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Yu, Pyeong Jun, Ph.D.

The Florida State University, 1989

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THE COLLEGE OF SOCIAL SCIENCES

PERCEPTIONS OF COMPUTER USES AND IMPACTS ON SELECTED MEASURES OF OPERATIONAL PERFORMANCE IN STATE FINANCIAL MANAGEMENT AGENCIES: THE CASE OF FLORIDA

BY

PYEONG JUN YU

A Dissertation submitted to the
Department of Public Administration in partial
fulfillment of the requirements for
the degree of Doctor of Philosophy

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PERCEPTIONS OF COMPUTER USES AND IMPACTS ON SELECTED MEASURES OF OPERATIONAL PERFORMANCE IN STATE FINANCIAL MANAGEMENT AGENCIES: THE CASE OF FLORIDA

(Publication No. _______)

Pyeong Jun Yu, Ph.D.
The Florida State University, 1989

Major Professor: William Earle Klay, D.P.A.

This study examined the impacts of computers in public organizations. Impacts were empirically examined through a questionnaire designed to measure the perceptions of employees in Florida state financial organizations. A conceptual framework was constructed to delineate expected patterns of association between sets of variables. Categories of variables included: managerial motivations and attitudes toward computer use, job dimensions, perceived impacts of computers upon organizations and individuals, employees' preferred policies for computer use, methods used by employees to learn about computers, intensity of computer use, and operational performance.

Univariate and bivariate data analysis revealed numerous significant findings. Managerial motivations underlying the adoption of computer technology are multidimensional. Employees simultaneously rely on several methods to learn about the use of computers, and informal

learning activities are highly important. Employees strongly desire to be involved in the making of decisions concerning new uses of computers. Prior notification of employees about technological changes is positively related to operational performance.

Job loss due to the use of computer technology seems minimal. Computer use is not perceived as a frequent cause of anxiety, health problems, or privacy invasion, however a minority did report increased mental stress and physical discomfort. Computerized work monitoring is common and appears to be well accepted by many respondents. There seems to be a trend toward automated decision making. Intensity of computer use seems to positively affect operational performance, and computers can affect operational performance in many subtle ways.

To my parents,

Chin To Yu and Soon Ja Hong,

with gratitude and love

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CHAPTER ONE

INTRODUCTION

The use of computer technology in public organizations has expanded rapidly. Almost all government agencies at the federal, state and local levels have become extensive users of computers (OTA 1986, 3; Danziger 1979b, 145). The increase in computer use has been based, in general, on the assumption that the computer is a tool which enables agencies to improve their organizational performance and the quality of their services.

Computer technology itself, like some other forms of technology, is neutral in many respects. It can, for example, be used to further managerial strategies to either centralize or decentralize an organization. But, once it starts being used in organizations, computer technology can bring about changes in many aspects of organizational life. It may modify the work process, affect the organizational structure, and change the social and psychological characteristics of the work place. In particular, potential impacts on workers have drawn much attention because they are often unintentional and difficult to foresee (Kiesler 1986, 46).

More importantly, many scholars have argued that the nature and impact of computer use within organizations would be contingent on contextual and organizational variables (Danziger 1970b; Stevens and LaPlante 1986; OTA 1985). Among these contingent variables are managerial philosophies and strategies, user behavior, and task environment.

In spite of the widespread use of computers in government, the field of Public Administration has made little effort to examine the consequences of the use of computers in public agencies. The utilization of electronic data processing systems has been cited as the foremost trend in state budgeting (Botner 1985, 616), but the impacts of this trend have been largely neglected by researchers. Furthermore, most research related to the use of computers in organizations, as many people point out, has had a tendency to be more speculative and prescriptive than empirical and descriptive (Bjørn-Andersen, Eason, and Robey 1986, 4; Kraemer and King 1986, 488; Stevens and LaPlante 1986, 523). Repeated calls have been made for research, especially empirical research, into the changes and problems that emerge with the increasing use of computers in government agencies. What follows herein is an empirical study of computer use and impact as perceived by the employees of several public organizations.

Research Questions

This study begins with a review of relevant literature to identify the major impacts that computers are likely to have on organizations and the employees who work in them. Since the initial use of computer technology, a concern of many researchers has been the organizational impacts of that technology (for example, Bjørn-Andersen, Eason, and Robey 1986; Forester 1980; Halachmi 1988; Kraemer, Dutton, and Northrop 1981; OTA 1985; Whisler 1970a). Some empirical examination and much speculation have been made about various types of computer impacts. Recently, Botner (1985) and Norris (1988) focused on financial management agencies in state and local governments, respectively, and attempted to identify the major impacts of microcomputers in these agencies. Following a review of the literature, this study will try to empirically examine the extent to which impacts are perceived by state government employees.

The present study will also investigate patterns of association between several organizational variables related to the use of computers. Among the organizational variables that will be studied are employee attitudes and perceptions with respect to: their jobs in general, their propensity to learn how to use computers, patterns and intensity of computer use, managerial motivations for adopting computer technology, implementation of computer technology in the work place, the impacts that computers are likely to have on organizations and the employees therein, and the changes in operational performance which result from the use of computers.

In particular, the present study places an emphasis on the role of senior management in planning and implementing the computer applications within an agency. According to Kraemer and his associates (1981), local governments that have been successful in computing have had managers who took an active role in determining strategies and policies for the use of computers. In contrast, in cases where managers have left the management of the technology to someone else, cities have experienced problems and have not achieved good performance. Given that the role of management is very important, the motivations and attitudes of managers about the use of computers are viewed as one of the most crucial factors that might affect employee attitudes and perceptions. Relationships between perceptions of managerial motivation and other attitudes will, therefore, be emphasized in this study.

A major part of organizational research has been devoted to the study of the relationships between employees attitudes and motivations and organizational productivity. Improving operational performance has been seen as the primary reason for the adoption of computer technology. Computers are expected to reduce costs, increase work speed, improve the effectiveness of operations, and so forth. Accordingly, this study inquires into the perceived gains in operational performance attributed to the use of computers. In a sense, therefore, the study has a bottom-line.

The number of potential impacts of computers is numerous indeed, and each of these could be associated with a variety of variables. It is necessary, therefore, to limit the scope of inquiry to those impacts and associations which seem to be especially important and promising. As a result of the review of literature, the following questions have been selected to become the focal point of the empirical inquiry herein.

1. Given that computers are being utilized increasingly in public organizations, what are the underlying motivations of management for adopting computer technology?

2. Are the differences in employee perceptions of managers' motivations toward the adoption and implementation of computer technology related to the attitudes which employees have toward their jobs, in general, and toward the impacts which computers are likely to have upon them and their organizations?

3. Are the differences in perceptions about managerial attitudes related to the propensity of employees to learn about the use of computers?

4. Are the differences in employees' attitudes toward their jobs related to their attitudes toward the impacts which computers are likely to have upon themselves and the

organizations in which they work?

5. Are the differences in employees' attitudes toward the impacts which computers are likely to have upon themselves and the organizations in which they work related to the changes that they perceive in operational performance as a result of the use of computers?

6. Are the differences in employees' attitudes toward the impacts which computers are likely to have upon organizations and employees working in them related to the propensity of employees to learn about the use of computers?

7. Are the differences in the propensity of employees to learn about the use of computers related to the intensity of computer use?

8. Are the differences in the intensity of computer use related to changes in individual performance which result from the use of computers?

While these questions are being investigated, two points should be noted. First, what the study is primarily based on is employee perceptions -- i.e. perceptions of managerial motivations and attitudes, perceptions of the changes in operational performance, and perceptions of the impacts of computers on organizations and individuals. For instance, the study does not measure actual changes in operational performance as a result of the use of computers. Rather, its concern is the employees' perceived changes in operational performance.

Second, the study is not intended to include all possible measures of operational performance, nor does it include all types of impacts that occur with the use of computers in organizations. No single research project of this nature, one done by a single individual with limited funds, could exhaustively investigate all possible measures of operational performance and all possible impacts of computers. The scope of this study is confined to selected measures of operational performance and selected impacts that the researcher views as both accessible and significant in light of recent developments in information technology and its applications.

Definition of Terminology

Before moving forward, it is worthwhile defining the terms that will be most frequently used throughout this study. These definitions may eliminate some confusion.

Computer Use. In this study, computer use is broadly defined as not only the direct operations of the computer and its peripherals, but also the use of the output of computer operations. The terms "computer use" and "the use of computers" are used interchangeably throughout this study with such terms as computer utilization, computing, computerization, and computer-based automation.

Computer Impact. A computer impact can be defined as any change or effect, including attitudinal changes, which occur as a result of the use of computers. An impact could be on society in general, on organizations in particular, or upon the individuals who work in them.

Operational Performance. In this study, the concept of operational performance contains the traditional elements of productivity, such as efficiency and effectiveness. The researcher, however, prefers using the term operational performance to productivity. A reason for this is that the impact of computers on operational performance or productivity is intended to be discussed with a distinction between organizational and personal performance rather than on that between efficiency and effectiveness.

Operational performance in the government sector has many difficulties in measurement, primarily because of the lack of measurable units of output (Burkhead and Hennings 1978, 34). Given such difficulties in measurement, the study will develop several computer-related measures of operational performance. It is not claimed that these measures are exhaustive. It should be noted that the focus of this study is perceived changes in operational performance, rather than overall measures of it.

The Locus of the Study

Seven state financial management agencies in Florida were selected as the locus of the study. The seven are the Office of Planning and Budgeting of the Executive Office of the Governor; the State Board of Administration; the Department of Insurance and Treasurer; the Department of General Services; the Department of Banking and Finance; the Department of Revenue; and the Office of Auditor General in the Legislature. Table 1-1 displays the list of the seven financial management agencies and some of their divisions where the study was conducted.

The selection of finance-related agencies was based partly on the expectation that their functions would be among the most extensively computerized (Norris 1988; Ostrowski, Gardner, and Motawi 1986; Schwartzrock and Jones 1986). Computer applications to finance-related functions are wider and deeper than those of any other function in government. Not only is the amount of electronically processed information very large, the range of applications -- from simple calculations and analysis to very sophisticated modeling -- is very broad. Computer applications in financial management agencies are extensive in such areas as accounting, utility billing, payroll, budget preparation, budget reporting, appropriations bill tracking, and revenue and expenditure forecasting (Botner 1987, 100; Norris 1984, 74; Ostrowski, Gardner, and Motawi 1986, 25).

The reason for the extensive use of computers in financial management agencies is that financial functions play a pivotal role in government operation and

Table 1-1. Seven finance-related agencies in the State of Florida and their divisions as the locus of the study.

Agencies and Divisions
Office of Planning and Budgeting of the Executive Office of the Governor
State Board of Administration
Department of Banking and Finance (One of six divisions) Division of Accounting/Auditing
Department of General Services (Two of ten divisions) Division of Purchasing Division of Bond Finance
Department of Insurance and Treasurer (Two of ten divisions) Division of Treasury Division of Risk Management
Department of Revenue (Four of six divisions) Division of Ad Valorem Tax Division of Audit Division of Collection and Enforcement Division of Technical Assistance
The Office of Auditor General of the Legislature of Florida (Two of four divisions) Division of Financial and Compliance Audit Division of Program Audit

Source: Florida House of Representatives, The Office of the Clerk. 1988. *Guide to Florida government*. January.

decision-making and deal with a large amount of quantitative information (Schwartzrock and Jones 1986, 311). A research inquiry into these agencies should, therefore, show a wide range of the impacts of the most advanced computer applications in government agencies.

The Office of Planning and Budgeting is the central budget office of the state and is located in the Executive Office of the Governor. Its emphasis during the last decade has been to link long-term state planning with annual budgeting. Its major missions are policy development, budget analysis, budget preparation and recommendation, budget allotments, monitoring of budget implementation, and economic forecasting.

The State Board of Administration is composed of the Governor, Comptroller, and Treasurer. It administers the distribution of certain taxes such as the two-cent gas tax. In addition, it administers debt services and all state general obligation and revenue bonds and handles the investment of several funds like pension funds.

With its insurance related regulatory activities, the Department of Insurance and Treasurer provides actual payments for all warrants issued by Banking and Finance and maintains detailed records of all transactions involving the State's money. It also produces state revenue through short-term investments and interest earnings.

The Department of General Services has two finance-related divisions. The first division is responsible for bond financing, and issues all bonds of the state for the purpose of financing capital improvement. The second division does general purchasing. This same division negotiates and executes purchasing agreements and contracts, and determines standards, specifications, and fair prices for the commodities bought by State agencies.

The Department of Banking and Finance has some service functions as well as the regulation and licensing of all state-chartered banking and finance companies. The Division of Accounting and Auditing is primarily responsible for issuing millions of warrants to pay for the state's debt, operating expenses, and employees' salaries, while also monitoring all state financial transactions. Risk management is also included because it is part of a broadly defined financial management function.

The Department of Revenue is a tax administration agency. It assesses and collects taxes as charged by state statutes. It also does tax auditing activities.

The Office of Auditor General in the State Legislature mainly develops an overall plan for management accounting and reporting and conducts financial and performance audits of all state agencies.

As a result of the Florida Fiscal Accounting and Management Information Systems (FFAMIS) Act of 1980, the State of Florida has begun to integrate its financial management systems. Currently, seven automated management information subsystems are being linked to each other. In general, these agencies use two forms of computer applications: the interconnected automated information systems and independent office automation systems.

Significance of the Study

The coming of the post-industrial society implies that new and radical changes are taking place in our society (Bell 1973). The axial force of much current societal change is information technology. Information technology often means the combination of computer and communication technologies. Government is a leading user of this new technology, but research has lagged far behind the world of practice. No previous study, for example, has focused upon the perceptions and attitudes related to computers in public financial agencies. The full significance of a study such as this can best be understood in the context of the rapidly expanding world of technology.

The earliest versions of the computer were invented and developed to solve complex calculations for military and scientific needs. Since then, a series of advances in computer technology has greatly enlarged the capacity of the computer and the scope of its applications. Such technological developments as the invention of the microchip have greatly increased the memory capacity of the computer. Furthermore, microchip technology has equipped the computer with the rudiments of an electronic brain. Even though most of its operations are based on previously programmed instructions, computers now have extensive capabilities for processing and manipulating information.

In addition, the development of telecommunication technology enables its users to transcend the conventional limits of time and space. Telecommunications make possible real-time access to persons or information sources at a great distance. Electronic communication channels, especially those within and between organizations, are increasingly used to replace face-to-face interactions. Given their technological capacities of storing, processing, and transmitting information, the convergence of computers and telecommunications in offices now offers the possibility to create "integrated" workstations. Such workstations can change the operations of an office by automating many activities such as data processing, data transmission, word processing, and so forth.

Information technology is designed to be labor saving. It is expected to improve organizational productivity by reducing staff and costs. In other words, the intended effect of the adoption of information technology is to utilize available resources in a more efficient and effective manner. A large proportion of automation efforts, in terms of cost and time, have been devoted to improving operational performance in the repetitive activities which predominate at the lower levels of organizational hierarchies (Emery 1987, 86-88). Many computer applications, however, create new problems and generate new costs. Therefore, it is still important to study whether the use of computers has improved operational performance even though there is some empirical evidence of a positive relationship between computer uses and productivity improvement (Botner 1987; Ostrowski, Gardner, and Motawi 1986). This study, therefore, inquires into perceived changes in operational performance.

The adoption of computers has required both organizations and their employees to adapt to the new technology (Kiesler 1986). Substituting what people have done previously in organizations and hence reorganizing the division of labor between humans and computers, computers bring about diverse changes in organizational life. Also the increased interaction between humans and computers can change the nature of many existing relationships among organizations and individuals. In summary, computerization modifies the work process, restructures the organization, and affects employee behavior.

Furthermore, the impacts of technology on employees and their organizations are likely to be dependent upon contextual and organizational variables. Kraemer and his associates (1981) argue that the outcomes of computer use are dependent upon the implementation policy itself, and that the implementation of the technology is affected by the behavior of major participants as well as by the task environment for which the technology is used. Therefore, it is imperative that this study considers several important contingent variables to investigate patterns of relationships among computer use and computer impacts. Perceptions of managerial attitudes and motivations and the employees' job characteristics are the primary contingencies for this study.

The advent of microcomputers has given the user direct access to computer systems. This access gives the user some discretion as to how computers are used. The user, as the person who knows most about certain computer applications, assumes greater importance. Participation of the user at every stage of the system development is now being emphasized by some observers (Ives and Olson 1984; Robey and Farrow 1982). Recognizing the importance of the user, this study focuses on individual employees' perceptions of and attitudes toward computer use, impacts, and the contingent variables in their agencies.

The results of this study are expected to increase the understanding of the impacts that computers are likely to have upon organizations and upon the employees in them. In particular, managers need to know employees' perceptions of and attitudes toward the changes that are related to computer use. The study is designed to enhance that knowledge and thereby facilitate the development of policy recommendations for the management of computer systems.

Methodology

This study is based primarily upon empirical research into the impacts of computers as perceived by the employees in seven state government agencies. In addition to a review of related literature, data were collected through a survey which used an existing questionnaire. Drs. William Earle Klay and Fiona F. Chen in the Department of Public Administration at The Florida State University cooperatively developed a questionnaire, involving me in its development process. The questionnaire was designed to be applied to a variety of organizations where computers are used, such as agencies in different functional areas as well as in different countries. The present study is the first one that employs the questionnaire developed by the project team for actual data collection.

The questionnaire includes a wide range of questions about the impacts of computers and the organizational variables related to the use of computers. Its focus is upon the individual employee and especially upon employee perceptions of and attitudes toward computer use and computer impact. These were measured using Likert-type questions for the most part. These yield data of an ordinal nature.

The population for this study includes the employees who work in financial management in the seven finance-related agencies in the State of Florida. Financial management here is defined to include budgeting and auditing as well as other functions such as procurement. Six hundred employees were sampled from the seven agencies for the survey based on simple random sampling procedures without regard to their agencies, positions, and job categories. Three hundred seventy seven or 62.8% of them returned the questionnaires with usable replies.

Two levels of analysis were conducted to examine the collected data. The first was a univariate analysis of the employees' perceptions of computer uses and impacts. Percentage distributions in responses to each question were analyzed to examine the direction and intensity of attitudes and perceptions. Chi-square statistics were obtained to make supplemental analyses of the differences in perceptions and attitudes between selected categories of respondents. The second level involved bivariate analysis of associations between pairs of variables included in this study. In doing this analysis, the scale of measurement was assumed to be ordinal. Kendall's tau-b correlation coefficients were calculated to measure the associations between pairs of ordinal variables. Ordinal measurement imposes more limitations to data analysis than do higher levels of measurement such as interval or ratio measurement. Since the 1970s, several studies have tried to develop advanced methods of analysis, including methods of multivariate analysis, which are appropriately applicable to ordinal data (Andrews et. al. 1981, 59; Hawkes 1971; Kim 1975). Developing methods of multivariate analysis for ordinal data has proven to be a difficult problem. The present study is truly exploratory in its substantive respect. It is intended, therefore, to focus analytical attention upon the patterns of possible association between specified pairs of variables. That is what is done here.

Organization of the Study

Chapter Two will make an overall review of much of the previous literature which has examined the use and impact of computers in organizations. The literature review will start with a background discussion about the basic functions of the computer, the reasons for computer use, and the major actors in computer use. The review will then continue to discuss the evolution of computer use in the office. Particular emphasis is placed upon identifying many types of possible impacts which previous research has identified, with a particular focus upon the impacts of computers upon operational performance, organizations, and individual employees. In reviewing the impact of computers, the relationships among the impacts and relevant organization variables will be discussed.

Chapter Three will construct a general conceptual framework which delineates some patterns of association between the variables related to the use of computers in organizations. Based on the framework, a number of hypotheses will be developed for the purpose of investigation. Chapter Four will explain the research methodology for the study. The research questionnaire, population, sampling procedures, sample size, data collection, and data analysis will be discussed in detail. Chapters Five and Six will discuss the results of the data analysis. Chapter Five will use univariate analysis to discuss employee perceptions of computer uses and impacts, while Chapter Six will use bivariate analysis to explore associations between selected pairs of the variables. Chapter Seven will summarize the major findings, discuss the policy implications of the findings, and provide a suggestion for further research.

CHAPTER TWO

LITERATURE REVIEW

This chapter will review much of the literature related to the use and impact of computers in organizations. The review will start with a discussion of the basic functions of computers, the reasons for computer use, and the major actors in computer use. Also, this chapter will profile the evolution of computer applications in office environments and some of the managerial and organizational issues relevant to them. Particular attention is given here to identifying the diverse types of impacts that computers may have on employees and on the organizations in which they work. This chapter will conclude with a brief review of the history of computer use in Florida state government in general and in its finance-related agencies in particular.

Two Basic Functions of the Computer

Simon (1973, 272-273) defines the two basic functions of the computer as an extension of human capacities for memory and processing. First, in its role as an enhancer of memory capacity, the computer stores potential information which can be retrieved in a systematic way whenever it is needed. Second, the computer is a processor which has capabilities for handling and manipulating various kinds of symbols. According to Simon, the most important processing applications are "to model complex situations, and to infer the consequences of alternative decisions" (Simon 1973, 273). A detailed description of the computer's processing capabilities was given by Issacs (1968, 489) as follows:

> *Repetitive Processing.* Repetitive processing of a long list of information on the basis of the previously established criteria.
>
> *Logical Comparison.* The comparison of equivalence or non-equivalence of two sets of records in a manner that contributes to decision making.
>
> *Potential for Learning.* Modification of its course of action based on different information examined during the processing.

Reasons for Computer Use

Simon's dichotomous functions of the computer only suggests the potential capabilities on the technological dimension, i.e. what it is capable of doing. The technological capability of computers is rapidly expanding along both dimensions. When the computer becomes an organizational resource for a certain usage, however, many factors other than technological capability can affect the introduction of computer technology and the intensity of its use (Simon 1977; Whisler 1970a, 12). Technological capability alone does not explain the persistence of efforts to use computers in the office. Two perspectives, rationalistic and political, suggest different reasons for this persistence.

People with a rationalistic perspective assert that a driving force for the use of computers comes from its increase in the rationality of organizational activity. Simon (1977, 23) quotes the doctrine of comparative advantage to explain the reason for the use of computers. He argues that the increasing use of computers can be justified by the comparative advantage of the technology over the human worker in performing relatively routine and repetitive tasks. Meanwhile, humans have retained a comparative advantage in more flexible, problem-solving tasks.

The classical justification for computerization has been its economic rationality--labor savings or cost savings (Emery 1987, 8; Gibson and Nolan 1974, 78; Griesemer 1984, 57). Zisman (1978, 2-3) points out that the increased availability and decreasing costs of computer technology, coupled with increased labor costs in the office, now make office automation more attractive. Emery (1987, 8) also maintains that managers seek to substitute inexpensive information processing for expensive human labor.

The political perspective focuses on the behavior of major organizational actors. Its argument is that the adoption of computer technology is determined and carried out by those who already possess substantial power and whose interests are served by the technology (Danziger et al. 1982, 12-18). Proponents of the political perspective, however, differ as to who are the principal beneficiaries of this new technology.

According to Feller (1980, 1022-1024), bureaucrats, rather than elected officials, provide the principal leadership for the technological innovations in public agencies. The bureaucrats, it is said, prefer innovations for service improvement to those for cost reduction because the service-improving innovations satisfy "bureaucratic self-interest" with individual or departmental growth in size, power and status. Feller's argument is clearly based on the assumption of utility-maximizing bureaucrats (Niskanen 1971).

Downs (1968, 208) argues, however, that the use of computer technology gives more power to computer specialists who control the actual operation of computer systems. Based on their relative monopoly of expertise, they can influence the decisions related to the use of computers and enjoy the most benefits from it. Computer specialists tend to benefit from the installation of additional capacity (Gibson and Nolan 1974, 81). The needs of the organizations and users can become secondary to the interest of computer specialists.

Danziger and his associates (Danziger et al. 1982, 18) have conducted the most extensive studies of computer use and impacts in public organizations. Their survey of local governments in the 1970s followed a reinforcement politics approach. Their primary objective was to discover whether the introduction of computers altered existing political relationships in local governments. They found that computer technology tends to reinforce the dominant interest coalitions. In other words, they concluded that computers tend to reinforce the power of whoever holds the reins in the first place.

Major Actors in Computer Use

As partially suggested in the preceding discussions about the political perspective, some of the major actors involved in the use of computers in organizations include senior managers, users, and computer specialists.

Senior Managers. Many writers assume that the use of computers depends largely on the leadership of senior managers in organizations (Emery 1987, ix; Feller 1980; McGowan and Lombardo 1986, 581; Whisler 1970a, 2). According to Whisler (1970a, 2), senior managers evaluate the costs and benefits of computerization at the organizational level, and strongly influence the decisions made about the adoption of new technology. Of particular importance, therefore, is how they guide the process in which the computer is adopted and implemented. Both management's philosophy and its specific decisions can affect the organizational outcomes of computer applications (Chisholm 1988, 44). Some research shows growing evidence of a positive relationship between the quality of managerial leadership and the successful implementation of computer systems (Dutton and Kraemer 1978, 30).

Gibson and Nolan (1974, 80) doubted whether all organizational members share the same enthusiasm as the managers have in computer use. They emphasized that organizations should not ignore the possibility of negative reactions from employees.

Users. In the earliest computer applications, the user was simply a receiver of information. His or her access to the systems was restricted except by going through computer specialists. Since dumb terminals and stand-alone personal computers appeared in the office, however, users have increasingly gained access to and influence over computing systems. They have become a major part of the computer systems.

Users now play very important roles in system development because they are often in the best position to know applications to improve personal performance and to provide clients with better services (Griesemer 1984, 58). Therefore, user involvement has been urged at various stages of system development. Some of the expected benefits of user involvement include: a) more accurate assessment of user information requirements, b) prevention of system features that are unacceptable to users, c) improved user understanding and support of the system, and d) granting of democratic rights to organizational members (Ives and Olson 1984, 587-588; Robey and Farrow 1982, 73). Involving users in decisions about computer applications is expected to have positive effects on the use of computers.

Computer Specialists. Specialized staff members can use their technical expertise to influence decisions related to the use of computer technology. Their technical services and their relationships with users are crucial in the successful system implementation (Lucas 1984, 58). According to Danziger's review of prior research (Danziger 1979b, 147), however, expert bureaucrats have a tendency to be more self-oriented than client-oriented and to be guided by standards of professional performance that may be narrowly defined. In an early study, Meyer (1968, 259) characterized the relationships between computer specialists and their major clients, mostly line managers, as one characterized by disagreement, non-cooperation, and avoidance behavior. According to Meyer, this conflict is due to a "...bureaucratic structural problem that compels high-status non-experts and low-status experts to cooperate with each other" (Meyer 1968, 259). Non-experts have the decision authority, but only the specialists possess requisite knowledge about technical alternatives.

Decentralized computing, which was accelerated by the emergence of microcomputers, has apparently changed the status of the computer specialists. Increased user access to the systems has reduced user dependence on computer specialists. As some point out, the role of computer specialists may be changing from that of gatekeepers who control information to an advisor to users who undertake their own system development (Griesemer 1984, 59; Overman and Simanton 1986, 585).

Evolution of Computer Use

Initial computer applications in the office started by automating information processing tasks. The early information systems, often called Electronic Data Processing Systems (EDPS), Automated Data Processing Systems (ADPS), or Transactions Processing Systems (TPS), were established to collect, classify, store, retrieve, and update transaction data. The primary functions of EDPS are record-keeping and data input to other information systems, such as Management Information Systems (MIS) and Decision Support Systems (DSS) (Kroeber and Watson 1987, 6). The major role of EDPS, therefore, is "...to update (a) database to keep it current with the real events" (Emery 1987, 85). The output of EDPS is mostly detailed reports for routine operational activities, and EDPS have been used primarily to increase operational control (Kroeber and Watson 1987, 216).

Since early computers were expensive and processing costs were high, efficiency in the use of this expensive resource was heavily emphasized. As a result, organizations utilized a centralized approach to the use of computer systems. Access to systems was highly controlled, and their use relied heavily on expert assistance.

Emery (1987, 86-88) provides a summary of several reasons that EDPS are still important even though more advanced applications have drawn much attention during last two decades. According to Emery, a large proportion of organizational resources, such as operating costs and computing time, is still devoted to data processing. Consequently, the way EDPS are utilized can affect operational efficiency. Increased efficiency through EDPS enhances the strategic position of the organization.

The next evolutionary step from EDPS is the MIS. Management Information Systems (MIS) have been designed to provide managers at all levels of an organization with information support for operational decision making (Kroeber and Watson 1987, 7). MIS are heavily dependent on a data base, a database management system, an application base, and a communications network (Emery 1987; Kroeber and Watson 1987). The database of a traditional MIS is largely restricted to information generated within the organization in conjunction with the accomplishment of routine activities. Within this context, some newer MIS's can be used to make some routine decisions which are especially structured (Ahituv and Neumann 1986, 133).

A key issue in MIS applications has been whether MIS can supply the information that the manager most needs to make decisions. Previous research emphasizes that MIS should have various subsystems that can support information demands which vary with the management activities (Gorry and Scott Morton 1971; Simon 1977). This argument is based on the assumptions that management activities differ according to the organizational level, and that the characteristics of information needed to support different management activities vary with the level. Gorry and Scott Morton's appealing framework for information systems has been a groundwork for this argument (Gorry and Scott Morton 1971). Their framework emphasizes that the different systems support should be provided for the applications which vary not only to the degree of structure in decision making but also to the level of management activity. The higher a manager is in an organization, the greater is the likelihood that the information that is most needed is that which informs about the nature of conditions beyond the organization itself.

Ironically, many researchers have found that MIS would fail to achieve their intended goal, providing useful information for managers. Ackoff (1968, 147) pointed out that management suffers from an "...over abundance of irrelevant information". Mintzberg (1972, 95) concluded that MIS cannot meet the manager's demand for information that is current, concrete, and verbal. Dearden (1972, 91) also indicated that MIS cannot provide the qualitative information that is most critical to management. The most important information to management comes mainly from external sources, not from internal records (Mintzberg 1972, 96; Simon 1973, 271). MIS primarily serve those who perform the more routine, programmed work, not the managers whose work is largely unprogrammed (Mintzberg 1972, 96).

Efforts to make information systems more responsive to the information needs for unprogrammed decision making have brought the establishment of Decision Support Systems (DSS). Their primary role is to aid and supplement human decision making. They are not intended to provide solutions or make decisions for the user (Davis and Olson 1985, 36; Keen and Scott Morton 1978, 1). A virtue of a DSS is its "educative" function (Gorry and Scott Morton 1971, 65). DSS enable the managers to learn about decision situations and to increase decision making ability through an interactive process between users and systems.

Alter (1978) attempted to construct a taxonomy of DSS, and Keen and Scott Morton (1978) tried to define the major characteristics of DSS. Regardless of these efforts, Naylor (1982, 92) criticizes the DSS as having no clear definition, lacking a well-defined conceptual framework, and providing relatively little useful information. Also Naylor suspects the identity of DSS because it is "...impossible to ascertain what is either new or unique about DSS" (Naylor 1982, 93). Meanwhile, others support the use of DSS, particularly because the development and use of a DSS emphasize the interactive process between users and computers. In addition, a DSS can provide an additional source of decision support for managers (Kroeber and Watson 1987, 376; Watson and Hill 1983, 86-87). Watson and Hill (1983, 87) conclude that "...unlike MIS which has subsumed EDP in many organizations, DSS coexists with MIS".

Kroeber and Watson (1987, 382) distinguish DSS from MIS as follows. First, MIS support routine and highly structured decisions, while DSS support unique and unstructured decisions. Second, DSS can be used to address ad hoc, unexpected problems, while MIS support decisions with structured information flows. Third, DSS can validly represent the real-world system with accepted validity of the model and the value of the results, while MIS cannot engender such trust.

In addition to the traditional use of computers for information support, developments in computer technology have expanded the scope of its applications to office automation (Ahituv and Neumann 1986, 182; Emery 1987, 23). Office automation (OA) can be defined as "...a multifunction, integrated computer-based system that allows many office activities to be performed in an electronic mode (Kroeber and Watson 1987, 8)."

The applications of office automation are wide ranged -- from those of replacing clerical work, through those for transmitting information, to those for complicated modeling. Examples include word processing, spreadsheet analysis, electronic mail, and teleconferencing. OA applications have been developed to automate and support office activities such as typing, filing documents, mailing, conferencing, and so forth.

A highly visible change brought about by OA is the increased access of nonspecialists to computer systems (OTA 1985, 12). In the era of mainframe computers, no user could gain physical access to a computer except by going through the specialized data processing staff. The emergence of "dumb" terminals in the 1960s enabled users to gain access to the central computer to input data and receive information. However, this level of access could not provide interactive support for users because most of the actual processing took place in the batch mode. Since the advent of stand-alone microcomputers in the 1970s, the computer has become a user's personal resource, and many office workers possess their own workstation. These offer personal access to extensive computing power, private data bases, and interactive support. Furthermore, the continuing evolution of OA offers growing access to a variety of computer-based communications systems, including electronic mail, facsimile, teleconferencing, and telecommuting. Direct access to communications network via a personal computer has rapidly gained acceptance.

A critical issue that has arisen with the widespread use of office automation is how to integrate information systems with office automation efforts (McKenney and McFarlan 1982). Increased interdependence between them has prompted a shift in emphasis from information processing to information resources management (IRM). IRM is based on the notion that information becomes a strategic resource and therefore should be managed through the expansion of responsibility for the information systems executive (Davis and Olson 1985, 630). IRM usually includes all activities related to data processing, telecommunications, and office automation.

The latest application of computer technology is the expert system (ES), which is a subset of artificial intelligence (AI) technology. AI reflects the continuing efforts to develop techniques that would allow computers to mimic human intelligence. These techniques have recently begun to prove their value, and numerous commercial applications are now underway.

The expert system is a collection of AI techniques developed for assisting people in analyzing problems and making decisions with suggestions and recommendations as to what ought to be done (Harmon and King 1985, 1; Hurley and Wallace 1986, 563). Its major characteristics are a high level of flexibility within the context of the decision making rules of thumb and procedures used by one or more human experts (Coursey 1987, 3). Unlike the traditional computerized decision aids, ES can learn from experience (Savory 1988, 23).

The expert system is composed of three basic elements: a knowledge base, a domain-specific database, and an inference engine (Coursey 1987, 3). A knowledge base incorporates expert rules of thumb or heuristics for solving problems. A domain-specific database includes relevant databases for solving a particular set of problems. An inference engine provides the reasoning strategy used to control and manage the knowledge base in making a decision.

The fields to which expert systems are well suited include routine diagnostic decisions, such as medical diagnosis and treatment, technical diagnosis and maintenance, and the design and delivery of various forms of training (Savory 1988, 26-28). A critical problem in ES development is how to capture and encode the specific knowledge from human expert (Coursey 1987, 4; Sheil 1987, 91). Due to the limitation that all of the relevant knowledge cannot be captured in an expert system, applications are limited to specific diagnostic tasks within a narrow range (Sheil 1987, 92). It is much more difficult to solve the broader, more general problems with existing expert system techniques (Sheil 1987, 93). Klay (1988b) expects that in the public sector the great promise of the expert system lies in the agencies that are engaged in repetitive applications of rules like the determination of eligibility for social services.

In summary, the use of computers in work organizations started with the establishment of EDPS. Systems applications have evolved from early record-keeping and data processing, through information support for operation and management (MIS), to interactive decision support (DSS). The advent of microcomputers has resulted in the automation of many office activities, e.g. word processing, spreadsheet and statistical analysis, graphic displays, and computer-based communications. The expert system, which is designed to supplement and perhaps to substitute for routine human decision making, has lately begun to prove its value, and its applications are now under development. The rate of evolution in computer technology is rapid and may even be increasing. As the technology becomes more potent, the potential of impact becomes even greater. It is imperative, therefore, that public administration scholars and practitioners develop ways to identify, analyze, and anticipate these impacts.

Impacts of Computers on Organizations and Employees

As defined in Chapter One, the impacts of computers mean those changes or effects, including changes in attitudes and perceptions, which occur as a result of the use of computers. The following section will review much of the literature which has empirically investigated or merely speculated about the types, directions, and magnitudes of computer impacts. Table 2-1 in pages 38 and 39 briefly summarizes and outlines the impacts which computers may have upon organizations and employees who work in them. The table is organized according to major impact categories, and indicates where previous research has observed such impacts.

Organizational Structure. One of the most evident consequences of computer use has been the reorganization of activities and functions (Leavitt and Whisler 1958, 42; Siegman and Karsh 1962, 112). Computer technology should be applied to fit the organization of which it is a part. At the same time, the structural adaptations are required to better exploit the newly introduced technology (Whisler 1970a, 33). Structural rearrangements can be viewed as impacts in themselves, and also as intervening factors which mediate other impacts (Meyer 1968, 257). In a comprehensive empirical study of the organizational impacts of computers, Whisler (1970b, 57-63) discussed several types of computer-induced structural and functional

Table 2-1. Impact Category, Impact, and Previous Research

Impact Category	Impact	Researcher and Publishing Year
Organizational Structure	reorganization span of control level of hierarchy	Leavitt and Whisler (1958); Siegman and Karsh (1962); Meyer (1968); Whisler (1970b)
Employment Effect	no change hiring avoidance expansion effects	Leavitt and Whisler (1958); Whisler (1970b); OTA (1985); Kraemer and King (1986); Ostrowski et al. (1986); Botner (1987); Norris (1988)
Job Content	job change staff pattern job characteristics team approach	Kraemer et al. (1981); OTA (1985); Er (1987); Gardner and Schermerhorn (1988); Klay (1988a); Klay and Yu (1988);
Skill Impact	deskilling enskilling	Whisler (1970b); OTA (1985); Kraemer and King (1986)
Management Control/ Supervision	increase no change electronic monitoring	Kraemer et al. (1981); Kraemer and Danziger (1984); Kraemer and King (1986); OTA (1985); Botner (1987); Gardner and Schermerhorn (1988);
Centralization	centralization decentralization	Leavitt and Whisler (1958); Robey (1981); OTA (1985); Moskovitz and Mammen (1985); Kraemer and King (1986); Er (1987); Gardner and Schermerhorn (1988)
Decision Making	decision process quality of decision automated decision-making	Ahituv and Neumann (1986); Kraemer and King (1986); McGowan and Lombardo (1986); Ostrowski et al. (1986); Botner (1987); Halachmi (1988); Gardner and Schermerhorn (1988)
Communication	communications time pattern of communications depersonalized interaction group decisions no change	Meyer (1958); Whisler (1970b); Kiesler (1986); Ostrowski et al (1986); Botner (1987); Norris (1988); Gardner and Schermerhorn (1988)

Table 2-1. Impact Category, Impact, and Previous Research (cont.)

Impact Category	Impact	Researcher and Publishing Year
Power Shifts	specialist dominant interest no change no power loser	Siegman and Karsh (1962); Meyer (1968); Danziger (1977b); Danziger et al. (1982); Kraemer and Danziger (1984); Lucas (1984); Gardner and Schermerhorn (1988); Norris (1988)
Work Intensity	increase decrease	Norris (1988)
Anxiety/ Job Satisfaction	computer anxiety job satisfaction	Simon (1977); Kraemer et al.(1981); Ostrowski et al.(1986); Botner (1987); Norris (1988)
Stress/ Physical Discomfort	mental stress physical discomfort health problem	OTA (1985); Ostrowski et al.(1986); Er (1987); Botner (1987); Klay (1988a);
Security/ Privacy	security privacy invasion	OTA (1985); Botner (1987);
Computer Learning	informal training mixed managerial responses	OTA (1985); Ostrowski et al.(1986); Botner (1987); Klay and Yu (1988); Norris (1988)
Operational Performance	time savings time utilization quality of output accuracy timeliness ad hoc task sense of accomplishment	Simon (1977); Kraemer et al.(1981); Griesemer (1984); Kraemer and Danziger (1984); Botner (1985, 1987); LaPlante (1985); OTA (1985); Kraemer and King (1986); Schwartzrock and Jones (1986); Gardner and Schermerhorn (1988); Kerns et al.(1988); Klay and Yu (1988); Norris (1988);

rearrangements. Some of these are the creation or elimination of departments, transfer of functions to other departments, and consolidation or division of departments.

