level of social interaction between the audit and tax departments. The faster completion of the data collection allows the identification of tax planning opportunities and the final decisions concerning them to be made in a more timely fashion. Indeed, because a member of the tax staff is present, some tax planning opportunities may be identified as the data is collected. Also, it should allow more time for the tax staff and the audit staff to discuss the current tax accruals, the tax planning opportunities, and the implications of those opportunities on the client's future tax accruals. Again, some of these discussions may take place as the data is collected.

EH_{10}: There has been a change in the pattern of work flow between the audit and tax departments since the introduction of ExperTAX.

EH_{11}: The level of social interaction between the audit and tax departments has increased since the introduction of ExperTAX.

3.6.5 Decision Making

The centralization of decision making could happen in at least two ways. First, the decision process could move up to a higher level. Because the analysis of the data is done by the system and the decisions were reviewed at a level above the decision maker before the introduction of the system, the role of the decision maker may no longer be as important. A partner could review the system's decisions as efficiently as the decision maker. Second, fewer decision makers could be assigned the task of reviewing the system's decisions for all clients.

EH_{12}: Tax accrual and tax planning decision making has become more centralized since the introduction of ExperTAX.

3.6.6 Power Structure and Politics

It is often said, "knowledge is power." ExperTAX contains the expertise developed by decision makers over a long period. The task of determining tax accruals and identifying tax planning opportunities is performed more quickly by the system than by the individuals. Therefore, the expertise of some of "experts" may be considered redundant. With the introduction of the ExperTAX, the task they previously performed individually can now be done by persons with a greater or a lesser level of expertise with little, or no, increased effort.

EH_{13}: The power of the decision maker has decreased since the introduction of ExperTAX.

The audit department, because it collected the initial data needed for making the tax accrual and tax planning decisions, served as a gatekeeper of information. The decision makers in the tax department did not know what additional information it would be necessary to collect from the client until the questionnaire was completed and given to them. This situation gave the audit department power over the tax department. Although the audit department still serves as a gatekeeper in that it is responsible for the data collection, the data is collected with the help of a member of the tax staff. ExperTAX is purported to provide all necessary information for the identification of tax planning opportunities. Additionally, what information it does provide is done in a more timely fashion. Therefore, the power of the audit department over the tax department should decrease.

EH_{14}: The power of the audit department with respect to the task of making the tax accrual and tax planning decisions has decreased since the introduction of ExperTAX.

3.6.7 Resistance

Based on the above predictions that decision makers will perceive themselves as having decreased upward mobility, decreased job satisfaction, and decreased power after the introduction of ExperTAX, it is predicted that they will be more resistant to the system's use.

EH_{15}: Decision makers will be more resistant to the use of ExperTAX.

This chapter introduced the basic research questions, described the methods used to collect the tax accrual and tax planning data before and after the introduction of ExperTAX, presented and discussed the exploratory hypotheses. The next chapter discusses the research design.

Chapter 4

Research Design

4.1 Why a Case Study?

The most appropriate method of inquiry for any research depends on the form of the basic research question - who, what, when, where, why, how, how much, or how many. The question of interest in this research was how does the introduction of an expert system affect the organization. The research methods generally used to investigate questions of how or why are experiments, histories, field studies, and case studies. Often a particular research question can be investigated equally well using any of the above methods. However, some questions, because of external constraints, may be best investigated using a particular method.

The two factors that are most likely to affect the choice of method among experiment, history, field study, and case study are (1) the degree of control the researcher has over the behavioral events, and (2) whether the events of interest are contemporary or historical [Yin 1984].

Experiments deal with contemporary events in which the researcher has control over the variables. A control group of subjects is maintained, the variables of interest are manipulated by the researcher for the experimental groups, and the outcomes noted, described, and/or explained.

A history generally focuses on a past event. Although historical research may include investigation or analysis of contemporary events, such events are generally of interest as they relate to a past event or flow of events. In historical research the researcher has no control over the events or the behavior of the participants.

Field studies and case studies both study contemporary events in which the researcher has no control and cannot manipulate behavior. Both study a phenomenon or intervention in its natural setting and both are particularly useful when there is no strong theoretical base and/or little research of the phenomenon. The major difference between them is that in a field study the researcher determines, a priori, what variables of interest will be investigated, while in a case study the variables of interest are not clearly defined or evident at the beginning of the research [Benbasat, Goldstein, and Mead 1986].

As is true with other research methods, a case study may take one of three approaches - explanation, description, or exploration. Each approach is appropriate under different circumstances. When there are competing theories that attempt to establish a cause and effect relationship for a set of events, the explanatory case study approach is used to determine which of the theories best explains the cause and effect relationship for the events of interest. A descriptive case study merely traces the events over time in

an attempt to identify key phenomena that were previously not able to be isolated. It is best used for a situation that has never been studied before. An exploratory case study is used when an intervention has occurred that may change the situation or entity under investigation but for which there is no clear, single set of outcomes. Exploratory case studies are often used in the early stages of hypotheses building [Yin 1984].

The question of interest in this research was how ExperTAX affected the Coopers & Lybrand field offices. How ExperTAX affects the field offices and their personnel can only be studied in the field offices themselves. The implementation of ExperTAX was and, to the extent that modules for new industries are being introduced, still is an ongoing phenomenon. In addition, changes are still occurring in response to the initial introduction of the system as the field office personnel act and react to changes in their tasks and responsibilities brought about by the use of ExperTAX.

There is little theoretical basis to guide the development of hypotheses and very little research has been conducted exploring the effect of expert systems on organizations. What guidance there is identifies only general areas of impact and acknowledges that the "list" of impacts suggested is likely to be incomplete, i.e., it does not and cannot clearly define the boundaries of the

phenomenon because of the nature of the intervention and the environment into which it is introduced. Therefore an exploratory case study approach was used for this research.

4.2 The Research Design

In designing an exploratory case study, the identification and articulation of three elements are especially important. These three elements are (1) the research question or questions, (2) the units of analysis, and (3) the criteria for interpreting the findings - - the plan of analysis.

4.2.1 Research Questions

The identification and statement of the research question(s) help define the scope and method of the research. The broad question in this research was how did the introduction of ExperTAX affect Coopers & Lybrand. Implicitly, there are two questions. First, has the organization changed with the introduction of ExperTAX. Second, if the organization has changed, in what ways has it changed.

4.2.2. Units of Analysis

This research studied three Coopers & Lybrand field offices. Although Coopers & Lybrand is a international firm with a common organizational mission and goals, it is

comprised of field offices located all over the country in cities of varying sizes and client bases. Some policies are mandated by the national office, while others are left up to the local partners. Therefore, it is possible that the organizational features - technology, structure, culture and politics - may differ among the field offices. Because of these possible differences, each field office was considered a separate case and a multiple-case design was used.

In a multiple case study design, each case, or in this research, each field office, is viewed as a replication of the study rather than as a member of a sample and the analysis follows cross-experiment design and logic. There are two types of replication logic, literal and theoretical. Literal replication predicts the same results for all cases, while theoretical replication expects contrary results for predictable reasons [Yin 1984]. In this research there is no basis for expecting contrary results. Therefore, these cases are literal replications.

In order to understand how ExperTAX affects a field office, it is necessary to study each of the field offices' organizational features. It is also necessary to study each subunit within the office that may be affected by the system as well as the office as a whole. Since the information gathered by the TAPQ and ExperTAX is used in two departments (audit and tax) and at three levels (staff, manager, and partner), each of these units may be affected by the change

and needs to be included in the investigation. The multiple units of analysis within the field office indicate an embedded design approach.

4.2.3 Plan of Analysis

The key to the analysis of evidence in a case study is the identification of the central questions (identified in 4.2.1, above) asked by the study itself and the integration of the evidence gathered based on those central questions [Yin 1981, Bonoma 1985]. In this research, the central questions are:

1. Has the organization changed with the introduction of ExperTAX, and
2. How has the organization changed?

Within the broad questions other questions that address changes in the organizational features can be identified. For example, how has the design of an individual job changed - - the tasks performed by the individual, the role of the job in the completion of the larger task (tax accrual and tax planning), etc.? These more specific questions are embodied in the exploratory hypotheses and provide measures for comparison among and within sites.

The evidence gathered from all sources (e.g., interviews, documents, and observation) was integrated based on the central questions of the study. From the integrated evidence a range of views can be determined and used to develop a picture of how the organization has changed with

the introduction of ExperTAX.

In interpreting the results of the research, two types of comparisons were made:

(1) pre-post
(2) cross-site.

The pre-post comparison was used to answer the research questions identified. It involved a comparison of the descriptions of the units and features of the field offices before and after the introduction of ExperTAX. Evidence was integrated from five sources, (1) interviews with personnel who had experience with both the TAPQ and ExperTAX, (2) descriptions from published articles written by the developers and designers of ExperTAX [Shpilberg and Graham 1986, and Shpilberg, Graham, and Schatz 1986] and by outside observers [Sviokla 1986], (3) archival evidence, (4) documents, and (5) observations. Cross correlation of interview responses was used to help confirm descriptions.

The cross-site comparison was used to investigate the possibility of differential changes among organizations. No differential changes are expected. However, as discussed in 4.2.1, above, some of the organizational features of the sites may not be identical. Therefore, it was possible that the introduction of ExperTAX may have had a differential effect on the individual offices. The sources of evidence for the cross-site comparison were (1) interviews, (2) documents, and (3) observations.

4.2.4 Tests of Quality

Yin [1984] identifies four tests of quality for case studies - - internal validity, construct validity, external validity, and reliability. Internal validity concerns the establishment of causal relationships. As there are no causal relationships under investigation in an exploratory case study, internal validity is not a concern for this research. However, the other three tests of quality are relevant to this research. Construct validity refers to the establishment of proper operational measures for the concepts under study. These measures are used to determine what data is to be collected. There is little theoretical guidance for the establishment of measures for changes in an organization due to the introduction of an expert system. The measures for this research were generated from the interactive perspective framework. In this research, with little theory to guide their generation, the appropriateness of the measures cannot be determined a priori. However, use of multiple sources of evidence and the development of a chain of evidence linking the questions asked, the data collected, and the conclusions drawn increase the construct validity [Yin 1984].

Reliability refers to the ability of another researcher to arrive at the same results for the same case following the procedures used for the original study. Documentation of procedures is a key to reliability. Two techniques are

generally used to increase reliability - a case study protocol and a case study data base. The case study protocol provides guidance for data collection at the study sites. The case study data base consists of the evidence gathered by the researcher. Both a case study protocol and a case study data base were developed for this research (see Appendices A and B).

External validity deals with the generalizability of the study's findings. Use of the multiple-case approach increases external validity. However, this research deals with only one expert system and three sites that have a great deal in common. Therefore, the generalizability is greatly decreased.

4.3 Conduct of the Research

This research was conducted in accordance with the steps of the interactive perspective (IP) framework. As discussed in Chapter 2, the (IP) framework has three steps - (1) classification of the system, (2) investigation of the organizational features related to the system's classification, and (3) identification of the impacts.

4.3.1 Classification of the System

The choice of ExperTAX as the system of focus and its classification were discussed in depth in Chapter 3. ExperTAX was classified as both an operational system and a

planning and decision system.

4.3.2 Investigation of the Organizational Features

Step 2 in the IP framework is the investigation of the organizational features related to the system's classification. Before this investigation can proceed, the organization of interest must be identified.

4.3.2.1 Case Sites

The choice of ExperTAX as the system to investigate narrowed the set of possible organizations to the Coopers & Lybrand field offices with clients who pay taxes to the United States government. For practical reasons, the set of possible sites was further narrowed to those within the continental United States. The three sites used were chosen after a study of published material about ExperTAX and discussions with faculty advisors and some Coopers & Lybrand personnel. The sites chosen had some diversity among them, such as region of the country and client base. Table 1 shows the characteristics of the three case sites. The Alpha and Gamma offices are located in large metropolitan areas, while the Beta office is in a medium sized metropolitan area. The Alpha and Beta offices are in the Midwest and Gamma office is in the Southwest. The Beta office was a pilot office for the implementation of ExperTAX. The number of professional staff in each office is approximately equal. The client

base varied among the sites with the Alpha office serving mostly medium to large manufacturing clients, the Beta office serving mostly medium sized service industry, financial services, and insurance clients, and the Gamma office serving mostly energy and energy services, financial services, retail, and manufacturing clients.

Table 1
Characteristics of Case Sites

Office	Client Base	Size of Metro Area	Region of Country	Pilot Office
Alpha	Manufacturing, Service/Health, Retail/Wholesale, Real Estate	Large	Midwest	No
Beta	Service, Retail, Banking, Insurance	Medium	Midwest	Yes
Gamma	Energy & Energy Services, Financial Services, Retail, & Manufacturing	Large	Southwest	No

4.3.2.2 Data Gathering

Once the sites were selected, the investigation of the organizational features related to ExperTAX's classification as an operational system and a planning and decision system was implemented using five sources of data. In some cases, access was limited, but data from all five sources helped to

develop a profile of the organization before and after the implementation of ExperTAX. The five sources of data were:

(1) observation,
(2) documents,
(3) archival evidence,
(4) published articles about ExperTAX, and
(5) interviews.

Two types of observations were made. The first was a demonstration of ExperTAX in a field office using sample data. Client data are part of the individual client's file and are considered proprietary. Therefore, actual client data could not be studied. While the demonstrators were loading and using the system, they discussed differences between the use of the TAPQ and the use of ExperTAX, and advantages and disadvantages of both systems.

The second observation was of decision makers reviewing ExperTAX output. Again review of the actual client data was prohibited because of its proprietary nature, but the size of the output was observable and an estimate of the time necessary to review the output could be made.

The documents studied were a blank TAPQ and organization charts of the offices. As with the ExperTAX output, the completed TAPQs are proprietary and could not be studied. Archival evidence consisted of information about the implementation strategy for ExperTAX. The published articles were used for preliminary descriptions of the Tax Accrual and Tax Planning process using the TAPQ and ExperTAX, descriptions of ExperTAX itself, and reasons for

the change from use of the TAPQ to use of ExperTAX.

Interviews were the primary source of evidence. They were used for descriptions of the organization and its features both before and after the introduction of ExperTAX, for perceptions of the changes in organizational culture, technology, structure, and politics, and for descriptions of the implementation process. The initial list of open-ended questions was based on the exploratory hypotheses. The lists of questions used to structure the interviews are found in Appendix C. Each interview lasted 30 to 75 minutes.

