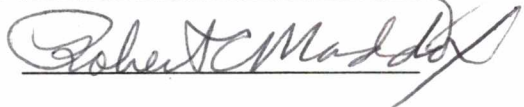


To the Graduate Council:

I am submitting herewith a dissertation written by Carol A. Decker entitled "Organizational Effectiveness Through Work Situation and Transfer of Training Influences on Employee Computer Use Self-Efficacy." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Human Ecology.


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ORGANIZATIONAL EFFECTIVENESS THROUGH WORK
SITUATION AND TRANSFER OF TRAINING INFLUENCES ON
EMPLOYEE COMPUTER USE SELF-EFFICACY

A Dissertation

Presented for the

Doctor of Philosophy
Degree

The University of Tennessee

Carol A. Decker

May 1996

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DEDICATION

This dissertation is dedicated to my parents

Mr. James David Decker

and

Mrs. Juanita Wiggins Decker

**who have encouraged my academic pursuits and
provided me with a Biblical foundation for my life.**

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Throughout my life I have made mental notes of those individuals who have given of their time and efforts to guide me in life's path. Consequently, these same people deserve to be credited with my accomplishment of this terminal degree. Without their words of wisdom and their sound advice, my steps toward this pursuit would have been met with constant strife.

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ABSTRACT

The primary purpose of this study was to investigate work situation and transfer of training influences of computer self-efficacy and self-efficacy on training programs that meet individual and organization objectives of university personnel. This was accomplished by assessing the computer self-efficacy and self-efficacy of computer technologies of employees subsequent to training and its duration as it pertains to training usefulness. Additionally, the computer self-efficacy and self-efficacy of computer technologies assessment sought to determine influences on computer use for human resource placement information and to determine present training needs.

A descriptive ex post facto survey design was used to gather data from a population of 2,597 university employees. A total of 357 responses from a sample of 448 provided an overall response rate of 80% on a Computer Self-Confidence Assessment that was distributed through the campus mail system. The Computer Self-Confidence Assessment consisted of a background segment for gathering demographic information, the computer self-efficacy scale (CSE), and the self-efficacy of computer technologies scale (SCT).

Parametric statistics included multiple analysis of variance which was used to determine significant predictors of time, job type, supervision, home use, previous computer classroom training, computer use required on the job, training responsibilities, job tenure, frequency of computer use, and department of employment on computer self-efficacy and self-efficacy of computer technologies. The Pearson r correlation coefficient was used to determine a significant relationship between the CSE and SCT scales.

Descriptive statistics including frequency counts, standard deviations and means were used for categorizing the background information.

Major findings of the study were: (a) computer self-efficacy and self-efficacy of computer technologies were sustained over a 2 1/2 year period, (b) job type predicted computer self-efficacy, (c) previous classroom computer training in database management predicted computer self-efficacy and self-efficacy of computer technologies, while previous classroom computer training in statistical processing predicted self-efficacy in computer technologies, (d) computer use required on the job in database management, spreadsheets, programming, and educational software predicted computer self-efficacy and self-efficacy of computer technologies, (e) frequency of computer use, home computer use, and training responsibility predicted computer self-efficacy and self-efficacy of computer technologies. A second MANOVA procedure revealed several significant interactions among significant independent variables and subscales on independent variables. The second MANOVA procedure also revealed that only job type and independent variable computer use required on the job subscale of programming were significant predictors of computer self-efficacy and self-efficacy of computer technologies.

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CHAPTER I
INTRODUCTION
Study Background

The performances of organizations, according to Heilman and Hornstein (1982), are affected by human forces rather than technical capabilities. For nearly a century, organizations have searched for the means to best achieve their organizational objectives. Curiously, they have overlooked the effects of employee beliefs or self-efficacy toward the technologies of the workplace as a component of achieving organizational success. Some theories suggest that the incentive to work and learn is facilitated through attention to self-efficacy needs rather than financial rewards (Ayers Gerhart, 1980; Bandura, 1977; Bandura, 1982; Bandura, 1991; Baron, 1988; Chowdhury, 1993; Clark, 1992; Evans, 1991; Gist, 1987; Hackett, & Betz, 1981; Karl, O'Leary-Kelly, & Martocchio, 1993; Kaufman, 1991; Laier, 1994; Latham, & Frayne, 1989; Leong, 1992; Lewis, 1986; Mager, 1992a; Martocchio, 1994).

Many efforts to improve organizational effectiveness have focused on restructuring so that employees can accomplish assigned tasks more easily and more efficiently. Luthans and Kreitner (1975) wrote that organizations are formed to accomplish objectives that individuals cannot accomplish alone. Some management theorists have begun to look at organizational effectiveness as a sharing of power among all employees (Conger, 1989). Gilley and Eggland (1989) suggested that improving organizational performance resides in achieving organizational goals through changes in quality, health, and economics. Today, more and more leaders of organizations recognize that an investment in employees is the

key to a healthy organization and essential financial returns. Employees now see self actualization through a more autonomous work environment. These empowered workers are consulted for their expertise in the tasks required to perform their job. Thus, they are considered as resources in decision making (French, 1994). Additionally, resources such as proper equipment and training are accepted for their contribution to organizational goals so that employees can adapt to changing work assignments and environments. A congruency is being established among the structure of the modern organization, its processes and strategies, its people, and the internal and external cultures (Argyris, 1964; Gilley & Egglund, 1989).

Miles (1975) and French and Bell (1984) noted that organizational development has been adapted by organizations as a long-range stride to improving problem solving, renewal, collaboration, and teaming. As a result of this focus, fringe-benefit plans, which constitute approximately 40 percent of compensation packages (U.S. Chamber of Commerce, 1994), enable employees to meet personal and family needs while they are stabilized in gainful employment.

While the effects of organizational development efforts are beginning to mature, today's organizations are questioning the effectiveness of resources such as training (Campbell & Decker, 1994). Carnevale and Schulz (1990) suggested that long-term aims rather than short-term substitutes reduce the waste and irrelevance in training programs. Trainers and organizations tend to think of training as a cure-all; however, training programs may decrease in value or only serve an initial purpose (Gordon, 1991).

The foundations of scientific management have contributed to the doubts

organization decision makers have that training fulfills organizational objectives. Since the scientific management movement of the early 1900s, many employees of large organizations have been frustrated with work (Heilman & Hornstein, 1982). Scientific management separated employees into workers and supervisors. Work orders were given without concern for the worker's emotional, physical, and mechanical needs (Heilman & Hornstein, 1982).

According to Nixon (1993), power was recognized as more important than the purpose and, in turn, employees became only instruments. The needs of the organization took precedence over the needs of the individual. Employees were thought of as lacking self-direction in physical work and decision making and were seen as being able to easily adjust to changes in job requirements (Heilman & Hornstein, 1982). However, employees have recognized that their own intellectual and physical abilities could support and enhance the decisions and goals of the organization (French, 1994).

Provisions for employee training have generally consisted of the desires of management and supervision rather than a mutually beneficial understanding of what an employee really wanted or needed to know. An employee's internal beliefs about being able to accomplish a task after training is rarely a concern of the employer. In these situations, if an employee felt unable to perform a task, then the training would not result in positive performance for the organization (Bandura, 1977; Gist, 1987). Negative feelings of self-efficacy can inhibit performance in training and the job performance after the training (Bandura, 1977; Gist, 1987). Those who do not believe they can perform a particular task may not even attempt it. Usually, the effort exerted toward situations

depends on the strength of self-efficacy (Torkzadeh & Koufteros, 1994). An individual's self-efficacy may also cause stress and depression, which in turn may interfere with performance and completion of organization goals (Mager, 1992b).

Supervisors often see training as a part of organizational improvement, while employees see training as personal development and as a facilitation to job performance (Gilley & Egglund, 1989). Employees have the potential for more insight into their own training needs because they are most knowledgeable about their job responsibilities. Training programs must be designed with the trainee in mind. Training must strengthen self-efficacy through practice and conditions that echo future performance (Clark, 1992).

The success of training is based on the communication of proper objectives and the student's performance in meeting those objectives. Moreover, training must parallel organizational objectives. Without these ingredients, training loses its luster or usefulness for employees and the organization. Campbell and Cheek (1989) concurred that knowledge and skills are passed on when the training departments and work environments cooperate to achieve mutually desired results.

As society evolves from an industrial to an information society, preparation for changes in environmental requirements and skill needs is a necessity. Skills must be developed for using and employing computers. The application of the computer, in the workplace, inherently causes the expansion of job duties and the upgrading of occupations. Employees at all levels will be expected to undertake responsibilities for word and data processing, storage, and manipulation (Georges, 1988). Organizations look to computers as their "saving grace" of efficiency (Ellen, Bearden, & Sharma, 1991).