Another concern has been whether the use of computers would alter the number of levels in the hierarchies of organizations or lead to changes in the span of control. Whisler (1970b, 54-55) found that computers displaced human workers with corresponding reductions in the levels of hierarchy, as well as a reduction in the number of persons supervised on average. Meyer, on the other hand, discovered exactly reverse consequences in data processing units, where such units underwent growth and hierarchical elaboration (Meyer 1968, 262-263). Within the same organization, some parts may grow while others contract in response to the same introduction of computer use. Studies that look only at overall organizational structure may, therefore, miss changes within organizations. Similarly, some employees within an organization may accurately perceive a situation of hierarchical elaboration while others experience the effects of a contraction. This is one reason that it is important to inquire into the perceptions of individual employees.

Employment Effects. Because computer technology is inherently designed to be labor-saving, its usage has been predicted to affect the number of employees in an organization. The potential for adverse impacts on the level of employment has seriously concerned employees and labor leaders since the installation of computer systems (Klay, 1988a). Scholars who have studied the potential for labor force displacement, however, are very divided as to the extent of such impacts.

At the whole organizational level, some have found that neither the numbers of personnel nor full-time equivalents (FTE) were changed by the introduction of computers (Botner 1987, 102; Norris 1988, 80; Ostrowski, Gardner and Motawi 1986, 26). Norris (1988, 80) found that agencies tended to avoid hiring additional personnel due to the use of computers. Some argue that net employment effects become unclear as the increasing use of computers tends to expand some existing jobs, or create new jobs, while replacing others (Kraemer and King 1986, 490; Whisler 1970b, 51).

Furthermore, Whisler and others (OTA 1985, 15; Whisler 1970b, 51) have found that employment effects vary with organizational level. Their findings also show that displacement effects are concentrated at the clerical level where computer technology takes over repetitive tasks. At the middle level, employment changes have occurred including some reductions in lower level supervisors and managers, but the empirical evidence has shown mixed effects (Leavitt and Whisler 1958, 42; Whisler 1970b, 51). Little employment changes have been observed at the higher managerial levels.

Job Content. Computers can change jobs in many ways. Computer technology may take over some tasks, create new tasks, or incorporate other tasks into existing jobs (OTA 1985, 104-105). The "clericalization of professional work" and "professionalization of clerical work" are evident examples of the changes in job content across job categories (OTA 1985, 105). A personal computer and easy-to-use software enable professionals and managers to do some clerical tasks such as drafting their own correspondence and documents, filing them, printing them, and retrieving them (OTA 1985, 52). Many professionals do these clerical tasks because they can better control the quality and pacing of their work and enjoy greater autonomy in their tasks (OTA 1985, 49). In contrast, clerical workers have taken over some professional tasks with the aid of computer technology. The appearance of user-friendly software, for example, enables clerks to do simple spreadsheet analysis that has formerly been considered part of the professional tasks (OTA 1985, 105). With expert systems, diagnostic tasks that were previously the exclusive purview of professionals can be performed by paraprofessional or clerical persons.

Changes in the job content can affect the pattern of staff composition (OTA 1985, 49). Klay and Yu (1988, 201) show empirical evidence that the ratio of support staff to professional staff decreased substantially in a central state planning and budgeting office.

Some of the prior research has been concerned with the impacts of computer use on the characteristics of a job. According to an OTA report (1985, 96-111), the use of computers can change job characteristics, but the impacts might be different according to the type of job. Some jobs become more differentiated with the use of computers. In such cases, employees may be called upon to perform increasingly specialized tasks with little opportunity to perceive how these relate to the tasks of others. Conversely, in other types of jobs, computer technology increases the possibility of integrating the work process, allowing a worker to view the whole operation and giving a variety of tasks to perform (OTA 1985, 101). An empirical study found that computer use increases the job variety of managers, allowing them to do a greater number of different things in their jobs (Kraemer, Dutton, and Northrop 1981, 58). However, Er (1987, 33) speculated that job responsibility, variety, and autonomy remained unchanged regardless of the increasing use of computers.

With respect to the changes in job content, another concern has been how the use of computers affects the way the work itself is being performed. Some researchers contend that computers, particularly computer networks, increase the number of project teams (Gardner and

Schermerhorn 1988, 94; Klay 1988a, 60). According to Gardner and Schermerhorn (1988), computer networks make it easier to create a special project team by restructuring work units beyond the traditional boundaries like departments, divisions, and geographical locations. In some instances, a team approach is expected to improve the overall quality of service, and it allows participants in the team to understand the whole process and facilitates communications (OTA 1985, 101). Such teamwork may modify previous distinctions among jobs.

Skill Impact. Where computers cause changes in job content, it follows that the nature and level of skills which are required to carry out those jobs might also be altered. Whisler (1970b, 139) found that skill requirements are affected by computers at all organization levels, but that skill impacts are most pervasive at the clerical level. Impacts diminished at successively higher levels.

There are two opposite opinions concerning skill impacts. One is that computer use "deskills" office work through the standardization and routinization of tasks as computers take over what workers have done (OTA 1985, 18). In such circumstances, the knowledge and skills required of employees become minimized. Deskilling occurs, for example, where standardized data processing enables trained clerks to be replaced by less trained workers. Similarly, persons qualified to perform some professional tasks may find that this portion of their job is replaced by means of programmed decision rules and automated analytical processes.

The other opinion contends that computer use "enskills" workers, enabling them to perform more complex tasks as the computer takes over routine and repetitive tasks (Kraemer and King 1986, 490; OTA 1985, 18; Whisler 1970b, 139). When computerization leads to an upgrading of job skills it follows that an increase in job variety and autonomy is also likely to occur (OTA 1985, 105). The professionalization of clerical work discussed before is an example of "enskilling" impacts.

Interestingly, Whisler's (1970b, 139-140) findings showed that clerical jobs can become more routinized at the same time their skills become upgraded. He concluded that, "...while activities in the job have indeed been routinized, the demands on the employee have increased" (Whisler 1970b, 139-140). In summary, both enskilling effects and deskilling effects have been observed. Moreover, these do not occur in a simple dichotomous fashion, for both effects may occur simultaneously in the same job. What is clear is that any reasonably comprehensive study of the impacts of computers should study effects on job skills.

Management Control and Supervision. Computer technology offers managers the prospect of enhanced control. Many managers have adopted the technology to improve their ability to control subordinate departments and individuals. The use of computer technology may increase management control in several ways. With the help of technology, managers can increase their access to information about employees' performance, can request more frequent reporting of information, and can reduce the "filtering" of information by lower-level staff (Kraemer, Dutton, and Northrop 1981, 55; Kraemer and King 1986, 481).

Empirical findings are mixed. Kraemer and his associates (Kraemer, Dutton, and Northrop 1981, 55) found that computerization has not facilitated effective control in general management except in the area of fiscal control. In contrast, others show positive evidence that the use of computers substantially enhances managerial control (Botner 1987, 101; Gardner and Shermerhorn 1986, 91).

Electronic monitoring of work performance becomes feasible through recent success in electronic access to the information about employees' work performance (Gardner and Schermerhorn 1988, 91). In the private sector, many organizations have applied computerized monitoring to measure employee productivity and then to use these measures to evaluate employees' work performance (Gardner and Schermerhorn 1988, 92). Although there are no reliable statistics on how many federal employees have their work monitored by the computer, it is expected to be used as much as in the private sector (OTA 1987, 32).

Electronic work monitoring can serve two kinds of purposes: supervision and task feedback (Gardner and Schermerhorn 1988, 95; OTA 1985, 129). First, it can provide the supervisors with a highly accurate source of performance information and retain such records for future use. Computerized monitoring, therefore, can be used to enhance the achievement of equity in evaluation by improving the consistency and reliability of performance information. Second, computerized monitoring can be used for task feedback to employees. The monitoring can provide employees with immediate and contingent feedback about their own performance and enable them to modify their performance on the basis of feedback information. The use of electronic monitoring for this purpose can offer positive opportunities for personal challenge and improvement.

Computerized monitoring, however, can also be used in a negative manner. It has been noted that computer-based work monitoring can promote a more stressful work environment. Monitoring raises questions about privacy, fairness, and the quality of work life (OTA 1987, 7-11). Extensive records of performance can be used as readily to punish one employee as to reward another.

Empirical research has shown that the use of computers does not necessarily alter the extent to which work is supervised (Kraemer and Danziger 1984, 34; OTA 1985, 132). According to Kraemer and Danziger (1984, 34), even though computerized systems are able to provide data on work performance, many supervisors rely less on automated data as opposed to other kinds of information personally gathered in their supervisory functions. However, computer technology may help managers to focus more attention on supervisory responsibilities by reducing the time spent on office chores (OTA 1985, 55). Computer networks are expected to increase the frequency and accuracy of leader-member interactions regarding job performance (Gardner and Schermerhorn 1988, 95). In summary, research does not indicate that increased monitoring of performance necessarily occurs, nor that it has adverse impacts when it does. It is clear, however, that monitoring is an area of potential impact that is of continuing concern.

<u>Centralization</u>. The term centralization means that one person or a few at the top hold most of the organizational power. Conversely, decentralization occurs when decision making discretion is devolved to persons who have occupied lower, or more distant positions in an organization. The status of centralization is not necessarily a static one. Computer technology can be used to facilitate either a concentration or dispersal of

decision authority.

A primary issue for computer related research is whether the computer has been used to facilitate centralization or decentralization. Contradictory findings exist in the literature. Some researchers have found that computer use results in more centralization since computer technology enables top managers to extend their range of thought and influence and to reduce their dependence on subordinates for information they need for managerial decisions (Er 1987, 35; Leavitt and Whisler 1958, 43). Other researchers contend that computer systems take over routine decision making at the lower levels and furnish information that enable managers at those levels to make a wider range of decisions, thereby allowing more decentralization (Er 1987, 35). As personal computers become widespread, easy access to computer systems has enhanced the potential to decentralize (Moskovitz and Mammen 1985, 78). Interestingly, Robey (1981) and Er (1987) both insisted that the decentralizing tendency attributed to microcomputers does not necessarily cause managers to lose their control over entire operations.

Specifically, concerning the impact of computer networks, Gardner and Schermerhorn (1988, 91, 93) argue that both centralization and decentralization can occur simultaneously. According to them, computer networks can enhance centralization via real-time monitoring and control and, at the same time, could result in greater decentralization of decision making. The example they raise is that telecommuting, doing work at home by using a computer which links to the office, will lead to decentralization, whereas electronic monitoring of the work done by telecommuters will increase centralization.

The empirical research of Kraemer and King leads them to conclude that the use of computers has neither an inherently centralizing nor decentralizing effect. Other factors like organizational history, management strategies, and task contingencies may be more influential on the degree of centralization or decentralization than computing (Kraemer and King 1986, 489). The U.S. Office of Technology Assessment reached the same conclusion (OTA 1985, 19).

Decision Making. Closely related to the question of centralization is the set of questions about the impacts of computers upon decision making in general. The early use of computers was for record-keeping, but their applications have been extended to support for management and decision making. A general finding is that lower level decision making is better supported by the use of computers than is decision making at the higher echelons of organizations (Kraemer and King 1986, 491; McGowan and Lombardo 1986, 581).

Decision making can benefit from computer technology in several ways. The use of computers can speed up managerial decision making through faster dissemination of information by such means as electronic mail (Halachmi 1988, 33, 34). A substantial amount of timely relevant information can be provided at minimal cost (Gardner and Schermerhorn 1988, 91). Computers can automatically determine when managers need to decide certain matters based on previously fixed decision schedules (Kraemer and King 1986, 491; Ostrowski, Gardner, and Motawi 1986, 26). Botner (1987, 102), however, found no significant impact on the maintenance of schedules in the organizations which he studied.

The use of computers affects the outcome and the quality of decision making as well as the decision-making process. A positive relationship has been reported between the use of computers and the quality of decisions (Botner 1987, 101; Ostrowski, Gardner, and Motawi 1986, 26). In general, computers can aid decision making in two ways: first, by providing more extensive access to information and second, by increasing a manager's capacity to analyze that information (Kraemer and King 1986, 4). Analytical capacity is especially increased by the modeling capabilities of the computer. Computer-based modeling enhances decision making not only because it can help to monitor developments; it can also help to assess the impact of alternative courses of action and increase the capabilities of anticipating situations (Botner 1987, 101; Kraemer and King 1986, 491; McGowan and Lombardo 1986, 582).

As discussed before, recent developments in information technology enable the computer itself to make some decisions on behalf of the user. Some MIS programs have the capacity to make some decisions which are specifically structured (Ahituv and Neumann 1986, 133). The use of computers in procurement MIS to automatically create reorders for depleted inventories is an example. Expert systems have increased the possibility that computers take over somewhat less structured aspects of human decision making as well (Harmon and King 1985; Savory 1988). They are now being developed to determine the eligibility of clients for financial support (Klay 1988b).

Communications. With respect to the effects of computers on communications, a primary concern has been whether change occurs in the amount of time spent in interpersonal communications when increased interaction with computers occurs. Whisler (1970b, 133) found that only clerical workers tend to work alone more following the installation of computers. They tend to have less communication with other clerks and supervisors. Gardner and Schermerhorn (1988, 90) believe that managers may spend more time in electronic communications. In some instances, managers may find it more convenient to send or read electronic mail directly without the presence of third party (Kiesler 1986). Meyer (1968, 258) mentions that the use of computers increases mutual interdependence when communications increase between data processing staff and their clients. In terms of the pattern of lateral communications, Whisler (1970b, 135) found a definite decline in clerk-to-clerk communication but a definite increase in supervisor-to-supervisor and manager-to-manager communications as a result of the use of computers.

There has been concern that an increase in electronic communications could lessen involvement in face-to-face communications. As a result, dysfunctional consequences in interpersonal relationships have been predicted (Gardner and Schermerhorn 1988, 90-91). Computer networks may alter group decision making processes by reducing barriers to communication and by depersonalizing interactions (Gardner and Schermerhorn 1988, 95). Kiesler (1986, 52) provides an example in which the members of a group were far more risk-seeking when they used computers to reach decisions than they were when they interacted face to face. According to Kiesler, a reason for this difference was that the depersonalized interactions disregard major social factors like status and gender.

In contrast, several others have found that the impact of computers is not significant yet in interpersonal relations and employee communications (Botner 1987, 102;

Norris 1988, 79; Ostrowski, Gardner, and Motawi 1986, 26). In summary, research findings are inconclusive as to the impact of computer technology upon communications patterns. The potential for substantial impact does exist, however, and reasonably comprehensive studies of impacts should be attuned to the possibility of communications patterns being affected.

Power Shifts. The use of computer technology raises new questions about the changes in power relationships in an organization. A primary concern is who gains or loses power as computers are increasingly used. Shifts in power relationships might occur because of the variations in the interests which the computer systems can be designed to serve.

Traditional power gainers have been specialized data processing staff who have influenced computer-related decisions and operations on the basis of their relatively monopolistic expertise (Danziger 1979b, 147; Siegman and Karsh 1962, 116). In an empirical study of intraorganizational power, however, Lucas (1984, 61) found that these specialized staffs in manufacturing companies had low levels of power. He predicted, however, that information processing staff would be more powerful in financial and services industries than in manufacturing ones "...because of the greater centrality to the mission of the organization" (Lucas 1984, 64). Also, Lucas (1984,

63) discovered that user involvement negatively affected the power of computer specialists.

Gardner and Schermerhorn (1988, 94), on the other hand, argue that computer networks may shift power from the people at the center of interpersonal communication to those at the center of electronic communications networks. Danziger and his associates (1982), however, found that established power groups in local governments have used computer technology to reinforce their own power, and that relative power relationships were not altered.

Several others have found that the use of computers has no significant effect on power relations. Norris (1988, 80) simply views computer specialists as persons "reckoned by their fellow employees as nice people to know" and thinks their status in the organization has not changed. Kraemer and Danziger (1984, 35) found that only a few employees felt their influence over others had been reduced by computing. Most respondents perceived no loss of influence as a result of the use of computers. In summary, the impacts of computer use on power relationships is unclear and are likely to be dependent upon specific contexts. The literature does indicate that there is a potential for alterations in patterns of power and influence. Consequently, studies of computer impacts should be sensitive to the possibility of such alterations.

Work Intensity. With respect to the changes in work intensity, Norris' (1988, 78-79) findings are mixed. His discussions are enlightening in this respect. According to Norris, increased demands for status or progress reports might give rise to the perception that computers increase work speed and efficiency and improve employees' proficiency. Increased frequency and detail in reports would increase the amount of tasks placed upon professional and administrative staff. By contrast, he also expects that computer use might decrease workloads by increasing the efficiency of specific task performance. In a computerized environment, the performance of specific tasks may become easier but the overall workload might also increase. If the rate of increase in workload outstretches the rate of increase in task performance efficiency, work becomes more intense. Findings regarding work intensity, therefore, are dependent upon specific contexts, and these may vary somewhat from one employee to another. It is important to inquire, therefore, as to how each employee perceives changes in work intensity.

Anxiety and Satisfaction. Many employees have experienced anxiety over the use of computers and have feared learning about new applications (Botner 1987, 103). Norris (1988, 79) argues that a main reason for anxiety and fear is "...the failure of management to prepare personnel properly for the new technology, to involve them in procurement decisions, or to provide effective training on the machines." Many agree that much anxiety caused by office automation is the result of mismanagement of change rather than an inescapable human effect of automation (Simon 1977, 94; Kraemer, Dutton, and Northrop 1981, xi). Although the extent to which technophobia impedes productivity is not well known, the relationship between them is usually negative (Ostrowski, Gardner, and Motawi 1986, 27).

On the other hand, the use of computers can be associated with positive employee satisfaction (Botner 1987, 102; Norris 1988, 79; Ostrowski, Gardner, and Motawi 1986, 26), because computers improve their performance with more and better work and enhance their work environment. As with other categories of impacts, findings have been both positive and negative with respect to anxiety and satisfaction. The continuing concern for such impacts indicates that anxiety and satisfaction are important topics for study.

Stress and Physical Discomfort. The increasing use of computers has been reported to generate physical, physiological, and mental problems that are attributable to prolonged interactions with computers and poorly designed work stations. Er (1987, 32) argues that Repetitive Strain Injury (RSI) has become a serious hazard associated with video display unit work. Similar attention has also been paid to reproductive hazards, eye strain, mental stress and fatigue (Er 1987, 33; Klay 1988, 62; OTA 1985, 139,144).

As computer use has increased, stress has been a persistent concern. Major sources of stress include increased workload, inadequate training, computerized monitoring of work, higher expectations for work speed, and increased social isolation (Gardner and Schermerhorn 1988, 92; OTA 1985, 127). The stress caused by the computer is likely to affect organizational productivity through the increase in turnover or absenteeism (OTA 1985).

Some empirical research has found no significant impacts of the use of computers on worker health (Botner 1987, 101; Ostrowski, Gardner, and Motawi 1986, 26). Day-to-day physical discomfort and injuries such as carpal tunnel syndrome have occurred, especially where ergonomics has been neglected. There is little evidence that organic deterioration or chronic disease is caused by computers (OTA 1985, 19). In studies of computer impacts, reports by any employees that their physical or mental health has been impaired should be considered of significance.

<u>Security and Privacy</u>. The security of agency data and the privacy of personal information have been continuing issues (OTA 1985, 1987). Decentralized computing and communication networks have made these issues more serious. Easy access to information about an individual through electronic channels increases the possibility of the invasion of privacy of both clients and employees.

Botner's (1987, 103) survey shows a negative relationship between computerization and the protection of privacy. As mentioned before, electronic work monitoring can have negative effects on the individual's privacy (Gardner and Schermerhorn 1988, 92). This impact area has probably been studied more than any other within a governmental context (for example, OTA 1987). Indications are that its importance may grow because increases in technological capacity enhance the potential for privacy abuses.

Computer Learning. As the use of computers has increased, many employees have become concerned about obtaining computer knowledge and skills in order to utilize the new technology. Klay and Yu (1988, 197) encountered employees who felt stress as their computer knowledge is limited and found that they strongly desired to learn more about the use of computers. Norris (1988, 79) points out that the employees' feeling of pressure will increase when they have to learn new computer applications. Norris concludes, however, that this pressure is likely to be short-lived. When the new applications are learned, the stress is likely to recede.

Some studies have found that informal on-the-job training activities are the most typical way in which employees acquire computer knowledge (Klay and Yu 1988, 197; Ostrowski, Gardner, and Motawi 1986, 27). An extensive congressional review indicates that

"...self-teaching and mutual learning appear to be the most common mode of training, followed by home study" (OTA 1985, 79). Klay and Yu (1988, 198) reveal that supervisors can show mixed responses to learning activities on the job. Supervisors normally want their subordinates to be knowledgeable about computer applications, but some of them do not allow expenditures of the amount of time that must be spent in order to learn about the use of computers.

The role of formal training in many organizations tends to be limited to teaching the basic structure of application commands and their potential utilization. Most formal training requires much subsequent learning on the job. The value of formal training is especially great when it provides opportunities for employees who are at a disadvantage with respect to computer knowledge to close the gaps between themselves and more knowledgeable employees (OTA 1985, 79). Botner (1987, 103) reported that budget officers become more enthusiastic in the use of computers after they had a formal training program.

In summary, it has been found that employees learn about the use of computers in many ways. The organization and supervisors within it may convey a mixture of signals as to whether and how such learning should occur. Learning itself, the gaining of knowledge about computers, is an important impact. The extent of such learning will also affect other possible impacts such as those related to improvements in individual and organizational performance.

Operational Performance. As defined above, the concept of operational performance includes the dimensions of efficiency and effectiveness that are traditionally associated with the term "productivity". In the literature, the impact of computers on operational performance has been discussed in terms of cost savings, time savings, time utilization, individual accomplishment, and the quantity and quality of organizational outputs.

A commonly found benefit from the use of computers is an increase in work speed, but the amount of time savings varies widely. Time savings in the budget preparation process and in the dissemination of documents and messages have been reported (Gardner and Schermerhorn 1988, 90; Kerns, Tomlinson, and Gordon 1988, 10; Norris 1988, 77). Time savings are most common in clerical work -- especially in the work involved in data entry (Kern, Tomlinson, and Gordon 1988, 10; OTA 1985, 47).

Many argue that time saved by automation will be devoted to more complex, analytical, and creative tasks (Botner 1985, 618; Botner 1987, 101; Griesemer 1984, 58; Kerns, Tomlinson, and Gordon 1988, 11; Schwartzrock and Jones 1986, 322; Simon 1977, 32). Time saved can also be spent for better service delivery to citizens (Kraemer, Dutton, and Northrop 1981, 58). However, freed time is not always applied to such higher order tasks. Klay and Yu

(1988, 199) find that government analysts spent much of their newly freed hours in the accomplishment of enlarged demands for relatively traditional record management tasks and control-oriented activities. In their case, the intent of an organization's leaders to free analysts to do more planning was overshadowed by the desires of the same leaders to control things in greater detail.

The use of computers can improve the quality of outputs through greater accuracy and timeliness in task performance as well as more knowledge of completed results (Norris 1988, 78; Kraemer, Dutton, and Northrop 1981, 214,219). In particular, accuracy and timeliness in reporting information are extremely important for financial documents (Botner 1987, 101). The capabilities of the computer to quickly detect certain types of errors can also increase overall accuracy and completeness (Halachmi 1988, 33).

Many observers believe that the use of computers facilitates the performance of the ad hoc tasks which often need quick responses. Computer use is expected to increase the number of special studies, to help complete them more quickly, often with little additional work, and to improve their quality (Botner 1987, 102; LaPlante 1985, 196; Norris 1988, 78).

Improved operational performance is expected to give greater sense of accomplishment to employees on the job

(Kraemer and Danziger 1984, 36; Kraemer and King 1986, 490; Norris 1988, 79). Other researchers found that the overall feeling of accomplishment attributed to the use of computers does not vary with role differences in an organization (Kraemer and Danziger 1984, 33). In summary, most observers feel that computers will improve operational performance. The degree to which they do, however, can vary widely between different contexts. Computers can create a variety of negative impacts upon employees. Where this happens, operational performance may also be affected, and perceptions of operational performance may vary among individual respondents.

Computer Use in Seven Finance-Related Agencies in the State of Florida

In the following section, computer use in the seven Florida finance-related agencies where this study was conducted is discussed. Some literature and agency documents will be reviewed to disclose the history of statewide management and use of information technology resources. In addition, the Florida Fiscal Automated Management Information Subsystems (FFAMIS) and major computer applications in the seven finance-related agencies will be outlined. Very little has been reported about the organizational impacts of computers in these agencies.

Florida has had computer-based information systems for at least 25 years and now occupies a leading position in its approach to information resources management (IRC 1988a, 1988b). The State's investment in information technology resources has recently increased, i.e. 33% per year between 1983 and 1986 (IRC 1988b, 3). This trend reflects the State's aspirations and endeavors to move forward to more automated operations.

According to a report prepared for the Florida House of Representatives (State of Florida 1972), early data processing equipment was introduced into state agencies in the 1950s to reduce steadily increasing workloads. A recent agency document (IRC 1988b) concludes that statewide information technology resources have served to increase efficiency and effectiveness in the delivery of services and communications among state agencies. Furthermore, the document emphasizes that information technology is not only a means for cost reduction but can also be a focal point for the overall development of agency strategy as well. In summary, Florida is attempting to utilize information technology resources as a strategic asset of the state as well as the means for productivity improvement.

Central Agency. During the early period of computer use, the State experienced a proliferation of expensive data processing equipment. Hence, a primary managerial concern at that time was how to control the acquisition and use of information technology resources. The Governor's Steering Committee of Data Processing of the 1950s and the

Electronic Data Processing (EDP) Management Board of 1967 were created to increase statewide control over the acquisition, use and management of computer equipment. The functions of the EDP Management Board were transferred to the Division of Electronic Data Processing within the Department of General Services in 1969. According to a report, this reorganization "...paved the way for data processing consolidation by removing political boundaries which had previously existed" (State of Florida 1972, 9).

An article by Davies and Hale (1986, 516-517) gives a good summary of the major problems which the State has encountered since the 1960s in managing information technology. It was based on a report prepared for the Joint Select Committee on Electronic Data Processing of the Florida Legislature. Four major problems that they pointed out are:

1. Lack of effective and consistent planning across agencies.

2. Weak structure for regulating electronic data activity.

3. Little accountability at the senior management level.

4. Few effective statewide policy standards concerning security, disaster planning, networking, and office automation.

The Florida Information Technology and Planning Act was established in 1983, and the Act "...changed the basic management structure of state information resources management by separating operating management from policy and planning functions" ('.RC 1987, 1). The 1983 act created the Information Resource Commission (IRC) within the Executive Office of the Governor solely for policy development and planning functions. The operational responsibility for information resources was placed in individual agencies. The creation of the IRC implies two things (IRC 1987). First, its creation established a formal statewide planning process for management of information resources. Each department is required to plan for and manage their information resources under the guidance of the IRC. Second, its creation recognizes the growing importance of a statewide perspective for the design, acquisition, and use of information technology resources.

An interview with a manager of computer systems in one of the seven financial agencies gave some insights into agency reactions to the creation of the IRC and to long range planning for information technology. Individual agencies have reported difficulty in procuring the latest technology and in maintaining control of procurement through centrally approved plans. For example, agencies have been required to specify for several years in advance exactly what technology they planned to procure. No one can say, however, what new technology will become available in the five years or so that are covered by the required plans.

Data Centers. In 1969 the Division of EDP in the Department of General Services developed and presented a plan for consolidation of Data Centers. As a result of the Data Center Consolidation Plan, nine data centers were established in 1972 to serve the data processing needs of all state agencies. Six of them are utilized by their respective sponsoring departments, while the remaining three centers are the true "service centers" for data processing in 18 different departments, including most of the finance-related agencies. As pointed out in a research report for the Florida Legislature (State of Florida 1972), the problem of communications between the data centers and the user agencies was universal, and there was often no formal orientation program to orient users to the systems. Problems resulted in user dissatisfaction with data processing services. In 1986, the number of the Data Centers increased to 14. Some finance-related agencies, such as Banking and Finance, General Services, Insurance and Treasurer, and Revenue, have had their own data centers since that time.

Trend in Computer Applications. Over the last 25 years the State has placed emphasis on large transaction processing systems in order to support functions such as accounting, registration, and licensing. As noted above, attempts to increase control and consolidation of state information technology resources have resulted in a centralizing tendency.

During the last decade, however, the State has increasingly undergone decentralizing computer applications. With the increase in the number of the data centers, more user agencies now possess their own data centers. Individual agencies have recently gained greater control over their information technology resources.

The use of personal computers has been quickly expanded within state government over the last decade. The total number of microcomputers in use at the end of FY 1987-88 was approximately 23,600, or roughly one microcomputer for every six employees (IRC 1988b). As the increasing number of microcomputers implies, agencies have found a large number of applications they can make to departmental functions with small computer capability. This trend has slightly reduced the growth rate of data centers, and central data processing capacity freed by this trend has increased the potential to support large applications (IRC 1987).

It should be noted, furthermore, that there has been an opposing trend. On-line applications with mainframe computers have increased, even though they do not seem to have reached their full potential impact (IRC 1987). This opposing trend has resulted in the creation of several multi-agency applications which are intended to meet interdepartmental needs across traditional agency jurisdiction lines. Multi-agency applications exist in the areas such as growth management, criminal justice, human services, and financial management. The Florida Fiscal Automated Management Information Subsystems (FFAMIS) is one of these multi-agency applications.

In summary, state agencies exist in a multi-tiered information processing environment. This is especially true of the financial agencies that make extensive use of FFAMIS. Large mainframe computers support the data processing in the FFAMIS agencies. Minicomputers supplement mainframes by meeting specific needs. Microcomputers are scattered around workplaces to serve personal computer applications. Table 2-2 shows the inventory of information technology resources across the six state finance-related agencies with the exception of the Office of the Auditor General. Detailed information about applications in the latter office was not available.

FFAMIS. The Florida Fiscal Automated Management Information Subsystems is an effort to create a unified financial information system from seven functionally independent subsystems. Their common goal is "...to produce accurate, timely information in a form readily useful to all decision makers, both in and out of state government" (IRC 1988b, 14). Note that the FFAMIS subsystems are not fully consolidated. In other words, the subsystems are unified through shared data files, common

Table 2-2. Information Resources Inventory in the Six Finance-Related Agencies in the State of Florida

Agency	Data Center	Mainframe	(qty)	Work-stations	Minis	(qty)	Micros Terminals	LANs
Banking and Finance	SCDC	IBM 3090-200 IBM 3090-400	1 1	1418	IBM S/36 IBM 5520	1 2	192	0
General Services	AMIC	Unisys 1100/93	1	929	n/a	0	172	4
Executive Office of the Governor (including OPB)	n/a	n/a	0	0	Wang VS 65 Wang VS 100 Wang VS 6 IBM S/34 IBM 9370	1 1 1 2 1	158	1
Insurance and Treasurer	TMIC	IBM 4381 Q12	1	212	DEC MV 2000 DEC MV II	2 1	201	0
Revenue	RMIC	Unisys 1100/92	1	598	DEC MV 3600	1	483	1
State Board of Administration	n/a	n/a	0	0	NCR 9050	1	21	n/a

Source: State of Florida. Information Resource Commission. 1988. Annual Report on Information Resource Management. Tallahassee, FL: December.

communications and processing facilities, and uniform data definitions and codes. However, "...there is no central repository for statewide information accumulated by the individual systems comprising FFAMIS" (IRC 1988b).

The scope of the individual FFAMIS subsystems varies. Some subsystems serve only their respective functional owner-agencies. Others are statewide systems connected to and utilized by all state agencies. Still others are a combination of these two characteristics. One of the factors which is vital to FFAMIS is a common means of communications, the State Standard Chart of Accounts. The Chart provides all FFAMIS subsystems with uniform data structures and codes.

The FFAMIS project is fundamentally a data processing project, and has not yet developed the capacity to support strategic applications. According to IRC reports (1987, 1989), FFAMIS needs to move forward to strategic applications. To do so, the FFAMIS project should identify the information requirements of the State's top decision makers, increase the horizontal systems integration of FFAMIS subsystems, and search for and employ technological solutions to minimize labor-intensive functions.

<u>Agency Computer Applications</u>. The following is a brief description of the major computer applications in the six finance-related agencies, as reported in agency

documents (IRC 1987, 1988a, 1988b, 1989).

The Department of Banking and Finance is the functional owner of the State Automated Management Accounting Subsystem (SAMAS), which is the focal point of FFAMIS. SAMAS is linked to all state agencies to provide on-line accounting and permit the generation of financial statements. This subsystem consists of three major components: 1) Departmental Accounting to provide state agencies with general ledger and subsidiary accounting, 2) Central Accounting to keep the state's official financial records, to produce all state warrants, and to monitor cash and budget balances, and 3) State Payroll to produce all payroll warrants for all state employees.

The Department of General Services, especially the Division of Purchasing, is the functional owner of the Statewide Purchasing Subsystem (SPURS). Major financial applications of this subsystem are for commodity procurement, inventory control and warehousing. More detailed applications are to process, monitor, and control purchase orders, to track and control inventories, and to use historical files in making contract decisions. SPURS is also used for the development of strategies for reducing purchase costs. In addition to SPURS, General Services has an office automation system to support department functions. Sperry-Link workstations are used to accomplish word processing, electronic mail, appointment scheduling, and bulletin board services, and to allow users to access its Automated Management Information Center (AMIC) files.

The Office of Planning and Budgeting (OPB) is the major user of computer technology in the Executive Office of the Governor (EOG). The EOG is the functional owner of the Planning and Budgeting Subsystem which is the executive side of the Legislative Appropriations Subsystem and Planning and Budgeting Subsystem (LAS/PBS). The LAS/PBS is used to automate the mechanics of the budget process in all state agencies, the EOG, and the Legislature. State agencies can prepare, publish, and transmit their legislative budget requests to the EOG and to the Legislature electronically through this subsystem. This subsystem consists of three components: 1) the Budget Preparation component for preparing budget requests, recommendations, and appropriations, 2) the Budget Allocation component for administering and monitoring approved budgets, and 3) the Personnel/Pay Package subcomponent for projecting the cost of state employee pay increases and implementing those increases. In addition, the OPB utilizes the EOG-wide office automation system for basic office activities such as word processing, personal computing, electronic mail, time management, and host computer interface. A minicomputer system works for the OPB to provide economic data, modeling, and forecasting for Revenue Estimating and Client Estimating Conferences between the EOG and the Legislature.

The Department of Insurance and Treasurer is the functional owner of the Banking and Collateral Securities Subsystem. Its application for financial management is the State Paid Warrant Processing function. This application provides reports necessary to balance the daily state warrants with clearing banks for state funds and the balancing of transfer files from the Comptroller.

The Department of Revenue is the functional owner of the Florida Revenue Integrated Tax Subsystem (FRITS). Its two main objectives are to provide an integrated and consolidated revenue reporting system and to compile historical data for the estimation or projection of agency revenue sources. The components of the FRITS are registration processing, payment processing, accounts receivable, audit processing, FFAMIS revenue reporting, and so forth. To increase the number of audits, Revenue provides 300 field auditors with portable lap-top computers to support the periodic audit of tax accounts for voluntary compliance.

The State Board of Administration is the functional owner of the Investment and Debt Control Subsystem. This subsystem is used to provide management information for investment decisions and to provide accounting information in support of the Board's investment and debt management activities. The Short Term Investment Security Subsystem exists to improve input posting time, better accounting control, and provide management with more comprehensive information on which to make investment decisions. The Debt Service Bond Subsystem is to facilitate the recording and reporting of refunded bond issues in a more timely manner.

In conclusion, the seven finance-related agencies function in a multi-tiered information processing environment. Recently, demands have been made for the development of information systems designed to support a broader range of services to users such as strategic information systems, Decision Support Systems (DSS), and Office Automation Systems (IRC 1988b). The finance-related agencies need data or information which is not currently collected in any of the FFAMIS subsystems. Therefore, the DSS and operational systems to support the DSS are required (1989). The direction of evolution within the FFAMIS project is toward strategic application and possible application of one or more DSS.

As noted earlier, the purpose of FFAMIS is not simply cost reduction or speed enhancement. It is intended to become an asset for the development of overall agency strategy (IRC 1988b). Therefore, it is of importance to keep data center facilities updated with current software and hardware resources and to keep staff current with new systems features. Furthermore, one of the critical success factors acknowledged by the FFAMIS Coordinating Council (IRC 1988b, D-5) is that top level leaders from the executive and legislative branches must support the basic concept of FFAMIS and enthusiastically work toward the planned direction.

As briefly described in the preceding section, state financial management agencies have been heavy users of computer technology and have a long history of computer applications. Their use of computers is evolving, and new applications are being created in them. Their intent is to use computers to highly integrate the financial management functions of these agencies through computers. Based on this experience, seven financial agencies in the State of Florida were selected as the locus of the study. The selection of financial organizations which have been the earliest and most extensive users of computers offers unique opportunities for a study such as this. Respondents in agencies such as these have had the opportunity to observe and use computers for some time, and it is expected that they will have formed numerous attitudes and perceptions about the use of computers.

CHAPTER THREE

CONCEPTUAL FRAMEWORK

The primary purpose of this study is to explore a fairly wide range of the impacts which computers have upon financial management organizations as perceived by the employees who work within them. The review of the literature in the previous chapter was conducted to identify the major categories of the impacts of computers. These categories were identified from prior research which is both speculative and empirical. The evolution of computer use in the office was briefly reviewed, and some of the major actors involved in the use of computers were identified. Based on the literature review, this chapter will construct a general conceptual framework to guide the empirical portion of this study. The conceptual framework will include six sets of variables which are related to the use and impacts of computers. First, these sets of variables and individual variables within each set will be defined. Then hypothesized associations between pairs of the variables will be developed on the basis of the previous literature.

Variables

Conceptual Importance of Univariate Analysis. Chapter Two reviewed relevant literature and summarized the major categories of issues related to the use of computers. The organization of the review of the literature itself, and particularly the manner in which it is organized into categories of impacts, constitutes much of the conceptual framework of the univariate analysis portion of this study. From reviews of the literature, fifty five variables were identified which seem to have important implications in light of recent developments in computer technology and its organizational applications. These variables have been developed into distinct items in the study questionnaire that was developed by the project team. These are listed in detail and categorized in Appendix B. Most of these are also listed and categorized in Figure 3-1 (see page 81) which is developed to guide bivariate analysis and which is discussed in the following section of this chapter.

Each of these individual variables needs to be studied in its own right because employee perceptions and attitudes about each of them are potentially important. Employee perceptions related to some of the variables, like the four developed to measure managerial motivations for computer use, have not been previously studied empirically in either business or public settings. A few variables, notably those related to job dimensions, have been widely used in other contexts but have not previously been used in the research about computer impacts. Furthermore, even though employee responses to some of these variables may seem weak, such responses may be important to both theory and practice, especially from a long-term perspective.