The initial set of interviewees for each site included the ExperTAX liaison, 1-2 partners from both tax and audit, 3-5 decision makers divided between tax and audit, and 3-5 data collectors divided between tax and audit. All interviewees were to have had experience with both the TAPQ and ExperTAX. Based on these criteria, interviews were arranged by the personnel staff at each site. The ExperTAX liaison could not be interviewed at any of the sites because at all three sites, the liaison was no longer used and neither personnel nor any of the interviewees could remember who the liaison had been.

Table 2 shows the number and level of the interviewees at each site along with the time of the interviews. The levels are indicated rather than the decision maker/data collector category because in some cases the decision maker and the data collector were the same person.

Table 2
Department & Level of Interviewees
Time of Interviews

Level		Site Alpha	Beta	Gamma
Partner	Tax	2	1	2
	Audit	1	1	0
Manager	Tax	2	3	1
	Audit	3	2	2
Staff	Tax	3	0	2
	Audit	2	1	5
Time of Interviews		Dec '88 Jan '89	April '89	March '89

4.3.3 Identification of the Impacts

Step 3 of the IP framework is the identification of impacts of the system on the organization. Using the data gathered from the five sources of evidence and the exploratory hypotheses, these impacts are identified in Chapter 5.

4.4 Limitations

Problems Encountered

In the course of this research, several problems were encountered that reduced the depth of the available evidence. First, no archival evidence or documents related to the intent and introduction of ExperTAX into the field offices survives. Most of this evidence was in the form of memos, announcements, and marketing brochures and posters. None of these were retained by the field offices. Second, completed TAPQs are retained as part of the client's file, but they are proprietary and could not be examined. This is also true for the completed ExperTAX output. Decision makers were observed working on the analysis but the printout itself was unavailable for study. Third, although a demonstration of the set-up procedures of ExperTAX for data collection was given, observation of an actual data collection session was not permitted. Fourth, none of interviewees remembered who the ExperTAX resource person was. At one site, the partners who represented the office at the national ExperTAX roll-out conference in 1986 were interviewed as substitutes. Fifth, it was difficult to find audit seniors or supervisors who had experience with both the TAPQ and with ExperTAX. Because of these problems, the evidence for this research is limited to the interviews, published articles about ExperTAX, some archival evidence such as organization charts, and documents related to the

implementation of ExperTAX.

This chapter discussed the use of the case study method and how the research questions, units of analysis, and plan of analysis relate to the overall research design. It also discussed the problems encountered during the research. The next chapter discusses the findings of the research.

Chapter 5

Findings and Analysis

The analysis of the data consists of two comparisons - an intra-office comparison of the features of each field office before and after the introduction of ExperTAX and an inter-office comparison of the field offices. The chapter includes analysis of (1) the perceived differences in the productivity of data collection and decision making before and after the introduction of ExperTAX, (2) the perceived differences in the horizontal and vertical mobility of those in the tax accrual and tax planning process, (3) the perceived differences in the roles and responsibilities of those involved in the tax accrual and tax planning process before and after the introduction of ExperTAX, (4) indications of possible resistance to ExperTAX, and (5) further analysis of the culture, technology, structure, and politics to help identify impacts not suggested by the exploratory hypotheses. Figure 7 lists the exploratory hypotheses (EH), indicates whether they were supported by the data from each office, and gives a brief summary of the reasons (suggested by the data) for support or non-support.

The exploratory hypotheses were proposed based on the impacts suggested by the classification of ExperTAX under the Interactive Perspective Framework. As discussed below, some of exploratory hypotheses were not supported by the

	Supported	Not Supported	Evidence
EH 1 Productivity in Data Collection	x		Completeness and accuracy of data; perceived contribution to productivity of the firm
EH 2 Productivity in Decision Process		x	No change in the method of identifying tax planning issues and opportunities
EH 3 Greater Horizontal Mobility - Data Collector		x	Moves made before ExperTAX experience; knowledge gained from ExperTAX not necessary to horizontal mobility
EH 4 Greater Vertical Mobility - Data Collector		x	No differential advantage; all staff will have ExperTAX experience
EH 5 Decreased Vertical Mobility - Decision Maker		x	No change in method of method of decision making; no reliance on ExperTAX for identification of tax planning ideas
EH 6 Job Content - Data Collector	x		Task changed from manual to computerized task; sequential to joint
EH 7 Job Satisfaction - Data Collectors	x		Increased interaction; increased knowledge base; increased pride in firm
EH 8 Job Content - Decision Makers	x		Participation in data collection
EH 9 Job Satisfaction - Decision Makers	x		Increased understanding of client; increased interaction; increased pride in firm
EH 10 Pattern of Work Flow	x		Task changed from sequential to joint; change in timing of data collection
EH 11 Social Interaction	x		Sequential to joint; increased interaction unrelated to data collection task
EH 12 Centralization of Decision Making		x	No change in the method or level of decision making
EH 13 Power of the Decision Maker		x	No change in the method or level of decision making
EH 14 Relative Power of Departments		x	Task does not represent a large part of the total task; perceived increase in cooperation
EH 15 Resistance of Decision Maker		x	If given the chance to change how the system is used, all would continue to use it as is

Figure 7
Evidence for Support or Non-Support of Exploratory Hypotheses

data gathered.

5.1 Productivity - EH 1 and 2

EH_1: Tax accrual and tax planning data collection productivity has increased since the introduction of ExperTAX.

EH_2: Productivity in the tax accrual and tax planning decision process has increased since the introduction of ExperTAX.

In each of the field offices the exploratory hypothesis (EH1) that productivity in the data collection process has increased with the introduction of ExperTAX was supported, but not for the reasons predicted. The process using ExperTAX required more time not only because the data was collected more thoroughly and carefully, but also because the collection process was a joint process and each actual hour spent collecting data represented two man-hours. However, the joint collection process allowed more complete and accurate information to be collected. The perception of those interviewed was that ExperTAX was rarely returned to the field for further information. Also, the cooperation necessary for the joint process was perceived to give both the auditor and the tax person more insight into the client's business. According to one tax partner, ExperTAX was "... causing more thinking -- looking -- introspection about what can be done for the client."

The interviewees felt that the TAPQ was often not properly completed or reviewed. In order to understand the

client situation based on the TAPQ, each question and answer had to be reviewed and put into perspective relative to the other questions and answers. However, ExperTAX generated output that identified issues and opportunities based on the answers to the questions asked.

In addition, the perception was that ExperTAX tended to impress the client with the firm's commitment to the use of new technology. Most of those interviewed felt that this impression and the tax planning ideas generated by the firm for the client would sell additional services to the client thereby increasing the productivity of the firm as a whole.

EH 2, increased productivity in the decision making process, was not supported in any of the field offices. The process for identifying tax planning issues and opportunities appeared not to have changed with the introduction of ExperTAX. The TAPQ and the Business Tax Planning Checklist, another paper checklist replaced by ExperTAX, previously were not used in the tax planning process. Issues and opportunities were, and still are, identified by tax practitioners who know their client's business situation and the tax laws well. At the time of this research ExperTAX is not used as a means to generate tax planning ideas and opportunities but as a back-up system to make sure nothing had been overlooked.

5.1.1 Intra-office Analysis

Productivity is defined in terms of the time necessary to complete the task and the quality of the output. Neither of these dimensions could be measured directly for either ExperTAX or the process used before its introduction. No separate records were kept of the amount of time spent on filling out the TAPQ or completing ExperTAX. That time was, for both the TAPQ and ExperTAX, part of the total time spent on the audit.

5.1.1.1 Alpha Office

Time

The amount of time necessary to complete the TAPQ conscientiously for either a new or continuing client was estimated by the interviewees at two to three hours. However, the tax partners, one tax manager, and one audit manager interviewed all stated that filling out the TAPQ for a continuing client took about 10 minutes.

> What usually happened was you took last year's [TAPQ] and you updated it and really didn't do much but write it over. People didn't update very well.
>
> Audit Manager 1 - Alpha Office

> [The auditors] would say, 'Anything new?' when they'd come out and review [the client situation] and the [client] would say, 'No.' [The auditor would] sign and that would be the end of the TAPQ.
>
> Tax Partner 1 - Alpha Office

The review of the TAPQ was equally cursory. The tax practitioners interviewed said that tax planning issues and opportunities rarely came from the TAPQ. Rather, they were a result of regular contact with the client, knowledge of the client's business activities, and knowledge of the tax laws. The auditors, for the most part, agreed. However, they felt that good tax planning ideas occasionally came out of the TAPQ.

With ExperTAX, those interviewed said the data collection process also took two to three hours. Although the time necessary to collect the data with ExperTAX was approximately equal to that required to complete the TAPQ properly, there was a requirement that ExperTAX be completed by an audit person and a tax person working together. Under some circumstances, such as those described below, the team requirement was not met, but for the majority of clients it was met. If the requirement was met, the man-hours for completion of ExperTAX were four to six hours.

Two of the interviewees did not use the team approach with ExperTAX. One of these was an audit manager on a large manufacturing client. The client maintained its own tax staff and client personnel provided the tax expertise generally provided by the Alpha office tax staff. The other non-team completion of ExperTAX was done by a tax manager for his foreign clients in situations in which an audit was not performed and for start-up clients in cases in which

losses made tax accruals of little concern. The tax manager felt that completing ExperTAX for his foreign clients took "a little longer" than filling out the TAPQ, because, "ExperTAX forces you to spend more time looking at things because it puts everything in front of you."

Review of the ExperTAX output by tax personnel required an additional two to three hours. Therefore, the time necessary, in terms of man-hours, for data collection and review, as it was normally done, increased by four to six hours with the introduction of ExperTAX.

Quality of Output

The quality of the data collection was reflected by the quality of the output and whether or not it was used. One audit manager noted that the TAPQ had no real output - no feedback - on the relevance of all the questions asked. The output of the data collection process using the TAPQ was the completed questionnaire. ExperTAX, on the other hand, produced volumes of output ("[i]t can be 80 pages...) that provided not only the questions and their answers but also output for tax accrual and tax planning identifying issues and opportunities separately for each task. All of those interviewed agreed that ExperTAX output was easier to review. However, seven of the twelve interviewees said that, although the system occasionally identified items not previously considered, generally the issues and

opportunities had already been identified by other means or were not applicable. Three of the tax people felt the output was "too simplistic," while one audit manager felt that it was "too tax technical." One tax partner and two members of the tax staff felt the output was redundant. One comment was that it "...generates vast amounts of output, most of which is useless."

Everything said thus far would indicate that the overall productivity of the data collection, as measured in "chargeable hours," decreased with the introduction of ExperTAX. However, all but one of the interviewees agreed that if given the opportunity not to use ExperTAX, they still use the system and, for the most part, as it had been used. They felt that the benefits derived from the use of ExperTAX were worth the extra time it took to collect the data and review the output. Most agreed with the tax partner who said that ExperTAX was "... much more useful than the TAPQ."

5.1.1.2 Beta Office

Time

The estimate of the time necessary to complete the TAPQ in the Beta office was one to two hours. Only one person mentioned that the completion of the TAPQ was based on the prior year's questionnaire. This person also said that sometimes entire pages were marked "not-applicable." In

addition, two audit managers said that completing the TAPQ was a mechanical task and that the questionnaire indicated only general areas to investigate and did not provide the necessary depth of information for the tax accrual and tax planning decision process.

The interviews indicated a range of estimates of the time for data collection using ExperTAX of from one to two hours for a continuing client and up to four hours for a new client. Because of the required audit-tax team approach this translates into two to eight man-hours, depending on the client . However, the audit partner interviewed said that for his clients the data collection process using the TAPQ had also been a joint process with an auditor and a tax person filling out the questionnaire together. He was the only person interviewed to indicate that completing the TAPQ was ever a joint task. Everyone agreed that review of the output took one hour. Thus the increase in total time for data collection and review with the introduction of ExperTAX ranged from one to eight hours.

Quality of Output

According to the audit managers, ExperTAX "creates a monster of paperwork" that may or may not be relevant even though it provided specific suggestions for the client. A tax manager felt that ExperTAX, "... streamlines the process - - cuts out much of what one doesn't need to be concerned

with." Another tax manager said that the team approach for the data collection process using ExperTAX made the process more efficient because the audit person and the tax person could "leverage off each other's expertise." It was felt that this leveraging not only made the process more efficient but resulted in better information.

The audit partner felt that the quality of the data gathered had increased, but he was concerned that the level of quality could not be sustained. Before ExperTAX was introduced the level of the data collector was audit senior. With the introduction of ExperTAX, the Beta office made audit and tax managers the data collectors. This was partially because the managers were curious about how the system worked and partially because everyone wanted to make sure the system was properly used. There was concern in the Beta office that as the newness and the novelty of the system wore off it would be viewed, as the TAPQ was, as merely a compliance task - something that must be done rather than something that enhances the audit or tax planning process. Also, as use of the system became more routine, the level of the data collector would be leveraged down again to the staff level, and the importance of the task would not be as well understood. Either of these situations were viewed as very possibly decreasing the quality of the data collected. However, all eight interviewees felt that the quality of the data collected

increased with the introduction of ExperTAX. They also felt that, even with the increased time necessary to use ExperTAX, productivity in data collection had increased.

The productivity of the decision making process was unchanged. The decision makers did not rely on ExperTAX to identify tax accrual and tax planning issues or opportunities. The tax planning ideas came from individual decision makers and were identified throughout the year. All interviewees agreed with two tax managers who said,

> [ExperTAX] might identify something that may have applications ... [Y]ou still need someone to apply it and to say, 'does this really fit our facts?' Some things fit the facts but they, from a practical standpoint, don't make sense. So you weigh the ideas that are generated.
>
> Tax Manager 1 - Beta Office

> [I] still don't rely on ExperTAX. It is there to cover yourself if you forget something. Nothing should surprise you if you're doing your job right.
>
> Tax Manager 2 - Beta Office

5.1.1.3 Gamma Office

Time

The estimates of the time necessary to complete the TAPQ were quite varied in the Gamma office. One tax partner estimated that it took one hour to complete the questionnaire while an audit supervisor, who said that he "tried to do it right," estimated that it took six hours to complete. The rest of those interviewed estimated that it

took two to three hours to complete the questionnaire. The estimates of the time necessary to input data for ExperTAX also varied but most of the interviewees estimated completion time at two to three hours for data input. As in the other field offices there was a team approach requirement so the man-hours for completion of data collection for ExperTAX is four to six man-hours.