However, computers cannot function without an interface made by a human being.

Organizations must, therefore, force employees to attend training so that they may be able to interact more fluently with this new technology (Kearsley, 1984). The desire is to increase productivity by improving the user's satisfaction with their ability to use computers (Bailey & Pearson, 1983). The basis of this thought is that if an individual accepts the use of a computer, then it is likely that it will be used productively by that individual as well as by others who are in contact with that person (Mathieson, 1993). After training, supervisors of organizations automatically expect proficiency from the employee. Similar to the concepts of scientific management, training is provided without sufficient employee input regarding attributes and abilities needed for proper job performance. Organizations fail to consider the overwhelming change and employee stifling that occur as a result of new technology implementation. Overwhelming technological advancements and initial experiences reduce an employee's confidence in their abilities (Duncan, 1994; Ellen et al. 1991; Evans, 1991; Garavan & McCracken, 1993; Green, 1993; Hess, 1993; Kinzie & Delcourt, 1991; Kizzier, 1985; Murphy, Coover, & Owen, 1988).

With the rise in expectations of high-technology equipment, the effectiveness of training programs will continue to be questioned. Therefore, it will be necessary to design training programs that fulfill long-term organizational objectives. Investigations of employee self-efficacy resulting from computer training will provide some direction for maximizing organizational effectiveness.

Statement of the Problem

Organizational effectiveness is dependent on employee proficiency in using computers on the job. Consequently, attention to work situations and the existence of transfer of training characteristics in computer technology interaction is a necessity. Many studies suggest that employees are skeptical of computer training provided and the impact computers have on their performance. Numerous leaders question the long-term relevance of training and suggest that an exploration into the evolution of self-efficacy from training is essential. Work situation and transfer of training influences must be analyzed for their impact on self-efficacy. Presently, no evidence exists that measures employee computer use self-efficacy subsequent to training for its impact on organizational development.

Purpose of the Study

The primary purpose of this study was to investigate work situation and transfer of training influences of computer self-efficacy and self-efficacy on training programs that meet individual and organization objectives of university personnel. This was accomplished by assessing the computer self-efficacy and self-efficacy of computer technologies of employees subsequent to training and its duration as it pertains to training usefulness. Additionally, the computer self-efficacy and self-efficacy of computer technologies assessment sought to determine influences on computer use for human resource placement information and to determine present training needs.

Research Questions

Major research questions for the study involved the following: (a) time, (b) supervision responsibilities, (c) job type, (d) campus unit, (e) previous classroom computer training (database management, word processing, statistical processing, spreadsheets, programming, educational software), (f) job tenure, (g) computer training required on the job (database management, word processing, statistical processing, spreadsheets, programming, educational software), (h) frequency of computer use, (i) home computer use, (j) training responsibilities, (k) interactions, (l) main effects, and (m) relationships between dependent variable scales.

More specifically, these research questions were posited as:

1. Does computer self-efficacy (CSE) or self-efficacy of computer technologies (SCT) differ among university employees, as measured by the Computer Self-Confidence Assessment, with regard to time between training and survey time?
2. Does computer self-efficacy or self-efficacy of computer technologies differ among university employees, as measured by the Computer Self-Confidence Assessment, with regard to supervision responsibilities?
3. Does computer self-efficacy or self-efficacy of computer technologies differ among university employees, as measured by the Computer Self-Confidence Assessment, with regard to job type?
4. Does computer self-efficacy or self-efficacy of computer technologies differ among university employees, as measured by the Computer Self-Confidence Assessment, with regard to campus unit of employment?

5. Does computer self-efficacy or self-efficacy of computer technologies differ among university employees, as measured by the Computer Self-Confidence Assessment, with regard to type of previous classroom computer training?

6. Does computer self-efficacy or self-efficacy of computer technologies differ among university employees, as measured by the Computer Self-Confidence Assessment, with regard to job tenure?

7. Does computer self-efficacy or self-efficacy of computer technologies differ among university employees, as measured by the Computer Self-Confidence Assessment, with regard to type of computer use required on the job?

8. Does computer self-efficacy or self-efficacy of computer technologies differ among university employees, as measured by the Computer Self-Confidence Assessment, with regard to frequency of computer use?

9. Does computer self-efficacy or self-efficacy of computer technologies differ among university employees, as measured by the Computer Self-Confidence Assessment, with regard to home computer use?

10. Does computer self-efficacy or self-efficacy of computer technologies differ among university employees, as measured by the Computer Self-Confidence Assessment, with regard to training responsibilities?

11. Does an interaction exist between the independent variables of time between training and survey time, supervision responsibilities, job type, campus unit of employment, previous classroom computer training, job tenure, type of computer use on the job, frequency of computer use, home computer use, and training responsibilities, as

measured by the Computer Self-Confidence Assessment, with regard to computer self-efficacy or self-efficacy of computer technologies?

12. Does computer self-efficacy, self-efficacy of computer technologies, time, supervision responsibilities, job type, campus unit of employment, previous classroom computer training, job tenure, computer use required on the job, frequency of computer use, home computer use, and training responsibilities differ among university employees as measured by the Computer Self-Confidence Assessment?

13. Does a relationship exist between computer self-efficacy and self-efficacy of computer technologies among university employees as measured by the Computer Self-Confidence Assessment?

Theoretical Framework

According to several researchers, a primary reason for studying self-efficacy is to examine the cognitive role in one's performance of a task (Bandura, 1971; Bandura, 1977; Cherniss, 1991; Ellen et al., 1991; Gist, 1987; Gist, 1989; Gist & Mitchell, 1992; Guthrie & Schwoerer, 1994; Jones, 1986; Karl et al., 1993; Miura, 1987; Popper & Lipschiz, 1993; Schunk, 1981; Tanner, Day, & Crask, 1989). The primary purpose of this study was to provide information regarding the impact of computer self-efficacy subsequent to training on the organizational effectiveness on employees. Therefore, it is vital that the study's theoretical base be founded upon a model that considers the self-efficacy philosophy.

Bandura's social learning theory evolved into his self-efficacy model. This model

was applicable to the present study because of its position that information is the source of self-efficacy and self-efficacy is the link to performance. Bandura (1971) said social learning occurs through casual or intentional observation of life activities are retained for appropriate use. Bandura (1977), Gist (1989), and Gist and Mitchell (1992) noted self-efficacy is the basis for choosing what to do, sustaining amount of effort needed for attainment, and preserving experiences. Bandura (1971) indicated social learning is a process in which patterned activities are the key to performance. Consequently, Bandura (1977) said that self-efficacy is continuously updated as a person experiences life.

Bandura (1977, 1991) addressed self-efficacy as one's belief in his/her ability to accomplish a specific task. This definition implies that in performing a task, one must have resources to perform actions to achieve completion of the task. Bandura (1991) offered that self-efficacy is a person's judgments of what specific task can be performed with the present skills possessed. Bandura (1977) inferred that people make self-efficacy judgments through interactions with self-thought, actions, and affective domains.

Bandura (1977) stated that information needed to make self-efficacious judgments are obtained by (a) performance accomplishments or enactive mastery, (b) vicarious learning experiences, (c) verbal persuasion, and (d) physiological arousal. Performance accomplishments make a cognitive register in which self-thought compares the possibilities of future task attainment. Bandura (1982) said

People register notable increases in self-efficacy when their experiences disconfirm misbeliefs about what they fear and when they gain new skills to manage threatening activities. If in the course of completing a task, they discover

something that appears intimidating about the undertaking, or suggests limitations to their mode of coping, they register decline in self-efficaciousness despite their successful performance (p.125-126).

Vicarious learning experiences occur by watching and absorbing the struggles and successes of others (Popper & Lipschitz, 1993). Verbal persuasion is the use of conversation and collaboration to come to a level of self-efficacy. Verbal persuasion must accompany real experiences of success for meaning to be transferred, and physiological arousal is responsible for changing emotions to fit a self-efficacy judgment mode (Bandura, 1982). Bandura (1977) wrote that psychological control over a previously avoided task is likely to change emotions and cause the individual to change behavior. Bandura (1991) said self-regulation encompasses self-efficacy and plays a role in the impact of thought, affect, motivation, and action.

Bandura (1982) recognized three dimensions in which individuals cognitively assess their ability to perform a task: (a) magnitude, (b) strength, and (c) generality. He addressed magnitude as the level of task difficulty that a person believes can be achieved. Strength is defined as one's own conviction of being able to act at any level. Generality is how much beliefs can be transferred to other situations (Bandura, 1982).