For example, some of the literature has emphasized the importance of managerial motivations in shaping the implementation of computer technology (Emery 1987; Feller 1980; Kraemer, Dutton, and Northrop 1981). No prior research in the public sector (nor in the private sector so far as we can tell) has empirically measured employee perceptions of managerial motivations and attitudes toward computer use. It is important, therefore, simply to examine managerial motivations for and attitudes related to computer use. This study obtains employee perceptions of managerial motivations (as well as responses from some managers that are examined in a bivariate manner to see whether they differ from employee perceptions). Analysis of each individual item can help to identify what types of motivations seem to exist, whether multiple motivations occur, and whether certain motivations and related attitudes are especially strong.

The literature review indicates that the use of computers can affect employees and their jobs in many ways. Each of these possible ways should be a separate topic of inquiry and analysis. This study, therefore, examines employee attitudes and perceptions as to what is occurring to them, to their jobs, and to their organizations on several dimensions. Responses to each of these items may be important, and this study provides the only known empirical measure of most of these employee attitudes and perceptions, especially within the context of public organizations. Responses from a group of public employees such as this as to whether their jobs are becoming deskilled, or whether they are learning about computers through informal interactions, or whether they desire to be involved in computer implementation decisions will constitute new findings in their own right.

<u>Conceptual Importance of Bivariate Analysis</u>. Figure 3-1 displays a general conceptual framework for the bivariate analysis portion of this study. In constructing this conceptual framework, primary attention was focused on perceived changes in operational performance related to the use of computers. The focus on operational performance can be justified because its improvement is one of the reasons for computer use. Other sets of employee attitudes and perceptions related to the use of computers are also included in the framework in order to study expected associations between these several sets of variables and perceived changes in operational performance.

Figure 3-1 encompasses six sets of variables and

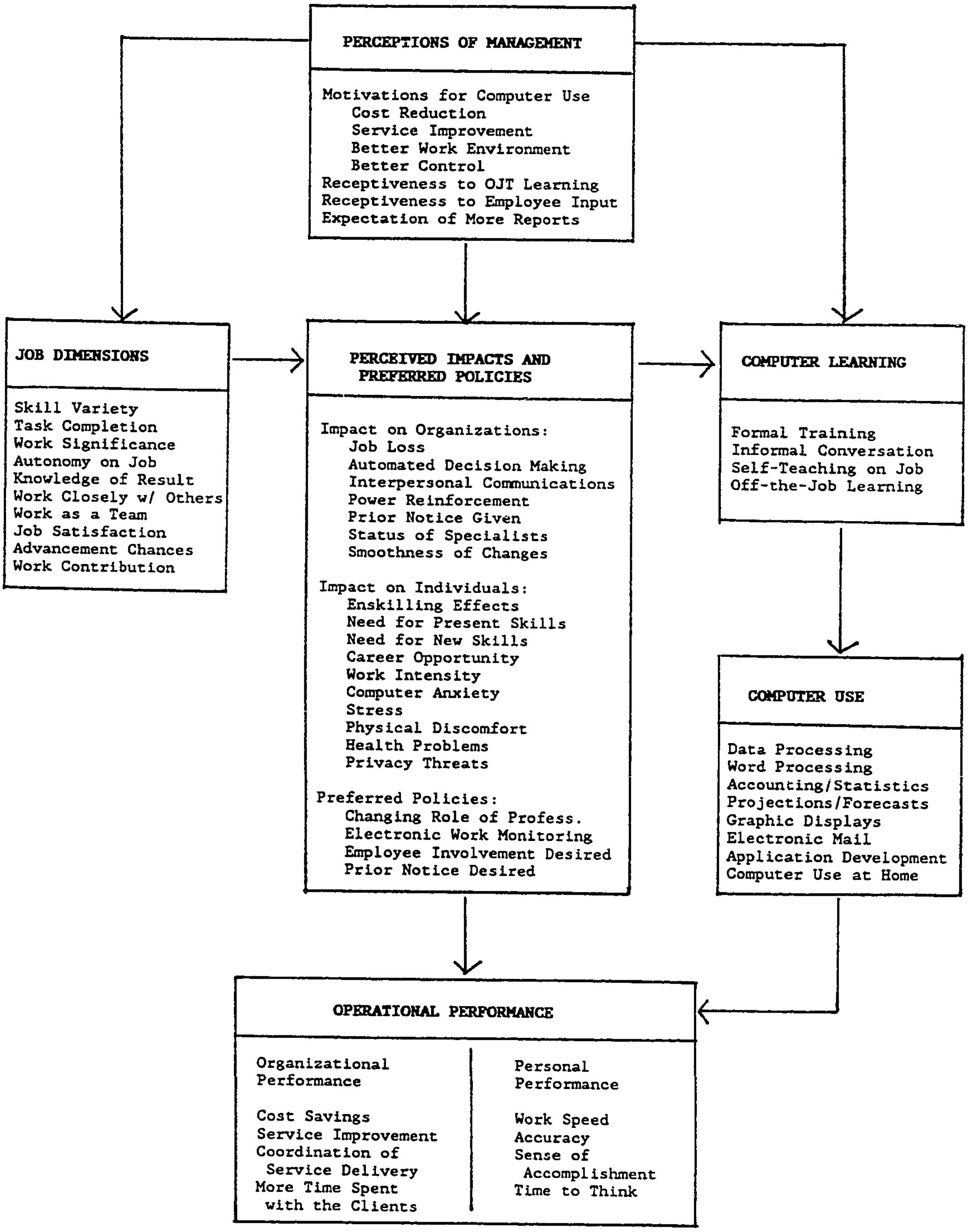

Figure 3-1. A Conceptual Framework for the Study

delineates the expected patterns of association between them. The six sets of variables are: perceptions of management, job dimensions, perceived impacts and preferred policies, computer learning, computer use, and operational performance. The framework shown in Figure 3-1 contains most of the variables that are included in the univariate analysis portion of the study. All are variables which previous literature has mentioned as being likely to be affected by or related to the use of computers. The reader is reminded, however, that previous research is often contradictory as to the directional nature of possible impacts associated with computer use. The use of directional arrows in Figure 3-1 represents informed speculation as to how these sets of variables might be related to operational performance impacts.

As an exploratory study, this research is concerned with the examination of possible associations between variables. It is of importance to note here that the arrows in the framework are drawn to show the general direction of expected patterns of association between the variables. In this respect, aspects of causality will be studied. Any inferences of causality will depend greatly upon whether any associations that are found fit together in a manner congruent with the logic employed to develop this framework.

The following paragraphs present the definitions of each of the sets of variables and of the individual variables within the set. Following the presentation of definitions is a discussion of the expected patterns of association between them.

Perceptions of Management. Many observers have found or concluded that the action of managers themselves is an important factor in the successful implementation of computer systems, and that their philosophies and decisions affect the outcomes of computer applications (Chisholm 1988; Dutton and Kraemer 1978; Emery 1987; Feller 1980; McGowan and Lombardo 1986; Whisler 1970a). The present study especially emphasizes the role of management in adopting and implementing computer technology. Hence the role of management is selected as the point of departure in delineating the likely associations between the variables within the framework.

In the study, the perceptions of management represent a set of multidimensional and nonadditive variables which are related to employees' perceptions of managerial motivations and attitudes toward the use of computers. Specifically, this set consists of the following seven variables:

1) Perceived managerial motivations for computer use. The managers are those who evaluate the value of computerization at the organizational level and who make decisions about the adoption and application of new

technology (Whisler 1970a). Therefore, the motivation of managers toward the use of computer technology is a critical factor. Four distinct managerial motivations have been identified -- i.e. cost reduction, service improvement, better work environment, and better control (Emery 1987; Feller 1980; Gibson and Nolan 1974; Griesemer 1984; Kraemer, Dutton, and Northrop 1981; OTA 1985; Zisman 1978). Distinctions of the four motivations do not necessarily imply that they are exclusive of one other. They may coexist.

2) Perceived managerial receptiveness to on-the-job learning activities. Recently, Klay and Yu (1988) found that the management of a public agency had mixed attitudes to on-the-job learning about computers. They wanted employees to learn, but some were unwilling to allow employees to take time from regular work. Specifically, this variable is included in this study to investigate its relationship to the employees' propensity to improve their knowledge about the use of computers.

3) Perceived managerial receptiveness to employee input. This variable focuses on management's attitudes toward employee input about organizational changes. The participation of employees is widely believed to be important in some aspects of organizational decision making. Employee involvement in the making of some of the decisions about technological changes has also been viewed

as a way to reduce resistance to applications, and to make them better fit the needs of the organization and its members. Klay (1988a) gave some examples of a wide range of employee participation in different countries. According to his review, a Canadian government agency has agreed to provide prior notice about technological changes being considered, while public unions in Japan have asserted that they should participate in system development in order to assess the likely impacts of new technology. Their position is to reject any applications which lead to the dismissal of employees. This variable tries to examine whether managers are perceived as having receptive attitudes toward employee involvement in the making of organizational decisions.

4) Managerial expectation of more reports. Managers can use computer technology as a tool to increase control. In this study, a tendency toward control oriented use of computers will be measured, in part, by whether or not management requires more progress or status reports. It is assumed that more frequent demand for these reports by managers is an indication of a control orientation. If management emphasizes the production of more reports, impacts such as greater work intensity or stress may occur, but so also might be an increase in learning about computers in order to produce such reports.

In summary, management can affect every stage of computer use, from system development to the evaluation of system implementation. Moreover, employee perception of managerial intent may be as important, or moreso, than management's own perception of its intent. It is the employees themselves who carry out much of the change that actually occurs. As shown in Figure 3-1, employee perceptions of managerial motivations and attitudes are assumed to be associated with three other sets of variables: the employees' perceptions about several dimensions of their own jobs, the perceived impacts of computers and employee attitudes toward policies for computer use, and the employees' propensity to learn how to use computers. More detailed descriptions of these sets of variables will follow.

Job Dimensions. Job dimensions in the framework refer to employee perceptions of their jobs on several dimensions. Researchers have mentioned that using computers changes the employees' job characteristics (Kraemer, Dutton, Northrop 1981; OTA 1985). Furthermore, much of the literature regarding job characteristics has suggested that employees' perceptions of their jobs are strongly related to management behaviors, styles and attitudes (Ferris 1983; Griffin 1981). The present study assumes the possibility of associations between managerial motivations and attitudes as perceived by employees and the employees' perceptions of their jobs. Furthermore, it also seems likely that the job dimensions variables are associated with the employee perceptions of computer impacts upon themselves and upon their organizations.

As shown in Figure 3-1, there are ten variables in the job dimensions set. Six of these are derived from the job dimensions scale which Hackman and Oldham (1975) developed for understanding and analyzing the characteristics of jobs as perceived by employees themselves. The remaining four are developed from other sources of the literature which was reviewed in the previous chapter.

Hackman and Oldham's six job dimensions were defined by them as below (Hackman and Oldham 1975, 161-162):

1) Skill Variety. The degree to which a job requires a variety of different activities in carrying out the work.

2) Task Completion. The degree to which the job requires completion of a "whole" and identifiable piece of work.

3) Work Significance. The degree to which the job has a substantial impact on the lives or work of other people.

4) Autonomy on Job. The degree to which the job provides substantial freedom, independence, and discretion to the employee in scheduling the work and in determining the procedures to be used in carrying it out.

5) Knowledge of Result. The degree to which the employee knows and understands, on a continuous basis, how effectively he or she is performing the job.

6) Work Closely with Others. The degree to which the job requires the employee to work closely with other people in carrying out the work activities.

In addition to Hackman and Oldham's six job dimensions, the framework includes four other variables as shown in Figure 3-1. These additional job dimension variables deal with the presence of teamwork, job satisfaction, advancement chances, and whether an employee's perceived contribution to the overall work of unit is static or dynamic.

The teamwork variable refers to the employees' perceptions as to whether they think of themselves as a team. As Gardner and Schermerhorn (1988) and Klay (1988a) argue, use of computers has sometimes been accompanied by efforts to promote team approaches. The existence of teamwork in organizations can ease the introduction of computers. According to a congressional study (OTA 1985), a team oriented approach to computer utilization is expected to improve the quality of services and to enhance employees' communications and their understanding of the whole process. Conversely, where teamwork has contributed to group cohesiveness, efforts to introduce computer technology that weakened the social framework might cause adverse impacts.

Some research has examined the effects of computer use on employee job satisfaction (Botner 1987; Norris 1988;

Ostrowski, Gardner, and Motawi 1986). This study is more concerned with the association between employees' satisfaction with their jobs and their perceptions of the use and impact of computers. The variable labeled "advancement chances" refers to employee perceptions of chances for advancement in the organization. The variable labeled "work contribution to unit" refers to the employees' perceptions of their contributions to the overall work of their units. These are variables that are commonly used to develop an understanding of the nature of jobs.

Perceived Impacts and Preferred Policies. In the framework, the "perceived impacts" refers to the ways in which employees perceive the impacts of computers upon themselves and upon the organizations within which they work. The "preferred policies" for computer use refer to the attitudes or opinions that employees have toward policies that can be adopted to guide the introduction of new uses of computers. Most of the variables in this category are derived from the previous literature review of the impacts of computers in Chapter Two (see Table 2-1 in pages 38 and 39).

The variables in this set can be categorized into three groups: 1) perceived impacts of computers on organizations, 2) perceived impacts of computers on individual employees, and 3) preferred policies for the implementation of new computer use. The variables will be defined in each group as follows.

Impacts on Organizations:

1) Job loss. Loss of jobs that other people undergo in the workplace as a result of the use of computers. This impact will be measured by two variables, job loss in the past and in the future.

2) Automated decision making. The making of some decisions by computers that were previously made by humans. This impact will be also measured by two variables: current presence of automated decision making and expectations as to whether this impact will occur in the future.

3) Interpersonal communications. Whether or not improvement in the quality of interpersonal communications occurs with the increasing use of computers.

4) Power reinforcement. Whether or not the influence of dominant groups is enhanced with the use of computers.

5) Prior notice given. Whether prior notification is given to employees about changes that are related to new uses of computers.

6) Status of computer specialists. The extent to which the cooperation of computer specialists is needed to get something done.

7) Smoothness of changes. Whether changes related to new uses of computers tend to be implemented smoothly in the organization.

Impacts on Employees:

1) Enskilling effects. Whether employees have more opportunity to use their knowledge, skills, and abilities than they had a year earlier.

2) Need for present skills in future. Employees' perceptions as to whether computer technology will affect the future need for their present skills. Responses in the negative are indicative of a deskilling effect.

3) Need for new skills. Whether employees feel a need to develop new skills to keep up with growing use of computers.

4) Career Opportunity. The perception that computers will give employees the opportunity to get ahead in a career.

5) Work intensity. Whether employees feel that they become busier when computer use increases.

6) Computer anxiety. The degree to which the presence of computers in the workplace make employees experience a sense of nervousness.

7) Stress. Whether computer use is accompanied by feelings of greater mental pressure.

8) Health problems. Whether the use of computers is believed to cause health problems.

9) Physical discomfort. Whether the use of computers is believed to cause physical discomfort.

10) Privacy threats. Interference with privacy due to the use of computers. This category of impact includes two variables: whether protection of client privacy has become more difficult and whether the use of computers has interfered with employees' privacy on the job.

Preferred Policies for Computer Use:

1) Changing role of professionals. Whether respondents believe that professionals should do work that was formerly clerical (specifically correspondence and filing) with computers.

2) Electronic work monitoring. Employees' attitudes toward the use of computerized electronic work monitoring.

3) Employee involvement desired. Whether or not employees desire to be involved in the making of decisions about the use of computers.

4) Prior notice desired. Whether or not employees desire to receive the earliest possible notice of computer-related changes that might affect their jobs.

As noted before, the conceptual framework in Figure 3-1 is based on the expectation that at least some of the employees' perceptions of the impacts of computers, as well as some of their preferences regarding computer implementation policies, are likely to be associated with their perceptions of managerial motivations and attitudes and some of the job dimensions variables.

Computer Learning. With the increasing use of computers, it is important to learn how employees obtain computer knowledge and skills. Whenever new applications of computer technology are introduced, it is essential for employees to be knowledgeable about them. No previous study has looked at this question within public financial agencies. It is expected that some of the perceived impacts and preferred policies are likely to be related to the propensity of employees to learn about computers and their applications. The term "computer learning" in the framework refers to the propensity of employees to learn about the use of computers. Individual employees can use any combination of four different types of methods to increase their computer knowledge and skills.

The four methods consist of three on-the-job learning methods and one off-the-job learning method (Klay and Yu 1988; Ostrowski, Gardner, and Motawi 1986; OTA 1985). Their brief definitions are as below.

1) Formal training on the job. Formal training that

is provided by the employer.

2) Informal learning through conversations on the job. Learning by talking with other, more knowledgeable, employees on the job.

3) Informal learning through self-teaching on the job. Learning through spending time on the job by themselves at a computer.

4) Off the job learning. Learning through spending their own time at home or at other places like special classes.

As mentioned before, the propensity of employees to learn how to use computers is expected to be associated with the managerial receptiveness to on-the-job learning activities and with the perceived impacts of and preferred policies for computer use. Furthermore, there is likely to be an association between computer learning and computer use as shown in the conceptual framework. The association between each of the four learning methods and measures of computer use is considered.

<u>Computer Use</u>. Computer use in the framework refers to the intensity of the use of computer technology. There are many different applications to which employees can apply computers. Nine questions were included to inquire whether, and to what extent, the respondents themselves used computers. Responses to these items provide the most complete profile to date of computer use by employees of public financial organizations. The computer applications that are studied are as follows;

1) Putting information into a computer
2) Getting information from a computer
3) Word processing
4) Accounting or statistical analysis
5) Projections or forecasts
6) Graphic displays
7) Electronic mail
8) Application development
9) Computer use at home

In particular, it should be noted that the first six applications are somewhat hierarchical. They range from simple data processing oriented applications to advanced learning oriented applications. The applications for projections or forecasts are viewed as the most creative ones. Graphic displays are also high order applications since they are often used to support the making of the decisions. Data processing applications include both putting information into a computer and getting information from a computer. This distinction is made to measure better the intensity of data processing oriented applications.

Electronic mail refers to the use of computer-based telecommunications to send messages to other people. Application development refers to the extent to which employees work on better ways to use computers on the job. Computer use at home is included as a variable to inquire about the employee's overall level of the usage of computer technology.

Operational Performance. As mentioned earlier, operational performance is the bottom-line of the conceptual framework for bivariate analysis in this study because the contributions of new technology to operational performance is of much importance to both scholars and practitioners. In this study, operational performance will be represented by two concepts: organizational performance and personal performance.

Organizational performance refers to employee perceptions of changes in organizational performance due to the use of computers. Personal performance refers to employee perceptions of changes in their own personal performance that are attributable to the use of computers. Organizational and personal performance are each measured by four variables which are selected on the basis of the previous literature (Danziger 1979b; Kraemer, Dutton, Northrop 1981; OTA 1985; Strassmann 1985). Among the measures of organizational performance are cost savings, service improvement, coordination of service delivery, and time spent with the client. Cost savings refers to perceived savings of expenditures attributed to the use of computers. Service improvement refers to whether the public is better served as the result of the use of computers. The coordination of service delivery variable inquires as to whether computer use facilitates the coordination of the delivery of the organization's services. The variable labeled "more time spent with the client" is derived from an item that inquires as to whether computers have freed time so that employees can talk more with the people whom they serve.

Selected as the variables of personal performance are work speed, accuracy, sense of accomplishment, and time to think. Work speed refers to the increase in speed that using computers brings about when an employee is doing his or her job. Accuracy is the decrease in errors in doing the job attributable to the use of computers. Sense of accomplishment is a variable based upon inquiry as to whether computer use has affected the respondent's own sense of accomplishment. The variable labeled "time to think" is based upon an inquiry as to whether computers have freed the respondent so that he or she can spend more time thinking about how to do his or her job better.

As noted before, organizational and personal performance were expected to be associated with the employees' perceptions of computer impacts, to their preferences for policies related to the use of computers, and to the intensity of computer use.

Expected Perceptions and Attitudes

The first purpose of the study is to identify the attitudes and perceptions that state employees have of the variables which are related to the use and impact of computers. To do this, the present study reviewed much of the literature and selected a number of variables. Table 3-1 is a summary display of the variables, previous

Table 3-1. Variables, Previous Findings and Speculation, and Related Literature

Variables	Previous Findings or Speculation	Related Literature
PERCEPTIONS OF MANAGEMENT		
Motivations for Use:		
Cost Reduction	positive	Gibson and Nolan (1974); Zisman (1978); Griesemer (1984); Emery (1987)
Service Improvement	positive	Feller (1980)
Better Work Environment	positive	OTA (1987)
Better Control	positive	Kraemer et al. (1981); Kraemer and King (1986)
Receptiveness to On-the-Job Learning	positive; negative	Klay and Yu (1988) Klay and Yu (1988)
Receptiveness to Employee Input	positive; negative	Author's conjecture Author's conjecture
Expectation of More Reports	positive;	Kraemer et al. (1981)

Table 3-1. Variables, Previous Findings and Speculation, and Related Literature (cont.)

Variables	Previous Findings or Speculation	Related Literature
JOB DIMENSION		
Skill Variety	positive; uncertain	Kraemer et al. (1981); OTA (1985); Er (1987)
Task Completion	positive; negative	OTA (1985) OTA (1985)
Work Significance	positive; negative	Author's conjecture Author's conjecture
Autonomy on Job	positive; uncertain	OTA (1985) Er (1987)
Knowledge of Results	positive; negative	Author's conjecture Author's conjecture
Work Closely with Others	positive; negative	Author's conjecture Author's conjecture
Work as a Team	positive	OTA (1985); Gardner and Schermerhorn (1988); Klay (1988a)
Job Satisfaction	positive	Ostrowski et al. (1986); Botner (1987); Norris (1988)
Advancement Chance	positive	Author's conjecture
Work Contribution to Unit	positive	Author's conjecture

Table 3-1. Variables, Previous Findings and Speculation, and Related Literature (cont.)

Variables	Previous Findings or Speculation	Related Literature
PERCEIVED IMPACTS AND PREFERRED POLICIES		
Impact on Organizations:		
Job Loss-Future	uncertain	Whisler (1970b); OTA (1985); Kraemer and King (1986); Ostrowski et al. (1986); Botner (1987); Norris (1988)
Job Loss-Past	uncertain	Whisler (1970b); OTA (1985): Kraemer and King (1986); Ostrowski et al. (1986); Botner (1987); Norris (1988)
Automated Decision Making-Current	positive	Harmon and King (1985); Ahituv and Neumann (1986); Kraemer and King (1986); Ostrowski et al. (1986); Savory (1988)
Automated Decision Making-Future	positive	Harmon and King (1985); Ahituv and Neumann (1986); Kraemer and King (1986); Ostrowski et al. (1986); Savory (1988)
Interpersonal Communication	positive; negative; uncertain	Kiesler (1986) Gardner and Schermerhorn (1988) Ostrowski et al. (1986); Botner (1987); Norris (1988)

Table 3-1. Variables, Previous Findings and Speculation, and Related Literature (cont.)

Variables	Previous Findings or Speculation	Related Literature
Impact on Organizations (cont.):		
Power Reinforcement	positive;	Siegman and Karsh (1962); Danziger (1979b); Danziger et al. (1982); Gardner and Schermerhorn (1988)
	uncertain	Norris (1988)
Prior Notice Given	positive	Robey and Farrow (1982); Ives and Olson (1984)
Status of Computer Specialists	positive	Griesemer (1984); Lucas (1984); Overman and Simanton (1986)
Smoothness of Change	positive	Simon (1977); Kraemer et al. (1981)
Impacts on Individuals:		
Enskilling Effects in Job	positive	Whisler (1970b); OTA (1985); Kraemer and King (1986)
Need for Present Skills in Future	positive	Whisler (1970b); OTA (1985)
Need for New Skill in Job	positive	Whisler (1970b); OTA (1985)
Career Opportunity Enhanced	positive	OTA (1985)

Table 3-1. Variables, Previous Findings and Speculation, and Related Literature (cont.)

Variables	Previous Findings or Speculation	Related Literature
Impacts on Individuals: (cont.)		
Work Intensity Increased	positive; negative	Norris (1988) Norris (1988)
Computer Anxiety Felt	positive	Botner (1987); Norris (1988)
Stress Increased	positive	OTA (1985); Gardner and Schermerhorn (1988)
Health Endangered	positive; uncertain	OTA (1985); Er (1987); Klay (1988) Ostrowski et al. (1986); Botner (1987)
Physical Discomfort	positive	OTA (1985); Er (1997); Klay (1988)
Privacy Threat-Client	positive	OTA (1985); Botner (1988); Gardner and Schermerhorn (1988)
Privacy Threat-Employee	positive	OTA (1985); Botner (1988); Gardner and Schermerhorn (1988)
Preferred Policies for Computer Use:		
Changing Role of Professionals	positive	OTA (1985)
Electronic Work Monitoring	positive	OTA (1985, 1987); Gardner and Schermerhorn (1988)
Employee Involvement Desired	positive	Robey and Farrow (1982); Ives and Olson (1984)
Prior Notice Desired	positive	Robey and Farrow (1982); Ives and Olson (1984)

Table 3-1. Variables, Previous Findings and Speculation, and Related Literature (cont.)

Variables	Previous Findings or Speculation	Related Literature
COMPUTER LEARNING		
Formal Training	positive	OTA (1985); Botner (1987)
Informal Conversation	positive	OTA (1985); Ostrowski et al. (1986); Klay and Yu (1988)
Self-Teaching on the Job	positive	OTA (1985)
Off-the-Job Learning	positive	Author's conjecture
OPERATIONAL PERFORMANCE		
Organizational Performance:		
Cost Savings	positive	Gibson and Nolan (1974); Griesemer (1984); Zisman (1978); Kraemer et al. (1981)
Service Improvement	positive	Kraemer et al. (1981);
Coordination of Service Delivery	positive	Kraemer et al. (1981)
More Time Spent with the Clients	positive	Kraemer et al. (1981)

Table 3-1. Variables, Previous Findings and Speculation, and Related Literature (cont.)

Variables	Previous Findings or Speculation	Related Literature
OPERATIONAL PERFORMANCE (cont.)		
Personal Performance:		
Work Speed	positive	Gardner and Schermerhorn (1988); Kerns et al. (1988); Norris (1988)
Accuracy	positive	Kraemer et al. (1981); Halachmi (1988); Norris (1988)
Sense of Accomplishment	positive	Kraemer and Danziger (1984); Kraemer and King (1986); Norris (1988)
Time to Think	positive;	Simon (1977); Griesemer (1984); Botner (1985, 1987); Schwartzrock and Jones (1986); Kerns et al. (1988)
	negative	Klay and Yu (1988)

findings and speculation about the possible impacts of computers upon the variables, and literature where the impacts were found and speculated. The previous findings and speculation will be compared with the findings of this study in Chapter Five.

In Table 3-1, the direction of previous research findings and opinion is labeled as either positive or negative. In other words, if the presence of a variable has been linked to increases in computer use, the finding is labeled as positive. Increased use of computers, for example, has been linked to automated replacement of decisions by humans, and the association between computer use and automated decision making is therefore positive. Many findings are mixed and uncertain. If more than one label is applied to a variable, this means that findings in the literature have differed with respect to that particular variable. Some further examples should serve to clarify this matter. The managerial motivation of cost reduction is labeled "positive," and it means that research suggests that management is likely to be motivated to use computers to reduce operating costs. In some cases, computer use has been found to increase stress, and the association between computer use and stress is therefore labeled as positive as well. The "positive; negative" label applied to work intensity indicates mixed findings. Some argue that the use of computers increases workloads due to more demand for recordkeeping and analysis, while others say it decreases workload by reducing repetitive work. In Table 3-1, impacts on several variables, such as receptiveness to employee input and work significance, are based upon the author's conjectures which are drawn from the findings and speculation about other related variables included in this study. This study will examine whether the employees from the Florida state financial management agencies perceive these variables as much of the previous literature has found and speculated.

Hypothesized Associations

The second purpose of the study is to explore patterns of association between selected pairs of the variables. To do this, a number of hypotheses are developed on the basis of previous findings and speculation within the context of the conceptual framework outlined in Figure 3-1. Some hypotheses have been formulated directly from specific literature sources, while others are based upon the author's conjectures which are derived from the patterns of potential association that are implied in the conceptual framework.

Hypotheses are not developed for all possible associations. This study brings several new variables into the context of computer related research. In addition, the previous literature provides sufficient grounds to establish the importance of these variables but is not clear as to the directions of expected association. The hypotheses developed here are, therefore, a guide to exploring some of the possible associations. The framework itself, not the hypotheses, should be considered as the primary guide to the study of associations. The following hypotheses of expected associations are elaborated in the context of the conceptual framework and are presented in order from the top to the bottom of the framework.

Perceptions of Management-Job Dimensions Associations

Ferris (1983) and Griffin (1981) found that there was a relationship between intended task-related managerial behaviors and employees' perceptions of job characteristics. Their measures of the managerial behaviors were slightly different from the variables in the category of perceptions of management in the present study. It seems possible, however, to apply their findings to construct the hypotheses of the associations between these two sets of variables. Although Ferris (1983) and Griffin (1981) were concerned only with the existence of the associations between managerial behaviors and employees' job characteristics, irrespective of direction, the present study will develop hypotheses that include expected directions of these associations. Hypotheses will be first developed and then followed by brief explanations.

First, with respect to the associations between the perceived managerial motivations for the use of computers and Hackman and Oldham's six job dimensions, twenty four associations could be hypothesized because the former consists of four variables and the latter consists of six variables. Rather than separately describing all of the hypotheses, the associations between the managerial motivations and the skill variety dimension will be described in detail. As noted before, Hackman and Oldham's six job dimensions were designed by them to be additive in nature and represent parts of a single concept. Hence the associations of the managerial motivations with each of the remaining five job dimensions were expected to reflect the same direction of association as is the case with skill variety. In addition to the following four hypotheses, each of the other twenty hypotheses is listed in Table 3-2 using a numbering system that will simplify further references.

H 1.1.1 Employees who believe that management is motivated to use computers to hold down increases in costs will tend to be those who feel that they have less opportunity to use a variety of skills in carrying out their jobs.

H 1.2.1 Employees who believe that management is motivated to use computers to improve the quality of services will tend to be those who feel that they have more opportunity to use a variety of skills in carrying out

Table 3-2. Hypotheses Numbers and Hypothesized Associations Between Perceptions of Management and Employees' Job Dimensions

	Motivations for Computer Use					
	Cost Reduction	Service Improvement	Better Work Environ.	Better Control	Receptiveness to Employee Input	Expectation of More Reports
Skill Variety	H 1.1.1 Inverse	H 1.2.1 Direct	H 1.3.1 Direct	H 1.4.1 Inverse	H 1.5.1 Direct	H 1.6.1 Inverse
Task Completion	H 1.1.2 Inverse	H 1.2.2 Direct	H 1.3.2 Direct	H 1.4.2 Inverse	H 1.5.2 Direct	H 1.6.2 Inverse
Work Significance	H 1.1.3 Inverse	H 1.2.3 Direct	H 1.3.3 Direct	H 1.4.3 Inverse	H 1.5.3 Direct	H 1.6.3 Inverse
Autonomy on Job	H 1.1.4 Inverse	H 1.2.4 Direct	H 1.3.4 Direct	H 1.4.4 Inverse	H 1.5.4 Direct	H 1.6.4 Inverse
Knowledge of Results	H 1.1.5 Inverse	H 1.2.5 Direct	H 1.3.5 Direct	H 1.4.5 Inverse	H 1.5.5 Direct	H 1.6.5 Inverse
Work Closely with Others	H 1.1.6 Inverse	H 1.2.6 Direct	H 1.3.6 Direct	H 1.4.6 Inverse	H 1.5.6 Direct	H 1.6.6 Inverse

their jobs.

H 1.3.1 Employees who believe that management is motivated to use computers to provide a better work environment for employees will tend to be those who feel that they have more opportunity to use a variety of skills in carrying out their jobs.

H 1.4.1 Employees who believe that management is motivated to use computers to increase control will tend to be those who feel that they have less opportunity to use a variety of skills in carrying out their jobs.

The expectation of associations between employee perceptions of managerial motivations and their perceptions of their jobs is tenuous, and the hypothesizing of directions for these associations is exploratory. The important thing in a study such as this is to identify which pairs of variables should be studied. Identifying possible directions of association can help to guide inquiry, but speculation about possible directions of association is definitely secondary to the identification of pairs of variables in the first place.

When the twenty four hypotheses were developed, the directions were hypothesized according to whether a managerial motivation is related to the consolidation of managerial authority or to the enhancement of other persons. Cost reduction and better control are motivations which, if accomplished, will enhance managerial authority.

Such motivations are hypothesized to be negatively associated with the employees' job dimensions. Efforts to increase control, for example, might reduce employees' job autonomy. The motivations of service improvement and better work environment are hypothesized to be positively related to employees' perceptions of their jobs. Managers who are motivated to improve work environments might be expected to encourage perceptions of work significance.

Second, with respect to the associations between perceptions of managerial attitudes related to the use of computers and employee perceptions of their jobs, several associations can be hypothesized. Table 3-2 also summarizes the expected relationships between the variables of these two sets. Like the previous hypotheses, the associations between some of the managerial attitudes and the skill variety dimension will be provided here as representative of the other pairs of associations.

H 1.5.1 Employees who believe that management is receptive to employee input will tend to be those who feel that they have more opportunity to use a variety of skills in carrying out their jobs.

H 1.6.1 Employees who believe that management expects to see more reports with the use of computers will tend to be those who feel that they have less opportunity to use a variety of skills in carrying out their jobs.

The hypotheses between these two sets are also developed according to whether managerial attitudes are related to the consolidation of managerial authority or to the enhancement of other persons. Management's receptiveness to employee input is likely to reflect a managerial environment that enhances the position of employees in other ways. Hence, a receptive managerial attitude is expected to be positively associated with the employees' perceptions of their jobs. When employees perceive management as receptive to their input, they will probably have more chance to use a variety of their skills as well. On the other hand, a likely effect of management's expectation to see more progress or status reports is the enhancement of managerial authority. It is expected that such efforts to enhance managerial authority have negative effects upon employees' perceptions of their jobs. For example, managers who want to control things more with extensive demands for reports are likely to be less concerned about extending employees more job autonomy.

Perceptions of Management-Impacts of Computers Associations

Some of the previous literature has investigated the associations between several pairs of variables in these two sets. The hypotheses will be developed on the basis of the review of the previous literature.

H 2.1.1 Employees who believe that management is motivated to use computers to improve the quality of services to the public will be those who are less likely to feel that job loss has been caused by computers in the past.

H 2.1.2 Employees who believe that management is motivated to use computers to improve the quality of services to the public will be those who are less likely to feel that job loss will be caused by computers in the future.

The managerial motivation of service improvement is inherently altruistic. In other words, the managers with this motivation are more likely to be concerned about the welfare of others, employees as well as clients. Therefore, the managerial motivation of service improvement is expected to be negatively associated with the decrease in the number of employees. Concerned managers will seek to ameliorate adverse impacts.

H 2.2 Employees who believe that management is motivated to use computers to increase control will be those who have positive perceptions of the reinforcement of power held by dominant groups.

Management can use computers to increase access to information about subordinates' work performance or to enlarge the scope of management control with less dependence on the subordinates (Kraemer, Dutton, and Northrop 1981; Kraemer and King 1986). It is hypothesized, therefore, that if the employees perceive that management is motivated to use computers to increase control, they will perceive an increase in the power of managers.

H 2.3.1 Employees who believe that management is receptive to employee input will be those who positively perceive that some of their decisions are currently being made by computers.

H 2.3.2 Employees who believe that management is receptive to employee input will be those who positively perceive that some of their decisions will be made in the future by computers.

According to Gardner and Schermerhorn (1988) and a congressional study (OTA 1985), computer technology may help managers to pay much more attention to the superior-subordinate interaction by reducing the time spent in routine decision making and office chores. Furthermore, Er (1987) mentions that as computers take over routine decision making the subordinates at the lower level have more chance for being involved in the less routine decision making. As a result of the automation of decision making, both managers and subordinates may be involved in more interactions between themselves.

On the other hand, employees who believe that management expects to see more reports with the use of computers could perceive that some of their decisions are currently being made by computers. There are no definitive research findings to guide the making of hypotheses H.2.3.1. and H.2.3.2. The relationships could be in either direction and they are offered for exploratory purposes only, as is true of several others. The automated making of some decisions may give less discretion to employees but more control to management. The efforts to increase control such as frequent request of reports could lead to greater automation of decision making.

H 2.4 Employees who believe that management expects to see more reports with the use of computers will be those who have positive perceptions of the reinforcement of power held by dominant groups.

Like Hypothesis 2.2 about an association between managerial motivation of better control and power reinforcing effect, it is expected that as managers use computers to increase their control, they will gain power.

H 3.1 Employees who believe that management is motivated to use computers to provide a better work environment will have less computer anxiety, i.e. feel less nervous around computers.

H 3.2 Employees who believe that management is motivated to use computers to provide a better work environment will feel that the use of computers has not led to greater stress, i.e. pressure placed upon them.

H 3.3 Employees who believe that management is motivated to use computers to provide a better work environment will be less likely to believe that using computers has endangered their health.

H 3.4 Employees who believe that management is motivated to use computers to provide a better work environment will be less likely to believe that using computers has caused them some physical discomfort.

H 3.5 Employees who believe that management is motivated to use computers to provide a better work environment will be less likely to believe that computers have threatened the client's privacy.

H 3.6 Employees who believe that management is motivated to use computers to provide a better work environment will be less likely to believe that computers have threatened the employees' own privacy.

These six hypotheses are concerned about the undesirable effects of computers upon humans which the previous search of the literature discussed (for example, Botner 1987; Norris 1988; OTA 1985). These six hypotheses were developed with the expectation that managerial use of computers to improve the quality of the employees' work environment will be negatively related to the undesirable effects of computers on employees.

H 3.7 Employees who believe that management expects to see more reports with the use of computers will perceive an increase in work intensity.

As Kraemer and his associates (1981) pointed out, managers can increase their control by requesting more frequent reporting of information. More frequent requests for reports would increase the workload of employees.

H 4.1 Employees who believe that management is motivated to use computers to provide a better work environment will have fewer negative attitudes toward the use of electronic work monitoring.

H 4.2 Employees who believe that management is motivated to use computers to increase control will have more negative attitudes toward the use of electronic work monitoring.

These two hypotheses concern the use of electronic work monitoring which often gives stress to the employees in the workplace. The managerial use of computers to improve the employees' work environment is expected to mediate against the adverse effects of computerized work monitoring. Conversely, it is hypothesized that if employees perceive that management is motivated to use computers to increase their control, they will have negative attitudes toward the electronic work monitoring which is designed to provide managers with immediate and detailed information about employees' work performance.

Perceptions of Management-Computer Learning Associations

H 5.1 Employees who believe that management is receptive to on-the-job learning about computers will be more likely to say that employees learn much through formal training that is provided by their employer.

H 5.2 Employees who believe that management is receptive to on-the-job learning about computers will be more likely to say that employees learn much through informal conversation with other employees who know more about computers.

H 5.3 Employees who believe that management is receptive to on-the-job learning about computers will be more likely to say that employees learn much through spending time on the job by themselves at a computer.

H 5.4 Employees who believe that management is receptive to on-the-job learning about computers will be less likely to say that employees learn much through spending their own time off the job.