The second tax partner interviewed said that the ExperTAX data collection took longer "only because the old process was not effectively done." An audit senior felt that the questions asked in the TAPQ were ambiguous and that the number of questions asked by ExperTAX were "dramatically" fewer than the number asked by the TAPQ. The audit senior also felt that because of the team approach used to complete ExperTAX and the 'why' feature of the system less time was spent "tracking down answers."

Quality of Output

Both tax partners indicated that although more time may be spent in the data collection process, the people in the field were being given more knowledge and producing a more efficient product. The tax manager said that with ExperTAX it was often possible to identify tax planning issues as the data was being input and that this was especially true if the client was present during the process. Identification of issues during the data collection process was not

possible when the TAPQ was used. With the TAPQ there was no logic chain connecting the questions and no summary of any kind. The tax planning issues and opportunities were "lost in the questionnaire."

Two staff auditors said that the TAPQ did not help in the tax accrual process. Additionally, even though ExperTAX took longer to complete and required the budgeting of both an auditor and a tax person, the advantages of using ExperTAX outweighed the time and budget pressures.

The decision making process in the Gamma office did not change with the introduction of ExperTAX except to the extent that it became possible to identify some tax planning issues as the data was put into the system. However, even in such a case, a complete analysis of the client's position was not possible as the data was input. The tax personnel regarded ExperTAX as a tool to verify issues and opportunities identified by individuals. One tax partner said,

> If you are properly servicing your clients, ExperTAX should not give you any tax planning ideas you haven't already thought of.
> Tax Partner 1 - Gamma Office

The other tax partner expressed some disappointment that a system as expensive as ExperTAX had not identified any "home runs," i.e., major tax planning issues not previously considered. However, he also said that had the system done so, "... it would mean we weren't doing our job."

5.1.2 Inter-office Analysis

Although their degree of satisfaction with the system differed across offices, the interviewees at all three offices agreed that the productivity of the data collection process increased with the introduction of ExperTAX. The differences among offices may have been a function of the timing of the interviews. Those interviewed at the Alpha office were the most dissatisfied with the data collection process using ExperTAX. However, these interviews were conducted in late December and early January during the busiest time for year-end audits of calendar-year clients. Both the tax and the audit personnel were under time pressures to gather and review the ExperTAX data. The interviews with the other offices' personnel were conducted in late March and late April, well after the year-end audit "crunch." Additionally, these interviewees were not using ExperTAX at the time of the interviews.

The productivity of the decision process was perceived to be unchanged by the introduction of ExperTAX at all three offices. All of the interviewees felt that the manner in which decisions were made before and after the introduction of ExperTAX was the same and stated that the output of the system was used only as a back-up.

5.2 Vertical and Horizontal Mobility - EH 3, 4, and 5

EH_3: Staff auditors who have experience with ExperTAX will perceive themselves to have greater horizontal mobility within the firm than those who do not have experience with ExperTAX.

EH_4: Staff auditors who have experience with ExperTAX will perceive themselves to have greater vertical mobility within the firm than those who do not have experience with ExperTAX.

EH_5: Decision makers will perceive themselves as having decreased vertical mobility since the introduction of ExperTAX.

Exploratory hypotheses 3 and 4, which state that the horizontal and vertical mobility of the staff auditors with ExperTAX experience is perceived to be greater than that of staff auditors without ExperTAX experience are not supported by the interviews. Although all those interviewed agreed that ExperTAX would probably increase the staff auditors' knowledge of tax and would make them more sensitive to their clients' situations, knowledge of the tax laws was not considered necessary for movement from the audit staff to the tax staff. Additionally, it was felt that most transfers between staffs occurred before the auditors had any experience with ExperTAX.

Similarly, the interviewees all agreed that with the knowledge gained from the use of ExperTAX, the staff auditors would likely have greater insight into their clients' businesses and the implications of the tax laws on the clients' situations. However, all interviewees felt

that by the time the staff auditors reached the audit supervisor position, they would all have experience with ExperTAX. Therefore, they felt that experience with ExperTAX would provide no differential advantage.

Exploratory hypothesis 5, that decision makers perceive themselves to have decreased vertical mobility since the introduction of ExperTAX, was also not supported. Although the system identified tax accrual and tax planning issues and opportunities, the decision makers stated that they did not rely on ExperTAX. The decision makers said they still identified the issues and opportunities based on their knowledge of their clients and the tax laws just as they did before the introduction of ExperTAX. The interviewees said that they used ExperTAX only as a back-up - a check to make sure they did not overlook anything.

5.2.1 Intra-office Analysis

5.2.1.1 Alpha Office

Horizontal Mobility of Staff Auditors

Movement from the audit to the tax staffs was perceived to be unaffected by the introduction of ExperTAX. One tax partner said that there was very little movement from audit to tax both before and after the introduction of ExperTAX. All seven of the tax personnel interviewed said that the tax staff consisted of people with law degrees or Masters in Tax. One tax partner said that they did not necessarily

look for a person with tax experience when filling a position on the tax staff. Rather, they looked for

> ... just a bright person. We've hired people without any tax or accounting experience. Our philosophy is that we want really bright people. That's the beginning premise.
> Tax Partner 1 - Alpha Office

The audit personnel indicated that, although ExperTAX would probably give staff auditors a knowledge of tax that they would not otherwise have, they felt that transfer from the audit department to the tax department would generally occur before the auditors had any experience with ExperTAX. Therefore, the introduction of ExperTAX was perceived to have no effect on horizontal mobility.

Vertical Mobility

The audit staff interviewed felt, as the audit partner did, that use of ExperTAX would provide the users with "an additional skill level" and might make them a "valuable resource" to be used by others. However, they also said that all auditors would have experience with ExperTAX by the time they reached the level of audit supervisor. Therefore, experience with ExperTAX would provide no differential advantage for upward movement within the audit department.

A tax partner said that experience with ExperTAX would not help tax people move up in the firm.

> [You] must deal with clients and have a foundation in tax that ExperTAX will not give you.
>
> Tax Partner 2 - Alpha Office

However, because the decision makers felt that the decision process had not changed, they perceived no decrease in their ability to move up within the firm either.

5.2.1.2 Beta Office

Horizontal Mobility

As discussed in 5.2.1.1, with the introduction of ExperTAX the data collection for the tax accrual and tax planning process was "leveraged up" from the audit staff level to the audit manager level in the Beta office. Therefore, because ExperTAX was not used by the staff auditors, it was felt that it could not affect their ability to move from the audit department to the tax department.

In addition, at the time of the interviews, the view held by all interviewees was that, even when the data collection task was "leveraged down" to the audit staff, the degree of horizontal mobility of the staff auditor would not change. The tax partner interviewed said that there had been a "general waning of interest in taxes by the auditors in the last five years." He said that even though he would like to see a tax department made up of 50 percent law

school graduates and 50 percent experienced audit transfers, he did not foresee much of a change from the tax department as it was - - 70 percent law school graduates with little or no accounting background. He did not feel that ExperTAX would have any impact.

Vertical Mobility

Again, as discussed above, the staff auditors at the Beta office generally had not used ExperTAX. Therefore, their vertical mobility within the audit department was unchanged by the introduction of ExperTAX. The vertical mobility of the audit managers who did collect the data for ExperTAX was also perceived to be unchanged. The feelings of most of the interviewees were reflected in the following remark of an audit manager,

> [ExperTAX] has helped [auditors to] know [their] clients better but hasn't changed their mobility.
>
> Audit Manager 1 - Beta Office

Within the tax department, the decision makers did not perceive that the decision making process had changed with the introduction of ExperTAX. Therefore, they also perceived that their vertical mobility had not changed.

5.2.1.3 Gamma Office

Horizontal Mobility

The tax department in the Gamma office, at the time of the interviews, was made of primarily Masters in Tax,

Masters in Accounting, and lawyers with a few transfers from the audit department. The tax manager interviewed felt that, with the use of ExperTAX, the in-charge auditors (ICAs) were learning more about tax and the tax implications of their clients' financial situations. With the increased tax knowledge and awareness, he felt that the ICAs were becoming more valuable to the audit department and also more attractive to the tax department. He felt that there would be an attempt on the part of the tax personnel to "lure" more people from audit to tax. However, he said he "hadn't seen it yet, but maybe it is too soon to tell."

An audit manager felt that there was no change in the ability of the staff auditors to move from audit to tax because of the introduction of ExperTAX. He said that the horizontal moves typically occurred before the staff auditors had any ExperTAX experience. None of the staff auditors interviewed felt that the introduction of ExperTAX had any effect on their horizontal mobility.

Vertical Mobility

Both audit managers and all five staff auditors interviewed did not perceive any difference in the upward mobility of the staff auditor before and after the introduction of ExperTAX. One audit supervisor said that use of ExperTAX provided a better understanding of both the client's financial and tax situations but agreed with the

staff auditor who said,

> There is no direct correlation between ExperTAX and advancement. It makes you a better rounded person, but everyone else is also.
> Staff Auditor 1 - Gamma Office

The decision makers interviewed all stated that their ability to advance within the firm was unchanged by the introduction of ExperTAX. The tax personnel felt that they had become better advisors to their clients because ExperTAX made them more knowledgeable about the client's business policies and strategies. They also felt this helped them understand why their client accepted some tax suggestions and rejected others. Additionally, the tax planning issues and opportunities had been identified by individuals before the introduction of ExperTAX and, at the time of the interviews, the identification and decision process was perceived to be unchanged. Therefore, the decision makers felt the system had no effect on their ability to advance in the firm.

5.2.2 Inter-office Analysis

The tax personnel at the Beta and Gamma offices indicated a concern for the apparent lack of interest on the part of staff auditors to make the horizontal move from the audit staff to the tax staff. The tax partner interviewed at the Beta office was actively seeking to increase the number of audit transfers to the tax staff. The Gamma

office tax manager interviewed expressed a hope that ExperTAX would "spark" an interest in tax in the staff auditors and that the tax staff would then be able to "lure" them to the tax staff. However, at the time of the interviews, the interviewees at all three offices agreed that the horizontal mobility for the staff auditors had not changed with the introduction of ExperTAX. They also agreed that the vertical mobility for the staff auditors was unaffected by the introduction of ExperTAX. Because they felt that all audit supervisors would have experience with ExperTAX, no staff auditor would be likely to advance to manager more quickly than any other based solely on ExperTAX experience.

The decision makers did not perceive that they had lost mobility because of ExperTAX. ExperTAX was universally referred to, by all levels in all three offices, as a tool to be used to assist, rather than to take the place of, the decision maker. Therefore, the system was not perceived to have decreased the decision makers' vertical mobility.

5.3 Job Content - EH 6 and 8

EH_6: The job content for the staff auditor collecting the tax accrual and tax planning data has changed since the introduction of ExperTAX.

EH_8: The job content of the decision maker has changed since the introduction of ExperTAX.

The exploratory hypotheses concerning the changes in the job content of the staff auditor/data collector and the decision maker were both supported by the data, although the decision makers' job content was perceived to have changed less than that of the data collector.

With one exception, the interviewees said that when the TAPQ was used the data collection process was sequential, with the staff auditor answering the TAPQ questions alone, often in the Coopers & Lybrand office. When confronted with a question for which the answer was not known, the staff auditor might call the client or a tax person, depending on the question, or leave it unanswered. It was perceived that the previous year's TAPQ was often used as a guide to fill out the current one, with responses copied directly from one to the other. After the auditor was finished with the TAPQ it was sent to the tax department to be reviewed and possibly completed by the tax staff member assigned to the client. The time estimates for filling out the TAPQ ranged from 10 minutes for a cursory transference of check marks from one year's TAPQ to the next to three to four hours for conscientiously researched answers.

With the introduction of ExperTAX, data collection became a joint process with a computer used as the repository for the information. An auditor and a tax person input the data together, often with client personnel present. Rather than checking "Yes", "No", or "NA" as on

the TAPQ, more complete and precise answers were required by the system. Those present had in-depth knowledge of the client's business and the accounting and tax implications of the client's activities. If there was any confusion as to why a particular question was asked, a help function was available on the computer that could explain the purpose of the question.

The job content of the decision maker also changed, but not to the same degree. After the introduction of ExperTAX, the decision maker still identified tax planning issues and opportunities and presented them via a memo to the tax manager or tax partner. In addition, the decision maker reviewed and analyzed the output from ExperTAX to make sure all relevant issues and opportunities were identified and considered, and, in some cases, the decision maker also assisted in the data collection. Analysis of the ExperTAX output could be very time consuming with output ranging from 75 - 100 pages (various interviews). Some decision makers interviewed felt that many of the issues and opportunities identified by ExperTAX were obvious, simplistic, had already been considered and rejected, or were not relevant to the client. All agreed that the output is voluminous and redundant, but most saw these and other problems as results of the "necessarily general nature of the system."

5.3.1 Intra-office Analysis

A description of job content includes a discussion of the tasks involved in the job, how the tasks are completed, the skills necessary to complete those tasks, and identification of who performs the tasks.

5.3.1.1 Alpha Office

Data Collectors

Although the purpose of the data collection task did not change with the introduction of ExperTAX, the manner in which the task was completed did change. As one tax manager put it, with the TAPQ "... all you needed was a pencil and the package." As discussed above, often the TAPQ was completed by using the previous year's questionnaire to answer the current year's questions. One tax manager said,

> [TAPQ] was a checklist and you could look through [it] and ... say 'yes' or 'no.' You never gave it much thought.
> Tax Manager 1 - Alpha Office

However, an audit manager explained that the TAPQ asked brief questions about specific situations. If the situation was not understood, the data collector had to spend time determining what was meant and how it affected the client. The audit manager felt that to complete the TAPQ properly, the data collector would often have to use his imagination.

Use of ExperTAX required five things of the data collector. First, a compatible computer had to be found. A

tax manager and the two staff auditors interviewed indicated that this was sometimes a problem. Next, the system had to be loaded from five or more floppy disks onto the computer's hard disk. Third, the computer had to be transported to the data collection site, which could be either the Alpha office or the client's office. Then, the system was used to collect the data and stored on a floppy disk. Finally, the computer and the floppy disk containing the client data were returned to the Alpha office computer room so that the output could be printed.

With the introduction of ExperTAX also came the requirement that the data be collected by an auditor and a tax person working together. One tax partner said that the joint completion requirement sometimes caused problems in scheduling (i.e., it was more difficult to find a time when both an auditor and a tax person were available to input data). If the client was also included in the data collection scheduling could be further complicated.