Self-efficacy judgments can result in four types of behavior: (a) performance, (b) coping efforts, (c) emotional arousal effort, and (d) persistence of situations individuals choose for themselves (Bandura, 1982; Gist & Mitchell, 1992). Bandura (1982) noted that self-efficacy is a determinant of choice behavior and influences the choice of behavioral settings. When individuals accept coping as inadequate for addressing threatening

situations, those situations are avoided. On the other hand, if people feel coping is acceptable, they may participate in that kind of situation. Bandura (1988) wrote that three elements; (a) skills matched with basic competencies, (b) complex skills broken down into subskills, and (c) learning to apply (a) and (c) with different people and circumstances results in positive performance. He emphasized new skills are rarely used for long unless they are put into action in work situations. Further, he stressed the importance of experience in building personal confidence in newly learned skill situations. Bandura (1988) conveyed people with insufficient practice will apply newly learned skills rarely and inconsistently. According to Bandura (1982a) self-efficacy:

in dealing with one's environment is not a fixed act or simply a matter of knowing what to do. Rather, it involves a generative capability in which component cognitive, social, and behavioral skills must be organized into integrated courses of action to serve innumerable purposes....Self-efficacy judgments, whether accurate or faulty, influence choice of activities and environmental settings (p.122-123).

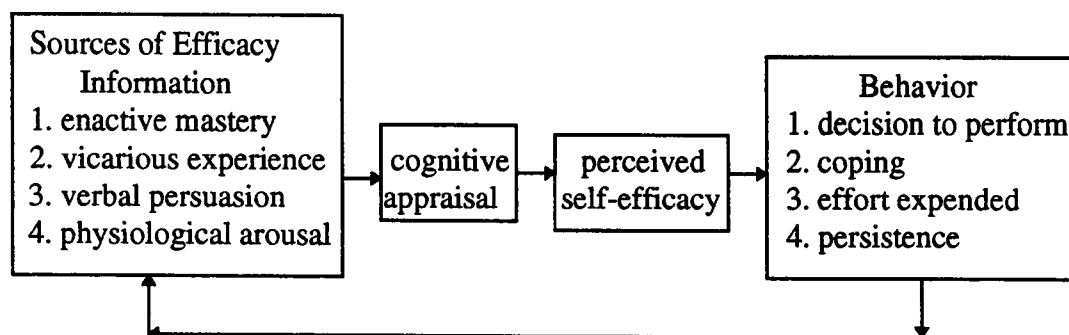
Bandura (1977) asserted that there are self-efficacy expectancies and outcome expectancies with regard to self-efficacy performance. Outcome expectancies are an individual's situational belief that certain behaviors will result in desired outcomes. Bandura (1982) recognized classes of outcome expectations as physical, social, and self-evaluative. Thus, self-efficacy judgments can affect individual behavior in areas such as career movement. Gist (1987) speculated that self-efficacy is influential to job choices. For example, an individual with high self-efficacy may choose to apply for a job vacancy

that is more challenging and financially beneficial, while employees with low levels of self-efficacy may remain in their present position or conform to the status quo. Bandura (1977) argued outcome expectations may make an independent contribution to motivation and behavior because outcomes can indirectly be linked to the quality of performance.

Bandura (1977) recognized desirable outcomes in activities as those in which individuals view themselves as efficacious. Self-evaluative outcomes are influential to interest development.

Bandura (1977) suggested a number of behavioral change interventions are successful because of their ability to replicate expectations of personal effectiveness. Bandura (1977) contended that training programs can influence these sources of information that, in turn, result in self-efficacy judgments. Bandura (1982) also asserted that self-efficacy is a reliable measure to assess performance in program objectives. As in Figure 1, Bandura (1982) considered a three-way interaction among a person's cognitive assessment, individual behavior, and personal environment information, which he called a triad reciprocity.

Figure 1. Bandura's Self-Efficacy Model



Note. Adapted from "Self-efficacy in health behavior: Research and practice," by J. Allen, 1988, *Cardiovascular Nursing*, 24, p.37.

Hypotheses

From the listed research questions, the null hypotheses for the present study are as follows and were tested at the .05 significance level:

Ho₁: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to time between training and survey time.

Ho₂: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to supervision responsibilities.

Ho₃: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to job type.

Ho₄: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to campus unit of employment.

Ho₅: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to type of previous classroom computer training.

Ho₆: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to job tenure.

Ho₇: There is no significant difference in computer self-efficacy or self-efficacy of

computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to type of computer use required on the job.

Ho₈: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to frequency of computer use.

Ho₉: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to home computer use.

Ho₁₀: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to training responsibilities.

Ho₁₁: There is no significant interaction among the independent variables of time between training and survey time, supervision responsibilities, job type, campus unit of employment, previous classroom computer training, job tenure, type of computer use on the job, frequency of computer use, home computer use, and training responsibilities, as measured by the Computer Self-Confidence Assessment, with regard to computer self-efficacy or self-efficacy of computer technologies.

Ho₁₂: There is no significant difference between computer self-efficacy, self-efficacy of computer technologies, time, supervision responsibilities, job type, campus unit of employment, previous classroom computer training, job tenure, computer use required on the job, frequency of computer use, home computer use, and training responsibilities among university employees, as measured by the Computer

Self-Confidence Assessment.

Ho₁₃: There is no significant relationship between computer self-efficacy and self-efficacy of computer technologies, among university employees, as measured by the Computer Self-Confidence Assessment.

Rationale

Despite efforts toward increasing productivity through more empowerment initiatives, decision makers of organizations remain puzzled by unmet business objectives. Research has noted the importance of organizational development as a means of achieving business objectives rather than futile short-term reactive attempts at solving huge problems. French and Bell (1984) defined organizational development as

a top-management-supported, long-range effort to improve an organization's problem solving and renewal process, particularly through a more efficient and collaborative diagnosis and management of organization culture--with special emphasis on formal work team, temporary team, and intergroup culture--with the assistance of a consultant-facilitator and the use of the theory and technology of applied behavioral science, including action research (p. 17).

French and Bell (1984) explained that decision makers have always focused on the goals of the organization and have failed to look at individual beliefs as a component of organizational development.

The explosion of computer technology in the workplace is dealt with in the same manner. Short-term "fixes" to implementing computer technology are quite common, and

unfortunately, training has become that quick fix. However, even computer training fails to meet organizational expectations without a receptive audience, strong reactions to computers (Hill, Smith, & Mann, 1987), and knowledge of participant beliefs. Campbell and Lee (1988) stated that constraints occur within the individual and within the situation, which limit self-efficacy and performance. Still, the expectations of those permitting employees to participate in training are mismatched with the employee confidence and capabilities that individual employees believe they possess.

Several researchers have revealed suggestions for better addressing the issue of organizational development. Torkzadeh and Koufteros (1994) indicated the need for understanding the relationship of training and trainee self-efficacy. Stevens, Bavette, and Gist (1993) wrote that training that addresses employee confidence may be necessary. Gist (1987) stated that research is needed to determine if self-efficacy is applicable to job situations, individual job assignments, key organizational factors, and to whether or not work groups are equal in levels of self-efficacy. Therefore, organizations should examine computer self-efficacy subsequent to training. In response to Gist's research, Smith (1990) implied that future research is needed on post-test self-efficacy to determine equity and effectiveness for the organization.

As computer technology overtakes much of an individual's work life, the present study provides upper management and human resource development professionals with information for evaluating their training programs. In a study of managers and supervisors, Guthrie and Schwoerer (1994) demonstrated that measures of self-efficacy indicate the usefulness of training. Havelock (1969) wrote that personality, feeling of threat, fears,

attitudes, self expectation, and past experience or prior training can affect the acceptance or rejection of new knowledge. Follow-up studies from Rogers and Shoemaker (1971) reasoned that favorable attitudes can predict adoption and use of training. Thus, it can be inferred that items such as employee self-initiative and acceptance to change indicate favorable attitudes because threats and fears of new technology are driven out by the employee's expanded confidence level.

Employees showing high levels of self-efficacy considered training useful to job performance and their own career development. Consequently, if the training program is useful to improving performance, then organizational objectives and expectations can be attained. Furthermore, if employees perceive personal benefits, then individual needs are likely to be satisfied.

Knowledge of how long computer self-efficacy is sustained is an additional benefit of this study. If human resource professionals have knowledge of decreasing or increasing fluctuations in self-efficacy, then computer training can be appropriately timed and appropriately tailored to meet an individual's self-efficacy needs as well as organization management's desire for increased productivity. As a result, employees with high self-efficacy would not require training because they are confident in performing their designated assignments. Likewise, employees with low self-efficacy would require training because they are not confident in performing their jobs. Additionally, with knowledge of the sustainment of self-efficacy, trainers within organizations can provide mass training to improve self-efficacy and confidence in performing computer tasks. If it is determined that self-efficacy fluctuates periodically, then training can be designed solely for improving

self-efficacy. Moreover, training provided to a large mass of people can reduce training costs for the organization.