Recently, Klay and Yu (1988) found that managers have mixed responses to learning about computers while doing regular work on the job. According to the authors, managers want their employees to be knowledgeable about the use of computers, but some of them do not allow time to be spent in order to learn about computer applications. It is hypothesized that the more receptive the managers are to on-the-job learning, the more likely employees will be to be engaged in learning through the three on-the-job learning methods. If employers do not allow opportunities for learning on the job, employees are expected to be more likely to seek off-the-job learning ways in order to become knowledgeable about computer applications.

<u>Job Dimensions-Impacts of Computers Associations</u>

With respect to the associations between the employees' job dimensions and their perceived impacts of computers, three sets of hypotheses related to the skill impacts are developed. Like the hypotheses in Table 3-2, the hypotheses between skill variety and some of the impacts of computers will be described below as representative of the logic employed to hypothesize associations between other job dimension variables and impacts of computers. Table 3-3 includes hypotheses numbers and hypothesized associations between these pairs of variables.

H 6.1.1 Employees who perceive themselves as using a variety of skills in carrying out their jobs will be more likely to think that they have more opportunity to use their knowledge and skills than before.

H 6.1.2 Employees who perceive themselves as using a variety of skills in carrying out their jobs will be more likely to think that their present skills will be needed in future.

These two hypotheses are related to the skill impacts of computers. Upgrading job skills via computerization is expected to increase job variety, work significance, autonomy, and so forth, while the opposite result is expected when using computers deskills the jobs (OTA 1985). Enskilling or deskilling can occur in a workplace. Employees who are professionals use a variety of skills.

Table 3-3. Hypotheses Numbers and Hypothesized Associations Between Job Dimensions and Some of Perceived Impacts of Computers and Preferred Policies for Computer Use

	Skill Variety	Task Comple-tion	Work Signifi-cance	Autonomy on Job	Knowledge of Results	Work Closely w/ Others	Work as a Team	Job Satis-faction	Advance-ment Chance	Work Contri-bution to Unit
Enskilling Effect in Job	H 6.1.1 Direct	H 6.2.1 Direct	H 6.3.1 Direct	H 6.4.1 Direct	H 6.5.1 Direct	H 6.6.1 Direct	H 6.7.1 Direct	H 6.8.1 Direct	H 6.9.1 Direct	H 6.10.1 Direct
Need for Present Skills in Future	H 6.1.2 Inverse	H 6.2.2 Inverse	H 6.3.2 Inverse	H 6.4.2 Inverse	H 6.5.2 Inverse	H 6.6.2 Inverse	H 6.7.2 Inverse	H 6.8.2 Inverse	H 6.9.2 Inverse	H 6.10.2 Inverse
Changing Role of Profes.	H 6.1.3 Direct	H 6.2.3 Direct	H 6.3.3 Direct	H 6.4.3 Direct	H 6.5.3 Direct	H 6.6.3 Direct	H 6.7.3 Direct	H 6.8.3 Direct	H 6.9.3 Direct	H 6.10.3 Direct

Using computers is expected to enhance the position of professionals, giving them more opportunity to use their various skills. To the contrary, computers are expected to replace clerical work which normally requires less variety of skills. In addition, the same logic is applied to the relationships of other job dimensions to skill impacts. Professionals who believe that their jobs have work significance and job autonomy will be likely to think that they have more opportunity to use their knowledge and skills.

H 6.1.3 Employees who perceive themselves as using a variety of skills in carrying out their jobs will feel that the role of professionals should change, including the doing of correspondence and filing through the use of computers.

Professionals who tend to do more clerical work with the use of computers can better control the quality and pacing of their work and enjoy greater autonomy in their work (OTA 1985). Therefore, this hypothesis expects that professionals themselves are more likely to do some clerical work which used to be done by others to support their work. On the other hand, clerical workers who do not have much opportunity to do complete tasks, or feel that their work is significant, are expected to be less likely to support the role change of professionals, feeling that the change threatens their jobs.

Impacts of Computers-Operational Performance Associations

H 7.1 Employees who are notified in advance about technological changes will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

Prior notification is expected to improve personal productivity as well as enable the organization to provide better services (Griesemer 1984). Lack of prior notice is expected to cause opposition from employees to technological changes, while advanced notice should increase understanding of the changes and allow better coordination of the changes to new technology (Ives and Olson 1984; Robey and Farrow 1982). It is hypothesized, therefore, that prior notification has a positive relationship to the eight measures of both organizational and personal performance.

H 7.2 Employees who feel that they must get the cooperation of computer specialists in order to get something done will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

The role of computer specialists is critical to the success of the systems, even if some researchers argue that their status has been shifted from a provider of information to an advisor for personal applications (Griesemer 1984; Lucas 1984; Overman and Simanton 1986).

In light of the important role of specialists, their cooperation is expected to be positively related to the operational performance. It should be pointed out, however, that there is the possibility of an inverse relationship between these two variables. Some have argued that specialized computer staff tends to be self-oriented and to be guided by their own professional performance standards (Danziger 1979b). When their technical services are inappropriate from the perspective of the whole organization, they could become obstacles to operational performance. The above hypothesis is developed on the expectation that specialists would play a positive role in organizations.

H 8.1 Employees who have more opportunity to use their knowledge and skills than before will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 8.2 Employees who believe that using computers will increase the need to use their present skills in the future will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

The perceived impacts of computers on skill requirements are expected to be positively related to perceived improvements in operational performance. For instance, using computers can enskill employees so that they carry out upgraded tasks. Employees who feel that using computers increases their opportunity to use their knowledge and skills will believe that computers enhance their personal performance and ultimately contribute to overall organizational performance.

The following nine hypotheses are derived from the same general expectation that beneficial effects of computers upon humans would be positively associated with changes in operational performance. In contrast, when the effects of computers on humans are not beneficial, they are expected to be negatively related to perceived improvements in operational performance. The first of the following nine hypotheses shows a positive relationship, while the remaining eight show negative relationships.

H 8.3 Employees who believe that computers give them more opportunity to get ahead in their career will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 8.4 Employees who believe that using computers increases work intensity will be less likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 8.5 Employees who feel computer anxiety will be less likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 8.6 Employees who feel that the use of computers has placed more stress upon them will be less likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 8.7 Employees who believe that using computers has endangered their health will be less likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 8.8 Employees who believe that using computers has caused them physical discomfort will be less likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 8.9 Employees who feel that computers have threatened the client's privacy will be less likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 8.10 Employees who feel that computers have threatened the employees' own privacy will be less likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

With respect to the associations between employees' preferred policies for computer use and operational performance, two hypotheses are developed as follows.

H 9.1 Employees who believe that professionals should use computers to do some clerical work will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

The tendency of professionals to do clerical work is expected to improve not only the quality and speed of their own tasks but also those of the clerical workers.

H 9.2 Employees who have favorable attitudes toward the use of electronic work monitoring will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

Those who justify the use of electronic work monitoring insist that it can provide immediate and contingent feedback to employees, enabling them to modify their performance (OTA 1985).

Impacts of Computers-Computer Learning Associations

H 10.1 Employees who believe that their jobs are being enskilled will have a strong propensity to learn how to use computers.

H 10.2 Employees who believe that there will be a need for their present skills as much in the future will have a weak propensity to learn how to use computers.

Enskilling effects require employees to develop new knowledge and skills, while deskilling effects minimize the knowledge and skills required of employees (OTA 1985). Therefore, enskilling effects will have a positive relationship with computer learning, as the requisite new skills require learning to take place. On the other hand, when employees perceive a continuing need for their present skills in the future, overall skill requirements may remain at the same level. This status quo for required skills may deter computer learning, but the relationship is expected to be weak.

H 10.3 Employees who feel computer anxiety will have a weak propensity to learn how to use computers.

H 10.4 Employees who feel that using computers has placed more stress upon them will have a weak propensity to learn how to use computers.

Anxiety and stress caused by the use of computers are regarded as adverse effects of computers upon employees. When using computers makes employees nervous, they are likely to avoid learning about computers. Also, employees who receive more pressure from the use of computers are likely to do the same. Negative relationships are hypothesized between these two pairs of variables.

Computer Learning-Computer Use Associations

H 11.1 Employees who have a stronger propensity to learn how to use computers will make more intensive use of them in each of the nine categories of computer applications.

Klay and Yu (1988) observed that some employees have a strong desire to learn more about the use of computers. The stronger the propensity to learn about the use of computers, the more knowledgeable employees are likely to be about their use. The more knowledgeable they are about computer applications, the more intensively they are likely to make use of computers. It is hypothesized, therefore, that the propensity of employees to learn about computers through each of the four learning methods is positively associated with the intensity of their computer use in the nine types of computer applications.

Computer Use-Operational Performance Associations

H 12.1 Employees who make more intensive use in each of the nine categories of computer applications will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

The use of computers is expected to increase work speed, improve the quality of outputs, have positive effects on ad hoc tasks, lead employees to have greater sense of accomplishment, and so forth. It is expected that these effects increase with use. It is hypothesized here, therefore, that the intensity of computer use is positively associated with perceived improvements in operational performance.

A Caveat with Respect to the Direction of Hypothesized Associations.

In the preceding section, a number of hypotheses are developed between pairs of variables which are believed to be related to the use of computers in organizations. In developing these hypotheses, their directions are framed to reflect the overall pattern of associations which are delineated in the conceptual framework for the present study as outlined in Figure 3-1. As mentioned earlier, the hypothesized relationships and their directions are derived from the findings or conclusions of much of the previous research insofar as was possible.

It should be noted, however, that the previous research about some of the bivariate associations is sometimes nonexistent or contradictory. Where research is nonexistent, the hypotheses are developed on the basis of other similar findings or conclusions which seem to be analogous to the particular variables in question. When the previous findings or conclusions conflict, another contrary hypothesis between that pair of variables could have been developed but was not. A hypothesis is simply a guide to inquiry. Hypotheses in different directions from those proposed here might be applied to other forms of conceptual frameworks. The concern here has been to develop hypotheses that were consistent with the conceptual framework and that helped to place much previous research into a context that seemed useful. The directions of the hypotheses in this chapter have been developed exclusively to fit the conceptual framework in Figure 3-1.

The conceptual framework outlined in Figure 3-1 delineates the patterns of possible association between pairs of the variables. The framework shows, in broad outline, how the sets of variables might be related to operational performance. The directional arrows do imply aspects of causality between collective sets of variables, even though it might be premature to make causal inferences about associations between most of the specific pairs of variables. Therefore, this study will strive not to overly emphasize the possibility of causality between pairs of variables, but neither will it dismiss the possibility of causality of between sets of variables.

Limitations to Inferring Causality

As will be described in Chapter Four, this study relies upon ordinal data. The statistical techniques that are applicable to ordinal data limit the scope of data analysis. According to Reynolds (1971, 42-45), researchers must choose one of the following three paths when they use ordinal data to evaluate causal models. First, ordinal data are treated as if they were interval. Measures of association for interval data and methods of multivariate analysis such as path analysis are applied to ordinal data. This "parametric strategy is adopted ... on the ground that the practical advantages of multivariate controls outweigh the compromises made in violating measurement assumptions" (Kim 1975, 261). The second is to calculate ordinal measures of association and to apply these measures to partial correlation formulas for interval variables. Reynolds says that there is no a priori reason for these partial analogues. The third is to develop nonparametric partial correlation coefficients, particularly designed for ordinal data.

Developing methods of multivariate analysis for ordinal data has been extensively considered in the methodological literature but has proven to be a difficult problem (for example, Hawkes 1971; Kim 1975). Their development is an issue which is not yet resolved (Andrews et al. 1981). As will be noted in the next chapter, the present study limited the scope of its inquiry to bivariate association between pairs of variables, excluding considerations of coefficients that measure multiple and partial association among ordinal measures. The first two paths are rejected in that they do not take the limitations of ordinal measurement into account. The third path is considered, but as will be noted in Chapter Four no computer software is available to accomplish the necessary calculations.

CHAPTER FOUR

RESEARCH METHODOLOGY

This chapter will address the research methodology used to examine employees' perceptions of the variables concerning computer uses and impacts and the patterns of association between pairs of the variables. This chapter includes discussions of the research questionnaire, population, sampling procedures, sample size, data collection, sample characteristics, and statistical techniques for data analysis.

Research Questionnaire

Data for the present study were collected mostly with an existing questionnaire. The questionnaire was developed by the cooperative efforts of Drs. William Earle Klay and Fiona F. Chen in the Department of Public Administration at The Florida State University, involving me in its development process. The construction of this questionnaire was intended to generate a model questionnaire which can examine the employees' reactions to their jobs and computer uses from a long-term perspective and which can be applied to employees in various organizational settings, i.e. agencies in different functional areas or in different countries. Appendix A shows the questionnaire in the actual format that was distributed to the sample.

The questionnaire begins with requests for biographical data. The year of birth, sex, length of employment with the present employer as well as in the present position, level of education, and a brief description of the job are obtained. In addition, questions are included in order to know the extent of the respondent's contact with the public, the presence of computer-based monitoring of performance, whether the respondent is a union member, and whether he or she is engaged in supervisory activities.

The questionnaire contains fifty five substantive questions about employees' job characteristics and their perceptions of computer uses and impacts. Of these, two questions on the role of employee unions in the automation of the public sector were included in the survey but will not be included in this analysis. They will be analyzed later when further use of the questionnaire in other settings obtains sufficient responses from union members.

Most responses are measured using a Likert scale with five categories, ranging from "strongly agree" to "strongly disagree". This scale which was devised by R. Likert (1932) has been used widely in studies of attitudes. The content, direction, and intensity of attitudes can be investigated with this scale (Nachmias and Nachmias 1976). The Likert scale does not claim to be more than an ordinal scale. In other words, "...it makes possible the ranking of individuals in terms of the favorableness of their attitude toward a given object, but it does not provide a basis of saying *how much* more favorable one is than another, nor for measuring the *amount* of change after some experience" (Selltiz et al. 1959, 369).

The questionnaire also has a section which measures the extent to which employees use computers. The intensity of computer use for each of nine categories of computer applications is measured in uni-directional items with four possible responses, scaled from "never" to "very often". The questionnaire concludes with an optional open-ended question which requests respondents' recommendations that might enable them to do a better job (with or without computers) or to make their job a better one.

The present study is the first one that uses this questionnaire. The questionnaire was successfully pretested with forty one respondents in Fall, 1988. The pretest resulted in some slight changes in the wording in a few of the questions.

Sampling Procedures

The population for the study includes all employees who are engaged in financial management functions in the seven finance-related agencies of the State of Florida. It includes all of the employees in two agencies -- the State Board of Administration and the Office of Planning and Budgeting -- and those working in some of the divisions of the five other finance-related agencies. The agencies and divisions where this study will be conducted were already listed in Table 1-1 (see page 10).

The sample for the study was selected on the basis of simple random sampling (SRS) procedures without regard to such factors as the employees' agencies, job categories, and positions. The sampling was carried out through the following procedures.

1. A complete list of the population elements, i.e. the state employees who work in the agencies and divisions listed in Table 1-1 as noted in the preceding section, was obtained to construct a sampling frame. The Bureau of Payrolls in the Office of the Comptroller provided for this study a list of employees who are engaged in financial management functions in the six agencies, except for the State Board of Administration. The Board directly provided a list of its own employees. Table 4-1 shows that the total population of this study is comprised of 2459 employees from the seven agencies. The population was compiled on May 15, 1989.

2. A number was assigned to each of the population employees. The proper numbers were simply assigned first to the employees in the order in which their names appeared

Table 4-1. Population Size, Sample Size, and Sample Percentages by Agencies

Agency	No. of Total Employees	No. of Sampled Employees	%
OPB	118	41	34.7%
State Board of Admin.	83	16	19.3%
Banking and Finance	153	32	20.9%
General Services	97	29	29.9%
Insurance and Treasurer	137	23	16.8%
Revenue	1448	352	24.3%
Auditor General	423	107	25.3%
TOTAL	2459	600	24.4%

in the computer printout provided by the Bureau of Payrolls and then to the employees in the State Board of Administration.

3. To determine an appropriate sample size, the researcher relied on subjective judgement, with particular consideration given to two points. First, the sample size was decided on the assumption that the number of the pages of the survey questionnaire would affect the response rate. The questionnaire is seven pages in length (see Appendix A), and hence its return rate was expected to be relatively low. Therefore, I conservatively expected that the length would hold the response rate down to about 25% when the

sample size was determined. Second, one of the statistical techniques for data analysis in this study is bivariate analysis using pairs of respondents. To do this analysis, a substantial number of observations is required. Taking these two points into account, this study decided conservatively that 600 employees would constitute a sufficient sample size.

4. A list of 600 random numbers was generated with the use of @RAND function in the LOTUS 1-2-3 program. [1] A "sampling without replacement" procedure was used to generate the random numbers.

5. Matching the random numbers generated in step 4 with the numbers assigned to employees in step 2, a sample of 600 employees was drawn for this study. Table 4-1 also shows the percentage of the sample among the total employees in each of the agencies. On an agency by agency basis, the sample ranged from 16.8% in one agency to 34.7% in another. The reader is reminded, however, that the population includes all employees of all designated agencies and divisions as a single entity, and that is the basis for analysis herein. No observations or conclusions are made on an agency specific basis.

Data Collection

Distribution and collection of the questionnaires

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[1]. The LOTUS formula is @INT(@RAND*2459)+1.

depended on the state courier system which connects not only the state agencies in Florida but also the State University System through the Board of Regents. The respondents were guaranteed confidentiality for their answers to the survey. The cover letter of the questionnaire is seen in Appendix C.

On June 6, 1989 the survey questionnaires were mailed to the sample of 600 Florida state employees who are engaged in financial management functions in the seven finance-related agencies. Of the 600 questionnaires distributed 383 were returned prior to the commencement of data analysis. Of the questionnaires returned, five were returned without having reached the respondents because of "Insufficient Address," and one was returned because the employee was no longer working there. Therefore, 377 or 62.8% of the questionnaires distributed were usable replies for data analysis.

The response rate (62.8%) of the questionnaires was much higher than expected. Many returns suggested that the questionnaires had been carefully considered by the respondents. In this survey, the response rate seemed independent of the page length of the questionnaire (i.e. seven pages). Appendix D provides a daily record of questionnaires collected. Of the questionnaires returned, 56% were collected within two weeks after the arrival of the first returned questionnaire, and 87% were within three weeks. Questionnaires were, however, received over a period of almost two months through the end of July.

Almost all questionnaires were returned with fully completed answers. The only notable exception was the optional open-ended question in the final page of the questionnaire. Every returned questionnaire was usable for data analysis.

Sample Characteristics

The sample usable for data analysis includes 15.3% of the total population, i.e. 377 of 2,459 employees. In general, the sample seems likely to be representative of the population, because the sample was generated randomly and a high proportion returned the questionnaire. Inquiry was made to the Department of Administration, but it was unable to provide the characteristics of the population for the purpose of comparison with the sample characteristics. The following section simply describes the characteristics of the sample.

As summarized in Table 4-2, the mean and median ages of the respondents are 39 and 38, respectively. Males comprise of 55.2% of the respondents, and females do 44.8% of them. The level of education that the respondents received is high. Table 4-2 shows that around two thirds (67.9%) of the respondents received baccalaureate or graduate degrees.

Almost three fourths (73.4%) of the respondents fall

Table 4-2. Sample Characteristics

1. Age:	Mean		39	(n=372)
	Median		38	
2. Sex:	Male		55.2%	(n=377)
	Female		44.8%	
3. Education:	Less Than High		.3%	(n=377)
	High School		6.9%	
	College;Vocational		24.9%	
	Baccalaureate		48.5%	
	Graduate		19.4%	
4. Job Category:	Clerical		14.1%	(n=368)
	Professional		73.4%	
	Managerial/ Supervisory		12.5%	
5. Supervision:				
	Supervising Supervisors		6.9%	(n=377)
	Supervising Non-supervisors		23.3%	
	Not supervising Others		69.8%	
6. Average work period for the present employer:			6.1 years	(n=377)
Average work period in the present position:			2.8 years	(n=375)
7. Public Contact:		Yes	72.8%	(n=375)
		No	27.2%	
8. Computerized Monitoring:		Yes	49.6%	(n=369)
		No	50.4%	

in the category of professional workers. Clerical workers comprise 14.1% of the respondents, and managers or supervisors are 12.5%. Also, Table 4-2 shows that almost a third (30.2%) of the respondents supervise others, and 6.8% of the total respondents are higher-level administrators who supervise other supervisors.

The average time spent working with the present employer is 6.1 years, and 15.1% of the respondents have worked for less than 1 year for the current employer. On the other hand, their average time spent in the present position is 2.8 years, and more than a fourth (27.7%) of them have worked for less than 1 year in the current position.

Slightly less than three fourths (72.8%) of the respondents have direct contact with members of the public. Almost half (49.6%) of the respondents say that some of their performance on the job is monitored by a computer.

Analytical Techniques

As noted earlier, the purpose of the study is to examine employee perceptions of computer uses and impacts in the state finance related agencies, and to investigate the patterns of association between the pairs of variables developed in the conceptual framework. To do this, two levels of data analysis are required. The first is univariate analysis of the distribution of relative frequencies of responses, and the second is bivariate analysis of the associations between the variables.

Univariate Analysis. Data analysis for the study starts with obtaining the distribution of frequencies of each variable. Frequency distributions provide information about employees' perceptions of and attitudes toward the variables: specifically, the percentage distribution in each of the various response categories. The use of Likert scale items also gives information about the intensity of the employees' perceptions and attitudes. The SPSSX FREQUENCIES procedure is used to calculate the sample proportions. Whenever necessary, two-way chi-square statistics are obtained to examine the independence between the variables being analyzed and differences in selected respondent characteristics (i.e. job category). This analysis of independence is supplemental to the univariate analysis of employee perceptions and attitudes, not related to the conceptual framework outlined in Figure 3-1.

Bivariate Analysis of Association. As noted before, the primary scale of measurement of the variables is ordinal. Most questions in the research questionnaire offer five response categories, and the measurements are ordered in an ordinal manner. Many statistical techniques for measuring the associations between categorical variables have been developed. For a variable that is categorical but nominal, the chi-square test of independence and the cross-classification tables are often used. For a variable that is categorical but ordinal, statistics that enable study of directional patterns of association are appropriate (Agresti and Agresti 1979).

Measures of ordinal association between pairs of variables have a common logic. They observe all of the possible pairs of responses with particular consideration given to the rank which a respondent assigns to each of the pairs of variables. If a respondent's response is higher on one variable and is also higher on the other variable in a pair of variables, this pair of responses is viewed as being positively related. If a respondent's response is higher on one variable but lower on the other variable, this pair of responses is regarded as negatively related. Ordinal statistics are essentially summaries of the patterns of association found over the entire set of pairs.

Two groups of techniques exist to study ordinal data. They differ primarily with respect to their ability to deal with pairs of responses that are tied in rank. First, for fully ranked data (in other words, no ties exist in the rank), Kendall's tau and Spearman's rho are appropriate. Second, in cases of ties occurring, Kendall's tau-b, Spearman's rho-b, and Gamma are applicable techniques which have been developed for describing the bivariate associations (Agresti 1984; Conover 1980; Daniel 1978). The variables in this study have only four or five categories of responses, but the number of cases was expected to be more than 150. Hence, numerous ties were expected to occur. One of the statistical techniques which can be applied to situations which have numerous ties in ranks was, therefore, essential to conduct the bivariate analysis of this study.

In order to select the most appropriate technique for the analysis of bivariate associations, a comparison among them was made. Spearman's rho and rho-b apply when the ranks of the ordered categories are treated as interval scales (Andrews et al. 1981; Conover 1980; Daniel 1978). They were rejected for use here as the data is largely ordinal and not interval. The Gamma has the advantage of being easier to calculate but may provide a misleading indication of the degree of association since tied pairs are omitted from calculation (Agresti and Agresti 1979, 257). In situations where the number of untied pairs is too small to be representative of the entire group of pairs, the Gamma shows limitation. For example, if ninety out of a hundred pairs of responses were tied, Gamma would be calculated only from the ten that were not tied. Kendall's tau-b is, however, applicable to such situations because it does not exclude the tied pairs from calculation (Agresti 1984; Conover 1980; Daniel 1978).

Kendall's tau-b is a refinement of Kendall's tau for measuring the associations between two ordinal variables that have a large number of ties among respondents on each of the variables. Kendall's tau-b is the statistic of choice for this study.

The following definitions are based on Agresti and Agresti's (1979, 241-266) textbook. The definition will be made first for Kendall's tau and be extended to Kendall's tau-b. Kendall's tau relies on the information contained in the relative rankings for all pairs of observations. If a respondent who ranks higher on one variable also ranks higher on the other variable, that pair of observations is concordant. If a respondent ranks higher on one variable but ranks lower on the other, that pair of observations is discordant. Concordant pairs of observations provide evidence of positive association, since, for such a pair, the observation ranked higher on one variable is also ranked higher on the other. On the other hand, the occurrence of discordant pairs provides evidence of negative association.

Let C denote the total number of concordant pairs of observations, and let D denote the total number of discordant pairs of observations. A positive difference for C - D indicates a positive association, in the sense that there are more concordant than discordant pairs. A negative difference reflects a negative association. It is necessary to standardize this difference so that it is easier to interpret how strong the association is. To do this, we divide C - D by the total number of possible pairs of observations in the sample. For a sample of size n, the maximum number of pairs of observations is n(n-1)/2. Therefore, the sample Kendall's tau, $\hat{\tau}$, is

$$\hat{\tau} = \frac{C - D}{n\,(n-1)\,/\,2} \qquad (1)$$

Furthermore, the sample value of the Kendall's tau-b, $_b$, is

$$\hat{\tau}_b = \frac{C - D}{\sqrt{[(n(n-1)/2)-Tx]\;[(n(n-1)/2)-Ty]}} \qquad (2)$$

In the formula (2) for the Kendall's tau-b, if two terms Tx and Ty are omitted, the denominator would be equal to n(n-1)/2. The formula (2) would be the same as the above (1) for Kendall's tau. Here, Tx denotes the number of pairs tied on a variable X, and Ty denotes the number of pairs tied on another variable Y. In the formula (2), Tx and Ty are subtracted from the total number of pairs of observations on each variable, since tied pairs are neither concordant nor discordant.

Tx and Ty can be calculated as follows. In general, if t_i denotes the number of observations in the ith of c columns of a cross-classification, then there are $t_i(t_i-1)/2$ tied pairs at the ith level of that column variable. When this is calculated for every column and then summed, we get the total number of pairs of ties on the column variable, namely

$$Tx = \sum_{i=1}^{c} \frac{t_i (t_i - 1)}{2} \qquad (3)$$

Also, if there are u_i observations in the ith of r rows of a cross-classification, the total number of pairs of ties on the row variable is

$$Ty = \sum_{i=1}^{r} \frac{u_i (u_i - 1)}{2} \qquad (4)$$

Finally, we can compute the value of Kendall's tau-b, $\hat{\tau}_b$, with the formulas (2), (3), and (4).

As pointed out before, the Gamma omits all of the tied pairs from calculation, while Kendall's tau-b takes them into account. In Kendall's tau-b, the number of the tied responses is subtracted from the total number of observations in each of response categories. The use of Kendall's tau-b, therefore, has advantages in terms of its consideration of the tied responses in calculation.

Now let τ_b denote the population analog of $\hat{\tau}_b$. If the null hypothesis Ho: $\tau_b = 0$, then the two ordinal variables are not associated, in the sense that the proportion of concordant pairs equals the proportion of discordant pairs in the population sampled (whether or not tied pairs occur). The alternative hypothesis in the test may take the form Ha: $\tau_b > 0$ or $\tau_b < 0$, depending to the sign of the association which was hypothesized in the previous section.

According to Agresti and Agresti (1979), the test statistic for testing Ho: $\tau_b = 0$ is most easily expressed in terms of C - D and its approximate standard error, $_{c-d}$. The following z test statistic has approximately the standard normal distribution, if Ho is true. Specifically, the z score for the Kendall's tau-b is

$$z = \frac{C - D}{\sigma_{c-d}} \qquad (5)$$

where

$$\sigma^2_{c-d} = \frac{n^3}{9}\left(1 - \frac{\sum_{i=1}^{c} t_i^3}{n^3}\right)\left(1 - \frac{\sum_{i=1}^{r} u_i^3}{n^3}\right) \qquad (6)$$

Kendall's tau-b takes on values between -1 and +1 and equals zero if the variables are not statistically associated. The larger its absolute value, the stronger the association. In general, the magnitude of Kendall's tau which does not consider tied pairs indicates the relative excess of concordant over discordant pairs. For example, $\hat{\tau} = .34$ means that 67% of the pairs are concordant and 33% are discordant. Thus $\hat{\tau} = .34$ indicates that there are two times more pairs representing positive association than there are pairs representing negative association.

Kendall's tau-b differs in that it considers the number of tied pairs. Its magnitude can be interpreted as an approximation of the difference between the proportion of concordant pairs and the proportion of discordant pairs that would be obtained if all the ties could be overcome through finer measurement and each pair of observations could be identified as concordant or discordant (Agresti and Agresti 1979, 253).

The value of Kendall's tau-b is regarded as intermediate as compared to other measures of association between ordinal variables, such as Gamma and Kim's d (Andrews et al. 1981, 8). Also, an empirical comparison among measures of association shows that a value for Kendall's tau-b is lower than that of the Pearson product-moment correlation coefficient or that of the Spearman rank order correlation coefficient, when computed from the same data (Reynolds 1971). The primary concern of this study is whether or not there exist any associations between pairs of variables. When defining the magnitudes of association, adjectives like "strong", "moderate", and "weak" will be used. Operationalized definitions of the adjectives are given for this specific study as follows. If the value of the tau-b is more than .25, it will be described as strong. If the value is between .10 and .25, it will be regarded as moderate. If the value is less than .10, the relationship is said to be weak. There is no a priori reason for the use of these adjectives. Some previous research has empirically employed the Kendall's tau-b or has discussed the interpretation of Kendall's tau-b (Agresti 1984; Kuklinski and West 1981; Reynolds 1971; Wilson 1969). However, none provided sources from which the definitions of adjectives for this study could be derived. These statistics will be calculated using the SPSSx procedure NONPAR CORR, for nonparametric correlation.

In analyzing associations between variables, the possibility of spurious associations is a threat to the validity of measures of the associations (Howard 1986). A spurious association occurs when the apparent association of variable X with variable Y is solely the result of the fact that X or Y also varies with Z. If Z becomes constant, then the association between X and Y will decrease greatly.

There is the possibility that some of the bivariate associations in a study such as this may be spurious because a large number of variables are involved in the analysis. To check for these spurious associations, the partial associations could theoretically be calculated for all pairs of variables while controlling for all other variables.

Agresti and Agresti (1979, 258) propose the partial tau-b which can be derived from a weighted average of Kendall's $\hat{\tau}_b$ values calculated in the multidimensional tables. The theoretical example presented in their text dealt with a very limited number of variables. The present study includes numerous variables so that it is not feasible to compute the partial tau-b in ways other than with computerized packages. Unfortunately, an extensive literature search revealed no report of a computerized statistical package which includes procedures for calculating the Kendall's partial tau-b correlation coefficients. For example, statistics books (Agresti 1984; Conover 1980), existing statistical packages (Dixon 1981; Nie et al. 1975; SAS Institute 1982; SPSS Inc. 1988), and a guide for selecting analytical techniques and computer-based packages for data analysis (Andrews et al. 1981) identify no computerized procedures which can be used to make the necessary calculations of the Kendall's partial tau-b.

The discussion in the following sentences is included, therefore, solely to inform future researchers who might wish to replicate it at a time when the computation of partial tau-b is feasible. The measure of partial association denoted by $\bar{\tau}_b$ is defined as

$$\bar{\tau}_b = \frac{\sum (C - D)}{\sum \sqrt{[(n(n-1)/2)-Tx]\ [(n(n-1)/2)-Ty]}}$$

If Kendall's partial tau-b could be computed, it would then be compared with the Kendall's tau-b. In any cases where the partial tau-b differs remarkably from the Kendall's tau-b, the Kendall's tau-b would be considered as potentially spurious.

Even if partial tau-b could have been calculated, its usefulness in testing hypotheses would be questionable. Note that the distribution of partial associations between ordinal variables is usually not known, and that it is unreasonable to assume that their distribution is normal. Thus, some scholars have argued that partial associations between ordinal variables cannot be used as test statistics in hypothesis testing (Conover 1980; Howard 1986). Therefore, the hypotheses in the present study will be tested on the basis of the significance of the Kendall's tau-b, but the conclusions thus derived will be carefully and conservatively drawn.

CHAPTER FIVE

PERCEPTIONS OF COMPUTER IMPACTS AND ATTITUDES TOWARD COMPUTER USE

This chapter presents the results of univariate analysis of the sample survey in the seven finance-related agencies in the State of Florida. The chapter will analyze employee perceptions of computer uses and impacts with the variables developed in the overall conceptual framework derived from the review of literature. The associations between pairs of variables as suggested by the conceptual framework outlined in Figure 3-1 will be analyzed in Chapter Six.

Some Thoughts for Data Analysis

As noted before, this chapter attempts to analyze employee perceptions of computer impacts and attitudes toward computer use based on the results of the sample survey. The employee responses to each questionnaire item will be examined using frequency distributions. This univariate frequency analysis is expected to provide information about the nature of the employee perceptions and attitudes related to computer uses and impacts. The analysis will emphasize relative frequencies such as percentages, rather than absolute frequencies, to facilitate comparisons.

Prior to the analysis of the frequency distributions of each of the 55 variables, efforts were made to search for a statistical method that would facilitate the univariate analysis. The statistical methods considered in this search, however, were found to be of little utility. A brief explanation of the statistical methods that were considered and the results of their applications will be briefly discussed in the following paragraphs for the purpose of helping future research.

The first idea considered was the construction of confidence intervals which could be used to estimate the parameters using the sample percentages. It was also suggested that decision rules be developed to reject items based upon the frequency of responses to them. If the parameter of the decision rule (i.e. a 50 percent response rate of agreement or disagreement) fell within the confidence interval the item would be retained for further analysis. The survey of this study, however, obtained a large-sized sample and the intervals of confidence limits tended to be quite small. The confidence intervals at various confidence levels were too narrow to be useful. Consequently, the use of the confidence intervals was evaluated as unnecessary to describe the responses.

It was suggested that a 50 percent response rate of agreement or disagreement could be used as a border line to conclude whether a prevalent perception or attitude existed toward a variable. Confidence intervals were applied to look at the feasibility of applying this criterion. As shown in Appendix E, once a combined sample percentage of Strongly Agree and Agree or Strongly Disagree and Disagree is greater than 50%, its parameter is estimated to be also greater than 50% with .995 or higher confidence, with the exception of only three questions (which have the mark "b)" in Appendix E).

At the same time it was recognized impractical to specify an arbitrary sample percentage, like the above 50%, as a criterion to make conclusions about the importance of employees' responses. As an exploratory study, this research needs to be attentive to sample percentages which are less than 50% but retain important implications from a theoretical standpoint. For example, the survey results show that around one fourth (26.7%) of the respondents mention that their employer should use electronic work monitoring to supervise their work performance, and a similar percent (23.7%) of the respondents say that some of the decisions that were formerly made by humans are being made by computers. Even though fewer than half of the respondents answered in the affirmative to these items, they have important implications for theory and practice. It was decided, therefore, that items should not be rejected according to arbitrary decision rules, but that the pattern of responses to each should be individually analyzed for importance.

The chi-square goodness-of-fit test was also considered. In general, the goodness-of-fit test is used to compare the distribution of the observed sample data to the theoretical distribution that is hypothesized (Gibbons 1985, 36-56; McClave and Dietrich 1982, 496-502). In this exploratory study, however, no basis exists to set in advance the specific theoretical distribution of the proportions in categories. The chi-square goodness-of-fit test was used here to measure the degree of disagreement between the sample data and the null hypothesis that employee perceptions are evenly distributed across the scale (i.e. each of the five categories has 20% of the respondents). Appendix F gives some examples of the chi-square values for the questions about the impacts of computers on employees and organizations. The large chi-square values imply that the null hypothesis is false. The chi-square values of all the questions included in Appendix F are incomparably larger than the critical value at the confidence level of .995 with four degree of freedom. The result of this chi-square analysis can lead to the statistical conclusion that some degree of attitudes and perceptions exist for all of the questionnaire items. The chi-square goodness-of-fit test was found to be of little help and was not used further.

The following univariate analysis of the employee perceptions of computer uses and impacts, therefore, will simply rely on the percentage distribution of responses. The analysis is presented from the context of conceptually related sets of variables. To supplement the analysis of frequency distributions, whenever necessary, a limited amount of bivariate analysis derived from the results of crosstabulation analysis are also presented in this chapter. The bivariate analysis in this chapter is intended to supplement the univariate analysis, and is, for the most part, not directly related to the conceptual framework outlined in Figure 3-1 (which is the primary concern of the following chapter). Two-way chi-square tests are used to investigate the independence between the variables being analyzed and differences in selected respondent characteristics such as job category, public contact, and the presence of computerized monitoring. A summary of the major findings will be given at the end of the analysis of each set of variables.

Perceptions of Management

Table 5-1 presents the employees' perceptions of managerial motivations and attitudes toward the use of computer technology. With respect to managerial motivations for computer use, a first glance at the table shows that the respondents perceive various managerial motivations to exist at the same time. With the exception

Table 5-1. Perceptions of Managerial Motivations and Attitudes Toward the Use of Computers

Questions	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree	
Motivations for Use:						
Cost Reduction	4.5%	32.9%	44.6%	16.2%	1.9%	(n=377)
Service Improvement	21.2%	67.6%	9.5%	1.3%	0.3%	(n=377)
Better Work Environment	11.7%	58.6%	19.4%	8.2%	2.1%	(n=377)
Better Control	13.5%	56.5%	19.6%	9.8%	0.5%	(n=377)
Receptiveness to On-the-Job Learning	4.5%	42.9%	19.5%	25.1%	8.0%	(n=375)
Receptiveness to Employee Input	17.5%	45.1%	14.6%	16.2%	6.6%	(n=377)
Expectation of More Reports	15.5%	44.5%	29.8%	8.3%	1.9%	(n=373)

of the motivation of cost reduction, more than 70% of the respondents agree or strongly agree that management is motivated by each of the remaining three categories of motivation -- service improvement, better work environment, and better control.

With respect to managerial motivation for cost reduction, only 37.4% of the respondents agree or strongly agree that it is a factor. A chi-square test shows, furthermore, that the employees' perceptions of the managerial motivation of cost reduction are statistically dependent on their job category (X^2=30.98, df=8, significance=.0001, n=359). A crosstabulation analysis showed that half (50%) of the respondents in the managerial-supervisory category believe that managers want to use computers to hold down increase in costs, while far fewer clerical and professional workers shared that perception.

On the other hand, a great majority (88.8%) of the respondents view improving the quality of services as a managerial motivation for computer use. Also, considerable proportions of the respondents feel that managers want to use computers to improve the work environment (70.3%) and to increase management control (70%). It was anticipated that a variety of the managerial motivations might exist, but the degree to which such motivations can apparently coexist was somewhat unexpected. Managerial motivations with different orientations, employee-oriented motivations and task/control-oriented motivations, are positively perceived by similar proportions of the respondents.