After the ExperTAX software was loaded into the computer, the system's operation was not difficult. Interviewees considered ExperTAX to be very user friendly. A tax manager who served as both a decision maker and a data collector said,

> [ExperTAX] is idiot-proof. If you can read, that's all you have to know how to do.
>
> Tax Manager 1 - Alpha Office

Most interviewees agreed that collecting the client data using the audit/tax team approach simplified the process.

> [ExperTAX] puts everything in one place vs. the [TAPQ] we had in the past.
> Tax Manager 1 - Alpha Office

Additionally, the team approach provided a learning experience for both the audit and tax personnel. With ExperTAX, when the data collection completed jointly, if there were any "items" that either the tax person or the auditor did not understand (i.e., things out of their area of expertise), the other person could explain the purpose and importance of the question (Tax Manager).

Decision Makers

The decision maker's job content also changed but not to the extent that the data collector's did. As previously discussed, it was felt that the tax planning issues and opportunities were identified in the same way both before and after the introduction of ExperTAX. However, the introduction of ExperTAX brought volumes of output to review. One tax partner said that in 80 or more pages of output there was a "lot of redundancy." He said that he went through the output to "make sure there's nothing blatant" that should be considered. An audit manager said that he reviewed the detail to see if he agreed with the

answers. Another audit manager said,

> The process hasn't changed much. Whether it's ExperTAX or the TAPQ, it's identifying a possibility which then gets followed up manually to see if all heads agree this is something we ought to pursue and then approach the client with it.
> Audit Manager 2 - Alpha Office

A tax manager said the ExperTAX output took longer to review but was easier to review.

> There's no thinking to it ... You're reading it to say, 'is this applicable, inapplicable, does this make sense?
> Tax Manager 3 - Alpha Office

5.3.1.2 Beta Office

Data Collectors

Using the TAPQ was perceived by all three tax managers interviewed to require no "independent thought." The audit staff just filled out the questionnaire, often based on what had been done the previous year, and dropped it off with the tax department. One audit manager described the data collection task using the TAPQ as mechanical, frustrating, and often, without the necessary depth to make decisions. The other audit manager interviewed said that the TAPQ highlighted areas that might be of concern but research was required to be sure. The auditor's frame of mind was, "Take it down, let tax review it." The staff auditor interviewed said that when the TAPQ was used, the tax people only met with the clients on "big jobs."

With the introduction of ExperTAX, the purpose of the task did not change, but, in most cases, according to the interviewees, the data collection task was "leveraged up" to the audit manager level. No one in the Beta office perceived there to be a problem with finding a compatible computer. In some cases, the ExperTAX software was left on the computers so that it was not necessary to reload it every time the system was used.

The tax managers felt that ExperTAX required a more conscious effort on the part of the data collectors than the TAPQ had. However, they said that it made the data collector think more about the client's situation. They also felt that the system raised questions that could be answered with ideas rather than with more research. As one tax manager put it,

> ExperTAX streamlines the process - - cuts out much of what one doesn't need to be concerned with and allows one to focus on the relevant issues, possibly spending the same amount of time on them as was spent on the whole process before.
>
> Tax Manager 1 - Beta Office

All the interviewees felt that the team approach required with the introduction of ExperTAX fostered a new perspective of the client's situation on the parts of both the tax and audit personnel. This new perspective was felt to be of benefit not only to the audit and tax personnel, but also to the client. The audit staff auditor interviewed

said that ExperTAX also forced the tax people to become more involved with the client.

Decision Makers

Although the decision makers perceived no change in the decision making process itself, they did feel that ExperTAX had an impact on their jobs. One tax manager felt that tax planning issues and opportunities were more easily missed using the manual [TAPQ] system. Another tax manager felt that reviewing the ExperTAX output made him follow through on tax planning issues and opportunities he had already identified. The third tax manager interviewed felt that reviewing the output made him think more about the client's situation.

> Sometimes issues generated [by ExperTAX] fit the facts, but they, from a practical standpoint, don't make sense. So you have to weigh the ideas that are generated.
> Tax Manager 2 - Beta Office

For some decision makers, the introduction of ExperTAX caused them to become data collectors, too. Because data collection with ExperTAX was a joint process, use of the system caused tax people to interact with auditors more than they had when the TAPQ was used. The tax partner predicted that ExperTAX "... would force the tax people out to see the clients," and said that he thought the contact would make them better tax advisors.

5.3.1.3 Gamma Office

Data Collector

Before the introduction of ExperTAX the data for the tax accrual and tax planning process were gathered manually at the Gamma office by staff auditors. Several of the staff auditors interviewed felt that completing the TAPQ was "rote" exercise with little purpose. The tax staff felt that the staff auditors did not understand what they were doing when they answered the TAPQ questions. The staff auditors interviewed confirmed the tax staff's feelings. The auditors who did understand the purpose and importance of the data collected felt that the audit department "did the leg work and tax got the credit" for all of the auditors' efforts.

With the introduction of ExperTAX, the technology of how information was gathered changed (Tax Partner - Gamma Office). In the Gamma office, ExperTAX was loaded onto computers owned both by the office itself and by individuals who work there. Most often ExperTAX was completed at the client's office (Tax Partner - Gamma Office).

The auditors felt that, with the introduction of ExperTAX, they had a better understanding of the purpose and importance of the data collected.

> Frequently I answered questions and I understood what the answer needed to be. But it was hard for me to look at all the implications in one place. And after I had seen the

> output that came out of [ExperTAX] - - that was something that really keyed me in on how valuable this could be.
>
> Audit Supervisor - Gamma Office

Additionally, the staff auditors interviewed felt that the job of collecting the data was easier using ExperTAX and that the data was more easily retrieved. Because of the team requirement for data collection, there was more interaction between the tax and audit staffs. Members of both staffs agreed that the increased interaction fostered a better understanding of and relationship with the other staff. Because the data was most often collected at the client's office, the tax personnel had more contact with the client and became more aware of the client's situation than they were when the TAPQ was used. Both the tax and audit personnel said that with the introduction of ExperTAX, the auditor began to serve as an interface between the client and the tax personnel. It was perceived that the auditor also became more involved in the decision process and in the discussions of tax planning issues and opportunities between the client and the tax personnel. As a result of their involvement in these discussions, the auditors felt that they got more feedback from the client. One audit senior said that using ExperTAX had reduced the amount of time spent on administrative tasks and on research for data collection.

Decision Makers

With the introduction of ExperTAX, the decision makers became data collectors. This led to more interaction with the auditors with whom they collected the data. The tax staff felt that ExperTAX required more involvement in the process for the tax people and that they were made more aware of the client's situation. Because of the increased contact with the tax staff, the auditors said that they felt more comfortable in calling the tax people they had worked with for help with client tax questions. Additionally, the tax personnel felt that clients called them more frequently with tax questions that, previously, they would have asked of the auditors.

5.3.2 Inter-office Analysis

At all three offices ExperTAX was used both at the client's location and in the firm's offices. The offices differed on which location was preferred. The Gamma office used ExperTAX almost exclusively at the client's location; the Beta office used it most often in the firm's office; and the Alpha office's location of use was mixed.

There was some question as to what level on the audit staff participated in the data collection for the Beta office. Some members of both the audit and the tax departments indicated that audit managers were the data collectors, while others suggested that the audit in-charges

performed the task. Those who indicated that managers collected the data felt this was a temporary condition until everyone became comfortable with the system and the process. Most of those interviewed felt that the in-charge accountant level was the proper level for data collection because the in-charge had the greatest contact with, and knowledge of, the day-to-day activities of the client.

On the tax side at all three offices, the auditors seemed to prefer that a tax manager assist in data collection because of the manager's greater experience both in tax and with the client. However, this was not always possible either because of the structure of the tax department or the time and budget constraints of the audit.

The level of the actual decision maker is varied both between and within offices. The ultimate responsibility for the tax planning issues and opportunities presented to the client rested with the tax partner. However, in all cases, the initial identification of those issues and opportunities was pushed to a lower level. In the Beta office, the initial decision making rested with either the tax supervisor or the tax manager depending on how much experience the tax supervisor had with the client. In the Gamma office, the initial decision making was done by a tax specialist or tax supervisor. The Alpha office tax department had a different structure than the other two offices. Each client had two tax people assigned to it, a

tax partner and one other - - either a manager, supervisor, or a specialist. The initial identification of issues and opportunities and the analysis of the ExperTAX output was the responsibility of either the manager, the supervisor or the specialist, whomever was assigned to the client.

5.4 Job Satisfaction - EH 7 and 9

EH_7: The job satisfaction of the staff auditor collecting the tax accrual and tax planning data has increased since the introduction of ExperTAX.

EH_9: The job satisfaction of the decision maker has decreased since the introduction of ExperTAX.

The exploratory hypotheses that the job satisfaction of the staff auditor/data collector and the decision maker increased since the introduction of ExperTAX are supported by the data. However, the contention that the job satisfaction of the decision makers has increased (EH_9) is only weakly supported.

Job satisfaction is increased by aspects of the job that are perceived by the worker to (1) make him feel better about what he does, (2) allow him to use and develop his skills and knowledge, (3) increase the importance of what he does, and (4) provide variety, interest, and feedback.

When asked directly if the change from using the TAPQ to using ExperTAX had increased job satisfaction, the answer was overwhelmingly, "No." Indeed, the data collection task

represented such a small part of the total job of the staff auditor that overall job satisfaction probably was not affected by the introduction of ExperTAX. For the decision makers, not only did the tax accrual and tax planning decision process represented by the TAPQ and ExperTAX constitute a small part of their overall responsibilities, they also felt that the basic decision process had not changed.

Concerns about the system and its use were also voiced. As discussed above, some of the data collectors felt that the process of finding a compatible computer and loading the disks was unnecessarily cumbersome. Most of the decision makers interviewed felt the ExperTAX output was voluminous and redundant. Some of the auditors felt that the system was too technical, while some of the tax people felt it was too simplistic. Some of the interviewees felt that ExperTAX was merely a computerized TAPQ.

However, the data collected in this research tends to support the conjecture that satisfaction in the data collection task did increase with the introduction of ExperTAX and that the decision makers are somewhat more satisfied with their tasks and responsibilities related to the tax accrual and tax planning identification and decision process. The interviews indicated that the auditors felt that they had become more knowledgeable about their clients and about taxes since the introduction of ExperTAX. They

felt that, given their greater knowledge base, they understood their client's business better and were better auditors for it. They also felt more comfortable when clients asked them tax questions. Not only were they comfortable answering the questions themselves, but they also felt comfortable referring clients to tax people they knew and with whom they had worked.

Clearly, the tax people felt that the fact that ExperTAX had not identified any major tax issues and opportunities that they had not already identified and considered indicated that they were serving their clients well. They also felt that there had been no decrease in creativity or flexibility in decision making. ExperTAX also forced the tax personnel to have more contact with the client, which they all felt was a very positive development.

In addition, most of the interviewees indicated they they felt that ExperTAX made them and the firm "look better" not only to current clients but also to prospective clients. They were proud of the system and what they felt it represented - - being on the cutting edge of a new technology.

5.4.1 Intra-office Analysis

5.4.1.1 Alpha Office

Data Collectors

As discussed above, when the TAPQ was used to collect the data for tax accrual and tax planning purposes, the previous year's questionnaire was often used to complete the current year's. Completion of the TAPQ was perceived to have little purpose and its importance to the audit and the client was not understood (various interviews). One audit manager indicated that the lack of comprehension of the importance of the data collected using the TAPQ resulted because there was no feedback to the data collectors. They did not see the results of their efforts. Additionally, most of the interviewees agreed with the staff auditors who said that the TAPQ was difficult to understand. Completing the TAPQ was generally a solitary exercise and, if done conscientiously, often necessitated research to answer some of the questions.

With the introduction of ExperTAX came the requirement that an audit/tax team be used to collect the tax accrual and tax planning data. All the interviewees agreed that the increased interaction helped them learn more about their clients. Additionally, the auditors felt that they not only better understood the importance of the task itself, but also, with the "why" feature of the system and the direct access to tax people during the data collection process,

they felt they learned more about taxes in general. An audit manager said with that the knowledge gained from working on the data collection team, he could better discuss the issues identified with the client. A tax manager thought that the auditors were able to give better answers to the questions asked by the system (i.e., more complete and to the point) because they had "a better understanding of what the process is all about." Also, with an auditor and a tax person working together, generally ExperTAX can be completed "on the first pass" and without any research. One tax partner simply said,

> ExperTAX is more fun and interesting because you've got a computer and you have to pay more attention to it to answer the questions.
> Tax Partner 1 - Alpha Office

However, the staff auditors interviewed indicated that finding a computer and loading the system onto the hard disk was time consuming and occasionally frustrating if a compatible computer could not be found. They felt that the office did not have enough computers with adequate memory for accommodating the system. They also said that sometimes they felt that the team approach was unnecessary and merely added to the difficulties of getting the job done on time and within the budget.

Decision Makers

The increased job satisfaction of the decision makers resulted mostly from the increased interaction with both the audit staff and the client. Although the tax decision makers interviewed did not feel that their role in the process had changed extensively, they did feel that they had gained a new understanding of their clients both from taking part in the data collection process and from reviewing the output of the system. Even though he felt that much of the output was redundant, one tax manager felt that his knowledge base had increased because of his exposure to ExperTAX. Another tax manager felt that ExperTAX made the audit staff more fully appreciate the complexity of the work performed by the tax staff.

5.4.1.2 Beta Office

Data Collectors

All but one of the interviewees at the Beta office agreed that when the TAPQ was used the data collectors did not appreciate the importance of their task. They said that little or no thought was required or used in filling out the questionnaire. When it was completed it was dropped off in the tax department and forgotten.

The two audit managers and the staff auditor interviewed all felt that they had learned a great deal both about their clients and about taxes from using ExperTAX

to collect data for tax accrual and tax planning purposes. One audit manager said he was more confident about tax issues and his ability to address them as they came up. The other audit manager interviewed said that ExperTAX and working in the audit/tax team to collect the tax accrual and tax planning data had "broadened his perspective of tax." He also said that he was more aware of some tax implications, could identify tax planning possibilities earlier in the year, and, in general, was a better auditor. He added,

> I now audit not only to look at what the number is but what the impact on the company is and how - -. It helps me to think more on a business standpoint - - on a operation standpoint.
>
> Audit Manager 1 - Beta Office

The staff auditor said that, in addition to learning more about taxes and his clients, using ExperTAX gave him more exposure with both the client "big shots" and the Beta office managers and partners.