Human resource placement information is a third benefit of the present study. By analyzing self-efficacy according to the independent variables of job type, campus unit of employment, previous computer training, and job tenure, human resource professionals will be able to fill positions according to self-efficacy in job requirements. Self-efficacy associated with particular job types conveys to human resource professionals as to what type of individual, in terms of self-efficacy, to place in particular positions so that consistency can be maintained toward organizational goal attainment.

Moreover, the self-efficacy levels by campus unit of employment will provide knowledge to the human resource professional as to what type of individual, in terms of self-efficacy, to search and place in a particular campus. To achieve the organizational goals and the goals of the department, all individuals in that department must believe they can accomplish the responsibilities of that department. Chu (1979) said that one person can change the shape of an environment. If one person has a low level of self-efficacy in that campus/department location, then that individual may hinder the performance of the campus/department.

Analysis provided by the independent variable of previous computer training will provide human resource professionals with knowledge of what types of computer training provide particular levels of self-efficacy as well as how to place individuals with self-efficacy generated from computer experience. If a job applicant indicates previous computer training on a resume or application, then human resource professionals can

determine if the efficacious previous experience is appropriate for vacant positions, campuses, and departments.

Evidence of self-efficacy associated with job tenure will provide information for job transitions and promotions. Employees requesting promotions or being considered for promotions can be considered based on their level of self-efficacy and the overall self-efficacy requirements of the job. Placing and promoting an employee according to the self-efficacy needs of the position can promote a cohesive work environment.

Being able to categorize training is the fourth and final benefit of the study. The information from this study will determine if computer technologies are appropriately classified for training computer skills. Upon this classification, human resource professionals will recognize what computer skill training to provide in order to transfer self-efficacy to higher computer technology self-efficacy.

An assessment of computer self-efficacy and self-efficacy of computer technologies can provide information for clustering individual abilities relevant to the employee's career development agenda. For example, if an employee has confidence in basic computer skills and these skills are related to technology skill confidence, then the employee could be provided advanced computer skill training to enhance career goals.

Categorizing training can also provide human resource professionals with information for assessing current training needs. For example, employees with high confidence in computer technologies may have a low computer self-efficacy score, which indicates the employee lacks basic computer knowledge and skills. Human resource professionals and trainers can provide the training to accommodate the employee's skill

deficiencies. Furthermore, appropriate training can be provided to enhance present computer self-efficacy.

Assumptions

1. It is assumed that other transfer of training variables such as type of instructor and method of instruction may impact employee computer use self-efficacy; however, these variables will not be controlled in this study.

2. The study assumes that respondents are conscious of their confidence in computers and computer technology and can report it accurately.

3. The study assumes that respondents are able to differentiate between types of previous classroom computer training and types of computer use required on the job and those listed on the Computer Self-Confidence Assessment.

Limitations

1. The study is limited by a descriptive study and responses from a mailed questionnaire.

2. The study is limited by the Office of Human Resource Management manual record keeping.

3. The study is limited by employee job and address changes within the two-year time period.

4. The study is limited by the judgment and accuracy of individual self-reported measures of computer self-efficacy and self-efficacy of computer technologies.

Delimitations

1. The general applicability of this study is delimited to the organization and employees at The University of Tennessee, Knoxville.
2. The study is delimited by the lack of responses from those individuals who were trained and are no longer with the university.
3. The study is delimited by the Computer Self-Confidence Assessment categories of previous training and computer use required on the job.
4. The study is delimited to the training period of May 1993 to August 1995.

Definition of Terms

Affective domains: A mental analysis or processing that affects performance (Bandura, 1977).

Autonomous work environment: Employee freedom in a work environment to make their own decisions and perform as they see fit.

Cognitive: Mental action resulting from learned information (Bandura, 1977; Bandura, 1982; Gist & Mitchell, 1992).

Computer self-efficacy: An individual's belief that they can perform a specific computer task (Kinzie & Delcourt, 1991; Murphy et al., 1988).

Computer training: Instruction provided for the purpose of enhancing an individual's ability to operate computers (classroom, on-the-job, coaching, etc.).

Computer use self-efficacy: The confidence individuals have in using computer knowledge and technologies, as assessed via the Computer Self-Confidence Assessment.

Coping: Toleration and acceptance of situations without confrontation (Bandura, 1982).

Campus unit of employment: A segregated location of an employee job assignment. In this study, campus unit of employment pertains to either The University of Tennessee, Knoxville's (UTK) main campus, agriculture campus, or medical center.

Frequency of computer use: The degree or how often an individual uses a computer.

Home computer use: The use of a computer in one's own home environment.

Human resource placement information: Information pertaining to hiring or where an employee would be most appropriately suited in an organization.

Individual objectives: The desired achievements established by individual persons.

Interface: An initiation that influences how computer technology performs (Page & Hooper, 1987).

Job tenure: The length of time an individual has been working in a specified job type, which is categorized as a newcomer or incumbent.

Job type: A clerical/administrative, maintenance/technical, or faculty job.

Level of self-efficacy: Either a high or low individual belief that a specific computer task can be performed.

Mutual benefit: A result that aids both the worker and the supervisor.

Organizational objectives: The desired mission/purposes established by an organizational entity.

Post performance: A term used in association with experimental designs in which performance is measured after a treatment (e.g., training).

Previous classroom computer training: The type of computer training received from UTK Human Resources Management that is categorized as database management, educational software, programming, spreadsheets, statistical procedures, and word processing.

Psychological control: The mental belief that something can be accomplished (Bandura, 1977).

Self-efficacy: An individual's belief in their ability to perform a particular task (Bandura, 1977; Bandura, 1982; Gist, 1989).

Self-efficacy of computer technologies: An individual's belief in their ability to use a specific computer technologies (e.g., word processing, electronic mail, and CD-ROM Data Bases) (Kinzie & Delcourt, 1991).

Self-thought: Individual mental processing about one's self (Bandura, 1971).

Supervise: To oversee the performance of other employees.

Training responsibilities: Having the responsibility to train fellow employees.

Type of computer use required on the job: The type of computer operation an employee is expected to perform in the normal functioning of their job.

University employees: Employees working for an institution of education beyond the secondary level.

User's satisfaction: A computer operations term in which the computer operator accepts assigned computer technology as operative (Bailey & Pearson, 1983).

CHAPTER II

REVIEW OF RELATED LITERATURE

This chapter presents a review of literature related to the present study. The review unveils a variety of studies on the subject of self-efficacy and computer training. These studies are divided into ten major categories: (a) self-efficacy and age, (b) self-efficacy and gender, (c) self-efficacy and race, (d) self-efficacy and education, (e) self-efficacy and human life, (f) self-efficacy and work, (g) self-efficacy and training, (h) self-efficacy and computers, (i) computer use, and (j) use and transfer of training. The following sections discuss each category according to its relevance and importance to the present study.

Self-efficacy and Age

A relationship between age and self-efficacy was addressed throughout studies of self-efficacy. Early studies found that age and self-efficacy were related to growth and development of individuals. Tyler and Gatz (1973) conducted a study of high-school-age adolescents and their development that found that growth in adolescents was attributed to a self-efficacy configuration of trust and coping. Their study also found that levels of self-efficacy were related to a person's attitudes about work and society.

Those societal influences spilled over into family situational aspects that affect children's levels of self-efficacy. Torgoff and Torgoff (1980), in a study of father-absent households, found that age was a significant factor influencing child self-efficacy.

In relation to earlier studies, self-efficacy is the influential component on how an

individual copes with situations. As self-efficacy is a belief, it also is attached to individual emotions. Sutton (1992) chose 90 individuals from ages 26 to 87 to detect how self-efficacy affected emotions. Sutton (1992) found that self-efficacy negatively affected negative emotions in the entire age group.

Studies related to the workforce indicated a concern over the self-efficacy of age groups such as middle-age and older workers. Rosen and Jerdee (1989) mentioned that with the projected labor shortage and the highly qualified base of older workers to fill these positions, training should seek to enhance the self-efficacy of the older worker. Heppner, Multon, and Johnston (1994) studied individual differences such as age in an individual's ability to move back into the workforce or to make a career transition. Heppner et al. (1994) found that younger subjects had higher levels of self-efficacy in making a career transition than older adults.