Table 5-1 suggests that the respondents have ambivalent perceptions of management's receptiveness to the on-the-job (OJT) learning about computers. Less than half (47.4%) of the respondents have favorable perceptions of managers' receptiveness, while a third (33.1%) of them had unfavorable ones. This finding supports the observation Klay and Yu (1988) made in a recent article that managers had mixed reactions to on-the-job learning about computers. Also, Table 5-1 shows that a considerable proportion (62.6%) of the respondents feel that management is receptive to employee input, and that management expects to see more reports in conjunction with use of computers (60%).

In summary, the respondents have differing perceptions as to whether cost reduction motivates managers to adopt new computer technology. Managers and supervisors tend to perceive the cost-reduction motivation more than the lower level employees. A large proportion of the respondents feel that management wants to use computers to improve the quality of services. Also, it seems that managerial motivation is multidimensional; employees believe that managers use computers to improve the quality of the employees' work life and at the same time to increase management control. Managers' attitudes toward OJT learning about computers were ambivalent. Managers' receptiveness to employee input is positively perceived by a considerable proportion of the respondents, but respondents also say that management expects to see more reports.

Job Dimensions

As noted earlier, the job dimension variables are included in this study to examine their relationships to the impact of computers on employees and the organizations in which they work. Much of the previous literature has underscored the importance of task contingencies as one of the intervening variables that would influence the use and impact of computers (Bjørn-Andersen, Eason, and Robey 1986; Danziger 1970b; Stevens and LaPlante 1986; OTA 1985). Table 5-2 shows that all of the six job dimensions which Hackman and Oldham (1975) developed to understand the nature of jobs are positively perceived by the respondents. Combined percentages of positive agreement (Strongly Agree and Agree) in responses to these items range from 62.4% to 85.2%. It is encouraging that the Hackman and Oldham's six job dimensions are positively present in the state employees working in the finance-related agencies which are characterized as bureaucratic. The majority of the respondents feel that they use a variety of skills in carrying out their jobs, do

Table 5-2. Perceptions of Job Dimensions

Questions	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree	
Skill Variety	32.9%	52.3%	4.5%	8.5%	1.9%	(n=377)
Task Completion	32.9%	48.5%	4.2%	11.4%	2.9%	(n=377)
Work Significance	21.8%	40.6%	20.2%	14.9%	2.4%	(n=376)
Autonomy on Job	22.8%	57.3%	6.4%	11.4%	2.1%	(n=377)
Knowledge of Results	21.2%	56.0%	11.9%	8.8%	1.9%	(n=376)
Work Closely with Others	33.0%	51.3%	4.5%	9.8%	1.3%	(n=376)
Work as a Team	12.2%	46.9%	16.4%	16.2%	8.2%	(n=377)
Job Satisfaction	29.2%	53.4%	10.5%	5.1%	1.9%	(n=373)
Advancement Chance	9.5%	37.7%	19.9%	21.5%	11.4%	(n=377)
Work Contribution to Unit	9.6%	32.7%	37.2%	17.6%	2.9%	(n=376)

complete tasks, do work which significantly affects others, have job autonomy, and know well as to whether they are doing good jobs. Also, Table 5-2 indicates that a considerable proportion (59.1%) of the respondents think they are working as a team, while a fourth (24.4%) of them do not so yet. A large proportion (82.6%) of them are satisfied with their own jobs.

In contrast, the respondents' perceptions of their chances to advance within the agencies, and whether their work contributes more to the unit than previously, are widely spread in five response categories. Almost half (47.2%) of the respondents have positive perceptions of their advancement chances within agencies, while one third (32.9%) of them have negative perceptions. With the question of the work contribution to unit, 42.3% of the respondents agree or strongly agree, while a fifth (20.5%) of them disagree or strongly disagree. Therefore, it seems that the respondents have wide ranged perceptions of the outcomes of their work performance, although they have positive perceptions of several other job dimensions in Table 5-2.

In summary, the respondents gave very positive responses to the items derived from Hackman and Oldham's job dimensions scale -- skill variety, task completion, work significance, job autonomy, knowledge of results, and working closely with others. Many of the respondents think of themselves as working in teams. Most of the respondents are satisfied with their own jobs. Opinions differ, however, with respect to the outcomes of their work, such as the chances for their advancement and the overall contribution of their work to the unit.

Perceived Impacts of Computers and Preferred Policies for Computer Use

One of the major concerns of this study is to identify the impacts of computers on employees and the organizations within which they work. Tables 5-3, 5-5, and 5-6 summarize the survey results of the impacts of computers and the employee preference for policies related to the use of computers.

Impacts on Organizations. As discussed earlier, the previous literature has shown diverse findings and contradictory opinions about the effects of computers on the size of employment in organizations. Table 5-3 indicates that around four fifths of the respondents from the seven agencies suspect that past job loss has occurred (80.3%) and that future job loss attributable to the use of computers is a possibility in their agencies (78.1%). Furthermore, a crosstabulation analysis shows that the perceptions of past and future job loss are statistically dependent on the respondents' job category. As shown in Table 5-4, no managers who responded to the survey agree or strongly agree that computers caused or will cause the

Table 5-3. Perceived Impacts of Computers on Organizations

Questions	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree	
Job Loss: Past	0.5%	4.5%	14.7%	46.7%	33.6%	(n=375)
Future	2.1%	7.2%	12.5%	55.7%	22.4%	(n=375)
Automated Decision Making:						
Current	5.1%	18.6%	22.1%	39.9%	14.4%	(n=376)
Future	4.0%	11.8%	22.5%	44.4%	17.4%	(n=374)
Interpersonal Communications Improved	4.8%	26.3%	38.6%	26.3%	4.0%	(n=376)
Power Reinforcement	2.1%	14.1%	48.5%	27.3%	8.0%	(n=377)
Prior Notice Given	4.5%	32.6%	20.2%	28.4%	14.3%	(n=377)
Status of Computer Specialists	5.6%	26.9%	23.7%	38.0%	5.9%	(n=376)
Smoothness of Change	2.9%	42.3%	24.5%	22.6%	7.7%	(n=376)

Table 5-4. Perceptions of Job Loss by Job Category

Job Category		Strongly Agree/ Agree	No Opinion	Strongly Disagree/ Disagree
Clerical : (n=52)	Past a)	7.7%	32.7%	59.6%
	Future b)	27.0%	21.2%	52.0%
Professional: (n=259)	Past	4.9%	13.1%	82.1%
	Future	7.7%	10.8%	81.5%
Managerial/ : Supervisory (n=46)	Past	0.0%	4.3%	95.6%
	Future	0.0%	8.7%	91.3%

Note: a) X^2=24.44, df=8, Significance=.0019, n=366
b) X^2=35.96, df=8, Significance=.0000, n=366

unemployment of their employees. Interestingly, only 7.7% of the clerical respondents felt that computers had caused other people to lose jobs in the past, but the proportion perceiving future job loss surprisingly increases to 27%. Therefore, Table 5-4 shows conflicting perceptions between managers and clerical employees. Managers perceive no job loss in the past nor in the future, but a number of clerical employees perceive its future possibility. This finding is also congruent with the previous finding that the displacement effect of computer technology is concentrated at the clerical level (OTA 1985; Whisler 1970b, Klay and Yu, 1988).

About a fourth (23.4%) of the respondents currently perceive some of their decisions as being made by computers. Interestingly, in spite of the evident presence of some automation of decision making, a high proportion (61.8%) of the respondents feel that the decisions that they now make will not be automated in the future. With the development of expert systems some observers expect computers to increasingly make direct decisions for the user (Ahituv and Neumann 1986). The finding of this survey shows, however, that most employees do not anticipate a major tendency toward computerized decision making.

The respondents have diverse perceptions of the impacts of computers on interpersonal communications. As shown in Table 5-3, almost the same percentages of the respondents have positive (31.1%) and negative (30.3%) perceptions as to whether interpersonal communications have been improved with the use of computers. This finding reinforces previous research (Botner 1987; Norris 1988; Ostrowski, Gardner, and Motawi 1986) which indicates that the impact of computers on interpersonal communications is unclear and contingent upon specific situations.

To the question as to whether the power of dominant groups is reinforced by the use of computers, slightly more than a third (35.3%) of the respondents disagree or strongly disagree but relatively few (16.2%) answered affirmatively. A high proportion in the category of No Opinion implies that the employees may perceive little association between computer use and shifts in power relationships.

The employee perceptions as to whether they are notified about technological changes as early as possible whenever a new use of computers is being considered are spread among various categories. A moderate proportion (42.7%) of the respondents feel that prior notice is not given as early as it could be. This proportion is slightly higher than that (37.1%) of those who feel that it is provided as early as possible. A crosstabulation analysis revealed that the employee perceptions as to whether prior notice is given are statistically dependent on their job category (X^2=16.69, df=8, significance=.0334, n=368). More than half (56.5%) of the respondents who are managers agree or strongly agree that prior notice is given as early as possible. Among clerical and professional workers, many (43.5%) disagree or strongly disagree that prior notice is given, while fewer (34.5%) of these persons agree or strongly agree that it is given as early as possible. In spite of the fact that much of the literature emphasizes the benefits of user involvement in the use, management, and development of computer systems (Griesemer 1984; Ives and Olson 1984; Robey and Farrow 1982), the survey result shows that many employees are not receiving notice as early as they feel is possible.

The employee perceptions of change in the status of computer specialists are also mixed. A moderate percentage (43.9%) of the respondents do not think they have to get the cooperation of computer specialists in order to get something done. Only a third (32.5%) of them agree or strongly agree that the cooperation of the specialists is a necessity. Even though the overall perceptions of the respondents are widely ranged, a plurality (45.2%) of them say that changes to new uses of computers are relatively smooth.

In summary, the job loss in the past and its possibility in the future is a concern to some respondents, and there is a tendency for the lower level employees to be more concerned about future job loss than the upper level ones. The possibility that some of the decisions will be made by computers in the future is more discounted than the degree to which they are being currently computerized. One of four respondents agrees that some of their decisions are being currently made by computers. Diverse responses were received with respect to the impacts of computers on interpersonal communications, shifts in power relationships, prior notification of technological changes, changes in the status of computer specialists, and the smoothness of computer-related changes.

Impacts on Individuals. Table 5-5 summarizes employee perceptions of the impacts of computers on themselves. Overall, the impacts on employees seem more certain than those on organizations. First, with respect to skill impacts, more than half (54.4%) of the respondents believe that they will have more opportunity to use current knowledge, skill, and abilities as computers are being used more and more, while slightly more than a fourth (27.8%) of them disagree or strongly disagree with it. Unexpectedly, a large proportion (82.9%) of the respondents think their present skills will be still needed in the future and do not expect any substantial deskilling effects due to the use of computer technology. Therefore, it seems that these respondents from state finance-related agencies anticipate more enskilling effects than deskilling effects. A considerable proportion (68.1%) of the respondents mention

Table 5-5. Perceived Impacts of Computers on Individuals

Questions	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree	
Skill Impacts in Job:						
Enskilling Effect	17.5%	36.9%	17.8%	20.4%	7.4%	(n=377)
Need for Present Skills	26.1%	56.8%	12.8%	3.5%	0.8%	(n=375)
Need for New Skills	13.8%	54.3%	12.5%	16.2%	3.2%	(n=376)
Career Opportunity Enhanced	23.3%	42.8%	21.1%	9.6%	3.2%	(n=374)
Work Intensity Increased	8.5%	24.7%	43.6%	21.5%	1.6%	(n=376)
Computer Anxiety Felt	0.8%	5.6%	5.3%	38.0%	50.3%	(n=374)
Stress Increased	4.5%	17.8%	27.9%	39.4%	10.4%	(n=376)
Health Endangered	0.8%	5.1%	20.2%	43.6%	30.3%	(n=376)
Physical Discomfort	1.9%	19.5%	13.6%	41.3%	23.7%	(n=375)
Privacy Threat-Client	3.4%	17.0%	34.2%	37.1%	8.2%	(n=377)
Privacy Threat-Employee	2.1%	4.0%	23.1%	56.5%	14.3%	(n=377)

that they will need to develop new skills to carry out their jobs as computers are used more and more.

According to Table 5-5, almost two thirds (66.1%) of the respondents indicate that computers will provide more opportunity to get ahead in their careers. Perceptions with respect to work intensity are widely spread. A third (33.2%) of the respondents agree or strongly agree that their workload increases as a result of the use of computers, while almost a fourth (23.1%) of them disagree or strongly disagree that workload increases. This ambivalence of perceptions supports Norris' (1988) finding that computer use can increase and at the same time decrease workloads.

As shown at the bottom of Table 5-5, this survey reveals that the impacts of computers on employees are not perceived as negatively as has been speculated or found in prior research. Unlike the assertions in the previous literature (Botner 1987; Norris 1988), only a small proportion (6.4%) of the respondents feel nervous (anxiety) when around computers, while a large proportion (88.3%) of them do not.

Half (49.8%) of the respondents disagree or strongly disagree that they have experienced more stress due to the use of computers. It is still notable, however, that one of five respondents (22.3%) feel that they have been mentally stressed by the use of computers in their workplaces. Considerable proportions of the respondents report no health problems (73.9%) and no physical discomfort (65%) which are caused by using computers. As with mental stress, however, it is noteworthy that a fifth (21.4%) of the respondents have experienced physical discomfort in working with a computer. At least one of five respondents has experienced mental stress and/or physical discomfort with the use of computers.

According to the survey results, most respondents do not feel that the use of computers is interfering with the employees' own privacy on the job (70.8%). Computer use, however, may be a threat to the privacy of the client. A fifth (20.4%) of the respondents agree or strongly agree that it becomes more difficult to protect the privacy of records about their clients, while 45.3% disagree or strongly disagree that client privacy is endangered. Furthermore, the employee perceptions of privacy threat to the client is statistically dependent on public contact with the clients (X^2=10.93, df=4, significance=.0273, n=375). A fourth (23.8%) of the respondents with public contact perceive a threat to the client's privacy, while only 11.8% of the respondents with no public contact perceive this threat.

In summary, some of the impacts of computers on individual employees are as follows. With respect to skill impacts, the employees perceive that their present skills will be still needed in the future and at the same time that new skills will need to be developed on the job. Computers are viewed by employees as helpful in enhancing their career opportunity. Unlike prior findings, the use of computers is not perceived as a primary cause of anxiety, physical discomfort, or health problems. Perceptions differ widely with respect to work intensity and intensification of pressure (mental stress). In regard to privacy threats, it was found that the employees' own privacy is perceived to be less affected by the use of computers than client privacy. More of the respondents who come into contact with the public perceive a threat to client privacy than do those with no public contact.

Preferred Policies for Computer Use. In addition to perceptions about impacts of computers on employees and their organizations, the respondents' attitudes about policies related to the introduction of computer-related changes were surveyed in the questionnaire and are summarized in Table 5-6. Almost half (49.4%) of the respondents agree or strongly agree that professionals should use computers to do some clerical work such as drafting correspondence and filing, while a fourth (25.8%) disagree or strongly disagree.

Opinions differ as to whether the employer should use computers to monitor how well an employee is doing his or her job. While a sizeable minority of the respondents

Table 5-6. Preferred Policies for Computer Use

Questions	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree	
Changing Role of Professionals	9.0%	40.4%	24.7%	23.7%	2.1%	(n=376)
Electronic Work Monitoring	3.4%	23.3%	32.9%	30.2%	10.1%	(n=377)
Employee Involvement Desired	21.0%	54.9%	15.6%	6.1%	2.4%	(n=377)
Prior Notice Desired	43.0%	52.5%	3.7%	0.3%	0.5%	(n=377)

(40.3%) disagree or strongly disagree with the use of computers for monitoring, around a quarter (26.7%) of the respondents have favorable perceptions of monitoring. It is interesting, furthermore, that attitudes toward the use of electronic work monitoring are statistically dependent on whether respondents say that any of their job performance is monitored by a computer (X^2=26.12, df=4, significance=.0000, n=369). As Table 5-7 shows, the employees whose performance is being electronically monitored tend to have more favorable attitudes toward computerized work monitoring, while the other employees who are not monitored tend to have less favorable attitudes. Electronic work monitoring can be a positive mechanism which gives task feedback to employees, as a congressional study reported (OTA 1985). It may be that this is what is occurring in Florida's financial agencies.

Table 5-3 indicated a diverse pattern of responses with respect to whether prior notice about technological changes is currently given. By contrast, as shown in Table 5-7, the respondents expressed a strong desire to be involved in the making of decisions (75.9%) about system changes and to obtain the earliest possible notice (95.5%) about them.

In summary, a sizeable minority of the respondents feel that the role of professionals should change but disagree or strongly disagree with the use of electronic

Table 5-7. Attitudes Toward the Use of Electronic Work Monitoring

	Strongly Agree/ Agree	No Opinion	Strongly Disagree/ Disagree
Knowing that Performance is Being Monitored	36.6%	29.5%	33.9%
Do Not Knowing that Performance is Being Monitored	16.1%	36.6%	47.3%

Note: X^2=26.12, df=4, significance=.0000, n=369 work monitoring. Great majorities of respondents believe that they should receive the earliest possible notice about technological changes and that they should participate in the making of decisions about the system changes.

Computer Learning

The present study is the first one to survey the patterns of learning about computers in state finance-related agencies. As presented in Table 5-8, the learning about computers through informal conversation with other employees who know more about computers is the prevalent mode of learning (83.7% of the respondents indicate its use). This result supports the prior finding that the most typical way of acquiring computer knowledge has been through in-house, informal, on-the-job learning (Klay and Yu 1988; Ostrowski, Gardner, and Motawi 1986). Self-teaching on the job follows informal conversation with positive responses from more than three fourths (78.3%) of the respondents.

About half of the respondents indicate that formal training provided by the employer (48.3%) is an important source of knowledge about computers. Apparently, many persons rely upon off-the-job learning (40%) as a way of learning about the use of computers. However, sizeable minorities of the respondents disagree or strongly disagree that these two methods have been important sources of information about the use of computers (40.5% and 35.7%,

Table 5-8. Use of Computer Learning Methods

Questions	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree	
Formal Training	9.9%	38.4%	11.2%	29.6%	10.9%	(n=375)
Informal Conversation	15.2%	68.5%	8.0%	6.7%	1.6%	(n=375)
Self-teaching on the Job	15.5%	62.8%	10.2%	10.2%	1.3%	(n=374)
Off-the-Job Learning	6.9%	33.1%	24.3%	28.0%	7.7%	(n=375)

respectively). Furthermore, it is notable that about as many respondents perceive off-the-job learning to be as prevalent a method as is the formal training provided by the employer.

A chi-square test shows that the respondents' perceptions about the use of computer learning methods such as formal training and self-teaching are statistically dependent on their job category. According to Table 5-9, formal training is said to be an important way of obtaining computer knowledge and skills by almost two thirds (65.4%) of clerical workers. On the other hand, large proportions of managers (87%) and professionals (80.1%) indicate use of self-teaching as a method of computer learning.

In summary, the most popular way of learning about computers is through informal conversation on the job with those who are more knowledgeable about computers. Self-teaching on the job follows closely behind the use of informal conversation. Overall, learning off-the-job is apparently as important as is formal training provided by the employer. Formal training is relatively more important to clerical workers, while self-teaching prevails among managers and professionals. These findings appear to be important for managers and researchers, and their implications will be discussed in the concluding chapter.

Intensity of Computer Use

The survey questionnaire includes nine indicators to

Table 5-9. Use of Computer Learning Methods by Job Category with Percentages of Strongly Agree and Agree

Job Category	Formal Training a)	Informal Conversation b)	Self-Teaching c)	Off-the-Job Learning d)
Clerical	65.4%	78.8%	63.5%	32.7%
Professional	44.4%	83.9%	80.1%	41.0%
Managerial/ Supervisory	50.0%	84.8%	87.0%	41.3%

Note: a) X^2=22.33, df=8, significance=.0043, n=366
b) statistically insignificant, n=366
c) X^2=23.34, df=8, significance=.0020, n=365
d) statistically insignificant, n=366

measure the variety of uses for which the individual respondents use computers as well as the intensity of each category of use. As shown in Table 5-10, the respondents are using computers for a variety of applications. The employee's pattern of computer use in each application is measured in four scales from Never to Very Often. The frequencies of three scales -- Sometimes, Often and Very Often -- are combined into the category labeled "Total" in the right column.

In Table 5-10, the first six indicators are listed in a relatively hierarchical order from simple information-processing applications to sophisticated learning-oriented applications. Most of the respondents from the state finance-related agencies use computers for electronic data processing (put information into a computer and get information from a computer), while successively decreasing proportions of them are using more advanced computer applications. As seen by the total percentages in the right column, most of the respondents have put information into a computer (89.4%) and obtained information from a computer (96%). More than three fourths (77.8%) of the respondents have used computers for word processing, while around two thirds of them have been engaged in computer-based accounting or statistical analysis. Also, Table 5-10 shows that a quarter (24.8%) of the respondents use computers for the purpose of displaying

Table 5-10. Self-Perceived Intensity of Computer Use.

	Never (A)	Sometimes (B)	Often (C)	Very Often (D)	Total (B+C+D)	
Put information into a computer	10.6%	27.9%	23.7%	37.8%	89.4%	(n=376)
Get information from a computer	4.0%	19.2%	28.3%	48.5%	96.0%	(n=375)
Word processing	23.2%	28.3%	22.1%	26.4%	77.8%	(n=375)
Accounting/statistical analysis	32.5%	25.6%	20.3%	21.6%	67.5%	(n=375)
Projections or forecasts	59.4%	23.0%	11.0%	6.7%	40.6%	(n=374)
Graphic displays	75.2%	18.1%	4.8%	1.9%	24.8%	(n=375)
Electronic mail	66.1%	22.7%	6.7%	4.5%	33.9%	(n=375)
Application development	37.4%	38.5%	15.2%	8.8%	62.6%	(n=374)
Computer use at home	56.0%	22.7%	9.3%	12.0%	44.0%	(n=375)

graphics. Only a third (33.9%) of the respondents have used electronic mail. It is interesting that almost two thirds (62.5%) of the respondents say they sometimes, often, or very often work on better ways to use computers on the job. It is also notable that almost half (44%) of the respondents are using computers at home. This proportion implies that the degree of technology use of the respondents is considerably high.

In summary, most of the respondents reveal that they are engaged in putting information into a computer or getting information from a computer. Considerable percentages of them are involved in the applications of word processing and accounting or statistical analysis as well as in the development of applications. Only moderate proportions of the respondents are engaged in more sophisticated applications such as projections, graphic displays, and electronic mail.

Operational Performance

As shown in Table 5-11, operational performance is considered at two levels: organizational and personal performance. First, improvements in organizational performance attributable to the use of computers are perceived by substantial proportions of the respondents in terms of cost savings (64%), service improvement (89.9%) and coordination of service delivery (71.1%). In these three measures of organizational performance, no more than

Table 5-11. Perceived Organizational Performance and Self-Evaluated Personal Performance

Questions	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree	
Organizational Performance:						
Cost Savings	20.3%	43.7%	27.2%	7.2%	1.6%	(n=375)
Service Improvement	33.4%	56.5%	6.6%	3.2%	0.3%	(n=377)
Coordination of Service Delivery	12.7%	58.4%	20.4%	6.6%	1.9%	(n=377)
More Time Spent with the Clients	4.5%	32.2%	35.9%	22.9%	4.5%	(n=376)
Personal Performance:						
Work Speed	36.4%	50.0%	9.0%	3.7%	0.8%	(n=376)
Accuracy	33.2%	50.0%	12.0%	4.5%	0.3%	(n=376)
Sense of Accomplishment	15.0%	41.7%	31.3%	10.2%	1.9%	(n=374)
Time to Think	6.9%	38.0%	31.1%	20.2%	3.7%	(n=376)

10% of the respondents disagree or strongly disagree that improvements have occurred in each of the three categories.

As shown in Table 5-11, perceptions differ widely as to whether time freed by the use of computers is spent in increased interaction with clients. Slightly more than a third of the respondents (36.7%) say that using computers gives them more time to interact with clients. This proportion slightly outweighs that of the respondents (27.4%) who say that free time is not spent with clients. It is questionable, therefore, as to whether the respondents come to spend more time with their clients as a result of the use of computers. A chi-square test did find that there is statistical dependence between respondents' perceptions of time utilization with the clients and public contact (X^2=9.70, df=4, significance=.0457, n=374). More of the employees who are in contact with the public (37.8%) feel that increased time is spent with the clients as the result of computer use than do those with no public contact (32.4%). This finding seems to be an indication that computers have freed some of the respondents' time to interact more with clients, but that indication is certainly not overwhelming.

In regard to personal performance, increases in work speed and accuracy are perceived by large proportions (86.4% and 83.2%, respectively) of the respondents. A slight majority (56.7%) of the respondents feel that they are accomplishing more. Fewer than half of the respondents (44.9%) indicated that the use of computers has enabled them to devote more time to think of ways to better their job performance. The responses to this question are disparate.

In summary, most of the selected measures of operational performance are perceived as improved due to the use of computers in the state finance-related agencies. However, much uncertainty exists regarding the utilization of time freed from the use of computers. Freed time is not necessarily devoted to clients nor to thinking about doing work better.

Table 5-12 summarizes employees' perceptions of computer impacts and their attitudes toward computer use with combined percentages of positive responses -- "strongly agree" and "agree". These percentages reveal the degree to which employees have positive perceptions and attitudes about the variables.

Table 5-12. Summary of Employee Perceptions of Computer Impacts and Attitudes Toward Computer Use

Variables	Employee Perceptions and Attitudes in Percentage *
PERCEPTIONS OF MANAGEMENT	
Motivations for Use:	
Cost Reduction	37.4
Service Improvement	88.8
Better Work Environment	70.3
Better Control	70.0
Receptiveness to On-the-Job Learning	47.4
Receptiveness to Employee Input	62.6
Expectation of More Reports	60.0
JOB DIMENSION	
Skill Variety	85.2
Task Completion	81.4
Work Significance	62.4
Autonomy on Job	80.1
Knowledge of Results	77.2
Work Closely with Others	84.3
Work as a Team	59.1
Job Satisfaction	82.6
Advancement Chance	47.2
Work Contribution to Unit	42.3
PERCEIVED IMPACTS AND PREFERRED POLICIES	
Impact on Organizations:	
Job Loss-Past	5.0
Job Loss-Future	9.3
Automated Decision Making-Current	23.7 **
Automated Decision Making-Future	15.8
Interpersonal Communications	31.1
Power Reinforcement	16.2
Prior Notice Given	37.1
Status of Computer Specialists	32.5
Smoothness of Change	45.2

Note: * combined percentage of "strongly agree" and "agree".
** indicates the impacts which are of importance even though a minority of the respondents positively perceive them.

Table 5-12. Summary of Employee Perceptions of Computer Impacts and Attitudes Toward Computer Use (cont.)

Variables	Employee Perceptions and Attitudes in Percentage *
PERCEIVED IMPACTS AND PREFERRED POLICIES (cont.)	
Impacts on Individuals:	
Enskilling Effects in Job	54.4
Need for Present Skills in Future	82.9
Need for New Skill in Job	68.1
Career Opportunity Enhanced	66.1
Work Intensity Increased	33.2
Computer Anxiety Felt	6.4
Stress Increased	22.3 **
Health Endangered	5.9
Physical Discomfort	21.4 **
Privacy Threat-Client	20.4 **
Privacy Threat-Employee	6.1
Preferred Policies for Computer Use:	
Changing Role of Professionals	49.4
Electronic Work Monitoring	26.7 **
Employee Involvement Desired	75.9
Prior Notice Desired	95.5
COMPUTER LEARNING	
Formal Training	48.3
Informal Conversation	83.7
Self-Teaching on the Job	78.3
Off-the-Job Learning	40.0
OPERATIONAL PERFORMANCE	
Organizational Performance:	
Cost Savings	64.0
Service Improvement	89.9
Coordination of Service Delivery	71.1
More Time Spent with the Clients	36.7
Personal Performance:	
Work Speed	86.4
Accuracy	83.2
Sense of Accomplishment	56.7
Time to Think	44.9

Note: * combined percentage of "strongly agree" and "agree".
** indicates the impacts which are of importance even though a minority of the respondents positively perceive them.

CHAPTER SIX

ASSOCIATIONS BETWEEN PAIRS OF VARIABLES: EXPLORATION OF THE CONCEPTUAL FRAMEWORK

In Chapter Five, descriptive analysis was made of the uses and impacts of computers as perceived by employees in the Florida state finance-related agencies. This chapter will explore the patterns of association between pairs of variables related to the use of computers. These variables were identified in the conceptual framework, and numerous hypotheses about the expected associations between pairs of the variables were constructed in Chapter Three. The hypotheses will be repeated here and will be examined using the data gathered in the survey. Furthermore, some exploration will be made of bivariate associations that were not previously hypothesized but which have been found to be statistically significant within the context of the data analysis that has been conducted subsequent to the framing of the initial hypotheses.

The results of data analysis will be described in the same order as the hypotheses were presented in Figure 3-1. Based on the conceptual framework outlined in Chapter Three, the associations between pairs of variables, respectively drawn from different sets, will be examined.

To enhance the understanding of the relationships, this chapter will provide several correlation tables. The tables will display the Kendall's correlation coefficients, more precisely Kendall's tau-b statistics, which appear significant at the alpha level of 0.05. They will also show the number of cases available for computation and the level of statistical significance. Note that if the hypothesized associations do not appear statistically significant, they will be excluded from the tables. The tables include only associations that were found to be significant and that were explored within the context of the conceptual framework.

Perceptions of Management-Job Dimensions Associations

Some prior research (Ferris 1983; Griffin 1981) found that there was a relationship between managerial behaviors and employees' perceptions of their jobs. Based on this finding, the present study hypothesized that there would be associations between perceptions of managerial motivations and attitudes toward the use of computer technology and respondents' perceptions of their own jobs. Table 6-1 summarizes the associations between these two sets of variables.

First, with respect to the associations between the four categories of managerial motivations for computer use and Hackman and Oldham's (1975) six job dimensions, twenty four associations could be hypothesized. The reader may recall that in Chapter Three it was pointed out that Hackman and Oldham's six job dimensions were designed to be relatively unidimensional, each scale usually correlates highly with the others. Consequently, the reader was led through a discussion of the logic behind the hypotheses related to one of the six dimensions -- skill variety. The hypothesized associations between the managerial motivations and each of the remaining five job dimensions were assumed to be in the same direction as those with skill variety. In addition to the following four hypotheses, Table 3-2 (see page 108) enumerates the hypotheses numbers of the other twenty pairs and their hypothesized relationships.

H 1.1.1 Employees who believe that management is motivated to use computers to hold down increases in costs will tend to be those who feel that they have less opportunity to use a variety of skills in carrying out their jobs.

As Table 6-1 reveals, except for the skill variety dimension, no significant association was found between the perception of managerial motivation for cost reduction and each of the five job dimensions. The association between cost reduction motivation and skill variety is statistically significant but very weak and, unexpectedly, positive (0.0770). This particular relationship with cost

Table 6-1. Associations Between Employees' Perceptions of Management and Their Job Dimensions

	Motivations for Computer Use						
	Cost Reduc-tion	Service Improve-ment	Better Work Environ.	Better Control	Receptive-ness to On-the-Job Learning	Receptive-ness to Employee Input	Expecta-tion of More Reports
Skill Variety	0.0770 N(377) SIG .046	0.1463 N(377) SIG .001	0.1527 N(377) SIG .000		0.1716 N(375) SIG .000	0.2767 N(377) SIG .000	
Task Completion		0.1459 N(377) SIG .001	0.1029 N(377) SIG .012		0.0842 N(375) SIG .030	0.1852 N(377) SIG .000	
Work Signifi-cance							
Autonomy on Job		0.1430 N(377) SIG .001	0.1080 N(377) SIG .009		0.1698 N(375) SIG .000	0.1961 N(377) SIG .000	
Knowledge of Results			0.1630 N(376) SIG .000	0.1166 N(376) SIG .005	0.1527 N(374) SIG .000	0.2966 N(376) SIG .000	
Work Closely with Others			0.1315 N(376) SIG .002			0.1537 N(376) SIG .000	
Work as a Team	0.0797 N(377) SIG .035	0.1648 N(377) SIG .000	0.1771 N(377) SIG .000		0.1857 N(375) SIG .000	0.4457 N(377) SIG .000	0.0835 N(373) SIG .029
Job Satisfac-tion		0.2282 N(373) SIG .000	0.2506 N(373) SIG .000		0.1981 N(371) SIG .000	0.3508 N(373) SIG .000	
Advance-ment Chance	0.0843 N(377) SIG .027	0.1301 N(377) SIG .002	0.2584 N(377) SIG .000		0.1182 N(375) SIG .003	0.3360 N(377) SIG .000	
Work Contri-bution to Unit	0.1514 N(376) SIG .000	0.1732 N(376) SIG .000	0.1955 N(376) SIG .000				

reduction is so weak that its theoretical importance is unclear and questionable. The hypotheses concerning the associations between the cost reduction motivation and the six job dimensions are not confirmed in this study.

H 1.2.1 Employees who believe that management is motivated to use computers to improve the quality of services will tend to be those who feel that they have more opportunity to use a variety of skills in carrying out their jobs.

Table 6-1 shows significant associations between the managerial motivation of service improvement and three of the job dimensions -- skill variety, task completion, and autonomy on the job. The moderate strength of their associations ranges from 0.1430 to 0.1463. Respondents who feel that management is motivated to use computers to improve services are slightly more likely to use a variety of skills, do complete tasks, and have autonomy in doing their jobs. The hypotheses concerning the associations between the service-improvement motivation and three job dimensions -- work significance, knowledge of results, work closely with others -- are not confirmed in this study. The hypotheses for the other three -- skill variety, task completion, and autonomy on the job -- are modestly confirmed.

H 1.3.1 Employees who believe that management is motivated to use computers to provide a better work environment for employees will tend to be those who feel that they have more opportunity to use a variety of skills in carrying out their jobs.

Table 6-1 indicates statistically significant associations between the managerial motivation to use computers to provide a better work environment and the employees' perceptions of five of the six job dimensions, the only exception being work significance. Even though the magnitude of their associations moderately ranges from 0.1029 to 0.1630, it seems that when the employees know that managers want to use computers to improve the quality of employees' work life, most of Hackman and Oldham dimensions are present in their jobs to a greater degree. The hypotheses about the associations between the motivation of better work environment and five job dimensions -- skill variety, task completion, autonomy on job, knowledge of results, and work closely with others -- are modestly confirmed.

H 1.4.1 Employees who believe that management is motivated to use computers to increase control will tend to be those who feel that they have less opportunity to use a variety of skills in carrying out their job.

In Table 6-1, only an association between the managerial motivation of better control and the employees' awareness of the results of their work performance appears statistically significant at a moderate level (0.1166).

Contrary to expectation, these variables are positively associated. None of the other five dimensions including skill variety is significantly associated with the control-seeking motivation. None of the hypotheses concerning the associations between the control-seeking motivation and the six job dimensions, therefore, is confirmed. The statistically significant relationship between the motivation of better control and the knowledge of results leads to the speculation that these two variables are positively related because they are both oriented toward the use of feedback. This speculation is not beyond the context of the conceptual framework for this study. Managers who are motivated to make greater use of feedback could establish an environment wherein employees also get more knowledge of the results of their work.

In regard to managerial attitudes toward the use of computers, two groups of the hypotheses were developed in Chapter Three. As with the previous analysis, the skill variety dimension is again used here to represent the hypotheses developed for each of Hackman and Oldham's six job dimensions (see also Table 3-2 in page 108).

H 1.5.1 Employees who believe that management is receptive to employee input will tend to be those who feel that they have more opportunity to use a variety of skills in carrying out their jobs.

Table 6-1 shows statistically significant associations between perceptions of managerial receptiveness to employee input and perceptions of most of the job dimensions. In particular, when employees perceive that their managers are receptive to input from employees, they tend to think they are using a variety of skills in carrying out their jobs (0.2767) and are well aware of the results of their work performance (0.2966). Also, they are somewhat more likely to do complete tasks (0.1852), maintain job autonomy (0.1961), and work closely with other people to do their job (0.1537). The hypotheses about the associations between management's receptiveness to employee input and most of the job dimensions are confirmed. Table 6-1 also indicates that the associations between management receptiveness to OJT learning and four of the six job dimensions -- skill variety, task completion, autonomy on job, and knowledge of results -- are confirmed within the context of the conceptual framework.

H 1.6.1 Employees who believe that management expects to see more reports with the use of computers will tend to be those who feel that they have less opportunity to use a variety of skills in carrying out their jobs.

Table 6-1 shows no significant associations between the employees' perceived managerial expectation to see more reports and their perceptions of Hackman and Oldham's six job dimensions. It does suggest, however, that there may be a slightly greater reliance on teamwork where more reports are expected, but the relationship is extremely weak and inconclusive.

Exploration. In addition to the associations that are discussed above, Table 6-1 includes several statistically significant associations which were not specifically mentioned in the previous literature and which are outside the framework of the Hackman and Oldham's job dimensions scale. The hypotheses that were discussed above were explicitly developed within the framework of Hackman and Oldham's job dimensions scale with an emphasis on the skill variety dimension. The lower part of the table shows significant relationships between several management variables and four additional job dimensions variables that were derived independently from the Hackman and Oldham's job dimensions scale. All of these significant relationships are congruent with the conceptual framework.

First, the two managerial motivations of service improvement and better work environment are strongly or moderately related to each of the other four job dimensions in the lower part of Table 6-1. The employees with positive perceptions of a managerial motivation to better the work environment are strongly satisfied with their jobs (0.2506) and optimistic about the chances for advancement in their agencies (0.2584). Also, the employees who positively perceive the service-improving motivation for computer use are strongly satisfied with their jobs

(0.2282).

Second, the table shows that management's receptiveness to employee input is very strongly related to the employees' perceptions of three job dimensions. According to Table 6-1, the employees who perceive their managers as receptive strongly think of themselves as a team (0.4457), are satisfied with their own jobs (0.3508), and are optimistic about the chances for advancement in the organizations (0.3360). These findings that some of the managerial motivations and attitudes related to the use of computers are statistically significantly associated with the other four job dimensions are congruent with the conceptual framework.

Summary. A glance at Table 6-1 suggests one point that underlies many of the significant associations in it. It is that the more decentralized or employee-oriented the managerial motivations and attitudes toward the use of computer technology are, the more positive are the perceptions which employees have of several dimensions of their jobs. In contrast, more centralized or task-oriented managerial motivations and attitudes are less likely to be significantly associated with the employees' job dimensions.

The specific associations which appear significant in Table 6-1 can be summarized as below. Of the four managerial motivations, better work environment has strong or moderate associations with most of the employees' job dimensions. In other words, where managers introduce computers to improve the quality of employees' work life, the employees have positive perceptions of most of their job dimensions. They are strongly satisfied with their jobs and perceive more chances for advancement in the organizations. The managerial motivation of service improvement also has moderate associations with several dimensions of the employees' jobs. In other words, where managers are motivated to use computers to serve clients, the employees have positive perceptions of several of their job dimensions, and they are strongly satisfied with their jobs.

The results also show that when the employees perceive their managers as receptive to employee input, they have positive perceptions of most of their job dimensions. In particular, the employees who believe that management is receptive to input are very likely to think of themselves as a team. Furthermore, they are likely to feel satisfied with their jobs and to feel positive about their chances for advancement in the organizations.

On the other hand, from the standpoint of the job dimension variables, there are a couple of noteworthy points. The employees' sense of working as a team is related to managerial motivations and attitudes, while feelings about work significance are not. In the preceding univariate analysis, it was found that the majority of the respondents (62.4%) feel that their work is likely to significantly affect other people. Their perceptions of work significance, however, are apparently not significantly related to managerial motivations and attitudes toward the use of computers.