Decision Makers

The decision makers did not feel that ExperTAX had changed their role in the decision making process. As one tax manager put it,

> It [ExperTAX] might identify something that may have applications. No matter how far you go with the artificial intelligence you still need somebody to apply it and to say, "Does this really fit our facts?" Some things fit the facts but they, from a practical standpoint, don't make sense...
> Tax Manager 3 - Beta Office

However, they were enthusiastic about the system and what it could do for them and the firm. One tax manager said that ExperTAX built credibility with the auditors - - that the auditors decided "you know what you're doing" after they work with the tax people collecting data. Another tax manager felt that ExperTAX was a "qualitative step forward." When the TAPQ was used he had been afraid that something might be forgotten. With the introduction of ExperTAX, he no longer had that concern. He also felt that ExperTAX fostered creativity in tax planning.

> I think that ExperTAX may tend to promote more creativity because it makes you sit down and think more than I think the TAPQ did. I try to picture in my mind someone with a TAPQ at their desk turned to a certain page, pondering something. It just doesn't seem to fit. But sitting in front of an ExperTAX screen with a particular question coming up and then following it up - - .
> Tax Manager 1 - Beta Office

All the interviewees expressed an increase in pride in the firm because of ExperTAX. They agreed with the tax manager who said that the system was a "marketing tool" for the firm, particularly the specialized industry modules.

5.4.1.3 Gamma Office

Data Collectors

The tax manager interviewed thought that the auditors did not feel that ExperTAX was much better than the TAPQ. However, all but one of the auditors interviewed said that ExperTAX helped them perform their job better. Four of the five staff auditors interviewed said that using ExperTAX to collect the tax accrual and tax planning data, particularly using the team approach, made them more aware of what things (i.e., transactions) might have a tax impact on their clients. Several of the staff auditors felt that the knowledge gained in using ExperTAX made them better auditors and more valuable to their clients and the firm. As an audit supervisor put it,

> You have to know so much about taxes now that I think any ... knowledge that you get makes you more valuable as an auditor and to the firm.
> Audit Supervisor - Gamma Office

One audit supervisor felt that, with the introduction of ExperTAX, the audit staff was getting more recognition for their role in the tax planning process. Before ExperTAX, he felt that the auditors did all the "leg work" and the tax people got all the credit and exposure with the client because it was the tax people who presented the tax planning ideas to the client. However, with the introduction of ExperTAX, he felt the auditor's role was

more visible to the client.

One tax partner perceived that, after the introduction of ExperTAX, the auditors felt the tax people were more valuable to them. The tax people brought information and knowledge to the data collection task that made it easier to understand and complete and that had not been perceived to be readily available. He also felt that the system and the team approach used for data collection helped the tax people know their clients and industries better. The tax staff agreed, saying that they had gained insight into the clients' businesses and the ramifications of the tax planning ideas identified for the clients.

The data collectors interviewed also perceived that ExperTAX had a positive effect on the firm's image with the clients. They thought that this was particularly so with less sophisticated clients who did not understand the purpose of the questionnaire and the implications of the questions. The data collectors felt that not only did the use by the firm of an advanced technology represented by ExperTAX impress the client, but that the capabilities of the system impressed the client even more (Audit Supervisor - Gamma Office).

Decision Makers

Because they felt that the decision making process had not changed with the introduction of ExperTAX, the decision

makers did not perceive a change in their job satisfaction. However, all the decision makers felt that ExperTAX impressed the client and helped both the firm's image and their own as auditors or tax practitioners.

> [ExperTAX is] one of the few tools that we're using in our practice that links us to using technology - - state of the art technology. And I think that's worth a lot to us. It's immeasurable.
> Tax Partner 2 - Gamma Office

The use of the system also increased the contact of the tax personnel with the client and the auditors. All the decision makers interviewed felt that their knowledge of their clients' businesses and industries had increased and that the knowledge gained had made them better tax advisors for their clients.

5.4.2 Inter-office Analysis

The data collectors in all three offices indicated an increase in the perceived importance of the data collection task. Both the data collectors and the decision makers in the Beta and Gamma offices indicated that they felt use of the system had increased their knowledge of their clients and had also helped them do their jobs better. The data collectors and decision makers interviewed at the Beta and Gamma offices also felt that the image of the firm and its personnel held by both clients and non-clients had been enhanced with the introduction of ExperTAX. As a result,

they said they felt increased pride in the firm.

The Alpha office personnel interviewed were less inclined to praise the system and its abilities. The lack of enthusiasm for ExperTAX may be a result of the timing of the interviews. As discussed previously, at the time of the Alpha office interviews, the interviewees were in the process of collecting the tax accrual and tax planning data and analyzing the output of the system. Both the data collectors and the decision makers were under pressure to complete their tasks before year-end. The interviews at the Beta and Gamma offices were several months later, when tax accrual and tax planning data collection and analysis was in process for few if any clients. Additionally, at the time of the interviews, the policies concerning computers and individual computer ownership differed among the offices. The Gamma and Beta offices were committed to a policy of encouraging the ownership and use of computers by all personnel to the extent of arranging special means of financing their purchase. The offices themselves had a considerable number of computers with the necessary memory capacity for ExperTAX. The Alpha office did not appear to have the same commitment to individual computer ownership, nor did it have the same number of computers available for staff use. Some of the computers that were available for use did not have sufficient memory to accommodate ExperTAX. The Alpha office also required that ExperTAX be purged from

the hard disk each evening when the data collectors were done for the day (staff auditors - Alpha office). The Beta and Gamma offices not only allowed ExperTAX to remain installed on the firm's computers but also allowed staff to install it on their own computers, which were then used for data collection for the firm.

5.5 Work Flow and Social Interaction - EH 10 and 11

EH_{10}: There has been a change in the pattern of work flow between the audit and tax departments since the introduction of ExperTAX.

EH_{11}: The level of social interaction between the audit and tax departments has increased since the introduction of ExperTAX.

The exploratory hypotheses concerning the change in the pattern of work flow and social interaction between the tax and audit departments were both supported by the data.

With one exception, those interviewed said the data collection process changed from a sequential to a joint task with the introduction of ExperTAX. Before the introduction of ExperTAX, the identification of tax accrual and tax planning issues and opportunities most often began with a single staff auditor filling out the TAPQ. When the staff auditor was finished with the TAPQ, an audit manager and a tax manager, either together or independently, reviewed the questionnaire. Often the questionnaire was incomplete and had to be returned to the staff auditor for further

information. Even when complete, the TAPQ required in-depth study to be helpful in identifying information relevant to the review of the tax accrual number. The interviewees agreed that the TAPQ was difficult to use and that tax planning ideas rarely came from the review. The ideas presented to the clients were generated by the decision maker from personal knowledge of the client and the tax laws. The tax accrual and tax planning process using the TAPQ encouraged little interaction between the tax and audit staffs.

With the introduction of ExperTAX came the requirement that the tax accrual and tax planning data be collected by a team made up of an auditor and a tax person. The data collectors agreed that when the team approach was used, ExperTAX was completed "on the first pass" most of the time and additional trips to the field for more data were rare.

Some of those interviewed felt that the timing of the data collection process had changed. They said that completion of the TAPQ was left until very near the client's year-end. They felt that ExperTAX was being completed earlier than the TAPQ had been.

Additionally, with the team approach, many of the tax people had direct contact with the client - - something that the interviewees agreed was not common before the introduction of ExperTAX. The tax personnel interviewed said that after the introduction of ExperTAX, they felt that

their contact with the clients had changed. They felt that the clients were contacting them directly with tax questions that would have been asked of the auditors before. Similarly, the auditors interviewed said that they felt more comfortable calling the tax people with whom they had worked when tax questions came up in discussions with clients.

For the decision maker, ExperTAX produced separate output identifying tax accrual issues and tax planning issues and opportunities. With separate output, it was not necessary for the auditors to wait until the tax people were through with the data before beginning their review of the tax accrual issues.

Because of the firm requirement that ExperTAX be completed by an auditor and a tax person together, inter-departmental interaction has increased. The data collectors said that the team approach generated discussions between the tax and audit members of the team about the implications of an idea proposed by ExperTAX. They indicated that such interaction was virtually non-existent before the introduction of ExperTAX - at least at the data collector level.

Some of the interviewees felt interaction other than that caused directly by the use of the system had also occurred. They felt that there was more informal communication between the departments. Because personnel on each of the staffs know members of the other staffs, they

felt comfortable calling to ask for an answer or an explanation to a question or problem in the other's area of expertise.

5.5.1 Intra-office Analysis

5.5.1.1 Alpha Office

Everyone interviewed agreed that the pattern of work flow changed and the social interaction increased with the introduction of ExperTAX. They felt that with the requirement to use a team approach there could be no other outcome.

One audit manager said that the TAPQ was filled out and then routed to the tax department, with very little time spent on it before it was signed off on by all necessary parties. The data collectors agreed that ExperTAX could not be so easily put aside. They felt that more effort was required to answer the questions posed by the system, particularly because they could not be answered with a simple 'yes,' 'no,' or 'NA.'

The audit manager also felt that the interaction between the staffs had increased beyond that necessitated by the data collection team requirement. He felt that the interaction in the data collection process prompted discussion about the implications of transactions and client policies between the audit and tax staffs and among the staffs and the client.

5.5.1.2 Beta Office

All but one of the interviewees felt that there was a change in the work flow after the introduction of ExperTAX. The one who did not was an audit partner who said that he had always required the data collection process to be a joint audit/tax effort. However, an audit manager felt that the data collection process using the TAPQ consisted of "take it down, let tax review it." A tax manager agreed. Another audit manager said that when the TAPQ was used, the tax people went out on the "big jobs" to review the audit accrual. With ExperTAX they were "on-site" at the beginning of the process. A tax manager felt that getting the tax personnel in the field might "uncover good tax planning opportunities."

The tax partner and two of the tax managers interviewed felt that ExperTAX was generally completed with the interim auditing work, one to two months earlier than the TAPQ had been. They felt the earlier completion allowed the tax and audit staffs to serve the client better by providing him with tax planning opportunities sooner before year-end.

All those interviewed agreed that ExperTAX promoted increased social interaction between the staffs and also between the tax personnel and the client. They perceived that the increased interaction improved communication between the departments and between the tax personnel and the client. The tax people felt the increased interaction

increased their credibility with both the audit department and the client. Indeed, many of the interviewees felt that the interaction among the audit department, the tax department, and the client was the greatest benefit provided by ExperTAX.

> When used properly - when it brings the ... people with the various fields of knowledge together - that's probably the most positive aspect of what ExperTAX does.
>
> Tax Manager 3 - Beta Office

5.5.1.3 Gamma Office

Everyone interviewed at the Gamma office felt that there had been a change in the work flow between the tax and audit departments and an increase in the social interaction. The TAPQ, said one audit manager, was considered an audit task but ExperTAX was considered an audit/tax task. The tax staff felt that before the introduction of ExperTAX the tax and audit managers had contact with each other but the staffs had not. They felt that ExperTAX had changed the situation and that the system promoted team work and team spirit. After the introduction of ExperTAX, both the tax staff and the staff auditors felt that the auditors began to serve as an interface between the client and the tax personnel. The staff auditors also felt that they had become involved in the tax planning process, although one auditor felt that the amount of involvement was dependent on the tax manager assigned to the client. Both the tax staff

and the staff auditors felt that there was an attempt to complete ExperTAX earlier than the TAPQ had been.

All the interviewees felt that social interaction had increased more than was necessary to just complete ExperTAX. One tax manager spoke of frequent lunches with tax and audit personnel together. He indicated that such lunches were not common before the introduction of ExperTAX. He also perceived that the audit ICAs and supervisors knew more tax specialists and supervisors than they had before the introduction of ExperTAX. The auditors indicated that they felt more comfortable soliciting input from the tax personnel on both client and personal tax questions. The tax staff perceived that the auditors were asking for help with tax questions more often without "dumping the problems" on the tax staff. An audit manager said that ExperTAX provided the staffs with more opportunities to interact and that once they worked together other interaction followed.

The contact between the tax personnel and the client also increased with the introduction of ExperTAX. All the interviewees agreed that the client was made more aware of the tax personnel because of the audit/tax team requirement imposed by ExperTAX.

5.5.2 Inter-office Analysis

The requirements set forth by the firm for the use of ExperTAX changed the pattern of work flow and the degree of social interaction between the audit and tax departments and between the tax department and the client. Because these requirements were mandated by the National Office of Coopers & Lybrand little or no difference should be expected among the offices. Indeed, the interaction caused by the requirement that ExperTAX be completed jointly appears to have made the members of both staffs more comfortable with each other and more aware of the contributions of the other staff both to the audit and to the client. This comfort and knowledge appears to have caused more interaction between the departments. Even though the team requirement was the same for all three offices, there are slight differences among the offices in their apparent reaction to the increased interaction. For instance, the interaction between the staffs appears to have increased the most in the Gamma office. Not only were the tax and audit staffs discussing their clients and sharing their expertise with each other, they also began going out to lunch together.

5.6 Power Structure and Politics - EH 12, 13, and 14

EH_{12}: Tax accrual and tax planning decision making has become more centralized since the introduction of ExperTAX.

EH_{13}: The power of the decision maker has decreased since the introduction of ExperTAX.

EH_{14}: The power of the audit department with respect to the task of making the tax accrual and tax planning decisions has decreased since the introduction of ExperTAX.

Increased centralization of decision making (EH12) was not supported in any of the field offices. The supervisors, managers, and partners interviewed in all three offices perceived that the introduction of ExperTAX had not affected the level of decision making. In some cases the level of the data collector had risen from staff to manager, but this was seen as a temporary condition arising from the novelty of the system and the curiosity of the higher level people. They all felt that ExperTAX was not intended to replace the decision maker but was to be used as a tool by both the data collectors and the decision makers. Indeed, many of the interviewees felt that the best use of ExperTAX was not for identifying tax accrual and tax planning issues and opportunities for current clients but for identifying potential services for current clients and as a marketing tool for prospective clients.

A small number of those interviewed voiced the concern that, in the future, the system might be used by the

decision maker as a replacement for in-depth knowledge of their clients and, possibly, as the tax laws become even more complex, as a replacement for in-depth knowledge of the tax laws. However, most people felt that "the tool will not replace the craftsman."