Self-efficacy and Gender

Gender is another individual characteristic that has been addressed in studies of self-efficacy. These studies have compared gender for the purposes of determining how much effort is expended by each sex (Robbins, 1987). Schunk (1980b) conducted a study in child/student performance of mathematical division and found that no gender differences occurred in their performance. In a later study of children, Schunk (1981) sought to determine if effort prolonged task involvement that consequently facilitated child behavior. He found that gender had no bearing on achievement behavior or sustained task involvement. However, prior effort did indicate a significant increase in self-efficacy.

Additionally, Randhawa (1994) concluded that boys and girls were different in their ability to process mathematical calculations resulting from the use of different cognitive structures. In other words, the gender differences associated with the ability to perform mathematical calculations were the result of different thought processes that the two genders use.

The level of effort exerted by gender has been studied from a broader perspective such as career choice (Saks, Wiesner, & Summers, 1994). Cherniss (1991) said self-efficacy can be used as a guide for intervention strategies for career commitment.

Ayres Gerhart (1980) selected 188 undergraduate students enrolled in an introductory psychology class and assigned them four occupations to measure the extent that gender differences in self-efficacy influenced vocational choice and to examine the role of self-efficacy in making career choices. Four occupations -- physician, nurse, professor, and elementary teacher were chosen to obtain comparisons in content area and traditionality/non-traditionality of the occupation for women. The final results suggested that self-efficacy expectations are related to an individual's choice of careers. Females were identified as having greater self-efficacy toward those occupations traditionally recognized as female occupations, such as a teacher. The occupations of physician and professor were viewed equally by both genders in terms of self-efficacy. Gender was also found to significantly affect the self-efficacy of specific tasks. Males were found to have a higher self-efficacy in math and science tasks, while females had a higher self-efficacy in areas of English, nursing, and teaching (Ayres Gerhart, 1980). This suggested that specific task self-efficacy interacts with the perceived importance of the task. Hackett and Betz

(1981) supported this study by its finding that males have a greater self-efficacy on tasks stereotyped as male tasks.

In a follow-up study Betz and Hackett (1986) examined gender differences in self-efficacy in educational requirements and job duties. No significant gender differences were found in overall occupational self-efficacy but gender differences did occur when traditional occupations were considered. Gender, occupational self-efficacy, and vocational interests significantly predicted choices in occupations. Moreover, no gender differences were observed in self-efficacy expectancies, but technical self-efficacy was significant in predicting grades in technical courses, persistence in college major, and consideration of career options.

Tenger (1991) investigated gender differences in career choices among university students by comparing self-efficacy regarding a variety of career options of third and fourth year computer science, education, geography, and nursing students. Tenger (1991) essentially found that of all female students there were indications of higher self-efficacy for traditional occupations, whereas male students showed higher self-efficacy for non-traditional occupations.

A later study focused on additional correspondence between gender and the self-efficacy associated with particular tasks. Showers (1981) more specifically studied gender effects on a teacher's ability to participate in school decision making. A sample was taken of four secondary schools for the purpose of determining the effects of demographic characteristics on self-efficacy beliefs. Gender, the subject taught and job tenure were not found to affect levels of self-efficacy. However, despite these negative

results, organizational characteristics such as freedom to participate did affect self-efficacy levels (Showers, 1981).

Self-efficacy has been recognized as a potential component of training or other interventions to increase performance. Feltz (1981) used path analysis as an intervention and measured post self-efficacy in female college students who were inexperienced in back-dive performance. The study found that self-efficacy was not a predictor of back-diving performance; however, there were indications that self-efficacy has an effective life. Self-efficacy was found to be a strong predictor of performance on the first set of back-diving trials; however, after-trial self-efficacy levels decreased (Feltz, 1981).

In an extension to studies of gender and occupational choice, Clement (1987) solicited 121 current and future university students for their opinions regarding stereotyped occupations for their future careers. Females continued to show lower levels of self-efficacy in relation to traditional male occupations; however, males did not rate their self-efficacy in the same direction as the females. Females indicated that low self-efficacy did not affect their consideration of male occupations (Clement, 1987).

In a study to determine what characteristics affected career transition, Heppner et al. (1994) found that only gender and self-efficacy affected career transition. Males were found to exert more initiative to make a career move than females.

Computer-related studies used gender as a predictive variable. Murphy et al. (1988) used 414 graduate, adult, vocational, and professional nursing students in three different settings to determine if computer skills were also related to gender. Univariate tests showed gender effects on advanced and mainframe skills, with males having higher

levels of self-efficacy. They additionally discovered that males had more previous experience in using computers, but both genders equally perceived the difficulty of using computers. However, females did not perceive themselves as being better able to learn how to use computers than males. Still, Kinzie and Delcourt (1991) found that gender had no extreme importance in predicting self-efficacy of computer technologies.

In a related study, a skewed gender population was used to assess external characteristics that affected microcomputer use in urban school settings. Bauer (1991) found that gender had an effect on varying patterns of computer use. The level of self-efficacy among females was also found to be equal to males in the use of computers. In a related study, Cavanaugh (1992), in a study of primary children, determined that gender and grade level were not significant in predicting computer self-efficacy. However, she found that grade did account for some variation in computer competence at the first grade level while less variation was discovered in the second grade level. She also found no significant gender differences occurred in self-efficacy before or after instruction. Overall, no significant differences were found in self-efficacy of first through third grade students.

Self-efficacy and Race

The literature is quite limited on studies that explore self-efficacy and race. In some studies, self-efficacy is the precedent for goal attainment which brings with it race and previous accomplishment characteristics (Tyler & Gatz, 1973).

Race was first studied for its cultural relevance. Johnson (1981) studied whether or

not culturally relevant interaction had any effect on self-efficacy, motivation, learning, and long-term memory retention. Black seventh and eighth graders were found to have higher levels of self-efficacy as a result of race interaction. Additionally, Williams (1987) examined black undergraduates in computer science and engineering majors and found that black student levels of self-efficacy reflected the level of academic progress.

Self-efficacy and Education

Self-efficacy and education can extend from the elementary level to higher education areas of study. Interest in subject content is thought to be related to individual levels of self-efficacy (Lenox & Subich, 1994). Thus, research has been conducted in areas that enable students to learn more productively. Schunk (1980a) found that high self-efficacy leads to greater interest among children. Other research by Schunk (1980b) found that by using behavior modeling, expected behaviors and levels of self-efficacy, such as in persistence, occurred. However, no increase in self-efficacy was found in adolescent children as a result of performing division problems. Kober (1991) also found that student attitudes toward performing mathematics was perceived as more useful when they coincided with high levels of self-efficacy. Bloome (1993), examining the effects of multiple metaphors on math task self-efficacy and using undergraduate students, posited that multiple metaphors increased math task self-efficacy in the treatment group. However, multiple metaphors were not significant in predicting general self-efficacy. No interactions were found among treatment group, control group, and gender.

In an attempt to understand how individuals learn better, researchers have

conducted experimental studies with various treatments and their relationship to self-efficacy. Jason (1980) chose three classes of inner-city high school seniors and exposed them to techniques in physiological, cognitive, and behavioral models. Higher levels of self-efficacy were evident when cognitive strategies in problem solving were used. In support of this finding, Randhawa (1994) found that competence in problem solving was a result of rich knowledge, cognitive strategies, and confidence or self-efficacy.

Although research has aimed toward the effects of organizational interventions on individual self-efficacy, productive education includes the self-efficacy levels of teachers in using instruction techniques. Olivier (1985) investigated self-efficacy of teachers in adapting to computers for instruction by conducting an experimental study of 58 teachers who had completed graduate coursework in instructional computing. The findings from the study indicated that self-efficacy for choosing computer instruction was dependent upon (a) the number of courses taken, (b) perceived mathematical ability, and (c) having a second language (Baird, 1981).

In a related study, Jorde (1986) examined the adoption of microcomputers in an elementary school setting. Administrators from nonprofit and private proprietary education programs were used for the study. His findings indicated that a direct relationship existed between self-efficacy and innovativeness for using computers.

Teachers often make decisions regarding their classroom, and to some researchers it is the decision-making process that influences the amount of learning and self-efficacy gained by their students (Olivier, 1985). Blank (1986) found that teacher decision making

within a tutorial setting was influenced by (a) general beliefs of teaching and learning, (b) role perception, and (c) their perceptions of student ability. The decision making of teachers is not only influenced by their beliefs about their audience, but also themselves. Blank (1986) also found the following secondary predictors of teacher decision making: (a) need for feedback from their students, (b) their own feelings of self-efficacy regarding their ability to teach, and (c) their own self-evaluation. In support of this study, Ridley (1991), with a group of undergraduates, explored the self-orientation aspect of the learning process and concluded that high levels of reflective awareness promote the development and implementation of performance and goals.