Perceptions of Management-Impacts of Computers Associations

As mentioned before, the impacts of computers in this study consist of three groups of variables: 1) perceived impacts on organizations, 2) perceived impacts on individual employees, and 3) preferred policies for computer use. Table 6-2 summarizes the associations between perceptions of managerial motivations and attitudes and perceived impacts of computers on organizations.

H 2.1.1 Employees who believe that management is motivated to use computers to improve the quality of services to the public will be those who are less likely to feel that job loss has been caused by computers in the past.

H 2.1.2 Employees who believe that management is motivated to use computers to improve the quality of services to the public will be those who are less likely to feel that job loss will be caused by computers in the future.

Table 6-2 shows, as hypothesized, that there are

Table 6-2. Associations Between Employees' Perceptions of Management and Their Perceived Impacts of Computers on Organizations

	Managerial Motivations						
	Cost Reduc-tion	Service Improve-ment	Better Work Environ.	Better Control	Receptive-ness to On-the-Job Learning	Receptive-ness to Employee Input	Expecta-tion of More Report
Job Loss: Future	0.0822 N(375) SIG .035	-0.1527 N(375) SIG .001					
Job Loss: Past		-0.0841 N(375) SIG .037					
Automated Dec Making: Current		0.1267 N(376) SIG .003	0.1141 N(376) SIG .005	0.1944 N(376) SIG .000		0.0753 N(376) SIG .040	
Automated Dec Making: Future			0.1003 N(374) SIG .012	0.1548 N(374) SIG .000	0.0722 N(373) SIG .050		
Inter-personal Communi-cations	0.1329 N(376) SIG .001	0.1443 N(376) SIG .001	0.1985 N(376) SIG .000	0.1627 N(376) SIG .000			
Power Reinforce-ment				0.1299 N(377) SIG .002			0.0765 N(373) SIG .044
Prior Notice Given	0.0775 N(377) SIG .039	0.1131 N(377) SIG .006	0.2929 N(377) SIG .000		0.3320 N(375) SIG .000	0.3704 N(377) SIG .000	
Status of Computer Specialists			-0.1196 N(376) SIG .004		-0.1592 N(374) SIG .000	-0.1499 N(376) SIG .000	0.0832 N(372) SIG .030
Smoothness of Change			0.1924 N(376) SIG .000	0.0898 N(376) SIG .022	0.1821 N(374) SIG .000	0.1318 N(376) SIG .001	

inverse associations between service motivation and perceptions of past or future job loss. It might be that managers who want to use computers to improve the quality of services are less likely to decrease the number of their employees in the future as well as in the past. In Table 6-2 it is also found that the inverse association is stronger with respect to future job loss (-0.1527) than to past loss (-0.0841).

H 2.2 Employees who believe that management is motivated to use computers to increase control will be those who have positive perceptions of the reinforcement of power held by dominant groups.

Table 6-2 indicates that there is a moderate association (0.1299) between the managerial motivation of better control and the perception of power reinforcement through computer use. The hypothesis is, therefore, modestly confirmed.

H 2.3.1 Employees who believe that management is receptive to employee input will be those who positively perceive that some of their decisions are currently being made by computers.

H 2.3.2 Employees who believe that management is receptive to employee input will be those who positively perceive that some of their decisions will be made in the future by computers.

These two hypotheses were developed on the argument that the automation of some of the routine and structured decision making will provide both superiors and subordinates with more time to allow them to be involved in mutual interaction (Er 1987; Gardner and Schermerhorn 1988; OTA 1985). Table 6-2 shows, however, that managerial receptiveness to employee input has a weak relationship (0.0753) to current automation in the making of some decisions but no statistically significant relationship to future automation of decision making. The hypothesis related to the current automation of decision making is weakly confirmed, but the other hypothesis about future automated decision making is not.

H 2.4 Employees who believe that management expects to see more reports with the use of computers will be those who have positive perceptions of the reinforcement of power held by dominant groups.

Like Hypothesis 2.2, it is expected that as managers use computers to increase their control, they will gain power (Danziger et al. 1982). Table 6-2 shows a weak relationship (0.0765) between these two variables. This hypothesis is weakly confirmed.

Exploration. A careful examination of Table 6-2 calls attention to several other associations. First, it is found that the managerial motivation of better work environment is moderately or strongly associated with several impacts of computers on organizations. In particular, employees who believe that management wants to achieve a better work environment also tend to perceive that the quality of interpersonal communications has been improved (0.1985), that they are notified in advance about technological changes (0.2929), and that changes related to new uses of computers are going smoothly in their agencies (0.1924).

Second, it is noteworthy that several managerial motivations are associated with the automation of decision making. The making of decisions by computers is associated with improving the quality of services (0.1267), providing employees with a better work environment (0.1141), and increasing management control (0.1944). In particular, those employees who believe that management is motivated to use computers to increase control are more likely to agree that some of their decisions are being made (0.1944) and will be made by computers (0.1548).

Third, Table 6-2 shows that the employees who perceive their managers as receptive to employee input tend to agree (0.3704) that they receive prior notice of technological changes as early as possible.

Summary. With respect to the associations between perceptions of management and impacts of computers on organizations, several pairs of variables show significant associations. All of these significant associations were in the expected direction. When managers want to use computers to improve the quality of services, using computers is not expected to cause decreases in the number of employees. Among the four categories of motivation, the use of computers to improve the work environment is strongly related to improvement in interpersonal communications, prior notification about technological changes, and perceived smoothness of computer related changes. The motivation of better control is related to the current and future automation of decision making. Control-oriented motivation and attitudes are likely to be associated with the power reinforcing effects, but only weakly. Management's receptiveness to employee input is associated with employees' perception as to whether they are given prior notice.

Table 6-3 outlines the statistically significant associations between perceptions of management and perceived impacts of computers on individual employees. The hypotheses constructed in Chapter Three are as below.

H 3.1 Employees who believe that management is motivated to use computers to provide a better work environment will have less computer anxiety, i.e. feel less nervous around computers.

H 3.2 Employees who believe that management is motivated to use computers to provide a better work environment will feel that the use of computers has not

Table 6-3. Associations Between Employees' Perceptions of Management and Their Perceived Impacts of Computers on Individuals

	Managerial Motivations						
	Cost Reduction	Service Improvement	Better Work Environ.	Better Control	Receptiveness to On-the-Job Learning	Receptiveness to Employee Input	Expectation of More Report
Enskilling Effect in Job	0.0911 N(377) SIG .019	0.1345 N(377) SIG .001	0.2174 N(377) SIG .000		0.1438 N(375) SIG .000	0.2954 N(377) SIG .000	0.0775 N(373) SIG .038
Need for Present Skills in Future		0.1712 N(375) SIG .000	0.0759 N(375) SIG .049			0.0816 N(375) SIG .034	0.0945 N(372) SIG .019
Need for New Skills		0.1351 N(376) SIG .002	0.1677 N(376) SIG .000		0.0737 N(375) SIG .047	0.1509 N(376) SIG .000	
Career Opportunity Enhanced	0.0808 N(374) SIG .035	0.1780 N(374) SIG .000	0.2073 N(374) SIG .000			0.0836 N(374) SIG .027	
Work Intensity Increased	0.0908 N(376) SIG .021	0.0966 N(376) SIG .018					0.1745 N(372) SIG .000
Computer Anxiety Felt		-0.1509 N(374) SIG .001	-0.0919 N(374) SIG .024				
Stress Increased		-0.0774 N(376) SIG .045	-0.1306 N(376) SIG .002		-0.1035 N(374) SIG .009	-0.0823 N(376) SIG .029	0.2538 N(372) SIG .000
Health Endangered		-0.1422 N(376) SIG .001	-0.1016 N(376) SIG .012				
Physical Discomfort		-0.1663 N(375) SIG .000	-0.1427 N(375) SIG .001			-0.0761 N(375) SIG .040	0.1281 N(371) SIG .002
Privacy Threat: Client			-0.0983 N(377) SIG .014			-0.1434 N(377) SIG .000	
Privacy Threat: Employee		-0.1386 N(377) SIG .002	-0.0813 N(377) SIG .037			-0.1269 N(377) SIG .002	

led to greater stress, i.e. pressure placed upon them.

H 3.3 Employees who believe that management is motivated to use computers to provide a better work environment will be less likely to believe that using computers has endangered their health.

H 3.4 Employees who believe that management is motivated to use computers to provide a better work environment will be less likely to believe that using computers has caused them some physical discomfort.

H 3.5 Employees who believe that management is motivated to use computers to provide a better work environment will be less likely to believe that computers have threatened the client's privacy.

H 3.6 Employees who believe that management is motivated to use computers to provide a better work environment will be less likely to believe that computers have threatened the employees' own privacy.

These six hypotheses were developed from previous literature which is concerned with the undesirable effects of computers upon humans (for example, Botner 1987; Gardner and Schermerhorn 1988; Norris 1988; Ostrowski, Gardner, and Motawi 1986; OTA 1985). In Table 6-3, as hypothesized, the associations between these six pairs of variables appear consistently negative. For example, employees who perceive that management wants to use computers to provide a better work environment tend to disagree that using computers has caused some physical discomfort (-0.1427) and stress (-0.1306).

H 3.7 Employees who believe that management expects to see more reports with the use of computers will perceive an increase in work intensity.

It was expected that the management would request more reports because computer technology can provide information more frequently and affordably (Kraemer, Dutton, and Northrop 1981). The hypothesis here is that more frequent requests for reports would increase the intensity of work for employees (Norris 1988). A moderate association between this pair of variables (0.1745) appears in Table 6-3.

Exploration. In addition to the hypothesized associations, Table 6-3 displays several other significant associations. A first glance at Table 6-3 shows a contrast between groups of managerial motivations and attitudes. There are significant associations between more decentralized or employee-oriented managerial motivations and attitudes and the impacts of computers on individuals. In contrast, few significant associations exist between centralized or task-oriented motivations and attitudes and the impacts on individual employees.

With respect to the specific pairs of variables, several significant associations appear in Table 6-3. The two managerial motivations of service improvement and better work environment are significantly associated with three skill effects included in this study. In particular, employees who perceive both motivations think strongly or moderately that they have more opportunity to use their skills and knowledge than before (0.1345 and 0.2174) and that they need to develop new skills (0.1351 and 0.1677). Moreover, they feel that their present skills will be needed in the future (0.1712 and 0.0759). In addition, the table indicates that respondents who believe that management is motivated by service improvement and better work environment also tend to believe that the use of computers will give them more opportunity to get ahead in their career (0.1780 and 0.2073).

As with the managerial motivation for a better work environment (Hypotheses 3.1 to 3.6), Table 6-3 shows that the managerial motivation for service improvement has inverse associations with the undesirable effects of computers on employees at weak or moderate levels ranging from
-0.0774 to -0.1663. Where the managerial motivation for service improvement is perceived, it appears less likely that those undesirable effects occur.

Also, Table 6-3 shows that the employees who perceive that managers are receptive to employee input believe that they have more opportunity to upgrade their knowledge and skills (0.2954), and that they need to develop new skills

(0.1509). Respondents who say that management is receptive to employee input are less likely to feel that there are threats to the privacy of the client (-0.1434) or to the privacy of the employees (-0.1269).

Employees who believe that managers expect to see more reports with the use of computers are likely to feel more stress (0.2538). They are also likely to feel physical discomfort (0.1281).

Summary. Two managerial motivations of service improvement and better work environment appear to be significantly related to most of the impacts of computers on employees. More specifically, the employees who perceive these motivations tend to think that using computers allows them to have more opportunity to use their present knowledge and skills, and that they will need to develop new skills in the job. They also think that the use of computers provides more opportunity to get ahead in their career.

The employees with positive perceptions of motivations toward service improvement and a better work environment are less likely to experience the presence of the undesirable human effects of computers, such as anxiety, stress, physical discomfort (including health problems), and threats to privacy. When management is perceived as receptive to employee input, employees believe that they have more opportunity to use their skills, that they need develop new skills in the job, and that the privacy of the client and the employees is not threatened by the use of computers. Finally, the employees who feel that managers expect to see more reports with the use of computers tend to experience increases in workload and stress.

Table 6-4 summarizes the associations between perceptions of management and employees' preferred policies for computer use. Two hypotheses concerning the use of electronic work monitoring were developed in Chapter Three.

H 4.1 Employees who believe that management is motivated to use computers to provide a better work environment will have fewer negative attitudes toward the use of electronic work monitoring.

Table 6-4 shows no association between this pair of variables.

H 4.2 Employees who believe that management is motivated to use computers to increase control will have more negative attitudes toward the use of electronic work monitoring.

Based on the adverse potential of computerized monitoring, it was hypothesized that employees would oppose the use of electronic work monitoring when they know that management uses computers to increase control. Contrary to this initial expectation, Table 6-4 shows that the employees who perceive the motivation of better control

Table 6-4. Associations Between Employees' Perceptions of Management and Their Preferred Policies for Computer Use

	Managerial Motivations						
	Cost Reduction	Service Improvement	Better Work Environ.	Better Control	Receptiveness to On-the-Job Learning	Receptiveness to Employee Input	Expectation of More Report
Changing Role of Profes.	0.0984 N(376) SIG .013	0.1294 N(376) SIG .002	0.0783 N(376) SIG .040		0.0741 N(374) SIG .046		
Electronic Work Monitoring	0.1310 N(377) SIG .001			0.1310 N(377) SIG .002			
Employee Involvement Desired						-0.1208 N(377) SIG .003	0.0907 N(373) SIG .022
Prior Notice Desired	0.1032 N(377) SIG .015	0.1616 N(377) SIG .000		0.1143 N(377) SIG .008	-0.0797 N(375) SIG .044		

have moderately favorable attitudes (0.1310) toward electronic work monitoring.

Exploration. In regard to the electronic work monitoring, Table 6-4 also shows a moderate relationship between the managerial motivation of cost reduction and the use of electronic work monitoring. In other words, the employees who believe that management uses computers to hold down increases in costs tend to have favorable attitudes toward the use of electronic work monitoring. Conversely, the table indicates that perceptions of the employee-oriented motivations (service improvement and better work environment) and attitudes (receptiveness to OJT learning and to employee input) are not significantly related to the attitudes toward the use of electronic work monitoring.

Table 6-4 shows a moderate association between the service improvement motivation and the employee desire to receive the earliest possible notice about technological changes (0.1616). The employees who believe that management uses computers to improve the quality of services are likely to feel that they should be given the earliest possible notice of changes that might affect their jobs.

Summary. As summarized in Table 6-4, perceptions of managerial motivations and attitudes have little or weak associations with the preferences for selected issues related to the use of computers. Associations were found between the motivations of cost reduction and control and the use of electronic work monitoring and between the service improvement motivation and employees' desire to be notified about technological changes.

Perceptions of Management-Computer Learning Associations

Management's receptiveness to on-the-job (OJT) learning about computers is a variable which is included in this study to examine its associations with the employees' propensity to learn about the use of computers. Although stated only in terms of OJT activity, it is expected to be related to each of the four different methods of learning.

H 5.1 Employees who believe that management is receptive to on-the-job learning about computers will be more likely to say that employees learn much through formal training that is provided by their employer.

H 5.2 Employees who believe that management is receptive to on-the-job learning about computers will be more likely to say that employees learn much through informal conversation with other employees who know more about computers.

H 5.3 Employees who believe that management is receptive to on-the-job learning about computers will be more likely to say that employees learn much through spending time on the job by themselves at a computer.

H 5.4 Employees who believe that management is receptive to on-the-job learning about computers will be less likely to say that employees learn much through spending their own time off the job.

As shown in Table 6-5, the respondents who believe that management is receptive toward on-the-job learning believe that people in their agencies learn about computers through formal training provided by their employer (0.2696). There is no significant association between the managerial receptiveness to on-the-job computer learning and the learning through informal conversation with more knowledgeable employees. The associations of management's attitudes with self-teaching (0.0844) and off-the-job learning (-0.0999) appear in the expected directions, but these associations are too weak to draw conclusions for theory or practice. These findings seem to imply that management attitudes toward OJT learning about computers are significantly related to formal training which is under the control of management, but not to the other three learning methods which are often initiated by individual employees and which seem to be independent of management's receptiveness.

Summary. Specifically, management's receptiveness to OJT learning about computers is not related to learning through informal conversation, self-teaching, and off-the-job learning. Rather, the more receptive the

Table 6-5. Associations Between Management's Receptiveness to On-the-Job Learning and Employees' Propensity to Learn How to Use Computers

	Formal Training	Informal Conversa-tion	Self-Teaching on Job	Off-the-Job Learning
Management's Receptiveness to On-the-Job Learning	0.2696 N(375) SIG .000	-0.0151* N(375) SIG .369	0.0844 N(374) SIG .030	-0.0999 N(375) SIG .011

* Statistically not significant.

management's attitudes are toward OJT learning, the more propensity the employees have to learn about computers through the formal training provided by the employer.

Job Dimensions-Impacts of Computers Associations

The review of previous literature provided no basis for hypothesizing about the associations between job dimensions and the perceived impacts of computers on organizations. No hypotheses were developed. Therefore, this section will explore possible associations between these two sets of variables in Table 6-6.

Exploration. Table 6-6 shows inverse associations between some of the job dimension variables and job loss in the past as well as in the future. The inverse association between skill variety and job loss implies that the employees who think of themselves as using a variety of skills in carrying out their jobs tend to disagree that computers caused some people to lose their jobs in the past (-0.1406) and will cause such loss in the future (-0.1361). Also, the table indicates that the employees who have to work closely with other people to do their jobs are less likely to feel that jobs have been lost in the past (-0.1894) or that they will be lost in the future (-0.1215).

A noteworthy finding in Table 6-6 is that the employees who indicate a positive presence of several job

Table 6-6. Associations Between Employees' Job Dimensions and Their Perceived Impacts of Computers on Organizations

	Skill Variety	Task Comple-tion	Work Signifi-cance	Autonomy on Job	Knowledge of Results	Work Closely w/ Others	Work as a Team	Job Satis-faction	Advance-ment Chance	Work Contri-bution to Unit
Job Loss: Future	-0.1406 N(375) SIG .001		-0.0846 N(374) SIG .028			-0.1894 N(374) SIG .000		-0.0799 N(371) SIG .041		
Job Loss: Past	-0.1361 N(375) SIG .002					-0.1215 N(374) SIG .004				
Automated Dec Making: Current							0.0753 N(376) SIG .040			
Automated Dec Making: Future	-0.0947 N(374) SIG .018				0.0873 N(373) SIG .025	-0.0790 N(373) SIG .040				
Inter-personal Communi-cations				0.0749 N(376) SIG .047		0.1063 N(375) SIG .009	0.1575 N(376) SIG .000	0.1261 N(372) SIG .003	0.1347 N(376) SIG .001	0.1723 N(375) SIG .000
Power Reinforce-ment				0.0894 N(377) SIG .024						
Prior Notice Given	0.1750 N(377) SIG .000	0.1296 N(377) SIG .002		0.0740 N(377) SIG .047	0.1885 N(376) SIG .000	0.1408 N(376) SIG .001	0.3065 N(377) SIG .000	0.2016 N(373) SIG .000	0.2226 N(377) SIG .000	
Status of Computer Specialists	-0.0865 N(376) SIG .027				-0.1138 N(375) SIG .005		-0.1105 N(376) SIG .005	-0.0946 N(372) SIG .018		
Smoothness of Change	0.1165 N(376) SIG .005	0.0921 N(376) SIG .020			0.1728 N(375) SIG .000	0.1310 N(375) SIG .002	0.2523 N(376) SIG .000	0.1207 N(372) SIG .004	0.1646 N(376) SIG .000	

dimensions tend to agree that they are notified about technological changes as early as possible. In regard to Hackman and Oldham's six job dimensions, five dimensions (with the exception of work significance) are significantly related to prior notification of changes. Particularly, employees who use a variety of skills in doing their job (0.1750) and who are aware of the results of their work performance (0.1885) feel that prior notice is given to them as early as possible. Furthermore, it is found that those who think of themselves as a team (0.3065), those who are satisfied with their jobs (0.2016), and those who are optimistic about the chances for advancement in their agencies (0.2226) strongly or moderately agree that they are notified in advance about technological changes.

Table 6-6 also shows that significant associations exist between several job dimensions and the employee perceptions of the smoothness of computer related changes. Employees with positive perceptions of their job dimensions have positive perceptions of the smoothness of changes related to new uses of computers. In particular, the employees who know well the results of their jobs (0.1728), the employees who think of themselves as a team (0.2523), and the employees who are optimistic about their chances for advancement in their agencies (0.1646) tend to perceive the changes as going smoothly.

From the job dimension perspective, it is interesting that the employees who have to work closely with other people tend to significantly perceive several of the impacts on organizations. Employees who must work closely with others are less likely to feel that jobs were lost in the past (-0.1215), that they will be lost in the future (-0.1894), and that some decisions will be made by computers in the future (-0.0790). The same employees are, conversely, more likely to feel that computers have helped to improve interpersonal communications (0.1063), that technological changes are notified in advance (0.1408), and that the changes go smoothly (0.1310).

Summary. According to Table 6-6, the employees who use a variety of skills and have to closely work with others to do their jobs tend to feel that jobs have not been lost in their organizations due to the increasing use of computers. Overall, the employees with positive perceptions of several of their job dimensions believe that they are notified in advance about technological changes and that these changes go smoothly. In particular, those who think of themselves as a team, those who are satisfied with their jobs, and those who are optimistic about their chances for advancement in their agencies are more likely to say that they receive prior notification about changes and that the changes are implemented smoothly. No associations between pairs of the variables in these two sets were hypothesized, but the associations that are found to be statistically significant are congruent with the conceptual framework.

With respect to the associations between the job dimensions and employee's perceptions of the impacts of computers on themselves, two sets of hypotheses were developed in Chapter Three. The hypotheses between skill variety and some impacts on employees will be repeated below as representative of the hypothesized associations between other job dimension variables and some impacts on employees. Table 3-3 (see page 119) shows hypotheses numbers and hypothesized associations between these pairs of variables.

H 6.1.1 Employees who perceive themselves as using a variety of skills in carrying out their jobs will be more likely to think that they have more opportunity to use their knowledge and skills than before.

Table 6-7 shows that all the job dimensions including skill variety are significantly associated with the enskilling effects in the job, ranging in strength of associations from 0.1022 to 0.3638. In particular, when the employees use a variety of skills (0.3541), think of themselves as a team (0.3100), are satisfied with their job (0.3620), perceive more chances for advancement (0.3638), and agree with their work contribution to the unit (0.3156), they believe that they have more opportunity to

Table 6-7. Associations Between Employees' Job Dimensions and Their Perceived Impacts of Computers on Individuals

	Skill Variety	Task Comple-tion	Work Signifi-cance	Autonomy on Job	Knowledge of Results	Work Closely w/ Others	Work as a Team	Job Satis-faction	Advance-ment Chance	Work Contri-bution to Unit
Enskilling Effect in Job	0.3541 N(377) SIG .000	0.2206 N(377) SIG .000	0.1022 N(376) SIG .009	0.2398 N(377) SIG .000	0.2325 N(376) SIG .000	0.1675 N(376) SIG .000	0.3100 N(377) SIG .000	0.3620 N(373) SIG .000	0.3638 N(377) SIG .000	0.3156 N(376) SIG .000
Need for Present Skills in Future	0.2737 N(375) SIG .000	0.1629 N(375) SIG .000	0.1119 N(374) SIG .006	0.1091 N(375) SIG .009	0.1413 N(374) SIG .001	0.2426 N(374) SIG .000	0.1222 N(375) SIG .003	0.2016 N(371) SIG .000	0.1481 N(375) SIG .000	
Need for New Skills	0.1270 N(376) SIG .003	0.1172 N(376) SIG .005	0.1254 N(375) SIG .002	0.0789 N(376) SIG .040	0.0806 N(375) SIG .036	0.1307 N(375) SIG .002		0.1593 N(372) SIG .000	0.1673 N(376) SIG .000	
Career Opportunity Enhanced		0.0753 N(374) SIG .046			0.0754 N(373) SIG .046			0.0904 N(370) SIG .023	0.2235 N(374) SIG .000	0.2198 N(373) SIG .000
Work Intensity Increased	0.1019 N(376) SIG .012				0.0888 N(375) SIG .024	0.0967 N(375) SIG .016	0.0885 N(376) SIG .022	0.1244 N(372) SIG .003		0.1229 N(375) SIG .003
Computer Anxiety Felt	-0.1140 N(374) SIG .008									-0.1111 N(373) SIG .007
Stress Increased	-0.0737 N(376) SIG .050							-0.1478 N(373) SIG .000		
Health Endangered						-0.1229 N(375) SIG .004	-0.1526 N(376) SIG .000		-0.0743 N(376) SIG .045	
Physical Discomfort					-0.0772 N(374) SIG .041		-0.0954 N(375) SIG .014			
Privacy Threat: Client		-0.0892 N(377) SIG .023			-0.1057 N(376) SIG .009		-0.0927 N(377) SIG .017		-0.0736 N(377) SIG .044	
Privacy Threat: Employee	-0.1754 N(377) SIG .000	-0.1827 N(377) SIG .000		-0.1361 N(377) SIG .001	-0.1017 N(376) SIG .013		-0.1260 N(375) SIG .002	-0.1128 N(373) SIG .007	0.0883 N(377) SIG .023	

use their knowledge and skills in their jobs than before.

H 6.1.2 Employees who perceive themselves as using a variety of skills in carrying out their jobs will be more likely to think that their present skills will be needed in future.

As hypothesized, Table 6-7 shows positive associations between most of the job dimension variables and the expectation of future need for present skills. These direct associations imply that the employees who have positive perceptions of their job dimensions tend to agree that their present skills will be needed in the future regardless of the use of computers. In particular, employees who think of themselves as using a variety of skills (0.2737), who must work closely with others to do their jobs (0.2426), and who are satisfied with their jobs (0.2016) strongly or moderately agree that there will be a future need for their current skills.

Exploration. Table 6-7 shows several other significant associations. First, most of the job dimension variables are significantly related (at weak or moderate levels) to the employees' perceived need for development of new skills as a consequence of the use of computers. In particular, in Table 6-7, employees who are satisfied with their jobs (0.1593) and who are optimistic about their chances for advancement (0.1673) positively perceive the need for development of new skills.

Second, the table indicates that the employees who are optimistic about the chances for advancement in their agencies (0.2235) and who think they make work contributions to units (0.2198) agree that the computer will give them an opportunity to get ahead in their career. In the lower part of Table 6-7, several statistically significant associations occur between job dimension variables and human effects of computers. All of these associations are inverse. Employees with positive perceptions of their jobs, along several dimensions, tend to disagree that computers are likely to cause several undesirable effects upon humans, but these associations are not strong. A noteworthy association is that the employees who are satisfied with their jobs are less likely to feel an increase in stress due to the use of computers (-0.1478).

Furthermore, employees with positive perceptions of their jobs in several dimensions tend to disagree that the increasing use of computers is a threat to their own privacy. In particular, the employees who think of themselves as using a variety of skills in carrying out their job (-0.1754) and the employees who do complete tasks (-0.1827) have negative perceptions of threats to their own privacy.

Summary. Employee perceptions of several dimensions of their jobs are significantly related to perceptions of enskilling and deskilling. Overall, when the employees have positive perceptions of their jobs, they feel that they now have more opportunity to use their knowledge and skills than before. Also, the employees with positive perceptions of their jobs tend to perceive not only that their present skills will be needed in future but also that they need to develop new skills in doing their jobs. On the other hand, the employees with positive perceptions of their jobs tend not to experience or expect some of the undesirable effects of computers on humans. More specifically, the employees who are satisfied with their jobs tend not to experience an increase in stress due to the use of computers. The employees who use a variety of skills and do complete tasks tend not to expect a threat to their own privacy. In retrospect, two groups of hypotheses that were developed for the associations between the job dimensions and the skill impacts are confirmed strongly or modestly. Other associations that were found to be significant are weak, but are congruent with the conceptual framework.

In regard to the associations between employees' job dimensions and their preference related to computer use, one hypothesis was developed previously. This hypothesis is representative of the hypotheses about other pairs of variables which are shown in Table 3-3 (see page 119).

H 6.1.3 Employees who perceive themselves as using a variety of skills in carrying out their jobs will feel that the role of professionals should change, including the doing of correspondence and filing through the use of computers.

Table 6-8 shows evidence of only two weak associations between these two groups of variables. These two associations are weakly confirmed.

Impacts of Computers-Operational Performance Associations

Based on the hypotheses constructed in Chapter Three, the associations between computer impact variables and measures of operational performance will be examined. Table 6-9 summarizes the associations between the impacts of computers on organizations and the measures of operational performance. As shown in the table, there are two categories of measures for operational performance: organizational performance and individual performance. The following hypotheses were developed and worded so that they could summarize the association between a computer impact variable and each of the measures of operational performance.

H 7.1 Employees who are notified in advance about technological changes will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

Table 6-8. Associations Between Employees' Job Dimensions and Their Preferred Policies for Computer Use

	Skill Variety	Task Comple-tion	Work Signifi-cance	Autonomy on Job	Knowledge of Results	Work Closely w/ Others	Work as a Team	Job Satis-faction	Advance-ment Chance	Work Contri-bution to Unit
Changing Role of Profes.				0.0735 N(376) SIG .050						0.1133 N(375) SIG .005
Electronic Work Monitoring		0.0729 N(377) SIG .050	0.0765 N(376) SIG .039		0.0749 N(376) SIG .045	0.0852 N(376) SIG .028				
Employee Involve-ment Desired	-0.1032 N(377) SIG .012					0.1086 N(376) SIG .009				0.1160 N(376) SIG .005
Prior Notice Desired	-0.0942 N(377) SIG .025									0.0981 N(376) SIG .018

Table 6-9. Associations Between Employees' Perceived Impacts of Computers on Organizations and Operational Performance.

	Job Loss: Future	Job Loss: Past	Automated Dec Making: Current	Automated Dec Making: Future	Inter-personal Communi-cations	Power Reinforce-ment	Prior Notice Given	Status of Computer Specialists	Smoothness of Change
Cost Savings	-0.0953 N(373) SIG .017		0.0818 N(374) SIG .031		0.2312 N(374) SIG .000		0.1511 N(375) SIG .000		0.2021 N(374) SIG .000
Better Service	-0.1206 N(375) SIG .005		0.0877 N(376) SIG .026		0.2684 N(376) SIG .000				0.1409 N(376) SIG .001
Coordination of Service Delivery		0.0886 N(375) SIG .026	0.1510 N(376) SIG .000		0.2883 N(376) SIG .000		0.1828 N(377) SIG .000		0.1641 N(376) SIG .000
More Time Spent with Clients	0.1095 N(374) SIG .007	0.0947 N(374) SIG .018	0.1741 N(375) SIG .000	0.1671 N(373) SIG .000	0.1558 N(375) SIG .000		0.1674 N(376) SIG .000	-0.0825 N(375) SIG .030	0.1631 N(375) SIG .000
Increasd Work Speed			0.0963 N(375) SIG .016		0.1605 N(375) SIG .000		0.0847 N(376) SIG .029	-0.0928 N(375) SIG .020	0.1553 N(375) SIG .000
Accuracy			0.1305 N(375) SIG .002		0.2111 N(375) SIG .000		0.0978 N(376) SIG .014		0.1470 N(375) SIG .001
Sense of Accom-plishment		-0.0975 N(372) SIG .015			0.1096 N(374) SIG .007		0.1201 N(374) SIG .003		0.1770 N(373) SIG .000
Time to Think			0.1442 N(375) SIG .000	0.1094 N(373) SIG .006	0.2484 N(375) SIG .000		0.1348 N(376) SIG .001	-0.075 N(375) SIG .043	0.2022 N(375) SIG .000

Table 6-9 shows several direct associations between prior notice and operational performance. Furthermore, the table indicates that the perceptions of prior notification are associated with improvements in both personal performance and organizational performance. Employees who believe that they are notified in advance about technological changes are more likely to feel that using computers saves costs (0.1511), facilitates the coordination of service delivery (0.1828), allows them to spend more time with the clients (0.1674), gives them a sense of accomplishment (0.1201), and allows them to think more about how to do a better job (0.1348).

H 7.2 Employees who feel that they must get the cooperation of computer specialists in order to get something done will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

This hypothesis is based on the argument that the role of computer specialists is critical to productivity improvement attributed to the use of computer technology (Lucas 1984). In Table 6-9, the result shows three inverse and very weak associations between the status of computer specialists and measures of operational performance. This result implies that the employees who perceive the need for cooperation of computer specialists to get their jobs done tend to believe that the use of computers does not contribute to the improvements in performance.

Exploration. Table 6-9 suggests several significant associations. According to the table, the employees who perceive that some of their decisions are currently made by computers tend to moderately perceive improvements in operational performance. Similar associations are between the current automation of decision making and individual measures of operational performance, ranging from 0.0818 to 0.1741.

On the other hand, Table 6-9 shows strong associations between interpersonal communications and operational performance. The table indicates that interpersonal communications seem to be a bit more strongly related to organizational performance than to personal performance. Specifically, interpersonal communications are strongly associated with service improvement (0.2684) and coordination of service delivery (0.2883).

There is also a significant association between employee perceptions of the smoothness of computer-related changes and each of the eight measures of operational performance. Perceived smoothness of technological changes is likely to affect both personal performance and organizational performance.

From the standpoint of operational performance, there is an interesting point. In the descriptive analysis of the percentage distribution, it is found that the employees' perceptions of utilizations of time freed by the use of computers are wide ranged. In Table 6-9, however, the time utilization variables -- more time spent with the clients and time to think -- show significant associations with several impacts on organizations. In particular, the employees who perceive that some of the decisions are being made or will be made by computers mention that they spend more time with the clients (0.1741 and 0.1671) and more time thinking about how they can do their job better (0.1442 and 0.1094).

Also the employees who perceive an improvement in interpersonal communications (0.1558 and 0.2484), who receive prior notification (0.1674 and 0.1348), and who say that computer-related changes occur smoothly (0.1631 and 0.2022) tend to mention that they spend free hours in contact with their clients and in thinking about how to do a better job.

Summary. It is found that the employees who perceive current automation of decision making, improvement in interpersonal communications, prior notification, and smoothness of computer-related changes tend to feel that greater improvements in operational performance have occurred. The employees who believe that some decisions are being made and will be made by computers tend to mention that they utilize some of their freed time in talking with clients and thinking about ways of doing a better job. Except for the status of computer specialists, all of the statistically significant associations between the impacts of computers and operational performance are congruent with the conceptual framework.

With respect to the relationships between perceived impacts of computers on individual employees and measures of operational performance, many significant associations appear in Table 6-10.

H 8.1 Employees who have more opportunity to use their knowledge and skills than before will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 8.2 Employees who believe that using computers will increase the need to use their present skills in the future will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

Both enskilling effects and future need for current skills were previously hypothesized to improve overall operational performance. Table 6-10 tends to confirm both hypotheses. Employees who perceive more opportunity to use knowledge and skills than before and who perceive the need for current skills in the future perceive improvement in most measures of operational performance.

Table 6-10. Associations Between Employees' Perceived Impacts of Computers on Individuals and Operational Performance.

	Enskilling Effect in Job	Need for Present Skills in Future	Need for New Skills	Career Opportunity Enhanced	Work Intensity Increased	Computer Anxiety Felt	Stress increased	Health Endangered	Physical Discomfort	Privacy Threat: Client	Privacy Threat: Employee
Cost Savings	0.1421 N(375) SIG .001	0.0947 N(373) SIG .019		0.1745 N(372) SIG .000		-0.1715 N(372) SIG .000	-0.0755 N(374) SIG .043	-0.1213 N(374) SIG .003	-0.1039 N(373) SIG .009		
Better Service		0.1992 N(375) SIG .000		0.2756 N(374) SIG .000		-0.1818 N(374) SIG .000		-0.1202 N(376) SIG .005	-0.1860 N(375) SIG .000		
Coordination of Service Delivery	0.1651 N(377) SIG .000	0.1071 N(375) SIG .010	0.1097 N(376) SIG .007	0.2922 N(374) SIG .000		-0.0873 N(374) SIG .030		-0.1370 N(376) SIG .001	-0.1162 N(375) SIG .005		
More Time Spent with Clients	0.1319 N(376) SIG .001			0.2248 N(374) SIG .000	-0.1185 N(375) SIG .004	-0.1077 N(373) SIG .009	-0.1503 N(375) SIG .000	-0.0972 N(375) SIG .014	-0.0762 N(374) SIG .041		
Increasd Work Speed	0.1309 N(376) SIG .002	0.1569 N(374) SIG .000	0.0761 N(375) SIG .048	0.3699 N(373) SIG .000		-0.2111 N(373) SIG .000	-0.0956 N(375) SIG .017	-0.1026 N(375) SIG .013	-0.1070 N(374) SIG .009	-0.0842 N(376) SIG .032	-0.1671 N(376) SIG .000
Accuracy	0.1111 N(376) SIG .006	0.1596 N(374) SIG .000	0.0953 N(375) SIG .018	0.3326 N(373) SIG .000		-0.1506 N(373) SIG .001	-0.0794 N(375) SIG .038	-0.1402 N(375) SIG .001	-0.1331 N(374) SIG .002		-0.1037 N(376) SIG .012
Sense of Accom-plishment	0.2129 N(374) SIG .000	0.1619 N(372) SIG .000	0.0784 N(373) SIG .039	0.1719 N(371) SIG .000	0.2165 N(373) SIG .000			-0.1536 N(373) SIG .000		-0.1272 N(374) SIG .002	-0.1866 N(374) SIG .000
Time to Think	0.1787 N(376) SIG .000	0.1199 N(374) SIG .004	0.0744 N(375) SIG .046	0.3096 N(373) SIG .000		-0.1444 N(373) SIG .001	-0.0920 N(375) SIG .018	-0.1304 N(375) SIG .002	-0.0961 N(374) SIG .014		

H 8.3 Employees who believe that computers give them more opportunity to get ahead in their career will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

Table 6-10 shows strong associations between employees' positive perceptions of career opportunity and operational performance. Furthermore, the table suggests that enhanced career opportunity is more strongly related to personal performance than to organizational performance, but that it is closely associated with both categories of operational performance.

H 8.4 Employees who believe that using computers increases work intensity will be less likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

Table 6-10 indicates that increased work intensity is significantly related to two measures of operational performance: time spent with the clients and sense of accomplishment. Hence, the more workload the employees have, the less time they spend with clients (-0.1185). As their workload increases, on the other hand, employees are likely to have high sense of accomplishment with the use of computers (0.2165). In retrospect, Hypothesis 8.4 above is too simplistically general. The specific associations that were found are congruent with the conceptual framework.

H 8.5 Employees who feel computer anxiety will be less likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

Table 6-10 confirms this hypothesis with inverse associations between computer anxiety and most measures of operational performance. In particular, an inverse relationship between computer anxiety and work speed (-0.2111) implies that the more computer anxiety employees have the less likely their work speed is to increase.

H 8.6 Employees who feel that the use of computers has placed more stress upon them will be less likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

Table 6-10 shows weak but consistently inverse associations between stress and operational performance (-0.0792). It is interesting that employees with high stress spend less time with the clients (-0.1503).

H 8.7 Employees who believe that using computers has endangered their health will be less likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 8.8 Employees who believe that using computers has caused them physical discomfort will be less likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

As indicated in Table 6-10, there are consistent patterns of significant inverse associations between these two pairs of variables.