Even though the system contained the expertise of other knowledgeable decision makers, the decision makers interviewed felt that ExperTAX was too general to constitute a "threat" to any other decision maker. At the time of the interviews, ExperTAX had not identified any significant issues and opportunities not already considered by the decision maker. Indeed, many of the issues and opportunities identified, by ExperTAX were considered simplistic and/or irrelevant. Of the relevant issues identified, most had already been identified by the decision maker and either used or rejected by the client.

The interviewees felt that use of ExperTAX would not change the level at which decisions were made of the decision maker. They felt that the lower-level personnel had not yet developed the necessary expertise and those at higher levels had other responsibilities.

EH 13 and 14, concerning the changes in the power of the decision makers and the audit department relative to the tax department were not supported. The determination of the tax accrual figure and the identification of tax planning issues and opportunities constitute a very small part of the

work of any accounting firm. The responses to questions concerning changes in power and in politics in general indicated that ExperTAX had not affected the power structure and politics within the offices.

5.6.1 Intra-office Analysis

5.6.1.1 Alpha Office

The decision makers in the Alpha office perceived no change in the decision making process with the introduction of ExperTax. They felt that ExperTax was introduced to provide a better, more efficient way to collect data for the tax accrual and tax planning process. They used the output from the system as a check to make sure nothing had been overlooked in their analysis. One of the tax partners interviewed said that ExperTAX would not replace the decision maker because there were too many "variances and nuances that the system doesn't handle."

No one interviewed perceived that the relative power of the departments was affected by the introduction of ExperTAX. They thought that there had always been a cooperative relationship between the departments. Several tax people felt that the auditors appreciated them and their abilities more after they had worked together, but that there was no difference in the relative power of the departments. The data was still collected as part of the audit work with the schedule prepared by the auditors. As

the audit partner put it,

> I think we all recognize that our number one goal is to service the client... That is the overriding consideration ... The engagement [audit] partner still has total responsibility for client service.
> Audit Partner - Gamma Office

5.6.1.2 Beta Office

Because they perceived no change in the decision making process, the interviewees in the Beta office did not perceive any move toward centralization of the tax accrual and tax planning decision making process or any change in the power of the decision maker. One tax manager felt that it might be possible to delegate the decision making down to the staff level but, even in that case, the manager would be "ultimately responsible" for the decisions. The tax managers agreed that the decision maker did not rely on ExperTAX and that it "just streamlines the process" and "frees up time to concentrate on real issues."

All interviewees agreed that the relative power of the tax and audit departments had not changed with the introduction of ExperTAX. The tax partner felt that the ICAs knew more about the clients than anyone else. The audit and tax managers felt that use of the system fostered a more collaborative relationship between the departments with both members of the audit/tax team using the knowledge and expertise of the other member to more effectively serve the client.

5.6.1.3 Gamma Office

None of the decision makers interviewed perceived any change in the power of the decision maker, nor did they perceive any centralization of the decision making process. They viewed ExperTAX as an aid and a research tool that gave more knowledge to the people in the field. They also thought that it could not be "tailored to come up with all the specifics." One tax partner said,

> [I] don't foresee any time in the near future when [ExperTAX] will be able to supplant people.
> Tax Partner - Gamma Office

Although one tax partner thought the auditors perceived the tax people to be more valuable to them after the introduction of the system, none of the interviewees perceived any change in the relative power of the departments. Rather, they agreed with the tax person who feel that the system promoted team work and team spirit. Additionally, the personnel in each department sensed that their counterparts in the other department had gained a better understanding and appreciation for their role in the tax accrual and tax planning process. ExperTAX was accepted by both staffs as "a tool of the trade and a policy and procedure of the office," although the auditors "initially complained that it was too time consuming." After the first three months of use the only "complaints" were about the size of the output.

5.6.2 Inter-office Analysis

There were no differences in the perceptions about changes in the centralization of the decision making, the power of the decision maker, or the relative power of the tax and audit departments with the introduction of ExperTAX among the offices. The interviewees at all three offices said that the tax accrual and tax planning process comprised such a small part of the overall function of the tax and audit departments that the introduction of the system should have no effect on the power structure or politics of the offices.

5.7 Resistance to the System - EH 15

EH_{15}: Decision makers will be more resistant to the use of ExperTAX.

Although concerns about ExperTAX were expressed, they did not represent resistance to it. For the most part, the interviewees were enthusiastic about both the idea and the reality of the system. They were looking forward to the roll-out of the more specialized modules and stand-alone systems that were under development. Feelings of disappointment were directed at the volume of output created by the system and at what the system could really do. Those who were disappointed felt that they had been led to believe by the marketing campaign that the system would be able to

do more than it actually could. Many felt that annual use of the system for every client was inefficient; that the system would be more appropriately used for clients who had drastic changes in their business environment and for all clients in years of major tax law changes.

Everyone interviewed was asked whether they would use the system if the decision were theirs to make and, if they would, how they would use it. All agreed that they would use the system essentially as it had been used. They all felt that the cost of the system in terms of additional time was well worth the benefits that accrued. However, many of those interviewed thought the best use of ExperTAX was as a tool to identify potential services for current clients, to sell those services to the clients, and to be used in presentation of proposals to prospective clients.

5.7.1 Intra-office Analysis

5.7.1.1 Alpha Office

The reaction to ExperTAX was mixed. When the system was first introduced, one tax partner interviewed took a "wait and see" attitude.

> We've seen programs from National
> before that haven't worked out.
> Let's try it and see what happens.
> Tax Partner 2 - Alpha Office

The other tax partner interviewed thought the concept was great but was disappointed in the reality. He said,

> I don't think [the designers] were as pragmatic or practical when they developed it as they should have been. I think they took a too theoretical approach.
>
> Tax Partner 1 - Alpha Office

He also felt that the system "wasn't marketed right." He thought that it would be best used for new clients or proposals for prospective clients.

> Because you don't know the client and you haven't been there, by going through all the questions, it's a good way to learn a lot about the client.
>
> Tax Partner 1 - Alpha Office

However, he said that even if there was no mandatory use requirement, he would use the system for data collection and as a back-up for decision making.

The audit managers felt that the idea of the system "[made] a lot of sense," and that the system was worth the time and effort necessary to use it. One tax manager was concerned that ExperTAX "might stifle creativity." Although he was not convinced that it was "as good as its cracked up to be," he felt that soon every CPA firm would "have something like it." He also said he would use the system even if given the opportunity not to. Another tax manager felt that ExperTAX was a "good tool that puts everything in one place" but he felt that there might be a better way to handle the security of the system.

Two members of the tax staff felt that ExperTAX was "a move in the right direction" but that the designers were not

aware of the practical problems of the task and the system. One said,

> The designers should spend a year in the field and then go back and design a better system.
> Tax Staff Member 1 - Alpha Office

Even so, she said that given the chance not to use the system, she still would.

5.7.1.2 Beta Office

Little or no resistance to ExperTAX was perceived by the interviewees. One tax manager said he thought the idea of ExperTAX sounded like a good one, but he was skeptical and waited to "see how it worked" before deciding how good the system really was. He felt that, initially, there had been some reluctance to use the system on the part of the audit department due to budget constraints. However, at the time of the interview, he felt that the reluctance had diminished.

An audit manager felt that in order to answer the questions posed by the system without the client present, the data collectors had to know the client well. However, he felt that when the client was present during the data collection process the system presented an impressive picture of the firm to the client. Another audit manager felt ExperTAX lived up to his expectations, but he also said that he was "knowledgeable about artificial intelligence and did not have overly idealized expectations."

Before the introduction of ExperTAX, one tax manager thought the system would be a development that would make his job easier. He said that this perception had been proved true, but he had also expected the system to propose "spectacular recommendations" not already considered for the client. He was disappointed when it did not. However, he said,

> It does prove that we're doing a fairly good job with most of our clients in addressing the issues.
>
> Tax Manager 3 - Beta Office

5.7.1.3 Gamma Office

All the interviewees were excited about the idea of ExperTAX. All thought it would be a "vast improvement" over the TAPQ. However, a tax partner tempered his expectations with the knowledge that a "system is only as good as the effort that is put in it." A tax manager was impressed that the firm had made such a large commitment in terms of time and money. A staff auditor thought that the system would bring the tax expertise from the National Office to the local office.

After the introduction of ExperTAX, many of the interviewees initially felt that the system was not quite as good as they had expected. An audit manager felt the partners and managers were still "pretty excited" about the system but the staff personnel "were groaning because they

were the ones who had to do it." She also felt that this was a normal reaction.

> Any time they change our policies, everybody moans and groans.
> Audit Manager 1 - Gamma Office

The revised opinions, after some use of the system, were favorable. An audit supervisor felt that the features "took awhile to learn" but the system lived up to his expectations. An audit manager initially felt that data collection using ExperTAX took more time than with the TAPQ and that the results were no better. However, at the time of the interview, he felt that data collection took about the same amount of time as it had with the TAPQ and the output was of much higher quality.

Everyone interviewed felt that the best use of the system was for marketing. They felt ExperTAX was "state of the art technology" and that both current and prospective clients were impressed with it and with the firm.

5.7.2 Inter-office Analysis

None of the interviewees in any of the offices was resistant to the use of ExperTAX. The Alpha office was the only site where any of the interviewees did not feel that system was a "vast improvement" over the TAPQ. Three of the Alpha office personnel felt that ExperTAX was merely "an automated TAPQ." However, they also felt that automation of

the data collection process was an improvement and that the feedback provided by the system was worth the extra effort. As discussed above, the negative feelings about ExperTAX voiced by the Alpha office personnel may be a function of the timing of the interviews. The interviews were conducted at a time when both the data collectors and the decision makers were under time pressure to collect and review the data for their clients with December 31 year-ends. Interviews conducted at a less busy time may have found different results.

This chapter presented the results of the research both on a intra and inter-site basis. The next chapter discusses the conclusions and implications of the research.

Chapter 6

Conclusions, Implications and Future Research

6.1 Conclusions

The tax accrual and tax planning process represents a small part but important of the overall tasks and responsibilities of a field office of an international accounting firm. Data collection for this process is also a small part of an audit. Therefore some of the changes suggested by the interactive perspective framework were not found and others were not felt as strongly as they might have been had the process encompassed a larger task.

Based on an analysis of the interviews, some changes in the technology, structure, and culture of the Coopers & Lybrand field offices did occur after the introduction of ExperTAX. The politics within the field offices were unchanged after the introduction of the system.

6.1.1 Technology

The technology of an organization consists of the methods and knowledge used to perform tasks within the organization. The introduction of ExperTAX changed the method of data collection for the tax accrual and tax planning process from a manual (often solitary) task to a computerized, joint task. In the process of collecting the

data, the participants gained knowledge that they felt helped them understand their clients better. The auditors also felt that they better understood the value of the task and the value of the tax staff's expertise. Many felt they had gained valuable knowledge about the tax law and how it affected their clients that they would otherwise not have.

The technology in the decision making process changed subtly. Although the decision makers did not feel that the decision process had changed, they did feel that they had gained an insight into the business practices and goals of their clients. They also felt that this insight would help them identify tax planning issues and opportunities that would more closely correspond to the client's overall goals.

Horizontal and vertical mobility generally are a function of knowledge and performance. However, at the offices studied, tax knowledge was not necessary to be hired into the tax department from outside the firm or for a horizontal move within the firm. Vertical mobility was also believed to be unaffected by the introduction of ExperTAX. It was perceived that all staff auditors would have experience with ExperTAX before the decision for promotion to manager was made. The tax staff felt that ExperTAX had not changed the decision making process and, therefore, would not affect vertical mobility within the tax department.

6.1.2 Structure

The structure of the organization refers to the formal lines of authority and responsibility within the organization. The introduction of ExperTAX did not change the lines of authority, but it did modify responsibility for data collection. Among the guidelines from the National Office concerning the use of ExperTAX was the requirement that the data collection process be a joint effort of the tax and audit departments. This requirement made the tax department jointly responsible with the audit department for collecting the tax accrual and tax planning data, whereas before the introduction of ExperTAX they had only been responsible for reviewing the data collected (in the form of the TAPQ).

Additionally, in the Beta Office and to a lesser extent in the other offices, the level of the auditor involved in the data collection process was raised to that of manager. Before the introduction of ExperTAX the audit managers were responsible for data collection as part of the audit, and they had overall responsibility for the audit. After the introduction of ExperTAX, some managers became directly involved in the data collection process, inputting the data into the system and, therefore, became directly responsible for the data collected.

Unanimously, the interviewees felt that the best use for ExperTAX was in making proposals to prospective clients.

Many interviewees said that before the introduction of ExperTAX the proposals were presented most often by tax partners and managers without any auditors present. They perceived that most of the proposals made after the introduction of the system were made by teams of both tax and audit partners and managers.

6.1.3 Culture

An organization's culture consists of the informal rules and relationships among individuals and groups. The culture of the Coopers & Lybrand field offices studied changed after the introduction of ExperTAX. In addition to the increased interaction between the tax and audit personnel caused by the required joint completion of ExperTAX, there was a perceived increase in the informal interaction between the tax and audit staffs and between the tax staff and clients. Interviewees at all three offices felt that there were more informal discussions between members of the tax and audit staffs about the implications to clients of the tax laws and transactions. Interviewees at one office reported that members of the tax and audit staffs met for lunch, something they said had not occurred before the introduction of the system. Members of each staff indicated an ease when dealing with members of the other staff that was not felt before the introduction of ExperTAX. Additionally, the auditors felt more comfortable

suggesting to their clients who had tax questions that they call a tax person directly.

Many of the interviewees also said that ExperTAX fostered in them increased pride in the firm. They felt that the system was an example of "cutting-edge" technology and that by developing and using ExperTAX the firm revealed its position of leadership in the profession.

6.1.4 Changes Due to the Guidelines for Use

Each of the changes identified was not a result of the system alone. In fact, the use of expert system technology to develop and maintain ExperTAX had little effect on the changes that occurred. All of the areas of change were affected by the guidelines issued for the system's use (see Figure 8).