Although studies were conducted in educational settings, the effect of level of education remains a concern in learning complex technology. Murphy et al. (1988), in validating the CSE instrument used in this study, found that the variable "previous computer use" was significant in predicting advanced computer skills. Further analysis by the authors found that previous computer use was not significant in predicting mainframe computer skills. Consequently, the researchers also found that the individual's level of education explained a significant portion of the variability in computer self-efficacy in advanced and mainframe computer skills.

Kinzie and Delcourt (1991) also found that experience in coursework or frequent use of computers was the most significant predictor of self-efficacy. This significance occurred in all subscales of computer technologies; word processing, electronic mail, and CD-ROM Data Bases.

Self-efficacy and Human Life

Self-efficacy occurs in many areas outside of daily work routines. Studies have shown how self-efficacy affects the human life functions. Umiker (1993) listed the following factors that have an effect on life: (a) self-efficacy, (b) how an individual is treated by others, (c) past experiences, and (d) guilt feelings.

Condiotte (1980) conducted an analysis of self-efficacy and relapse in individuals who smoke. His study revealed a correlation between cluster smoking situations and self-efficacy. Those individuals relapsing into smoking experienced low levels of self-efficacy.

Further studies revealed that personal situations can affect one's degree of confidence to perform. However, other studies suggested that the external factors of one's family life can affect that confidence level. Torgoff and Torgoff (1980) identified the level of strength in self-efficacy as a result of father-absent families. Girls growing up in a father-absent household showed a decrease in confidence of family support but showed an increase in self-efficacy. Boys of father-absent households, too, showed a drop in family strength as well as a sharp increase in self-efficacy.

Sandor (1991) specifically studied teenager performance as a result of family transitions within the divorce process. Her concerns were the intervention effects of bibliotherapy on problem solving, self-perceptions, self-efficacy, and self-esteem. Single-parent mothers were also assessed. Sandor (1991) recognized moderate correlations between self-efficacy and self-esteem and self-efficacy and problem solving. Self-efficacy was also moderately correlated with self-perception, scholastic competence,

social competence, behavior, friends, self-worth, and romance while it was slightly correlated with athletic ability, physical appearance, and job confidence. In relation to single-parenting subscales, self-efficacy was slightly correlated with warmth and enthusiasm. Pretest scores of parent mothers explained 6.1% of the variance in adolescent scores.

Investigations of personal moods and self-efficacy used depressed and non depressed experimental groups. Kanfer (1981) investigated the relationship of standard-setting and self-efficacy expectations in depressed and non-depressed subjects with 39 depressed and 39 non-depressed undergraduate psychology students. The students completed self-ratings on two forms of the Interpersonal Concerns Questionnaire (ICQ). Students were measured using a third device that instructed subjects to rate the importance of each item on the ICQ so that a relationship could be investigated between standards and the expectations of self-efficacy. Kanfer (1981) distinguished that, in the strength of personal standards and self-efficacy expectations, a large discrepancy existed for the depressed. The depressed showed lower self-efficacy expectations than the non-depressed (Kanfer, 1981). Correlation analysis showed a positive correlation between importance and strength ratings for standards of the depressed and non-depressed.

In a further study, Hughes (1993) determined the effect of adventure-based counseling and levels of sensation on the development of self-efficacy in chemically dependent males. Using a randomized posttest-only control group design, he found significant differences in self-efficacy as a result of traditional treatment and adventure-based therapy. Low sensation seeking individuals had a significantly higher total

self-efficacy score than high sensation seeking dependents. With higher sensation seeking scores, individuals were less likely to resist temptations to drink or use drugs when personal control was tested.

Other studies listed items that a person can perform to control for fluctuations in levels of self-efficacy. Hill and Ward (1989) listed that one should (a) avoid mood changes, (b) avoid similar task performances, and (c) employ personal evaluation to measure self-efficacy. In support of this list, Tanner, Hunt, and Eppright (1991) discovered that the emotion of fear significantly affects levels of self-efficacy.

Other routine behaviors such as eating are related to self-efficacy. Ward (1991) evaluated Banduras' self-efficacy theory for adolescents' eating behaviors by using 136 high school students. Ward (1991) found a relationship between self-efficacy and food choice situations, which indicated that self-efficacy was related to diets chosen. As part of the study, participants were assigned to three groups according to their self-efficacy diet level. Those with higher self-efficacy also maintained higher diet quality.

Later studies revealed a connection between self-efficacy and the health of individuals. Gellatly and Meyer (1992) studied undergraduate heart rates by assigning perceptual tasks that were thought to be more difficult. The study found that high self-efficacy resulted in higher heart rate.

One's self-efficacy is not always inherent in routine actions but can be intentionally imposed through life experiences and habits. Tanner et al. (1989) found, in using college juniors as subjects, that self-efficacy was a significant contributor to coping with sexually transmitted diseases. Even in areas such as childbirth, self-efficacy can be an indicator of

actions taken. Parker (1993) used women who were enrolled in childbirth preparation classes to determine if self-efficacy, outcome expectancy, and importance were related to actions taken in the delivery room. Parker (1993) deduced that self-efficacy, outcome expectancy, and importance were all related to the medication chosen in the labor process. No other secondary predictors such as length of labor, type of delivery, control, and previous training had a more positive effect than self-efficacy.

Self-efficacy and Work

With today's need for increased productivity with fewer resources, it is vital that self-efficacy beliefs be a consideration in the success of employees and organizations. Self-efficacy studies that relate to the work environment are numerous and have made strides toward determining the self-efficacy status of work environments. Rafferty (1993) listed six characteristics of professional self-efficacy: (a) reflective/reflexive (Bandura, 1977), (b) flexible/adaptive, (c) desiderative, (d) collaborative, (e) conatational, and (f) communicative.

One of the factors that has always influenced how individuals work is the amount of autonomy that can be exercised on the job. Hayes (1987) examined the effect of control on youngsters who have encountered emotional conflict and treatments that sought to improve the amount of autonomy on the job and, consequently, levels of self-efficacy.

Because work involves change in today's environment, self-efficacy beliefs could be crucial to the successful implementation of work changes and levels. Jorde (1985) found that age, gender, job title, cost-effectiveness, complexity, efficiency and degree of

use (Hill & Elias, 1990; McDonald & Siegall, 1993) were indicators of successful workplace transitions. Chester Barnard (as cited in Stensrud, 1986) recognized three levels in executive level thinking strategies: content-- strong belief in personal self-efficacy, structure-- more complex thought, and context--strategies occur from organizational demands. Krueger and Dickson (1994) found that those executives who felt confident in their decision making were more likely to take risks in their business and personal lives. In a study of service organizations, Davis (1994) found that organizational levels of clerical and administrative/professionals did not result in significant differences in advanced computer self-efficacy.

Sales is one type of work that requires simultaneous handling of a multitude of demands. In an experimental study of business students in a simulated role play, Chowdhury (1990) studied the motivational consequences of continuously increasing quota levels on sales personnel. By using the level of externally set goal, the individual's self-efficacy, and external information about the task, he deduced that low self-efficacy individuals negatively evaluate increased externally set goals. Thus, high self-efficacy individuals are encouraged by task success and other intrinsic rewards as a result of successful performance. Chowdhury (1990) wrote that when tasks increased in difficulty, individuals with high levels of self-efficacy responded more positively to increased levels of goal difficulty as well as adjusted their expectancies upward. Chowdhury (1993) found that high or difficult quota levels are appropriately suited for those with high levels of self-efficacy. Self-efficacy interacted with quota had a significant effect on the effort put forth by sales personnel. In further studies of how self-efficacy affects performance or

organizational behavior, Gist and Mitchell (1992) found that those more focused on a single task had a lower self-efficacy level.

Leadership in organizations is partially responsible for the personal performance of employees. Thus, concern is given to levels of self-efficacy and actions taken by individuals in reacting to job situations. Parker (1993) performed a study of hospital nurses to determine if self-efficacy influenced the nurse's choice to challenge leadership demands, leave the organization, or cope with the leadership. A relationship was found between self-efficacy and dissent. Nurses who are highly confident are more likely to make their opinions known. The level of self-efficacy did not influence the nurse's choice to quit his/her job.

Barbarin (1977) found self-efficacy to influence the behavior of coping. In another related study using graduating MBA students, Barbarin (1977) studied the effects of self-efficacy on organizational roles. Barbarin (1977) found that individuals with high levels of self-efficacy perceive their responsibilities differently and are more concerned with demonstrating their abilities than becoming a "yes" person. Redmond, Mumford, and Teach (1993) also found that leader behavior toward subordinates encourages self-efficacy and leads to greater creativity among employees.