H 8.9 Employees who feel that computers have threatened the client's privacy will be less likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 8.10 Employees who feel that computers have threatened the employees' own privacy will be less likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

Table 6-10 shows no significant association between privacy threats, whether to the client or to the employee, and organizational performance. On the other hand, both privacy threats to the client and to the employees have significant associations with personal performance. Interestingly, if the employees perceive a threat to their own privacy, they are less likely to have experienced an increase in their work speed (-0.1671), accuracy (-0.1037), or sense of accomplishment (-0.1866) in doing their work.

Summary. As shown in Table 6-10, most of the perceived impacts of computers on individual employees are significantly related to operational performance. The employees' perceptions of the increased opportunity to use skills and the need for present skills in future are moderately associated with operational performance. The perceptions of enhanced career opportunity are strongly related to personal performance. The undesirable effects of computers on humans, such as computer anxiety, stress, physical discomfort (including health problems) and privacy threats, appear negatively related to operational performance. These findings are fully consistent with the conceptual framework.

With respect to the associations between employees' preferred policies for computer use and overall operational performance, Table 6-11 summarizes the results of the analysis.

H 9.1 Employees who believe that professionals should use computers to do some clerical work will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

Table 6-11 shows a consistent pattern of moderate association between these pairs of variables.

H 9.2 Employees who have favorable attitudes toward the use of electronic work monitoring systems will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

Table 6-11 also shows a consistent pattern of moderate associations between these pairs of variables.

Exploration. The employees who desire to be notified

Table 6-11. Associations Between Employees' Preferred Policies for Computer Use and Operational Performance

	Changing Role of Profes.	Electronic Work Monitoring	Employee Involve-ment Desired	Prior Notice Desired
Cost Savings	0.1562 N(374) SIG .000	0.1705 N(375) SIG .000	0.0831 N(375) SIG .032	0.1686 N(375) SIG .000
Better Service	0.1424 N(376) SIG .001	0.1158 N(377) SIG .005		0.3274 N(377) SIG .000
Coordination of Service Delivery	0.0960 N(376) SIG .016	0.1091 N(377) SIG .007		0.1636 N(377) SIG .000
More Time Spent with Clients	0.1432 N(375) SIG .001	0.0724 N(376) SIG .048		0.0836 N(376) SIG .037
Increasd Work Speed	0.1466 N(375) SIG .001			0.2081 N(376) SIG .000
Accuracy	0.1827 N(375) SIG .001	0.1028 N(376) SIG .011		0.2061 N(376) SIG .000
Sense of Accom-plishment				
Time to Think	0.1947 N(375) SIG .000	0.1020 N(376) SIG .010		0.0989 N(376) SIG .017

in advance about technological changes tend to be persons who perceive numerous improvements in operational performance. There is a strong association between the desire to be notified about technological changes and perceptions of improved services (0.3274).

Summary. Table 6-11 shows consistent patterns of association between two sets of variables. It is hard, however, to draw causal inferences about these sets of associations. What can be speculated within this table is that perceptions of improvements in operational performance may affect attitudes related to the use of computers. Employees who believe that using computers improves operational performance are more likely to say that professionals should do some clerical work with the use of computers, that computers should be used to monitor how well employees do their jobs, and that the earliest possible notice about technological changes should be given to employees.

Impacts of Computers-Computer Learning Associations

In Chapter Three, no hypothesis was developed about the associations between the impacts of computers on organizations and the employees' propensity to learn about computers. Therefore, an exploration will be made from the results presented in Table 6-12.

Exploration. According to Table 6-12, some of the

Table 6-12. Associations Between Employees' Perceived Impacts of Computers on Organizations and Computer Learning

	Job Loss: Future	Job Loss: Past	Automated Dec Making: Current	Automated Dec Making: Future	Inter-personal Communi-cations	Power Reinforce-ment	Prior Notice Given	Status of Computer Specialists	Smoothness of Change
Formal Training	0.1424 N(375) SIG .001	0.0785 N(375) SIG .039		0.1212 N(373) SIG .003	0.0963 N(374) SIG .014		0.3319 N(375) SIG .000	-0.1473 N(374) SIG .000	0.2048 N(374) SIG .000
Informal Conversa-tion									0.1074 N(374) SIG .009
Self-Teaching on the Job	0.0940 N(374) SIG .020								
Off-the-Job Learning								0.1001 N(374) SIG .011	

impacts on organizations are significantly associated with the propensity to use formal training to learn how to use computers. There appears to be a minimal relationship, at best, with learning through informal and off the job methods. Interestingly, it is found that the employees who perceive the future impacts of computers tend to be positive in computer learning. The employees who positively perceive the possibility of job loss in the future (0.1424) and the automation of some decision making in the future (0.1212) are more likely to use formal training in particular. Also, the table shows that the employees who perceive that they are notified in advance about technological changes (0.3319), and who say that computer-related changes go smoothly in their agencies (0.2048), are more likely to learn through formal training.

Summary. Some of the organizational impacts are significantly associated with the propensity to learn how to use computers. The employees who receive prior notice about technological changes and who say that change goes smoothly in their agencies tend to be positively involved in computer learning activities, particularly in formal training that is provided by the employer. Interestingly, it is found that as the employees perceive the future impacts of computers, they are positive to the learning about computers.

With respect to the associations between the impacts of computers on individuals employees and their overall propensity to learn about computers, Table 6-13 summarizes the results.

H 10.1 Employees who believe that their jobs are being enskilled will have a strong propensity to learn how to use computers.

H 10.2 Employees who believe that there will be a need for their present skills as much in the future will have a weak propensity to learn how to use computers.

More specifically, Table 6-13 indicates the employees who perceive that they have developed new skills and knowledge are more likely to feel that people learn the use of computers through formal training provided by the employer (0.2039) as well as through off-the-job learning (0.0730). Persons who feel that they will be able to continue to use their present skills are slightly more likely to emphasize the importance of self teaching on the job.

H 10.3 Employees who feel computer anxiety will have a weak propensity to learn how to use computers.

H 10.4 Employees who feel that using computers has placed more stress upon them will have a weak propensity to learn how to use computers.

Table 6-13 shows one weak association with respect to

Table 6-13. Associations Between Employees' Perceived Impacts of Computers on Individuals and Computer Learning

	Enskilling Effect in Job	Need for Present Skills in Future	Need for New Skills	Career Opportunity Enhanced	Work Intensity Increased	Computer Anxiety Felt	Stress increased	Health Endangered	Physical Discomfort	Privacy Threat: Client	Privacy Threat: Employee
Formal Training	0.2039 N(375) SIG .000		0.1155 N(375) SIG .004	0.0805 N(374) SIG .032		0.0860 N(374) SIG .028					
Informal Conversa-tion			0.0802 N(375) SIG .039								
Self-Teaching on the Job		0.1196 N(373) SIG .005	0.1411 N(374) SIG .001	0.1319 N(373) SIG .002	0.0825 N(373) SIG .034			-0.0874 N(373) SIG .028			
Off-the-Job Learning	0.0730 N(375) SIG .044									0.0973 N(375) SIG .013	0.1490 N(375) SIG .000

formal training and computer anxiety but enhancement of stress from computers is not likely to induce greater learning activity.

Exploration. Table 6-13 indicates that the employees' perceived need for development of new skills is associated with the propensity to learn how to use computers through three OJT learning methods, even though their associations are not strong. The employees who feel a need for development of new skills indicate that employees simultaneously rely on several methods available to them on the job (0.1155 for formal training , 0.0802 for information conversation, and 0.1411 for self-teaching). On the other hand, it is interesting that the employees who perceive that their own privacy (0.1490) as well as the client's (0.0973) are being threatened by computers say that people learn about computers off the job.

With respect to the associations between employees' preferred policies for computer use and overall propensity to learn computers, Table 6-14 shows several statistically significant associations. The pattern here is weak and any substantive implications seem elusive.

Summary. The employees who perceive more opportunity to use their skills and knowledge are positive toward learning about the use of computers, especially through formal training. The employees who perceive the need to develop new skills to do their jobs tend to rely on three

Table 6-14. Associations Between Employees' Preferred Policies for Computer Use and Computer Learning

	Changing Role of Profes.	Electronic Work Monitoring	Employee Involve-ment Desired	Prior Notice Desired
Formal Training				
Informal Conversa-tion	0.1746 N(374) SIG .000			0.0940 N(375) SIG .026
Self-Teaching on the Job	0.0853 N(373) SIG .029	0.0851 N(374) SIG .028		
Off-the-Job Learning	0.0954 N(374) SIG .014	0.0995 N(375) SIG .011		

learning methods available on the job.

Computer Learning-Computer Use Associations

Table 6-15 shows the associations between individual measures of computer learning and computer use.

H 11.1 Employees who have a stronger propensity to learn how to use computers will make more intensive use of them in each of the nine categories of computer applications.

There appears a significant but weak association between computer learning and computer use. A first glance at Table 6-15 shows that employees who perceive that people around their agencies learn about computers through self-teaching on the job tend to make more intensive use of computers. The more intensively an employee makes use of computers, the more reliance is placed on the self-teaching method. In particular, Table 6-15 shows that the employees who perceive that people learn computers through the self-teaching method tend to use computers for word processing (0.1288), accounting or statistical analysis (0.1632), and projections or forecasting (0.1270).

As might be expected, the employees who use computers at home learn something about computers through off-the-job learning (0.2215). Also there is a tendency that the learning through informal conversation is associated with the use of computers for word processing (0.1403), while

Table 6-15. Associations Between Computer Learning and Computer Use

	Formal Training	Informal Coversa-tion	Self-Teaching On the Job	Off-the-Job Learning
Put data into Computer			0.1176 N(373) SIG .005	
Get data from Computer				
Prepare Letter, Memo, etc.	0.0779 N(373) SIG .036	0.1403 N(373) SIG .001	0.1288 N(372) SIG .002	
Accounting Statistical Analysis			0.1632 N(372) SIG .000	0.1469 N(373) SIG .000
Projections Forecasting			0.1270 N(371) SIG .003	
Graphic Displays			0.0782 N(372) SIG .050	
Electronic Mail			0.0933 N(372) SIG .024	
Application Development		0.1150 N(372) SIG .006	0.1107 N(371) SIG .008	0.1087 N(372) SIG .007
Computer Use at Home		0.1094 N(373) SIG .009	0.0997 N(372) SIG .015	0.2215 N(373) SIG .000

off-the-job learning is related to the analysis-oriented applications such as accounting and statistical analysis (0.1469).

Summary. Overall, the propensity to learn about computers seems to be weakly associated with the intensity of computer use. Also it is found that the employees who rely on the self-teaching method to learn computers tend to make more intensive use of computers.

Computer Use-Operational Performance Associations

Table 6-16 presents the associations between the intensity of computer use in several applications and the individual measures of operational performance.

H 12.1 Employees who make more intensive use in each of the nine categories of computer applications will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

There appears to be a strong association between computer use and operational performance. In Table 6-16, it is found that persons who are engaged in simple data processing applications such as putting data into a computer and getting data from a computer are those who are most likely to indicate that computers make contributions to improvement in operational performance. Strong associations exist between some of the pairs of variables.

Table 6-16. Associations Between Intensity of Computer Use in Various Applications and Selected Measures of Operational Performance

	Put Data into Computer	Get Data from Computer	Prepare Letter, Memo, etc.	Accounting Statistical Analysis	Projections Forecasting	Graphic Displays	Electronic Mail	Application Development	Computer Use at Home
Cost Savings	0.1721 N(374) SIG .000	0.1929 N(373) SIG .000	0.1266 N(373) SIG .002	0.1419 N(373) SIG .001	0.0981 N(372) SIG .016	0.0784 N(373) SIG .047	0.1696 N(373) SIG .000	0.1484 N(372) SIG .000	0.1506 N(373) SIG .000
Better Service	0.1260 N(376) SIG .003	0.1143 N(375) SIG .007					0.1240 N(375) SIG .005	0.0880 N(374) SIG .029	0.1180 N(375) SIG .006
Coordination of Service Delivery	0.1850 N(376) SIG .000	0.2103 N(375) SIG .000	0.1173 N(375) SIG .004	0.0868 N(375) SIG .025	0.0982 N(374) SIG .016		0.1869 N(375) SIG .000	0.1702 N(374) SIG .000	
More Time Spent with Clients	0.1277 N(375) SIG .002	0.2283 N(374) SIG .000							
Increased Work Speed	0.3265 N(376) SIG .000	0.2707 N(375) SIG .000	0.1432 N(375) SIG .001	0.1692 N(375) SIG .000	0.2208 N(374) SIG .000	0.1394 N(375) SIG .002	0.0984 N(375) SIG .019	0.1645 N(374) SIG .000	0.1811 N(375) SIG .000
Accuracy	0.3008 N(376) SIG .000	0.1927 N(375) SIG .000	0.1906 N(375) SIG .000	0.1596 N(375) SIG .000	0.2018 N(374) SIG .000	0.1278 N(375) SIG .004	0.1180 N(375) SIG .006	0.1821 N(374) SIG .000	0.1821 N(375) SIG .000
Sense of Accomplish-ment	0.1668 N(373) SIG .000	0.1196 N(372) SIG .004	0.1888 N(372) SIG .000	0.1626 N(372) SIG .000	0.2248 N(371) SIG .000	0.1279 N(372) SIG .003	0.0940 N(372) SIG .021	0.1653 N(371) SIG .000	0.1996 N(372) SIG .000
Time to Think	0.2232 N(375) SIG .000	0.2353 N(374) SIG .000	0.1948 N(374) SIG .000	0.1441 N(374) SIG .000	0.1266 N(373) SIG .000	0.1726 N(374) SIG .000		0.2447 N(373) SIG .000	0.1415 N(374) SIG .001

Employees who often put data into a computer are more likely to indicate that computers increase work speed (0.3265), increase accuracy (0.3008), and allow them to think more about how to do a better job (0.2232). Employees who often get data from a computer are more likely to feel that computers save costs (0.1929), facilitate the coordination of service delivery (0.2103), allow them to spend more time with the clients (0.2283), increase work speed (0.2707), increase accuracy (0.1927), and enable them to think more about how to do a better job (0.2353).

Table 6-16 suggests that word processing (prepare letter, memo, etc.) and learning oriented applications (accounting and statistical analysis, projections and forecasts, and graphic displays) do contribute to improvements in operational performance but not so much as do data processing applications. Specifically, word processing enables employees to do their jobs with fewer errors (accuracy, 0.1906), increases a sense of accomplishment (0.1888), and allows them to think more about how to do a better job (0.1948). In particular, employees who often use computers to develop some projections and forecasts are more likely to believe that computers increase work speed (0.2208), accuracy (0.2018), and a sense of accomplishment (0.2248).

Overall, employees who often send messages electronically to other people (electronic mail), work on better ways to use computers on the job (application development), and use a computer at their home, perceive improvements in operational performance. According to Table 6-16, electronic mail seems to be more related to organizational performance than personal performance. Employees who send messages through electronic channels are more likely to feel that computers facilitate the coordination of service delivery (0.1869). Employees who work on better ways to use computers on the job tend to believe that computers have enabled them to spend more time thinking about how to do a better job (0.2447). Employees who use a computer at their home are more likely to believe that computers increase work speed (0.1811), accuracy (0.1821), and a sense of accomplishment (0.1996).

Table 6-16 presents some other interesting points. First, in Table 5-1 of Chapter Five, a large proportion of the employees (88.8%) were found to believe that management is motivated to use computers in order to improve the quality of services. Table 6-16 shows, however, that employees who are engaged in some categories of computer applications (for example, putting data into a computer and electronic mail) are only modestly or weakly likely to feel that computers help them to serve the public better. Word processing and learning oriented applications seem not to have statistically significant associations with improvements in the quality of services. Employees who make intensive use in the seven categories of the applications, with the exception of graphic displays and computer use at home, are likely to feel that using computers helps to better coordinate the delivery of services (ranging from 0.0868 to 0.2103).

Second, in Table 6-16 it is found that the use of computers in each of the applications is more likely to be associated with personal performance than organizational performance. A possible reason for this may be that improvements in personal performance are more conspicuous to employees than those related to organizational performance. The associations with some measures of personal performance tended to be stronger and more significant.

Summary. Overall, the intensity of computer use is positively associated with improvements in operational performance. Simple data processing applications are perceived as being more related to improvements in operational performance than are advanced learning oriented applications. The use of computers seems to be more related to perceptions of personal performance than to organizational performance. Some types of computer applications are not significantly related to every measure of organizational performance. All of the computer applications, however, are found to be significantly associated with several measures of operational performance, such as cost savings, increase in work speed, accuracy, and sense of accomplishment. These findings are consistent with the conceptual framework.

Figure 6-1 summarizes the results of bivariate analysis of associations which has been discussed above. Providing information about the number and direction of statistically significant associations, the figure shows the overall patterns of association between categories of variables. For example, the proportion of significant associations of all possible associations between intensity of computer use in several applications and measures of operational performance is large, and all significant associations are positive. These findings imply that these two sets of variables have significantly positive relationships.

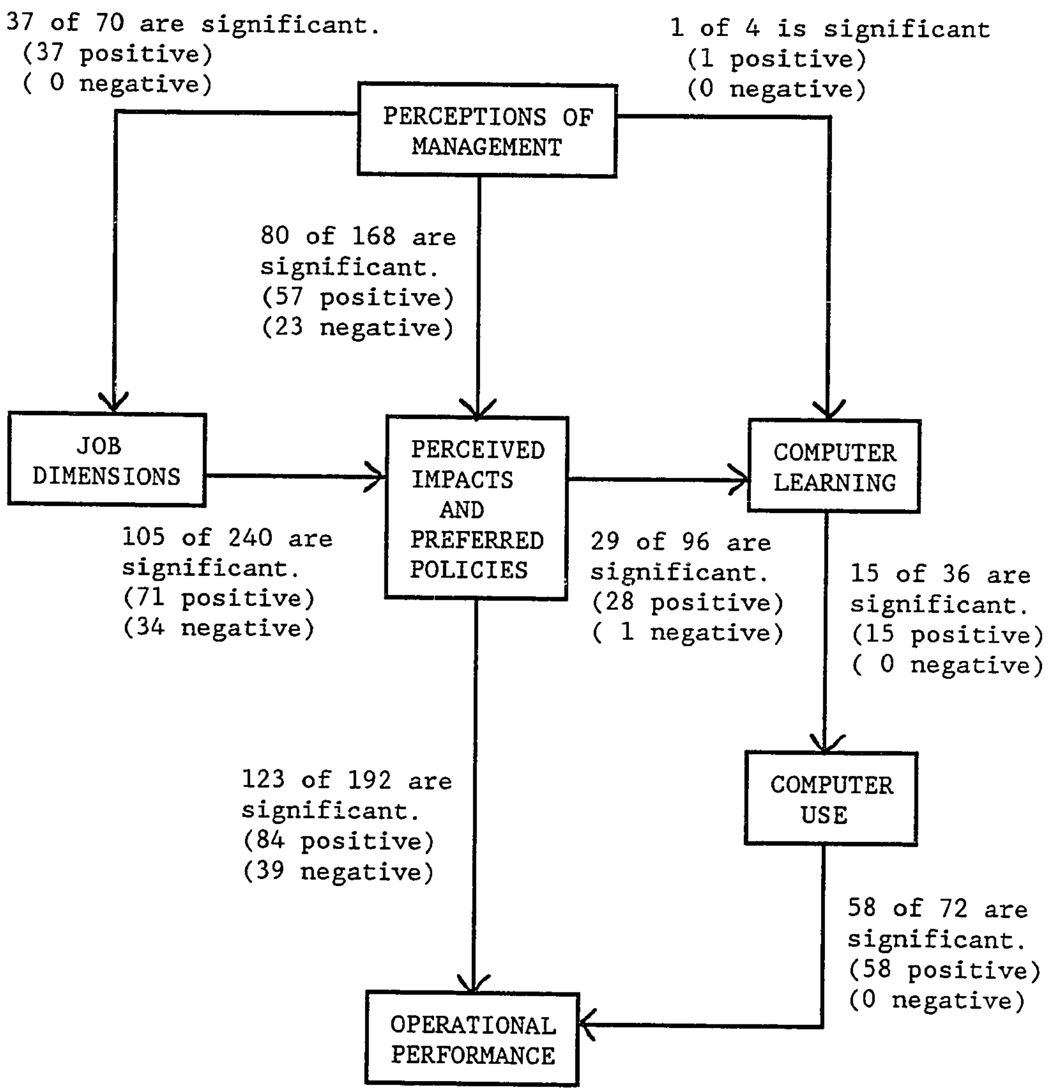

Figure 6-1. Number and Direction of Significant Associations Between Categories of Variables

CHAPTER SEVEN

SUMMARY OF FINDINGS, POLICY IMPLICATIONS AND FURTHER RESEARCH

The purpose of this study is to identify the perceptions and attitudes that state employees have toward the variables related to the use and impact of computers and to explore patterns of association between the variables. Based on an overall review of the literature, numerous organizational variables related to the use and impact of computers were identified in Chapter Two. A conceptual framework was developed in Chapter Three to explore the patterns of association between pairs of the variables. The conceptual framework includes the following sets of variables identified for bivariate analysis: managerial motivations and attitudes toward the use of computers, job dimensions, perceived impacts of computers and preferred policies for computer use, computer learning, intensity of computer use, and operational performance. In developing the framework, a primary focus was given to selected measures of operational performance.

Seven state finance-related agencies in Florida were selected as the organizational setting for this study. Having diverse types and degrees of computer applications, including some of the most advanced computer applications in state government, these agencies were expected to show a wide range of impacts. No previous study has focused on employee perceptions and attitudes related to the use of computers in public financial organizations. Data were collected through a survey which used an existing questionnaire. Two levels of analysis were conducted to examine the collected data. The results of univariate analysis of employee perceptions and attitudes toward computer uses and impacts were reported in Chapter Five. The results of bivariate analysis of associations between pairs of variables related to the use and impact of computers were discussed in Chapter Six. To conclude the present study, this chapter will briefly summarize its major findings. The implications of these findings for policy makers and researchers will be discussed, and some recommendations to make better use of computers will be made. Some suggestions for further research will be also provided.

Summary of Findings

Employee Perceptions and Attitudes. With respect to the perceptions and attitudes that employees have toward the variables which are related to the use and impact of computers, this study revealed numerous interesting findings. One of the most important findings is that the respondents perceive various managerial motivations (service improvement, better work environment, better control, and cost reduction) to exist at the same time. In particular, managerial motivations with different orientations -- employee-oriented (better work environment) and task/control oriented (better control) -- are believed to coexist.

In regard to employee perceptions of their own jobs, most of the respondents tend to believe that they use a variety of skills, do complete tasks, do work which significantly affects others, have job autonomy, and know well as to whether they are doing a good job. Many of the respondents also think of themselves as a team, and most of them are satisfied with their own jobs.

The results of this study show that employees do have a variety of perceptions related to the impacts of computers on organizations and individuals, as well as some strong attitudes about preferred policies for computer use. Substantial agreement exists among respondents about some impacts, but a range of opinion emerges with respect to other impacts. Some of the important findings are as follows. Many of the respondents suspect that past job loss has occurred and that future job loss attributable to the use of computers is possible in their agencies. There is a tendency for the lower level employees to be more concerned about the possibility of job loss in the future. Most of the respondents do not anticipate a tendency toward computerized decision making, but the result shows that about a fourth of them said that some of the decisions that were formerly made by humans are now being made by computers. Interestingly, the possibility that additional decisions will be made by computers in the future is more discounted than the degree to which decisions have already been computerized. The respondents have diverse perceptions as to whether they are notified in advance about technological changes, but a great majority said that they should be so notified.

With respect to the skill impacts of computers, enskilling effects are consistently perceived. Employees now have more opportunity to use knowledge, skills, and abilities than before. They expect that their present skills will be needed in the future and that they need to develop new skills to carry out their jobs. Computers are viewed as helpful in enhancing their career opportunity. Contrary to the assertions in the previous literature, the undesirable effects of computers on humans are not so negatively perceived as has been speculated and found. Computer use is not a primary cause of anxiety, physical discomfort, or health problems. Only a small proportion of the respondents indicate that computers make them nervous (anxiety). Perceptions differ widely with respect to work intensity and mental stress. It is important to note, however, that about a fifth of the respondents feel that they have been mentally stressed by the use of computers in their work places. Most respondents report no health problems and physical discomfort. It is noteworthy that a fifth of the respondents have experienced physical discomfort in working with a computer. Employees' own privacy is perceived to be less affected by the use of computers than client privacy. More of the respondents who come into contact with the public tend to feel a threat to client privacy than do those with no public contact.

Half of the respondents say that professionals should use computers to do some clerical work such as drafting correspondence and filing. Opinions differ as to whether the employer should use computers to monitor how well an employee is doing his or her job. It is interesting that employees whose performance is being electronically monitored tend to have more favorable attitudes toward computerized work monitoring.

This study is the first to survey the patterns of learning about computers in state finance-related agencies. Learning about computers through informal conversation with other employees who know more about computers is the prevalent mode of learning. Self-teaching on the job follows closely behind the use of informal conversation. Off-the-job learning is used much less but is apparently as important as is formal training provided by the employer.

Most of the respondents reveal that they are engaged in basic data processing applications. Considerable proportions of them are using computers for word processing and accounting or statistical analysis. Only moderate proportions of the respondents are engaged in more sophisticated applications such as projections and graphic displays.

Most selected measures of operational performance are perceived as improved due to the use of computers. Much uncertainty exists regarding the utilization of time freed by the use of computers. Freed time is not necessarily devoted to clients nor to thinking about doing work better.

Patterns of Association. With respect to patterns of association between pairs of variables related to the use of computers, almost all statistically significant findings are consistent with the conceptual framework outlined in Figure 3-1. A few of the hypotheses were not confirmed as expected, but even these unexpected findings are not necessarily incongruent with the conceptual framework. A primary concern of the conceptual framework is to guide the exploration for associations between pairs of variables. It does not necessarily indicate whether the associations are likely to be positive or negative, but whether associations might exist at all. The direction of the associations with respect to some of the pairs of variables is secondary to discovering whether associations exist in either direction.

In this study, it was found that the perceptions of managerial motivations and attitudes toward the use of computer technology are associated with employees' job dimensions. Employee-oriented motivations (i.e. better work environment) and attitudes (i.e. management's receptiveness to employee input) are more likely to be related to the presence of such job dimensions as skill variety. Task- and control-oriented motivations and attitudes are less likely to be related to the job dimensions. Respondents who said that their employers held employee-oriented motivations are more likely to be satisfied with their own jobs and be optimistic about the chances for advancement in their agencies. Employees who believe that management is receptive to employee input strongly think of themselves as part of a team.

A moderate or strong association is found between some pairs of variables which respectively are derived from managerial motivations and attitudes toward the use of computers and perceived impacts of computers and preferred policies for computer use. These associations are also congruent with the conceptual framework. When managers are motivated to use computers to improve the quality of services, using computers is not expected to cause decreases in the number of employees. The use of computers to provide a better work environment is strongly related to improvements in interpersonal communications, the provision of prior notice about technological changes, and perceived smoothness of computer-related changes. When managers use computers to increase control, employees tend to feel that some of their decisions are being made, and will be made even more in the future, by computers. Where managers are receptive to employee input, employees are more likely to say that they are notified in advance about technological changes.

Employees who believe that managers are motivated to use computers to improve the quality of services and to provide a better work environment are more likely to feel enskilling effects -- more opportunity to use knowledge and skills than before, need for present skills in the future, and need to develop new skills. Also, they feel that computers provide more opportunity to get ahead in their career and feel less presence of the undesirable effects of computers on humans (anxiety, stress, physical discomfort, and privacy threats). When managers are receptive to employee input, employees perceive enskilling effects and less threats to privacy. When managers expect to see more reports with the use of computers, employees tend to experience increases in workload and stress.

It is found that employees who believe that management is receptive to OJT learning are more likely to learn about computers through formal training provided by the employer. The implications of this paradox will be discussed below.

Several consistent associations are found between some of the job dimensions and employee perceptions as to whether prior notice is given about technological changes and as to whether changes go smoothly. Those who think of themselves as a team, those who are satisfied with their jobs, and those who are optimistic about their chances for advancement in their agencies are more likely to say that they are notified about changes as early as possible and that the changes are implemented smoothly.

It is found that employees who have positive perceptions of their jobs tend to feel that computers enskill their jobs. They feel that they now have more opportunity to use their knowledge and skills than before, that their present skills will be needed in the future, and that new skills will need to be developed to carry out their jobs. Also, employees who have positive perceptions of their jobs tend not to experience or expect some of the undesirable effects of computers on humans, such as anxiety, stress, health problems, and privacy threats.

Some of the organizational impacts of computers are associated with operational performance. Employees who believe that computers currently make some decisions for users and that computers improve interpersonal communications, as well as employees who believe that they are notified about technological changes as early as possible and that changes go smoothly, tend to feel that great improvements in most measures of operational performance have occurred. Interestingly, employees who believe that computers currently make some decisions and will make more decisions in the future tend to mention that they utilize some of their freed time in talking with clients. They also indicate that they have more time to think about ways of doing a better job. Several impacts of computers on individual employees are also significantly related to measures of operational performance. In particular, employees who believe that computers give them an opportunity to get ahead in their career strongly feel that computers improve operational performance. Undesirable effects of computers on humans appear to be negatively related to measures of operational performance. Employees who believe that using computers improves operational performance are more likely to say that professionals should do some clerical work with the use of computers, that computers should be used to monitor how well employees do their jobs, and that the earliest possible notice about technological changes should be given to employees.

Employees who say that they receive early notice about technological changes and who say that changes go smoothly in their agencies tend to be positively involved in computer learning activities, especially formal training provided by the employer. Employees who believe that they have more opportunity to use their knowledge and skills than before are positive toward learning about computers through formal training. Those who feel that new skills need to be developed to carry out their jobs tend to rely on three learning methods available on the job (formal training, informal conversation, and self-teaching).

The result of this study shows that a propensity to learn about computers is weakly associated with the intensity of computer use. When employees have a strong propensity to learn how to use computers, they tend to be those who use computers for advanced applications, such as word processing, accounting or statistical analysis, applications development and computer use at home. Employees who rely on self-teaching to learn about computers are more likely to make intensive use of computers in most applications.

Overall, the use of computers is found to be positively associated with operational performance. Basic simple data processing applications are more related to perceived improvements in operational performance than are advanced learning oriented applications. The use of computers seems to be more related to perceptions of personal performance than to those of organizational performance. Interestingly, it is found that some computer applications are not significantly related to every measure of operational performance. Each of the computer applications, however, was found to be significantly associated with several measures of operational performance, such as cost savings, increase in work speed, accuracy, and sense of accomplishment.

Policy Implications and Recommendations

Multidimensionality of Managerial Motivation. Computer technology is a tool which can be used to further the aspirations of its users. In many ways, the technology is neutral and its malleability offers opportunities for users to further a wide variety of aspirations. Much of the previous literature which was reviewed in Chapter Two has assumed a unidimensionality toward managerial motivations for the implementation of computer technology. For example, some researchers assert that computers are introduced either to reduce operating costs or to improve the quality of employees' work life, but not both. The assumption of a unidimensionality in managerial motivation has led researchers to hypothesize simplistic associations between managerial actions and other organizational aspects related to the use of computers.

Results of this study show, however, that several managerial motivations for computer use can exist simultaneously. The management of these financial agencies is apparently motivated to use computers to hold down increase in costs <u>and</u> improve the quality of services, to provide employees with a better work environment <u>and</u> increase control. In particular, two motivations with different orientations (better work environment and increase in control) are found to coexist.

The employee oriented motivations were found to have a strong relationship with positive employee perceptions of their own job characteristics. Both types of motivations (employee oriented and task/control oriented), however, are significantly related to the perceptions of impacts of computers on organizations and individuals. For example, each of the four questionnaire items related to managerial motivations was found to be positively related to improvements in interpersonal communications due to the use of computers. Computers are found to improve the quality of interpersonal communications when management uses them to improve the quality of services and the quality of employees' work environment. It is also found that computers improve the quality of interpersonal communications when management uses them to reduce costs and to increase control. If a researcher approaches managerial motivation for computer use from a unidimensional perspective, he or she may develop simplistic hypotheses: i.e. that if management wants to use computers to increase control, the resulting centralization would interfere with the quality of interpersonal communications. Results of this study indicate, however, that future research needs to avoid developing simplistic hypotheses about associations between managerial motivations and organizational impacts of computers.

On the other hand, with respect to the impacts of computers on individual employees, distinctions were found between employee oriented motivations and task/control oriented motivations. The employee oriented motivations are significantly associated with most of the impacts on employees, while the task/control oriented ones have significant relationships to only a few impacts on employees. It is recommended, therefore, that the impacts of computers on agencies need to be considered within the context of the differences in managerial motivations for the adoption and use of the new technology. It should be noted, however, that as long as multidimensional motivations exist for computer use, it is very difficult, in some cases, to distinguish which managerial motivations have or do not have significant associations with the impacts of computers on organizations and individuals.

Multiple Approaches to Computer Learning. Results of this study show that the employees have a strong propensity to learn about the use of computers. More importantly, it was found that the respondents simultaneously rely on several learning methods in order to acquire their computer knowledge -- methods such as formal training, informal conversation, self-teaching, and off- the-job learning. Employees' reliance on on-the-job (OJT) learning activities such as informal conversation and self-teaching was found to be particularly prevalent. It was also found that there is a positive association between self-teaching and the intensity of computer use.

With respect to managerial attitudes toward employees' learning about computers, it might be expected that where managers are not receptive to OJT learning, employees may feel restrictions in learning about computer applications during their regular work hours. Results of bivariate analysis in this study show, however, that there is little association between managerial receptiveness to OJT learning and each of the prevalent modes of OJT computer learning (informal conversation and self-teaching). Rather, formal training that is provided by the employer was found to be significantly related to the managerial receptiveness to OJT learning. This paradoxical finding is not necessarily incongruent with the conceptual framework outlined in Figure 3-1. Formal training is the only learning method under the control of management. The employees who believe that management is receptive to OJT learning think that people in their agencies learn about computers through formal training provided by their employer. The other three methods of learning -- informal conversation, self-teaching, and off-the-job learning --

are learning methods which are initiated by individuals and are apparently independent of management's receptiveness.

Furthermore, results of bivariate analysis show that formal training is significantly related to other impact variables. Among the impact variables related to formal training include enskilling effects in the job, prior notice of technological changes, and smoothness of the changes. The significant associations between these pairs of variables imply that formal training can be used a policy instrument to affect employee perceptions and attitudes related to some impacts of computers. For example, results of this study show a positive association between prior notification given to employees about technological changes and the propensity to learn about the use of computers through formal training. The association between this pair of variables implies that as employees are involved in formal training, their perceptions as to whether they are notified about technological changes as early as possible may be altered. Management can, therefore, utilize formal training programs in order to affect employee perceptions and attitudes toward the implementation of computer technology within agencies as well as to enhance employee understanding of computer applications.

In summary, it is recommended that management create an organizational atmosphere in which informal OJT learning methods (informal conversation and self-teaching) are explicitly or implicitly supported because these methods are significantly associated with the intensity of wide ranged computer applications. For example, what management can do to support the self-teaching method is to provide employees with more user-friendly manuals for software or precise written instructions that are indispensable for users who learn about the use of computers by themselves. Above all, management can see to it that employees are allowed to spend the time that is necessary on the job to accomplish learning. At the same time, management can utilize the provision of adequate formal training programs as a managerial strategy which is intended to not only improve employees' knowledge about the use of computers but also to affect employee perceptions and attitudes related to the use of computers. As a consequence, managers need to allow employees to learn about computers in multiple ways -- OJT learning activities as well as formal training. Different types of computer applications may require different patterns of computer learning. As this study found, formal training is effective for simple data processing applications, while self-teaching at a computer is more frequently used for advanced applications such as projections and statistical analysis. It is important, therefore, that managers maintain balance among several ways of computer learning so that employees can simultaneously use multiple ways of learning about computers.

<u>Advance Notice of Technological Changes</u>. The literature review in Chapter Two indicated that involving users in decision making about computer applications has positive effects on the use of computers (See page 26-27 for expected positive effects of user involvement). Advance notice of some changes in the use of computers is regarded as a type of user involvement whose level is very low (Ives and Olson 1984).

Results of this study show that employee perceptions widely differ as to whether they are notified as early as possible about technological changes in their agencies. It was found, at the same time, that most of the respondents strongly indicate that they should have a say in the making of decisions about the use of computers and should be given the earliest possible notice of changes that might affect their jobs. This gap between employee perceptions as to whether prior notice is given and employee desires to be involved in decisions about computer applications implies that employees in the Florida state financial agencies are not as involved in system development and implementation as they desire to be.

Results of bivariate analysis in the present study indicate a positive relationship between prior notice and operational performance. The employees who believe that they are notified about technological changes as early as possible are more likely to indicate that using computers saves costs, facilitates the coordination of service delivery, allows them to spend more time with the clients, increases their sense of accomplishment, and allows them to think more about how to do a better job. It is recommended, therefore, that management notify employees in advance about technological changes, not only because employees strongly want to be notified as early as possible, but also because prior notification is related to improvements in operational performance. Managers have introduced computer technology to improve operational performance; they also should notify employees in advance about new uses of computers for the same purpose.

Results of this study suggest, furthermore, that prior notice is closely related to management's general receptiveness to employee input. With respect to user involvement related to the use of computers, it seems to be very important that managers have employee oriented attitudes. Such attitudes seem to encourage greater user involvement in computer applications. It appears that such user involvement ultimately results in improvements in operational performance.

Noteworthy Impacts Perceived by a Minority of Respondents. With respect to the impacts of computers on organizations and individuals, results of this study show that a majority of respondents agree about many impacts. With respect to some impacts, however, only a minority of the respondents believe that the impacts have appeared in their agencies. In some instances, these minority responses are of importance for both theory and practice. Among the variables which fall in this category of impacts are the current automation in the making of some decisions, mental stress, physical discomfort, threat to the privacy of the client, and the use of computers to monitor how well employees are doing their jobs.

For example, much of the prior research concluded that computers had negative effects on individual employees by causing anxiety, mental stress, health problems, physical discomfort, and privacy threats. Results of this study show that the effects of computers on employees are not perceived so negatively by most employees in the Florida state financial agencies. However, a minority do report that they have experienced mental stress, physical discomfort, health problems, and privacy threats. More specifically, a fifth of the respondents say they have experienced mental stress and/or physical discomfort in working with a computer. The finding that one out of five respondents has experienced these negative effects of computers in their work place is, however, theoretically important. It is recommended, therefore, that managers and scholars continue to consider these impacts and to strive to avert or ameliorate them.

Results of bivariate analysis show, furthermore, that several of these impacts that are perceived by a minority of respondents are related to other variables such as measures of operational performance. For example, approximately one fourth of the respondents believe that some of the decisions that were formerly made by humans are now being made by computers. This automation in the making of some decisions is related to measures of operational performance. The employees who believe that some of their decisions are currently made by computers tend to perceive improvements in operational performance.

In conclusion, the rapid rate of development in computer technology suggests that some impacts of computers have significant theoretical implications even though only a minority of the respondents have perceived those impacts. The extent of such impacts could expand in the future. Therefore, managers and researchers should consider these impacts and their relationships to other variables from a long term perspective.