The system itself affected four areas, (1) productivity in data collection, (2) job content of the data collector, (3) job satisfaction of the data collector, and (4) job satisfaction of the decision maker. Productivity in data collection was increased, in part, by the computerization of the questionnaire. The job content of the data collector was changed by the introduction of computer technology into what had been a manual task. Both of these changes could have been achieved by the use of any computerized system. A portion of the increase in the job satisfaction of both the data collector and the decision maker was affected by the

Changes	Change Due to System	Change Due to Guidelines
Productivity in Data Collection	x	x
Job Content - Data Collector	x	x
Job Content - Decision Maker		x
Job Satisfaction - Data Collector	x	x
Job Satisfaction - Decision Maker	x	x
Pattern of Work Flow		x
Social Interaction		x

Figure 8

Changes Due to the System and/or the Guidelines

perception that the firm was on the leading edge in the development and use of computer technology, which increased feelings of pride in the firm.

The guidelines requiring the use of an audit/tax team had a greater effect on the changes that occurred. The design of the system did not require a team approach for data collection. There were two cases (both with special circumstances) in which the data was collected by a single Coopers & Lybrand person.

In terms of productivity, the completion of ExperTAX by an audit/tax team allowed the questions to be answered more accurately and completely than when answered by an auditor or tax person working alone. The increase in job satisfaction of both the data collector and the decision maker associated with the increase in knowledge base can also be attributed to the team requirement. The increase in the auditors' knowledge of taxes and how they affect on the client was initially a result of the availability of the tax personnel to answer and/or clarify tax questions. The increase in the tax staff's insight into the client was initially due to the availability of the auditor during the data collection session. Additionally, the team requirement guidelines caused the initial increase in interaction between the tax and audit staffs, the changes in job content of both the data collector and the decision maker, and the pattern of work flow between the departments.

6.2 Implications

6.2.1 Relationship Between the System and the Changes Observed

The findings of this research indicate that the changes that occur in an organization with the introduction of an expert system are related not only to the system itself, but also to (1) the scope of the system's purpose, (2) the decisions made about its use, and (3) its implementation. As discussed previously, the tax accrual and tax planning process represent only a small part of the overall audit and tax functions. Therefore, the changes associated with the introduction of ExperTAX did not have an extensive effect on the organization and its features. The politics and power structure were not affected by the introduction of the system and the structure was affected only to the extent of the roles of the data collector and of the decision maker who became a data collector.

The initial increase in interaction between the audit and tax departments was not a result of the system per se but of the guidelines issued on how it was to be used. Additionally, the increased interaction between the tax personnel and the client may partially have been a result of guidelines. The National Office guidelines did not require that data be collected at the client's place of business or that the client be present during data collection. However,

one of the field offices issued additional guidelines for its use stating that the preferred data collection site was the client's office and that the client be present whenever possible. These guidelines gave the client more exposure to the tax personnel and may have had an impact on the later increased interaction between the tax personnel and the client.

The change in the job content and role of the decision maker who became a data collector with the introduction of ExperTAX also resulted from decisions made about the system's use. In one office the interviewees suggested that a formal decision was made to "leverage-up" the level of the data collector from audit staff to audit manager. In the other two offices, the same decision was made but at an informal level.

The implementation of the system involves not only the system's installation, but also the creation and maintenance of lines of communications between the users and the designers. The lines of communication provide a means of (1) obtaining help with problems encountered, (2) obtaining clarification of the guidelines and restrictions concerning the system and its use, and (3) communicating problems and concerns about the system.

The implementation of ExperTAX included the creation of an ExperTAX liaison in each office. The role of the liaison was to promote the use of ExperTAX at the field office, to

be a resource person for field office personnel, and to communicate any problems and/or concerns expressed by field office personnel to the National Office for consideration.

At the time of the interviews, two years after the introduction of ExperTAX, the ExperTAX liaison function no longer existed in the three office studied. Indeed, no one interviewed remembered who the liaison had been and many had no recollection of the existence of the position. When problems were encountered or help was needed with the system, the interviewees said they found someone who had more experience with ExperTAX to help them.

The basic guidelines concerning the use of ExperTAX were included in the guidelines for the practice. However, there were differences among the offices about what the interviewees thought was allowed to be done with the system. At one office the system was removed from all computers every night if not after every use. The interviewees perceived that this was a requirement from the National Office. At another office, ExperTAX was often loaded on staff members' privately owned personal computers (PC). These PCs were used for data collection in addition to the PCs owned by the field office. ExperTAX was often left on the computers and updated throughout the "busy season."

All of the interviewees felt that the best use for ExperTAX was in making proposals to perspective clients. Although they were using the system for this purpose, some

believed that ExperTAX's use in proposals was not an anticipated use of the system, others believed it was not a sanctioned use, and still others believed that this was the ultimate, primary, planned use of the system.

For the designers to be aware of how the system is used and of problems and concerns identified by the users there must be lines of communications. It is not enough that those lines exist at the beginning of the life of the system. To prevent misuse of, either intended or unintended, or misunderstanding about the use of the system, the lines of communication for all levels of users must be present and remain open.

6.2.2 Implications for the Interactive Perspective Framework

The interactive perspective framework (IPF) predicts impacts based on the classification of the system. Although the IPF clearly states that all the impacts predicted may not be found and that those predicted may not be the only ones present, it does assume that the system's classification will capture the design features of the system and that the designers' intentions relative to the impacts of the system are included in those design features.

As found by this research changes, that occur in the organization can be related to at least three other factors,

(1) the scope of the task performed by the system, (2) the decisions made about its use, (3) the process used for its implementation. Although use of the framework requires that the impacts be investigated on many levels and helps the researcher keep an open mind, it fails to address impacts caused by factors that are related to the introduction and use of the system but that are not an integral part it.

Furthermore, in any organization the impacts of an individual system cannot be evaluated in a vacuum (by looking only at the current system). The history of the designers and their interaction with the users, their marketing strategies, and the success of previous systems may have an effect on the success of unrelated systems introduced in the future. For example, in this research some of the interviewees who had experience with systems developed and implemented by the National Office were less inclined to believe the marketing campaign that accompanied the introduction of ExperTAX. Most of them kept an open, if skeptical, mind about the system until they were able to form their own opinion. Additionally, the experience of the users in other organizations or contexts may have an impact on the success of the system. Potential users who have had no experience or a frustrating experience with computers may be negatively biased against any new system no matter how well designed it is.

6.3 Future Research

This research represents only a small step toward the understanding of how the introduction of an expert system affects a professional accounting organization. It was concerned with one system in three offices during one particular time period. Ideally, the three offices studied should be revisited to learn how the organization and its features have changed since the initial research. Questions that come to mind include:

(1) Has the level of the data collector been "leveraged" back down to that of audit staff in the Beta office?

(2) Have the concerns about ExperTAX becoming "merely a compliance tool" been realized?

(3) Is the system used in the same way as at the time of the initial research?

(4) Has the level of interaction between the staffs and between the tax staff and the client remained the same, decreased, or continued to increase?

(5) What other changes related to the use of ExperTAX are now apparent?

To fully understand how expert systems affect professional accounting organizations more research is necessary. Future research should include the study of a wide variety of expert systems in terms of size, scope, purpose, implementation strategies used, and guidelines for use. Longitudinal studies following the development, implementation, and use of expert systems, and comparative studies of both similar and dissimilar systems should be

undertaken. In addition to gaining an understanding of the effects of the introduction of an expert system on a professional accounting organization, this line of research should help identify items to consider when designing and implementing expert systems for professional accounting organizations.

REFERENCES

REFERENCES

Argyris, Chris. "Management Information Systems: The Challenge to Rationality and Emotionality," Management Science (June 1971), pp. B-275 - B-292.

Bariff, Martin L., and Jay R. Galbraith, "Interorganizational Power Considerations for Designing Information Systems," Accounting, Organizations and Society (Vol. 3, No. 1, 1978), pp. 15-27.

Benbasat, Isak, David Goldstein, and Melissa Mead, "The Case Research Strategy in Studies of Information Systems." Unpublished Paper. (Harvard Business School, June 1986).

Benbasat, Isak, and Barrie R. Nault, "Empirical Research in Decision Support and Expert Systems: An Examination of Research to Date and Emerging Topics," in Andrew Bailey (ed.) 1987 Proceedings of the Arthur Young Professors' Roundtable (The Council of Arthur Young Professors, 1988), pp. 256-303.

Bjorn-Andersen, Niels, and Poul H. Pedersen, "Computer Facilitated Changes in the Management Power Structure," Accounting, Organizations and Society, (Vol. 5, No. 2, 1980), pp. 203-216.

Bonoma, Thomas V., "Case Research in Marketing: Opportunities, Problems, and a Process," Journal of Marketing Research, (Vol. 22, May 1985), pp. 199-208.

Bostrom, Robert P., and J. Stephen Heinen, "MIS Problems and Failures: A Socio-Technical Perspective," MIS Quarterly, (September 1977), pp. 17-32.

Brown, Carol E., "Tax Expert Systems in Industry and Accounting," Expert Systems Review, (Vol. 1, No. 3, 1988), pp. 9-16.

Brown, Carol E., "Expert Systems in Public Accounting: Current Practice and Future Directions," Expert Systems with Applications: An International Journal, (Vol. 3, No. 1, June 1991), Forthcoming.

Davis, Gordon B., and Margrethe H. Olson, Management Information Systems: Conceptual Foundations, Structure, and Development, (McGraw-Hill, 1985).

Denna, Eric L., "Toward a Representation of Auditor Knowledge: Evidence Aggregation and Evaluation," Ph.D. Dissertation Proposal, (Michigan State University, 1987).

Gal, Graham, "Using Auditor Knowledge to Formulate Data Model Constraints: Expert System for Internal Control Evaluation," Ph.D. Dissertation, (Michigan State University, 1985).

Graham, Lynford E., "Overcoming Obstacles to Expert System Development," in Andrew Bailey (ed.) 1987 Proceedings of the Arthur Young Professors' Roundtable (The Council of Arthur Young Professors, 1988) pp. 149-170.

Huse, Edgar F., Organization Development and Change, (West, 1975).

Ives, Blake, and Margrethe H. Olson, "User Involvement and MIS Success: A Review of Research," Management Science, (May 1984), pp. 586-603.

Lucas, Henry C., Jr., Why Information Systems Fail, (Columbia University Press, 1975).

Markus, M. Lynne, "Understanding Information System Use in Organizations: A Theoretical Explanation", PhD Dissertation, (Case Western Reserve University 1979).

Markus, M. Lynne, Systems in Organizations: Bugs + Features, (Pitman, 1984).

Markus, M. Lynne, and Jeffrey Pfeffer, "Power and the Design and Implementation of Accounting and Control Systems," Accounting, Organizations and Society, (Vol. 8, No. 2/3, 1983), pp. 205-218.

McCarthy, William E., and Edmund Outslay, "An Analysis of the Applicability of Artificial Intelligence Techniques to Problem Solving in Tax Domains," Accounting Horizons, (Vol. 3, No. 2, 1989), pp. 14-27.

McCarty, L. Thorne, "Reflections on 'Taxman': An Experiment in Artificial Intelligence and Legal Reasoning," Harvard Law Review, (March 1977), pp. 837-893.

Meservy, R. D., "Auditing Internal Controls: A Computational Model of the Review Process", Ph.D. Dissertation, (University of Minnesota, 1985).

Meservy, R. D., Andrew D. Bailey, and Paul E. Johnson, "Internal Control Evaluation: A Computational Model of the Review Process," Auditing: A Journal of Practice and Theory, (Vol. 6, No. 1, 1986), pp. 44-74.

Messier, W. F., Jr., and J. V. Hansen, "A Preliminary Test of EDP-XPERT, "Auditing: A Journal of Practice and Theory, (Fall 1986).

Michaelsen, Robert H.,"A Knowledge-Based System for Individual Income and Transfer Tax Planning", Ph.D. Dissertation, (University of Illinois, 1981).

Michaelsen, Robert H., "An Expert System for Selecting Tax Shelters," The Journal of the American Taxation Association, (Vol. 9, No. 1, 1987), pp. 35-47.

Needham, James T., "Trends in Artificial Intelligence," 1987 Update: Trend Analyses and Related Statistics - United States, Districts, Regions and Service Centers, (Department of Treasury, Internal Revenue Service, 1987), pp. 39-45.

Newell, A., "Heuristic Programming: Ill-Structured Problems," Progress in Operations Research, Volume 3, (John Wiley & Sons, 1969), pp. 360-414.

Newquist, Harvey P., III, "The Making of a Tax Expert," AI Expert, (March 1987), pp. 57-59.

Pettigrew, Andrew M., "Information Control as a Power Resource," Sociology, (May 1972), pp. 187-204.

Schatz, Harry, Roanne Strahs, and Leo Campbell, "Designing an Expert System for Long-Term Maintenance," Journal of Accounting and EDP, (Fall 1987), pp. 20-24.

Shank, Roger C., The Cognitive Computer: On Language, Learning and Artificial Intelligence, (Addison-Wesley, 1984).

Shpilberg, David, and Lynford E. Graham, "Developing ExperTAX℠: An Expert System for Corporate Tax Accrual and Planning," Auditing: A Journal of Practice and Theory, (Fall 1986), pp. 75-94.

Shpilberg, David, Lynford E. Graham, and Harry Schatz, "ExperTAX: an Expert System for Corporate Tax Planning," Expert Systems (July 1986).

Sowa, J. F., Conceptual Structures: Information Processing in Mind and Machine, (Addison-Wesley, 1984).

Steinbart, Paul J., "Materiality A Case Study Using Expert Systems," The Accounting Review, (January 1987), pp. 97-116.

Sviokla, John J., "Business Implications of Knowledge-Based Systems," Data Base, (Vol. 17, No. 4, 1986), pp. 5-19.

Sviokla, John J., ExperTAX: Coopers & Lybrand's Tax Accrual and Tax Planning Expert System, (Harvard Business School, 1988).

Yin, Robert K., "The Case Study Crisis: Some Answers," Administrative Science Quarterly, (Vol. 26, No. 1, 1981), pp. 58-65.

Yin, Robert K., Case Study Research: Design and Methods, (Sage Publications, 1984).

APPENDICES

APPENDIX A

CASE STUDY PROTOCOL

Appendix A

Case Study Protocol

Protocol

Key features of approach:

1. multiple-sites with ExperTAX
2. pre-post analysis
3. cross-site analysis
4. exploratory design - guided by Markus' interactive perspective framework

Organization

I. Case Study Protocol
II. Plan of Analysis

I. Case Study Protocol

Identification of System

Why ExperTAX?

1. Direct impacts on more than one department possible - used by more than one department,

2. One of the first of the expert systems put in place by professional accounting organizations in the U.S., and

3. Best publicly documented of the U.S. systems used by accounting organizations.

Site Selection

Possible Sites

1. Initial identification - Possible sites include all Coopers & Lybrand field offices that serve clients who pay taxes to the United States government.