Job performance can often be a result of leadership criticisms. Baron (1988) performed an experimental study using undergraduates and employing two types of feedback: feedback specific and destructive criticism on two tasks, proofreading and clerical. Baron (1988) found that lower self-efficacy and lower personal goals resulted in response to destructive criticism on both tasks. It was also discovered that the type of

criticism depended on the gender of the individual on the proofreading task.

Additional studies have shown how ability and coping conditions are related to self-efficacy. Jex and Gudanowski (1992) used university employees of two major U.S. universities to determine how work characteristics affected emotions. Job titles and age were used as segregating variables in which to study self-efficacy. Self-efficacy was moderately related to anxiety and weakly related to frustration. Working long hours influences anxiety and job satisfaction (Jex and Gudanowski, 1992).

Self-efficacy has been shown to add to the knowledge of human behavior; however, current evidence reveals information with regard to its sustainability. Gist and Mitchell (1992) said that self-efficacy changes over time as new information and experiences are gained.

Latham and Frayne (1989) found that self-efficacy predicts job attendance in individuals during training and after seven months. Therefore, this study shows that self-efficacy remains consistent over time. On the other hand, Lachman (1981) used 76 older adults for a study of memory span and self-efficacy and found that both changed over a two-year period.

Inherent in job attendance studies are the reasons why individuals choose to perform at particular levels of productivity. Michener (1969), in a study of ethnicity, found that those individuals requiring recognition for achievement had high levels of self-efficacy. Additionally, individuals may enter employment with expectations that influence performance. Maddux (1980) found that self-efficacy expectations and the expectancy of the results of a situation independently affect intentions to perform a task.

Lee and Gillen (1989) using a company of sales representatives, found that self-efficacy positively relates to quality and quantity performance. Also, Latham and Frayne (1989) used a sample of state government employees, including carpenters, electricians, and painters, and found that self-efficacy increased with the perceived ability to perform without controls. High levels of self-efficacy were also maintained over a six to nine-month period after self-management training. Paradoxically, sick leave became actual sick leave for the individual rather than an excuse to be out of work. Stevens et al. (1993) used MBA students to determine gender differences in negotiation tactics in business. Women had less self-efficacy in the ability to negotiate even though training was an intervention. His study also indicated that women had lower levels of self-efficacy in establishing goals but, due to training, woman had higher levels of control perception in goal achievement (Lewis, 1986; Stevens et al., 1993).

Favorable attitudes and positivity can sometimes be a reflection of individual characteristics that influence training utility. Kizzier's (1985) study found that age affected the acceptance of automated office technology, more specifically in secretarial positions than in any other job type. Connell (1989) confirmed that the type of work performed was the most significant predictor to job satisfaction or favorability.

Recent studies have focused on self-efficacy and the performance as a result thereof. One study looked at the organization's performance as a result of self-efficacy (Bandura, Bailey, and Wood, 1990). The results showed that self-efficacy was positively related to the use of analysis in managerial decision making and the establishment of personal goals.

Until recently, self-efficacy was referred to as only having high and low levels. Research has indicated, however, that a level of general self-efficacy and its relationship to the employment process is possible. Eden and Aviram (1993) found that training resulted in a general self-efficacy increase. The training also increased reemployment of those who otherwise had low initial levels of self-efficacy. This further shows the need for training of those with low levels of confidence.

Self-efficacy and Training

Many studies have looked at the effect of training on one's belief to accomplish a task. Organizations mainly believe that training automatically convinces an individual of future successful performance. In response to this notion, various types of training have been analyzed for their influence on or relationship to self-efficacy.

Early studies by Kazdin (1979) suggested that training that encompasses modeling and the collaboration of the experience has greater changes in self-efficacy. Jason (1980) used inner city high school seniors and found students exposed to life transition problem solving classes would have higher self-efficacy and better problem solving skills. Davis (1980) also concurred and found that self-efficacy definitely increased as a result of previous training.

However, Reilly (1989) studied the effectiveness of relapse prevention training in a stop-smoking treatment program using Veterans Administration employees and found no significant difference in the number who had quit smoking or in the days of abstinence from smoking as a result of the training.

Goldsworthy (1980) expanded the investigations of self-efficacy beyond fear training interventions to interpersonal skill training effects. He compared interpersonal skills training, verbal persuasion, and assessment-only control conditions and their influence on self-efficacy, outcome expectations, and contrived performance. He found that with interpersonal skills training, self-efficacy is limited in fear avoidance behaviors. Other findings suggested that performance training results in significant social competence over and above verbal persuasion and assessment. Thus, self-efficacy is significantly affected by these treatment procedures. Scherer, Adams, Carley, and Wiebe's (1989) study furthered prior research by showing that the presence of a model influences the self-efficacy of performing any task.

Patterson (1984) used undergraduate students of business and education to study the effects of verbal persuasion training on self-efficacy. No significant differences in self-efficacy were discovered due to verbal persuasion. Additionally, no significant differences in self-efficacy occurred due to the degree of feedback used after the training.

In a later study, Wahtera (1991) used students completing licensed practical nurse (LPN) preparation to determine the degree in which educational preparation, nursing work experience, domain-specific knowledge, strategic knowledge, and self-efficacy impacted student performance. No significant differences were found in conceptualization of nursing procedures due to education and work experience. Self-efficacy was positively correlated with performance and strategic knowledge. Education and work experience had no effect on performance or conceptualization. LPN students, reporting more coursework and more years of work experience, had significantly higher self-confidence than a basic skills

control group.

Despite some groups having increased self-efficacy due to training, it appears that the differences found in self-efficacy from training may depend on the population group. Harmon-Bowman (1981) used secondary school educators as the population and no differences were found in self-efficacy as a result of Stress Inoculation Training. However, job newcomers had differences in self-efficacy and, depending on the level of self-efficacy, personnel had different post performances. Davis (1994) reported that time in the organization for end users with one year or less or ten year or more had the lowest advanced computer self-efficacy. She determined that advanced skills were associated with individuals who had more than one year to nine years in the organization. Davis (1994) found no significant differences between time in the organization and advanced computer self-efficacy when studying six service-based organizations.

At this point, performance may potentially be the result of varying degrees of self-efficacy. However, research by Bleuer (1987) reversed this course and attempted to determine if performance affected self-efficacy. Research by Bleuer (1987) used a training workshop related to computer counseling and found that low and high action levels significantly affected self-efficacy. Additionally, expectations were related to the evaluation of the workshop (Bleuer, 1987). In other words, these expectations of self-efficacy significantly determined good and bad comments regarding the workshop.

Not to have rejected the idea that training has an effect on self-efficacy, Gist (1989) studied the effectiveness of various training methods when matched with different content types. Modeling as a training technique increased self-efficacy more than the

lecture technique (Gist, Schwoerer, & Rosen, 1989). Their study went on to mention that the modeling technique or approach to training can also create a new environment for the trainee.

Linn (1992) furthered studies by Gist by comparing Behavioral Modeling training, Computer-Aided Instruction along with control groups. Computer self-efficacy was measured prior to the training method as well as after the training instruction. Performing two types of computer tasks-WordPerfect 5.1 and financial spreadsheet analysis-58 university students participated and indicated that more computer experience was a reflection of computer self-efficacy. More specifically, the behavior modeling training group had significant increases in computer self-efficacy from pretest to posttest. However, the behavior modeling group did not have higher scores than the computer-assisted instruction group. The behavior modeling group and the computer-assisted instruction groups had significantly higher computer self-efficacy scores than the control group. Age was found as a significant covariate in predicting computer self-efficacy.

Dougher (1981), using female university students and a cognitive restructuring training treatment, was concerned with its effect on career development esteem and self-efficacy. She detected that the self-esteem/self-efficacy level of college women can be significantly changed due to cognitive restructuring training using a single case experimental design and subjects which showed problem solving deficiencies. Enoch (1993) later discovered that the combination of cognitive behavioral, metacognitive strategies, and attribution training reduced the number of errors in computer task

performance, improved problem solving skills, and increased perceived self-efficacy.