Factors Related to Operational Performance. The adoption of computer technology has been justified by the expectation of improvements in operational performance -- including both organizational and individual performance. The present study is concerned about the associations between impacts and policies related to the use of computers and operational performance, as well as between the intensity of computer use and operational performance. As discussed above, several impacts of computers on organizations and individuals are significantly related to operational performance. Among the variables which are positively related to operational performance are: prior notification about technological changes, automation in the making of some decisions, interpersonal communications, smoothness of the changes, enskilling effects in the job, enhanced career opportunity, and the use of computers to monitor work performance. Among the variables which have inverse relationships to operational performance are the undesirable effects of computers on humans -- such as computer anxiety, mental stress, physical discomfort, health problems, and privacy threats. These results indicate that operational performance can be affected by: (1) the impacts of computers on organizations, (2) the impacts of computers on employees, and (3) the policies used to guide the introduction of new computer applications. Management should be aware of the impacts of computers and shape its policies from a long term perspective.

This study also shows a positive relationship between the intensity of computer use and operational performance. This positive relationship indicates that when employees use a computer, they can improve their personal performance and can contribute to organizational performance. This group of employees has evidence a strong desire to use computers to improve their operational performance. The positive association between computer use and operational performance requires managers to be concerned about employees' access to computers. In addition to keeping abreast of new technologies, management needs to take care that its own policies create an environment that is conducive to both formal and informal methods of learning.

Implications for Further Research

This study is empirical and exploratory. Results of univariate analysis describe employee perceptions and attitudes toward the variables related to computer uses and impacts in the Florida state financial management agencies. Results of bivariate analysis show patterns of association between these variables. The findings of this study are believed to lay a foundation for further research into the same field of inquiry.

This study constructs a conceptual framework which delineates patterns of potential association between pairs of variables. Numerous hypotheses were developed with respect to expected patterns of association between pairs of variables. Almost all statistically significant findings are congruent with the conceptual framework outlined in Figure 3-1. Only a few of the hypotheses were not confirmed as expected. Furthermore, even the contrary findings are not necessarily inconsistent with the conceptual framework. In such cases, the framework simply suggests an association, but does not indicate the likely direction of the association. It is not necessary, therefore, to modify the conceptual framework of this study because it is substantially congruent with almost all results of empirical data analysis. The conceptual framework of this study is consistently supported by its results, and it is, therefore, now possible to frame better informed hypotheses to guide future research. This conceptual framework is likely to have important implications for future studies in the same research area.

The significant associations of managerial motivations and attitudes related to the use of computers with job dimensions and some impacts of computers on organizations and individuals verify the importance of the role of management in the adoption and implementation of computer technology. The coexistence of several managerial motivations will require researchers to consider the impacts of computers within the context of multiple dimensions of managerial motivations. In particular, the distinction of whether managerial motivations and attitudes are employee-oriented or task/control-oriented is suggestive for further research in that the distinction was very effective in explaining the differences in their associations with other computer-related variables.

Employees' propensity to learn about the use of computers also needs to be studied from the perspective of multiple dimensions. The association between computer learning and computer use should be researched within the context of several computer learning methods because it was found in this study that different patterns of computer applications require different ways of learning about computers.

A limitation of this study may be that it did research within a single group of agencies. The present study collected data from a set of finance-related agencies within a single state government. Additional research in other functional agencies or in the financial management agencies in other states is expected to provide valuable findings which can be compared with the findings of this study. As noted above, however, financial agencies have been the most extensive users of computer technology, and this investigation into these agencies has revealed well developed employee perceptions and attitudes toward the variables related to the use of computers.

Results of the present study provide a list of computer-related variables that are significantly related to operational performance. The conceptual framework is confirmed in that the intensity of computer use is positively related to measures of operational performance. Changes in operational performance are also affected by some of the impacts of computers on organizations and employees and some of the preferred policies for computer use. In conclusion, the conceptual framework for this study does not need to be modified and has significant implications for further research.

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APPENDIX A

QUESTIONNAIRE

EMPLOYEE SURVEY

Your responses to the following questions are very important and should take no more than 8-10 minutes of your time. They will help us to learn more about how public employees feel about their jobs and about new developments such as computers. Even if you have never touched a computer, your responses are very important! Your answers are strictly confidential; we will not separately identify anyone's answers. Any recommendations that we might make to your employer will not reveal the identity of any person. Your help is greatly appreciated. Thank you.

Professors Earle Klay and Fiona Chen
Florida State University

BIOGRAPHICAL DATA (Fill in or check space as appropriate)

1. In what year were you born? _____

2. Sex: Male___ Female___

3. How long have you worked for your present employer? _____years
(if less than one year, how many months? _______)

4. How long have you been in your present position? _____years
(if less than one year, how many months? _______)

5. Education: Please check the highest level of school that you completed.
   ______Less than high school
   ______High school
   ______Some college or vocational training after high school
   ______Baccalaureate degree
   ______Graduate degree

6. What is your current job? (ie. secretary, computer programmer, intake specialist, etc. if you would rather describe your job in a few words, rather than give your job title, please feel free to do so.)

____

____

____

7. In your job do you come into direct contact with members of the public? Yes___ No___

8. Is any of your performance on your job monitored by a computer?
Yes___ No___

9. Are you a member of an employee union? Yes___ No___

10. Do you supervise others? Yes___ No___

If yes, do you supervise other supervisors? Yes___ No___

INSTRUCTIONS: Please circle the number to the right of each statement which most closely represents your opinion. For example, if the statement said "I like chocolate" and you love it, you would circle number 1; if you were uncertain or had never tasted it and had no opinion about chocolate you would circle number 3.

Strongly Agree	Agree	Undecided/ Not Applicable	Disagree	Strongly Disagree
1	2	3	4	5

	SA	A	U/N	D	SD
1. My job allows me to use a variety of my skills and talents.	1	2	3	4	5
2. My job enables me to do complete tasks, from start to finish, rather than doing a small part that is mostly finished by others.	1	2	3	4	5
3. On my job, I can decide on my own how to go about doing my work.	1	2	3	4	5
4. The results of my work are likely to significantly affect the lives or well-being of other people.	1	2	3	4	5
5. I must work closely with other people in order to do my job.	1	2	3	4	5
6. I like my job.	1	2	3	4	5
7. It is easy for me to tell whether or not I am doing a good job.	1	2	3	4	5
8. Supervisors here listen to what employees have to say.	1	2	3	4	5
9. I have more opportunity to use my knowledges, skills, and abilities now than I had a year ago.	1	2	3	4	5
10. People around here think of themselves as a team.	1	2	3	4	5
11. I am busier than I used to be before computers were used as much here as they are now.	1	2	3	4	5
12. I am accomplishing more than I used to before computers were used as much here as they are now.	1	2	3	4	5
13. I am optimistic about my chances for advancement in this organization.	1	2	3	4	5

Strongly Agree 1	Agree 2	Undecided/ Not Applicable 3	Disagree 4	Strongly Disagree 5

	SA	A	U/N	D	SD
14. If computers are used more and more here, my present skills will be needed as much in the future.	1	2	3	4	5
15. If computers are used more and more here, I will have to develop new skills.	1	2	3	4	5
16. Some of the decisions we used to make ourselves are now being made by computers.	1	2	3	4	5
17. Many of the decisions which I now make on the job will some day be made by computers.	1	2	3	4	5
18. If computers are used more and more here, I am worried that some people may lose their jobs.	1	2	3	4	5
19. Computers have already caused some people to lose their jobs here.	1	2	3	4	5
20. Computers make me nervous.	1	2	3	4	5
21. Computers will give me an opportunity to get ahead in my career.	1	2	3	4	5
22. People here learn much of what they know about using computers through formal training that is provided by our employer.	1	2	3	4	5
23. People here learn much of what they know about using computers by talking with other employees who know more about computer.	1	2	3	4	5
24. People here learn much of what they know about using computers through spending time on the job by themselves at a computer.	1	2	3	4	5
25. People here learn much of what they know about using computers through spending their <u>own</u> time at home or at other places like special classes.	1	2	3	4	5
26. Management gives employees enough time on the job to learn how to use the computers.	1	2	3	4	5
27. Management expects to see more reports, such as progress or status reports, than it used to before computers were used as much here as they are now.	1	2	3	4	5

Strongly Agree 1	Agree 2	Undecided/ Not Applicable 3	Disagree 4	Strongly Disagree 5

	SA	A	U/N	D	SD
28. An employer should use computers to monitor how well an employee is doing his or her job.	1	2	3	4	5
29. People are able to communicate better with each other than they used to before computers were used as much here as they are now.	1	2	3	4	5
30. My job (my current position) contributes more to the overall work of this unit than it did a year ago.	1	2	3	4	5
31. Management wants to use computers to hold down increase in costs.	1	2	3	4	5
32. Management wants to use computers to improve the quality of our services.	1	2	3	4	5
33. Management wants to use computers to make things better for the people who work here.	1	2	3	4	5
34. Management wants to use computers to better control what is going on.	1	2	3	4	5
35. Professional employees (those whose jobs usually require a college degree) should use computers to do their own correspondence and filing work.	1	2	3	4	5
36. Whenever a new use of computers is being considered around here, employees are notified about changes as early as possible.	1	2	3	4	5
37. Before a decision is made as to how computers should be put to use around here, employees should have a say in the making of that decision.	1	2	3	4	5
38. Employees should be given the earliest possible notice of changes that might affect their jobs.	1	2	3	4	5
39. Computers help us to serve the public better.	1	2	3	4	5
40. Computers help me to do my job quicker.	1	2	3	4	5
41. Computers help me to do my job with fewer errors.	1	2	3	4	5

Strongly Agree 1	Agree 2	Undecided/ Not Applicable 3	Disagree 4	Strongly Disagree 5

	SA	A	U/N	D	SD
42. Computers help to save the taxpayers' money.	1	2	3	4	5
43. I believe that using computers has endangered my health.	1	2	3	4	5
44. Using a computer has caused me some physical discomfort.	1	2	3	4	5
45. More pressure is being put on me now than it used to be before computers were used as much here as they are now.	1	2	3	4	5
46. Computers have freed some of our time so that we are able to talk more with the people whom we serve (ie. clients, people in other organizations, etc.) about their particular problems.	1	2	3	4	5
47. Computers have made it easier to better coordinate the delivery of our services.	1	2	3	4	5
48. Computers have enabled me to spend more time thinking about how I can do my job better.	1	2	3	4	5
49. It is becoming more difficult to protect the privacy of records about the clients of this organization.	1	2	3	4	5
50. The use of computers has interfered with my own privacy on the job.	1	2	3	4	5
51. More and more, we have to get the cooperation of computer specialists in order to get something done.	1	2	3	4	5
52. Employee unions help to see that computers are put to use in ways that are helpful, not harmful, to employees.	1	2	3	4	5
53. Employee unions help to see that computers are put to use in ways that help to serve the public.	1	2	3	4	5
54. Whenever we undergo a change to new uses of computers, things generally go pretty smoothly.	1	2	3	4	5
55. Computers are used as the tools to reinforce the influences of the dominant groups and hence to preserve the status quo.	1	2	3	4	5

COMPUTER USE: Please circle the number which best describes how much you yourself use a computer to do each of the following tasks.

TASKS	Never	Sometimes	Often	Very Often
Put information into a computer....	1	2	3	4
Get information from a computer....	1	2	3	4
Prepare letters, memorandums, etc..	1	2	3	4
Do accounting or statistical analysis..............	1	2	3	4
Develop projections or forecasts...	1	2	3	4
Make graphic displays..............	1	2	3	4
Send messages electronically to other people....................	1	2	3	4
Work on better ways to use computers on the job........	1	2	3	4
Use a computer at my home..........	1	2	3	4

OPEN ENDED (OPTIONAL):

What recommendations would you make to enable you to do a better job (with or without computers) or to make your job a better one?

APPENDIX B

VARIABLES AND QUESTIONS

VARIABLES AND QUESTIONS

All the questions in the model questionnaire in Appendix A are classified here by the variables for the present study. Only two questions on the role of public employee union (#52 and 53 of the questionnaire) are excluded.

PERCEPTIONS OF MANAGEMENT

MOTIVATIONS FOR USE

31. Management wants to use computers to hold down increase in costs.

32. Management wants to use computers to improve the quality of our services.

33. Management wants to use computers to make things better for the people who work here.

34. Management wants to use computers to better control what is going on.

RECEPTIVENESS TO ON-THE-JOB LEARNING

26. Management gives employees enough time on the job to learn how to use the computers.

RECEPTIVENESS TO EMPLOYEE INPUT

8. Supervisors here listen to what employees have to say.

EXPECTATION OF MORE REPORTS

27. Management expects to see more reports, such as progress or status reports, than it used to before computers were used as much here as they are now.

JOB DIMENSION

SKILL VARIETY

1. My job allows me to use a variety of my skills and talents.

TASK COMPLETION

2. My job enables me to do complete tasks, from start to finish, rather than doing a small part that is mostly finished by others.

WORK SIGNIFICANCE

4. The results of my work are likely to significantly affect the lives or well-being of other people.

AUTONOMY ON JOB

3. On my job, I can decide on my own how to go about doing my work.

KNOWLEDGE OF RESULT

7. It is easy for me to tell whether or not I am doing a good job.

WORK CLOSELY WITH OTHERS

5. I must work closely with other people in order to do my job.

WORK AS A TEAM

10. People around here think of themselves as a team.

JOB SATISFACTION

6. I like my job.

ADVANCEMENT CHANCE

13. I am optimistic about my chances for advancement in this organization.

WORK CONTRIBUTION TO UNIT

30. My job (my current position) contributes more to the overall work of this unit than it did a year ago.

PERCEIVED IMPACTS OF COMPUTERS

JOB LOSS-FUTURE

18. If computers are used more and more here, I am worried that some people may lose their jobs.

JOB LOSS-PAST

19. Computers have already caused some people to lose their jobs here.

AUTOMATED DECISION MAKING-CURRENT

16. Some of the decisions we used to make ourselves are now being made by computers.

AUTOMATED DECISION MAKING-FUTURE

17. Many of the decisions which I now make on the job will some day be made by computers.

INTERPERSONAL COMMUNICATIONS IMPROVED

29. People are able to communicate better with each other than they used to before computers were used as much here as they are now.

POWER REINFORCEMENT

55. Computers are used as the tools to enhance the influences of the dominant groups and hence to preserve the status quo.

PRIOR NOTICE GIVEN

36. Whenever a new use of computers is being considered around here, employees are notified about changes as early as possible.

STATUS OF COMPUTER SPECIALISTS

51. More and more, we have to get the cooperation of computer specialists in order to get something done.

SMOOTHNESS OF CHANGE

54. Whenever we undergo a change to new uses of computers, things generally go pretty smoothly.

ENSKILLING EFFECT IN JOB

9. I have more opportunity to use my knowledges, skills, and abilities now than I have a year ago.

Need for Present Skills in Future

14. If computers are used more and more here, my present skills will be needed as much in the future.

NEED FOR NEW SKILL IN JOB

15. If computers are used more and more here, I will have to develop new skills.

CAREER OPPORTUNITY ENHANCED

21. Computers will give me an opportunity to get ahead in my career.

WORK INTENSITY INCREASED

11. I am busier than I used to be before computers were used as much here as they are now.

COMPUTER ANXIETY FELT

20. Computers make me nervous.

STRESS INCREASED

45. More pressure is being put on me now than it used to be before computers were used as much here as they are now.

HEALTH ENDANGERED

43. I believe that using computers has endangered my health.

PHYSICAL DISCOMFORT

44. Using a computer has caused me some physical discomfort.

PRIVACY THREAT-CLIENT

49. It is becoming more difficult to protect the privacy of records about the clients of this organization.

PRIVACY THREAT-EMPLOYEE

50. The use of computers has interfered with my own privacy on the job.

PREFERRED POLICIES FOR COMPUTER USE

CHANGING ROLE OF PROFESSIONALS

35. Professional employees (those whose jobs usually require a college degree) should use computers to do their own correspondence and filing work.

ELECTRONIC WORK MONITORING

28. An employer should use computers to monitor how well an employee is doing his or her job.

EMPLOYEE INVOLVEMENT DESIRED

37. Before a decision is made as to how computers should be put to use around here, employees should have a say in the making of that decision.

PRIOR NOTICE-DESIRED

38. Employees should be given the earliest possible notice of changes that might affect their jobs.

COMPUTER LEARNING

FORMAL TRAINING

22. People here learn much of what they know about using computers through formal training that is provided by our employer.

INFORMAL CONVERSATION

23. People here learn much of what they know about using computers by talking with other employees who know more about computer.

SELF-TEACHING ON THE JOB

24. People here learn much of what they know about using computers through spending time on the job by themselves at a computer.

OFF-THE-JOB LEARNING

25. People here learn much of what they know about using computers through spending their own time at home or at other places like special classes.

OPERATIONAL PERFORMANCE

COST SAVINGS

42. Computers help to save the taxpayers' money.

SERVICE IMPROVEMENT

39. Computers help us to serve the public better.

COORDINATION OF SERVICE DELIVERY

47. Computers have made it easier to better coordinate the delivery of our services.

MORE TIME SPENT WITH THE CLIENTS

46. Computers have freed some of our time so that we are able to talk more with the people whom we serve (ie. clients, people in other organizations, etc.) about their particular problem.

WORK SPEED

40. Computers help me to do my job quicker.

ACCURACY

41. Computers help me to do my job with fewer errors.

SENSE OF ACCOMPLISHMENT

12. I am accomplishing more than I used to before computers were used as much here as they are now.

TIME TO THINK

48. Computers have enabled me to spend more time thinking about how I can do my job better.

APPENDIX C

COVER LETTER OF THE QUESTIONNAIRE

June 5, 1989

Dear Sir or Madam:

We are members of the public administration department at the Florida State University and are working on a research project in which we need your help. We are studying the attitudes of state employees about several topics, and especially about the impacts which computers are having. Even if you have never touched a computer, your responses to these questions are very important. No one knows what is going on better than someone like yourself.

Experience has shown that the enclosed questionnaire should not take more than 8-10 minutes to complete. All answers are strictly confidential. We will not separately identify anyone's answers.

After completing the questionnaire, would you kindly insert it in the preaddressed envelope and return it through the state courier system used by all agencies (This allows us to save badly needed funds from postage).

We will be using the results of this survey to advise policy makers and managers in our state. If you want to learn about the results of this survey, please forward a request to one of us at the above address. Your assistance is greatly valued and much appreciated.

Sincerely,

William Earle Klay
Associate Professor

Fiona F. Chen
Assistant Professor

APPENDIX D

RECORD OF QUESTIONNAIRES RETURNED

APPENDIX D: RECORD OF QUESTIONNAIRES RETURNED

Date	Number of Questionnaires Returned	Cumulative Number of Questionnaires Returned	
June 6	Questionnaires mailed out		
June 8	5	5	
9	9	14	
June 12	21	35	
13	29	64	
14	35	99	
15	15	114	
16	33	147	
June 19	28	175	
20	16	191	
21	19	210	(56% of 377)
22	31	241	
23	19	260	
June 26	42	302	
27	7	309	
28	20	329	(87% of 377)
29	1	330	
30	4	334	
July 3	5	339	
4	Independence Day		
5	19	358	
6	7	365	
7	1	366	
July 10	2	368	
11	0	368	
12	1	369	
13	1	370	
14	0	370	
July 17	1	371	
18	1	372	
19	2	374	
20	2	376	
21	0	376	
July 24	1	377	

APPENDIX E

ESTIMATION OF POPULATION PROPORTIONS

BASED ON CONFIDENCE INTERVALS

Questions	Strongly Agree/ Agree		Strongly Disagree/ Disagree	
PERCEPTIONS OF MANAGEMENT				
Motivations for use:				
Cost Reduction	37.2%			
Service Improvement	88.9%	a)		
Better Work Environment	70.7%	a)		
Better Control	70.1%	a)		
Receptiveness to On-the-Job Learning	47.0%			
Receptiveness to Employee Input	63.0%	a)		
Expectation of More Reports	60.2%	a)		
JOB DIMENSION				
Skill Variety	85.1%	a)		
Task Completion	81.0%	a)		
Work Significance	61.9%	a)		
Autonomy on Job	79.6%	a)		
Knowledge of Results	77.7%	a)		
Work Closely with Others	84.2%	a)		
Work as a Team	59.0%	a)		
Job Satisfaction	82.4%	a)		
Advancement Chance	46.5%			
Work Contribution to Unit	42.2%			
PERCEIVED IMPACTS OF COMPUTERS				
Impacts on Organizations:				
Job Loss-Future			78.1%	a)
Job Loss-Past			80.0%	a)
Automated Decision Making-Current			55.0%	b)
Automated Decision Making-Future			61.8%	a)
Interpersonal Communications	31.3%			
Power Reinforcement			34.8%	
Prior Notice Given			43.0%	
Status of Computer Specialists			45.6%	
Smoothness of Change	45.5%			

Note: a) Sample proportions that are greater than 56.67%, the lower confidence limit at .995 confidence level.

b) The sample proportion is greater than 50%, but the confidence that its parameter is greater than 50% is less than .95.

Questions	Strongly Agree/ Agree		Strongly Disagree/ Disagree	
PERCEIVED IMPACTS OF COMPUTERS (cont.)				
Impacts on Individuals:				
Enskilling Effect in Job	54.3%	b)		
Deskilling Effect in Job			82.8%	a)
Need for New Skill in Job	67.6%	a)		
Career Opportunity Enhanced	65.8%	a)		
Work Intensity Increased	33.5%			
Computer Anxiety Felt			88.5%	a)
Stress Increased			50.2%	b)
Health Endangered			73.6%	a)
Physical Discomfort			65.3%	a)
Privacy Threat-Client			45.4%	
Privacy Threat-Employee			70.9%	a)
PREFERRED POLICIES FOR COMPUTER USE				
Changing Role of Professionals	49.3%			
Electronic Work Monitoring			40.8%	
Employee Involvement Desired	75.8%	a)		
Prior Notice Desired	95.4%	a)		
COMPUTER LEARNING				
Formal Training	47.6%			
Informal Conversation	83.6%	a)		
Self-teaching on the Job	78.1%	a)		
Off-the-Job Learning	40.4%			
OPERATIONAL PERFORMANCE				
Organizational Performance:				
Cost Savings	64.5%	a)		
Service Improvement	90.0%	a)		
Coordination of Serv. Delivery	70.7%	a)		
More Time Spent w/ Clients	37.0%			
Personal Performance:				
Work Speed	86.1%	a)		
Accuracy	82.8%	a)		
Sense of Accomplishment	57.3%	a)		
Time to Think	45.2%			

Note: a) Sample proportions that are greater than 56.67%, the lower confidence limit at .995 confidence level.

b) The sample proportion is greater than 50%, but the confidence that its parameter is greater than 50% is less than .95.

APPENDIX F

RESULTS OF THE CHI-SQUARE GOODNESS-OF-FIT TEST

RESULTS OF THE CHI-SQUARE GOODNESS-OF-FIT TEST

Questions	n	SA	A	N	D	SD	X^2
PERCEIVED IMPACTS OF COMPUTERS							
Job Loss-Future	375	8	27	47	209	84	341.52
Job Loss-Past	375	2	17	55	175	126	289.25
Automated Decision Making-Current	376	19	70	83	150	54	123.55
Automated Decision Making-Future	374	15	44	84	166	65	174.10
Interpersonal Communications Improved	376	18	99	145	99	15	171.55
Power Reinforcement	377	8	53	183	103	30	257.89
Prior Notice Given	377	17	123	76	107	54	94.60
Status of Computer Specialists	376	21	101	89	143	22	149.21
Smoothness of Change	376	11	159	92	85	29	181.61
Enskilling Effect in Job	377	66	139	67	77	28	85.59
Deskilling Effect in Job	375	98	213	48	13	3	391.07
Need for New Skill in Job	376	52	204	47	61	12	294.13
Career Opportunity Enhanced	374	87	160	79	36	12	172.12
Work Intensity Increased	376	32	93	164	81	6	198.02
Computer Anxiety Felt	374	3	21	20	142	188	379.45
Stress Increased	376	17	67	105	148	39	145.65
Health Endangered	376	3	19	76	164	114	236.21
Physical Discomfort	375	7	73	51	155	89	157.33
Privacy Threat-Client	377	13	64	129	140	31	172.96
Privacy Threat-Employee	377	8	15	87	213	54	367.60
Changing Role of Professionals	376	34	152	93	89	8	157.80
Electronic Work Monitoring	377	13	88	124	114	38	123.38
Employee Involvement Desired	377	79	207	59	23	9	328.32
Prior Notice Desired	377	162	198	14	1	2	493.68

APPENDIX G

LIST OF HYPOTHESES

APPENDIX G: LIST OF HYPOTHESES

Perceptions of Management-Job Dimensions Associations

(Cost Reduction Motivation-Job Dimensions)

H 1.1.1 Employees who believe that management is motivated to use computers to hold down increases in costs will tend to be those who feel that they have less opportunity to use a variety of skills in carrying out their jobs.

H 1.1.2 Employees who believe that management is motivated to use computers to hold down increases in costs will tend to be those who feel that they do complete tasks, from start to finish, rather than doing a small part that is mostly finished by others.

H 1.1.3 Employees who believe that management is motivated to use computers to hold down increases in costs will tend to be those who feel that the results of their work are likely to significantly affect the lives or well-being of other people.

H 1.1.4 Employees who believe that management is motivated to use computers to hold down increases in costs will tend to be those who feel that they can decide on their own how to go about doing their work.

H 1.1.5 Employees who believe that management is motivated to use computers to hold down increases in costs will tend to be those who feel that they can easily tell whether or not they are doing a good job.

H 1.1.6 Employees who believe that management is motivated to use computers to hold down increases in costs will tend to be those who feel that they must work closely with other people in order to do their jobs.

(Service Improvement Motivation-Job Dimensions)

H 1.2.1 Employees who believe that management is motivated to use computers to improve the quality of services will tend to be those who feel that they have more opportunity to use a variety of skills in carrying out their jobs.

H 1.2.2 Employees who believe that management is motivated to use computers to improve the quality of services will tend to be those who feel that they do complete tasks, from start to finish, rather than doing a small part that is mostly finished by others.

H 1.2.3 Employees who believe that management is motivated to use computers to improve the quality of services will tend to be those who feel that the results of their work are likely to significantly affect the lives or well-being of other people.

H 1.2.4 Employees who believe that management is motivated to use computers to improve the quality of services will tend to be those who feel that they can decide on their own how to go about doing their work.

H 1.2.5 Employees who believe that management is motivated to use computers to improve the quality of services will tend to be those who feel that they can easily tell whether or not they are doing a good job.

H 1.2.6 Employees who believe that management is motivated to use computers to improve the quality of services will tend to be those who feel that they must work closely with other people in order to do their jobs.

(Better Work Environment Motivation-Job Dimensions)

H 1.3.1 Employees who believe that management is motivated to use computers to provide a better work environment for employees will tend to be those who feel that they have more opportunity to use a variety of skills in carrying out their jobs.

H 1.3.2 Employees who believe that management is motivated to use computers to provide a better work environment for employees will tend to be those who feel that they do complete tasks, from start to finish, rather than doing a small part that is mostly finished by others.

H 1.3.3 Employees who believe that management is motivated to use computers to provide a better work environment for employees will tend to be those who feel that the results of their work are likely to significantly affect the lives or well-being of other people.

H 1.3.4 Employees who believe that management is motivated to use computers to provide a better work environment for employees will tend to be those who feel that they can decide on their own how to go about doing their work.

H 1.3.5 Employees who believe that management is motivated to use computers to provide a better work environment for employees will tend to be those who feel that they can easily tell whether or not they are doing a good job.

H 1.3.6 Employees who believe that management is motivated to use computers to provide a better work environment for employees will tend to be those who feel that they must work closely with other people in order to do their jobs.

(Better Control Motivation-Job Dimensions)

H 1.4.1 Employees who believe that management is motivated to use computers to increase control will tend to be those who feel that they have more opportunity to use a variety of skills in carrying out their jobs.

H 1.4.2 Employees who believe that management is motivated to use computers to increase control will tend to be those who feel that they do complete tasks, from start to finish, rather than doing a small part that is mostly finished by others.

H 1.4.3 Employees who believe that management is motivated to use computers to increase control will tend to be those who feel that the results of their work are likely to significantly affect the lives or well-being of other people.

H 1.4.4 Employees who believe that management is motivated to use computers to increase control will tend to be those who feel that they can decide on their own how to go about doing their work.

H 1.4.5 Employees who believe that management is motivated to use computers to increase control will tend to be those who feel that they can easily tell whether or not they are doing a good job.

H 1.4.6 Employees who believe that management is motivated to use computers to increase control will tend to be those who feel that they must work closely with other people in order to do their jobs.

(Receptiveness to Employee Input-Job Dimensions)

H 1.5.1 Employees who believe that management is receptive to employee input will tend to be those who feel that they have more opportunity to use a variety of skills in carrying out their jobs.

H 1.5.2 Employees who believe that management is receptive to employee input will tend to be those who feel that they do complete tasks, from start to finish, rather than doing a small part that is mostly finished by others.

H 1.5.3 Employees who believe that management is receptive to employee input will tend to be those who feel that the results of their work are likely to significantly affect the lives or well-being of other people.

H 1.5.4 Employees who believe that management is receptive to employee input will tend to be those who feel that they can decide on their own how to go about doing their work.

H 1.5.5 Employees who believe that management is receptive to employee input will tend to be those who feel that they can easily tell whether or not they are doing a good job.

H 1.5.6 Employees who believe that management is receptive to employee input will tend to be those who feel that they must work closely with other people in order to do their jobs.

(Expectation of More Report-Job Dimensions)

H 1.6.1 Employees who believe that management expects to see more reports with the use of computers will tend to be those who feel that they have less opportunity to use a variety of skills in carrying out their jobs.

H 1.6.2 Employees who believe that management expects to see more reports with the use of computers will tend to be those who feel that they do complete tasks, from start to finish, rather than doing a small part that is mostly finished by others.

H 1.6.3 Employees who believe that management expects to see more reports with the use of computers will tend to be those who feel that the results of their work are likely to significantly affect the lives or well-being of other people.

H 1.6.4 Employees who believe that management expects to see more reports with the use of computers will tend to be those who feel that they can decide on their own how to go about doing their work.

H 1.6.5 Employees who believe that management expects to see more reports with the use of computers will tend to be those who feel that they can easily tell whether or not they are doing a good job.

H 1.6.6 Employees who believe that management expects to see more reports with the use of computers will tend to be those who feel that they must work closely with other people in order to do their jobs.

Perceptions of Management-Impacts of Computers Associations

(Perceptions of Management-Impacts of Computers on Organizations)

H 2.1.1 Employees who believe that management is motivated to use computers to improve the quality of services to the public will be those who are less likely to feel that job loss has been caused by computers in the past.

H 2.1.2 Employees who believe that management is motivated to use computers to improve the quality of services to the public will be those who are less likely to feel that job loss will be caused by computers in the future.

H 2.2 Employees who believe that management is motivated to use computers to increase control will be those who have positive perceptions of the reinforcement of power held by dominant groups.

H 2.3.1 Employees who believe that management is receptive to employee input will be those who positively perceive that some of their decisions are currently being made by computers.

H 2.3.2 Employees who believe that management is receptive to employee input will be those who positively perceive that some of their decisions will be made in the future by computers.

H 2.4 Employees who believe that management expects to see more reports with the use of computers will be those who have positive perceptions of the reinforcement of power held by dominant groups.

(Perceptions of Management-Impacts of Computers on Individuals)

H 3.1 Employees who believe that management is motivated to use computers to provide a better work environment will have less computer anxiety, ie. feel less nervous around computers.

H 3.2 Employees who believe that management is motivated to use computers to provide a better work environment will feel that the use of computers has not led to greater stress, i.e. pressure placed upon them.

H 3.3 Employees who believe that management is motivated to use computers to provide a better work environment will be less likely to believe that using computers has endangered their health.

H 3.4 Employees who believe that management is motivated to use computers to provide a better work environment will be less likely to believe that using computers has caused them some physical discomfort.

H 3.5 Employees who believe that management is motivated to use computers to provide a better work environment will be less likely to believe that computers have threatened the client's privacy.

H 3.6 Employees who believe that management is motivated to use computers to provide a better work environment will be less likely to believe that computers have threatened the employees' own privacy.

H 3.7 Employees who believe that management expects to see more reports with the use of computers will perceive an increase in work intensity.

(Perceptions of Management-Preferred Policies for Computer Use)

H 4.1 Employees who believe that management is motivated to use computers to provide a better work environment will have fewer negative attitudes toward the use of electronic work monitoring.

H 4.2 Employees who believe that management is motivated to use computers to increase control will have more negative attitudes toward the use of electronic work monitoring.

Perceptions of Management-Computer Learning Associations

H 5.1 Employees who believe that management is receptive to on-the-job learning about computers will be more likely to say that employees learn much through formal training that is provided by their employer.

H 5.2 Employees who believe that management is receptive to on-the-job learning about computers will be more likely to say that employees learn much through informal conversation with other employees who know more about computers.

H 5.3 Employees who believe that management is receptive to on-the-job learning about computers will be more likely to say that employees learn much through spending time on the job by themselves at a computer.

H 5.4 Employees who believe that management is receptive to on-the-job learning about computers will be less likely to say that employees learn much through spending their own time off the job.

Job Dimensions-Impacts of Computers Associations

(Job Dimensions-Impacts of Computers on Individuals)

H 6.1.1 Employees who perceive themselves as using a variety of skills in carrying out their jobs will be more likely to think that they have more opportunity to use their knowledge and skills than before.

H 6.1.2 Employees who perceive themselves as using a variety of skills in carrying out their jobs will be more likely to think that their present skills will be needed as much in the future.

H 6.2.1 Employees who feel that they do complete tasks, from start to finish, rather than doing a small part that is mostly finished by others will be more likely to think that they have more opportunity to use their knowledge and skills than before.

H 6.2.2 Employees who feel that they do complete tasks, from start to finish, rather than doing a small part that is mostly finished by others will be more likely to think that their present skills will be needed as much in the future.

H 6.3.1 Employees who feel that the results of their work are likely to significantly affect the lives or well-being of other people will be more likely to think that they have more opportunity to use their knowledge and skills than before.

H 6.3.2 Employees who feel that the results of their work are likely to significantly affect the lives or well-being of other people will be more likely to think that their present skills will be needed as much in the future.

H 6.4.1 Employees who feel that they can decide on their own how to go about doing their work will be more likely to think that they have more opportunity to use their knowledge and skills than before.

H 6.4.2 Employees who feel that they can decide on their own how to go about doing their work will be more likely to think that their present skills will be needed as much in the future.

H 6.5.1 Employees who feel that they can easily tell whether or not they are doing a good job will be more likely to think that they have more opportunity to use their knowledge and skills than before.

H 6.5.2 Employees who feel that they can easily tell whether or not they are doing a good job will be more likely to think that their present skills will be needed as much in the future.

H 6.6.1 Employees who feel that they must work closely with other people in order to do their jobs will be more likely to think that they have more opportunity to use their knowledge and skills than before.

H 6.6.2 Employees who feel that they must work closely with other people in order to do their jobs will be more likely to think that their present skills will be needed as much in the future.

H 6.7.1 Employees who think of themselves as a team will be more likely to think that they have more opportunity to use their knowledge and skills than before.

H 6.7.2 Employees who think of themselves as a team will be more likely to think that their present skills will be needed as much in the future.

H 6.8.1 Employees who are satisfied with their jobs will be more likely to think that they have more opportunity to use their knowledge and skills than before.

H 6.8.2 Employees who are satisfied with their jobs will be more likely to think that their present skills will be needed as much in the future.

H 6.9.1 Employees who are optimistic about their chances for advancement in the organization will be more likely to think that they have more opportunity to use their knowledge and skills than before.

H 6.9.2 Employees who are optimistic about their chances for advancement in the organization will be more likely to think that their present skills will be needed as much in the future.

H 6.10.1 Employees who think that their jobs contribute more to the overall work of their units than before will be more likely to think that they have more opportunity to use their knowledge and skills than before.

H 6.10.2 Employees who think that their jobs contribute more to the overall work of their units than before will be more likely to think that their present skills will be needed as much in the future.

(Job Dimensions-Preferred Policies for Computer Use)

H 6.1.3 Employees who perceive themselves as using a variety of skills in carrying out their jobs will feel that the role of professionals should change, including the doing of correspondence and filing through the use of computers.

H 6.2.3 Employees who feel that they do complete tasks, from start to finish, rather than doing a small part that is mostly finished by others will feel that the role of professionals should change, including the doing of correspondence and filing through the use of computers.

H 6.3.3 Employees who feel that the results of their work are likely to significantly affect the lives or well-being of other people will feel that the role of professionals should change, including the doing of correspondence and filing through the use of computers.

H 6.4.3 Employees who feel that they can decide on their own how to go about doing their work will feel that the role of professionals should change, including the doing of correspondence and filing through the use of computers.

H 6.5.3 Employees who feel that they can easily tell whether or not they are doing a good job will feel that the role of professionals should change, including the doing of correspondence and filing through the use of computers.

H 6.6.3 Employees who feel that they must work closely with other people in order to do their jobs will feel that the role of professionals should change, including the doing of correspondence and filing through the use of computers.

H 6.7.3 Employees who think of themselves as a team will feel that the role of professionals should change, including the doing of correspondence and filing through the use of computers.

H 6.8.3 Employees who are satisfied with their jobs will feel that the role of professionals should change, including the doing of correspondence and filing through the use of computers.

H 6.9.3 Employees who are optimistic about their chances for advancement in the organization will feel that the role of professionals should change, including the doing of correspondence and filing through the use of computers.

H 6.10.3 Employees who think that their jobs contribute more to the overall work of their units than before will feel that the role of professionals should change, including the doing of correspondence and filing through the use of computers.

<u>Impacts of Computers-Operational Performance Associations</u>

(Impacts of Computers on Organizations-Operational Performance)

H 7.1 Employees who are notified in advance about technological changes will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 7.2 Employees who feel that they must get the cooperation of computer specialists in order to get something done will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

(Impacts of Computers on Individuals-Operational Performance)

H 8.1 Employees who have more opportunity to use their knowledge and skills than before will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 8.2 Employees who believe that using computers will increase the need to use their present skills in the future will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 8.3 Employees who believe that computers give them more opportunity to get ahead in their career will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 8.4 Employees who believe that using computers increases work intensity will be less likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 8.5 Employees who feel computer anxiety will be less likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 8.6 Employees who feel that the use of computers has placed more stress upon them will be less likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 8.7 Employees who believe that using computers has endangered their health will be less likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 8.8 Employees who believe that using computers has caused them physical discomfort will be less likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 8.9 Employees who feel that computers have threatened the client's privacy will be less likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 8.10 Employees who feel that computers have threatened the employees' own privacy will be less likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

(Preferred Policies for Computer Use-Operational Performance)

H 9.1 Employees who believe that professionals should use computers to do some clerical work will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

H 9.2 Employees who have favorable attitudes toward the use of electronic work monitoring will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.

Impacts of Computers-Computer Learning Associations

(Impacts of Computers on Individuals-Operational Performance)

H 10.1 Employees who believe that their jobs are being enskilled will have a strong propensity to learn how to use computers.

H 10.2 Employees who believe that there will be a need for their present skills as much in the future will have a weak propensity to learn how to use computers.

H 10.3 Employees who feel computer anxiety will have a weak propensity to learn how to use computers.

H 10.4 Employees who feel that using computers has placed more stress upon them will have a weak propensity to learn how to use computers.

Computer Learning-Computer Use Associations

H 11.1 Employees who have a stronger propensity to learn how to use computers will make more intensive use of them in each of the nine categories of computer applications.

Computer Use-Operational Performance Associations

H 12.1 Employees who make more intensive use in each of the nine categories of computer applications will be more likely to state that the use of computers has caused improvements in each of the eight measures of operational performance.