2. Refinement of site selection - from published material, and discussion with faculty advisors and C&L personnel.

3. Final site selection - for the possibility of diversity among sites

    1. offices differing in region of country
    2. offices differing in client base
    3. offices differing in size of metro area
    4. include one pilot office.

4. Final sites

    1. large Midwestern city with clients in manufacturing
    2. medium sized Midwestern city with clients in banking, service industries, retail, and insurance - pilot office
    3. large Southwestern city with clients in energy, financial services, retail, and manufacturing.

Data Collection

1. Data will be collected over 2 to 3 day period at each site.

2. Sources of Evidence

    1. Observation
    2. Documents
    3. Archival
    4. Published articles
    5. Interviews

    Observation
    1. Completion of ExperTAX
    2. Review of ExperTAX output

    Documents
    1. Any documents (memos, policy statements, etc.) about the reasons for the change to ExperTAX
    2. Any documents about the implementation of ExperTAX

    Archival
    1. Organization Charts
    2. Descriptions of tasks and responsibilities as they apply to the Tax Accrual and Tax Planning Process
    3. Completed TAPQ

Published articles
1. Schatz, Strahs, & Campbell
2. Shpilberg & Graham
3. Shpilberg, Graham, & Schatz
4. Sviokla

Interviews - attempt to interview (per site)
1. ExperTAX Liaison
2. 1 or 2 Tax Partners
3. 1 or 2 Audit Partners
4. 3 to 5 Decision Makers (both tax and audit)
5. 3 to 5 Data Collectors (both tax and audit)

Initial Contact

Phone communication with tax partner in Alpha office provided explanation of research - purpose, scope, and anticipated needs.

Written and phone communication with contact in the National Office of Coopers & Lybrand.

Follow-up - sent copy of proposal and letter outlining the project.

Second follow-up - phone conversation with Alpha office tax partner indicating:

1. criteria for interviewees
2. approximate length of interviews
3. other information desired.

Personnel in Alpha office set up interview schedule and selected interviewees based on criteria set forth in proposal and phone conversations and based on availability of prospective interviewees.

Personnel contact in Alpha office provided name of contact person for the Beta and Gamma offices.

II. Plan of Analysis

Analysis will have 2 components:

1. Comparison of features of each site before and after the introduction of ExperTAX
2. Cross-comparison of sites.

Analysis will include analysis of:

1. Differences in productivity of tasks within the tax accrual and tax planning process (TATPP),
2. Differences in the roles and responsibilities of those involved in the TATPP,
3. Differences in the mobility of those involved in the TATPP,
4. Indications of possible resistance to the system, and
5. Analysis of each feature and site in an attempt to identify any impacts not suggested by the exploratory hypotheses.

The basis for the above analysis is the support or non-support of the exploratory hypotheses. Each hypothesis will be identified and a decision made about its veracity will be made based on the evidence.

After the analysis of each site is completed, cross-site comparisons will be made. All of the items, above, will be compared across sites to identify any differential impact from the introduction of ExperTAX.

APPENDIX B

CASE STUDY DATA BASE

APPENDIX B

Case Study Data Base

The case study data base consists of six sources of data:

1. Published articles about ExperTAX,
2. Observations,
3. Documents,
4. Archival evidence,
5. Interviews, and
6. Material generated by the researcher.

The published articles were used to develop an initial description of the system and the tax accrual and tax planning process, to discover the reasons for the change, and to develop an initial picture of the features of the organization.

Observations were made of a demonstration of ExperTAX using sample data in the Alpha office of Coopers & Lybrand and of decision makers reviewing ExperTAX output.

Documents examined included some of the documents used in the implementation process of ExperTAX - a discussion of the purpose of the marketing campaign and the introductary materials.

Archival evidence examined included a blank TAPQ and organization charts of the field offices.

The interviews contain most of the data used in this research. They provide a description of the organization both before and after the implementation of ExperTAX, the tasks and outcomes, and the implementation process, and perceptions of changes in the organizational features of the sites.

The materials generated by the researcher include such things as proposals, questionnaires, and other items developed by the researcher in the course of the research.

APPENDIX C

INTERVIEW QUESTIONS

APPENDIX C

Interview Questions

Resource Person

1. Describe your role with regard to ExperTAX.
2. How did you first learn about ExperTAX?
3. What did you think of the concept (if it was still conceptual at that point)?
4. What reason did the national office give for ExperTAX development (in initial memos dealing with ExperTAX - - at the training session in Chicago)?
5. How was ExperTAX introduced to the offices? (was there publicity prior to its introduction, etc.?)
6. What was the initial reaction (to the introductory material and then to the actual system) of the partners? the decision makers? the data collectors? anyone else I might not have considered?
7. Describe the tax accrual and tax planning process before the introduction of ExperTAX.

8. Describe the tax accrual and tax planning process after the introduction and use of ExperTAX. (Probe for changes in the timing of the decision making, the participants in the decision making, and the participants in the review process, if it doesn't come out in the descriptions. Also, productivity issues - - time necessary to complete task and quality of output. Maybe something about attitudes of decision makers to system coming up with nonsense issues?)
9. What kind of training was there for those who would use the system to collect data? for the those who would use the system for decision making?
10. Who had access to the training? Who supervised the training?
11. Were there any changes in attitudes about the system after its initial use? Partners? Decision makers? Staff? Describe, please. (was the system used as suggested for at least two audits per partner during the '86-'87 busy season)
12. Were there any changes in attitude about the system after use of it became mandatory for the '87-'88 busy season? Explain, please.

Partners

1. What is the organizational structure of the department?
2. Describe the relationship between the tax and audit departments.
3. Before the introduction of ExperTAX, what types of interactions were there between the tax and audit department personnel? Has the amount and type of interaction changed since the introduction of ExperTAX?
4. When and how did you first hear about ExperTAX?
5. What was your initial reaction to ExperTAX?
6. How did your attitude toward the system change after its initial use?
7. How did you feel about it after its use became mandatory?
8. Describe your role in the tax accrual and tax planning process before the introduction of ExperTAX.
9. Describe your role in the process after the introduction and use of ExperTAX.
10. Who was involved in the decision process before the introduction of ExperTAX? When and how?
11. How was the decision made before the introduction of ExperTAX?
12. What information was presented to you in connection with the tax accrual and tax planning decision before the introduction of ExperTAX?
13. Describe the review process - - who was involved?

14. How is the tax accrual decision made now - - again who is involved, when and how?
15. What information is presented to you and who's decision is that?
16. Who schedules the collection of data for the tax accrual and tax planning decision (before and after ExperTAX)?
17. How has the efficiency of the tax accrual and tax planning process changed with the use of ExperTAX?
18. How has the quality of the process changed? Is the input better? Are the decisions made better?
19. Is more or less time being spent developing tax planning strategies after the "raw" data is made available? Why?
20. Is the timing of the receipt of "raw" data different with ExperTAX?
21. Using ExperTAX, is it likely or possible to identify tax planning opportunities as the data is input into the system? Does this happen often?
22. How many (what percentage) audit in-charges worked with the TAPQ at some time during the time they were staff accountants?
23. How many audit in-charges work with ExperTAX before they move up?
24. How many tax specialists worked with the TAPQ?
25. How many will work with ExperTAX?

26. What is the procedure for moving from the audit staff to the tax department?
27. Do you think that audit in-charges feel that exposure to ExperTAX will make them more attractive to the tax department and therefore help their career?
28. Do you think that an audit in-charge would feel that knowledge gained through use of ExperTAX will make them more valuable to the audit department?
29. How might ExperTAX affect the ability of a pre-ExperTAX decision maker to advance within the firm?
30. Would this be different for a decision maker who had no pre-ExperTAX experience (had not made the tax accrual or tax planning decisions) decisions without using ExperTAX?
31. What kind of training is there for users of ExperTAX?
32. Is the system used for anything other than making tax accrual decisions and identifying tax planning opportunities? How? Is this type of use encouraged? By whom?
32. What was the initial attitude of the decision makers toward ExperTAX? Of staff accountants?
33. What is the present attitude of the decision makers toward ExperTAX? Of staff accountants?
34. If the decision of whether and how to use ExperTAX were yours alone, how would you use the system?
35. Who gains by the use of this system?

Decision Makers

1. How did you first learn about ExperTAX?
2. What was your initial reaction to ExperTAX?
3. How did you feel about it after its initial use?
4. How did you feel about it after its use became mandatory?
5. Who makes the tax accrual decision?
6. Describe your role in the tax accrual and tax planning process before the introduction and use of ExperTAX. Skills required, flexibility of decision making, independence of decision making, review process.
7. If the TAPQ wasn't properly completed, how were tax accrual and tax planning decisions made?
8. What was presented to the partners when the TAPQ was used?
9. Who had primary responsibility for determining what was presented?
10. Describe the process using ExperTAX and your role in it. (Include the same things as above.)
11. Is output from ExperTAX used in the initial decision process or is it used more to verify the decisions made by the decision maker?
12. How do you feel about being "checked" by the system?
13. Have you changed the way you make your initial decisions because the system is also making decisions?

14. What do the partners look at now - - still decisions presented by the decision makers, recommendations made by the decision makers with ExperTAX backup, or ExperTAX output only?
15. Using ExperTAX, is it likely or possible to identify tax planning opportunities as the data is input into the system? Does this happen often?
16. Was that also possible with the TAPQ?
17. What is the procedure if, for any reason, you question or don't like a decision the system has generated?
18. Has the overall time to complete the process changed? How?
19. What advantages might a staff person working with ExperTAX have over one who does not have knowledge of, or experience with the system (upward and/or lateral mobility).
20. Was this also true of those who worked with TAPQ?
21. Does knowledge or experience gained through training have the same effect on mobility as does working with the system on an audit?
22. How do you think your ability to advance in the firm has been affected by ExperTAX.
23. Is the system used for anything other than collecting actual data and making actual tax accrual and tax planning decisions? How? Who has access to the system? Is such use encouraged?

24. What was the initial attitude of the staff accountants (data collectors) toward the system?
25. What is the present attitude of the staff accountants toward the system?
26. How do the staff accountants feel about their jobs? More satisfied? less satisfied? same?
27. Describe the relationship between the tax and audit departments before ExperTAX? After ExperTAX?
28. What kind of interaction (and at what level) did you have with anyone in the audit (tax) department before the introduction of ExperTAX (any kind of interaction -- not just related to TAPQ)?
29. How has the level of interaction changed?
30. How has the introduction of ExperTAX changed the way you do your job as it relates to the tax accrual and tax planning process? Also how you think about your job?

<u>TAX</u>

31. How much control did the audit department have over the release of information to the tax department for tax planning purposes?
32. Who scheduled when the TAPQ was started and completed --Did the tax department have any say in that - - Did it make much difference in the tax department's tax planning activities?

33. With ExpertAX is more or less time needed to develop a tax planning strategy after the "raw" information is made available?
34. Is the timing of the receipt of "raw" data different with ExperTAX - - sooner or later?
35. Does the timing of the availability of data from ExperTAX give you the amount of time you would like to develop a strategy?
36. How has ExperTAX affected the way you feel about your job in general and your part in the tax planning function in particular?

AUDIT

37. Once the data was collected using the TAPQ, who was involved in making the tax accrual decision?
38. How does that differ with ExperTAX?
39. How much control does the tax department have over the final determination of the tax accrual number?
40. Are there cases of the tax department alone collecting the data using ExperTAX? How many?
41. Did this happen with the TAPQ? How often?
42. How has ExperTAX affected the way you feel about your job in general and your part in the audit function (especially the tax accrual function) in particular?

BOTH

43. If the decision of whether and how to use ExperTAX for the office were solely up to you, how would you use it?

Staff

1. Describe your role in the tax accrual and tax planning process using the TAPQ. (Include total amount of time spent on completing the questionnaire, skills required.)
2. How many times did you fill out a TAPQ? How many clients did that number represent?
3. What did the use of the TAPQ involve - -
   What tools
   Where done
   Who involved
   Amount of time
4. How did you feel about filling out TAPQ?
5. Did you feel it was important, challenging; what did you learn from the task?
6. How much did you feel that the task contributed to the tax accrual and tax planning process?
7. How did you first learn about ExperTAX?
8. What was your initial reaction to the system?
10. Describe the training you received prior to your first field use of the system. What is the attitude about "playing" with the system? Have you done so?
11. How much experience did you have with computers before you started using ExperTAX? How helpful do you feel your computer experience was?
12. Did you use the system during the 1986-87 busy season? (If no, when did you first use the system?)

11. How did you feel about the system after you started using it?

12. What is involved in the use of ExperTAX?
    What tools
    Where used
    Who involved
    Amount of time

13. How do you feel about the system now that you have used it more?

14. Do you use any of the special features of the system? Explanations? Note Taking? If no, why not?

15. How do you feel about the special features? (Do they make the process more understandable?)

16. How has your level of understanding of the tax accrual and tax planning process changed since you started using ExperTAX?

17. Has your feeling about the importance of the data collection task in the overall tax accrual and tax planning process changed with the use of ExperTAX?

18. How has using ExperTAX changed your knowledge-base about taxes and the tax accrual process?

19. Do you feel that this change in your knowledge-base will be beneficial to your career? How? Why or why not?

20. What was your feeling about the importance of your contribution to the tax accrual and tax planning process when you filed out the TAPQ? How has this feeling changed with the use of ExperTAX?

21. How many audit in-charges have the opportunity to use ExperTAX in an audit? How many used the TAPQ?
22. What advantages might a staff person working with ExperTAX have over one who does not have knowledge of, or experience with, ExperTAX? (upward and/or lateral mobility)
23. Do you think this was also true for a staff person who has only filled out TAPQ?
24. What kinds of interaction did you have with the tax department before the introduction of ExperTAX (any kind - - not just TAPQ related)?
25. Has the level of interaction changed? How?
26. What do you like about the way ExperTAX has changed the data collection task?
27. What don't you like about the changes that have occurred with ExperTAX?
28. If the decision of whether and how to use ExperTAX were entirely up to you, how would you use the system?
29. How has the introduction of ExperTAX affected the way you do your job as it relates to tax accrual and tax planning?

AUDIT

30. How has ExperTAX affected the way you feel about your job in general and your part in the audit (especially the tax accrual) function in particular?

TAX

31. How has ExperTAX affected the way you feel about your job in general and about your part in the tax planning function in particular?