Although the training technique and the overall design of the instruction accounts for variances in self-efficacy, the very conditions under which training is administered will affect self-efficacy, performance, and organizational effectiveness. Tannenbaum, Mathieu, Salas, and Cannon-Bowers (1991) found useful training was related to post training, organizational commitment, self-efficacy, academic self-efficacy, and training motivation. Gist, Stevens, and Bavetts (1991) performed a study in which two stages of training were conducted on acquisition and maintenance of interpersonal skills. In their study, trainees received basic training in negotiation. Gist et al. (1991) found that the training contributed to learning the skill and that self-efficacy effects were due to the method of instruction. The self-efficacy effects of instruction ultimately resulted in delayed performance. Gist et al. (1991) also found that self-management training encouraged performance regardless of initial levels of self-efficacy. In further studies regarding soft skills training, Stevens et al. (1993) studied MBA students and their effectiveness in various training programs and found gender to be an underlying factor for self-efficacy in negotiation skills training.

The effects of training reside not only in training techniques, but also in the design of the instruction. Valasek (1990) examined older and younger adults for the purpose of determining the effectiveness of the Valasek and Sterns' training model for learning to use a computer terminal. The model consisted of training modules that dealt with motivation, structure, familiarity, organization, and time. Those trainees receiving an enhanced approach, which included a focus on fear, memorization, and experience, were measured after such discussions. By performing pre- and post-observation, Valasek (1990) observed

a change in self-efficacy throughout the training. The major findings of Valasek's (1990) study are as follows:

1. Age was a factor in the performance of older adults in training.
2. Older groups needed more time for training even when the content of the training was relevant and sought to enhance performance.
3. All groups in the study remained attitudinally competent in the prerequisite.
4. Training design was a predictor of self-efficacy expectations for all groups in the study.
5. Self-efficacy increased in all study groups as a result of make-up or refresher sessions.
6. The influences of post performance were (a) the number of incorrect responses during training, (b) the number of blank responses in training, (c) vocabulary score, and (d) age. However, the self-efficacy enhancement training did not significantly affect performance (Valasek, 1990).

Furthering other research regarding performance, the literature unveiled the effect on performance as a result of self-efficacy. Eyring, Honson, and Francis (1993) indicated training's effect on the learning curve. Prior to this research, it was suggested that familiarity with the task (Drum, 1981) through life-like training simulations improved self-efficacy and self-efficacy's influence on performance. Those participating in a computer simulation and having low levels of self-efficacy made modest improvements in their performance, while those having high levels of self-efficacy took less time to achieve a successful performance (Eyring et al., 1993; Mitchell, Hopper, Daniels, George-Falvy,

James, 1994).

Mathieu et al. (1993) used an undergraduate bowling course and found that self-efficacy was positively related to achievement during training. In their research, a midpoint assessment of self-efficacy revealed that self-efficacy, although appearing stable, did not continue over time to affect performance during the end of the training course. Thus, indications are that self-efficacy diminishes over time and loses its ability to affect necessary performance.

Training and its effects on self-efficacy have become a factor in studying the white collar workforce. Phillips and Russell (1994) examined the relationship between research self-efficacy and research training. In a study of graduate students, the results revealed a direct relationship between research self-efficacy, the training environment, self-efficacy, and productivity.

In another study that focused on graduate students and their research training, Prieto and Altmaier (1994) found that graduate teaching assistants who had prior training and experience had higher levels of self-efficacy than those without the experience.

Earley (1994) examined the relationship of training individualism and collectivism to self-efficacy and performance. The study was conducted with managers from Hong Kong, China, and the United States. Self-focused training was found to have a stronger impact on self-efficacy and performance than group-focused training. However, in a coed environment, group-focused training had a stronger impact on self-efficacy and performance than individually focused training.

The focus of research on self-efficacy filters into the workforce through studies

performed to determine the items necessary in training and in the workforce to increase levels of self-efficacy. One such item is feedback and its effect on self-efficacy.

Feedback studies include Schimmel (1987), who investigated the preferences of learners on different information gained from feedback. From his study, the best influences on achievement were aptitude pretest, self-efficacy, and the learner's post feedback performance.

Kaufman (1991) designed a study that encompassed an assessment of typing speed and accuracy before feedback and found that performance is correlated with task interest; however, trainee estimates of accuracy were less than actual performance.

Also, Leong (1992) found that the effects of feedback, including encouragement of self-efficacy, were unproductive in increasing self-efficacy.

Karl et al. (1993) studied the effect of feedback on self-efficacy and found that feedback influences on performance were due to the level of self-efficacy. The study was conducted with juniors and seniors in a general management university course. Karl et al. (1993) recommended that feedback be offered to those having low self-efficacy because they can only strive to improve their performance. In a follow-up to the above feedback observation, Waldersee (1994) discovered that anxiety in training is a result of feedback and vis a vis.

Self-efficacy and Computers

As the need for computer technology equipment exceeds the abilities of employees, many factors support the concern and adjustments that are required in today's

workforce. The recent attention to computers and self-efficacy somewhat follow the pattern of the self-efficacy model in that there are influences that render a behavior such as computer use.

Toombs (1981) used gender to analyze computerized word processing use and recent Looker and Power (1993) studies compared the job performance of those of different genders. These studies suggested that gender should be considered in how learning is used. Despite efforts made toward gender equality, studies reveal that there are still differences in reactions to computers due to gender. Wilder, Mackie, and Cooper (1985) found that boys and girls perceived the computer as more appropriate for boys. Boys, themselves, perceived the computer as more appropriate for them because girls simply had a dislike for computers. It is important to note that at the sixth grade level there was a decrease in dislike of the computer for both boys and girls. Video games and science were perceived as more male oriented, and writing was seen as more female oriented (Wilder et al., 1985).

It is common knowledge that attitudes are generally a result of one's surroundings and interactions with others. Green (1983) found that the level of training provided boosted the level of user awareness of computer capability factors and greatly affected their acceptance and use of computer training. In addressing the attitudes of office personnel toward automated office technology (AOT), Kizzier (1985) found that favorable attitudes occurred with more opportunities for participation. She supported the Green (1983) study that concluded that without sufficient training, workers experience isolation, which in turn induces negativity toward advanced automation.

Johnson (1985) found that trainers were the major obstacle to the ability to use computer technology.

In a study of male and female college students, Hill et al. (1987) found evidence to support that self-efficacy, with respect to computers, may be a determinant of computer use. Previous experience with computers was not found to contribute to the choice to learn about computers. The author went on to say that change in self-efficacy is the only factor that will lead one to adopt technology.

Miura (1986a, 1987) expanded earlier studies by finding other reasons for variation in self-efficacy. She found that males tend to have higher self-efficacy than females in training situations. The study used undergraduates for the population and addressed gender, year in school, age, major, computer ownership, and non-school computer use as variables influencing self-efficacy. Her research revealed that males see how computers pertain to their future career, as to knowledge of how it works and future coursework, more so than females (Miura, 1986a, 1986b, 1987).

Kagan and Pietron (1987) used students who were enrolled in one of two computer business class sections and found that the most important variable to achievement is learning by doing which, in this case, involved using computers.

In studying self-efficacy and computers, Murphy et al. (1988) realized that attitudes toward computers were related to the usefulness of computers and could be influenced by one's environmental setting. Colvin (1988), in a study of task complexity and goal-setting on performance of a video game computer task, observed that performance varied according to goal setting and task complexity. Self-set goals and

degree of goal achievement varies according to task complexity. As part of the Computer Self-Efficacy instrument, age, gender, employment, education level, prior computer use, type of computer used, and type of previous training were used to assess demographics and other influences with regard to computer self-efficacy. In another instrument, Kinzie and Delcourt (1991) used age, gender, education, previous experience, and prior computer use as other variables affecting self-efficacy subsequent to computer training. Rozell (1992) tested the conceptual model of cognition, motivation, and affective processes on computer-related performance. The results of her study indicated support for a relationship between computer attitudes, attributional style, perceived importance, computer self-efficacy, mood, gender, computer experience, computer anxiety, and academic achievement on computer performance.

Additional factors affecting the utility of training can be tied to the organization. Connell (1989), in a study of job satisfaction among clerical employees at four different types of higher education institutions, found that the institution type, such as a four-year or two-year school, influenced job satisfaction or favorable attitudes.

Gelberg (1990) conducted another study related to computer anxiety and self-efficacy in which the variables of vocational/personality type, gender, previous experience, computer self-efficacy, and math anxiety were independent measures. A negative correlation was found between computer self-efficacy and computer anxiety. The use of multiple regression analyses indicated self-efficacy, vocational interests, and math anxiety as significant predictors of computer anxiety, more so than gender or previous training. Of these three, computer self-efficacy was the most significant predictor

of computer anxiety.

Using undergraduate business students, Ellen (1987) studied the effects of level of satisfaction with the current behavior and self-efficacy with an alternative behavior with regard to resistance to change and adoption of high technology. Ellen (1987) observed that self-efficacy with the alternative computer-assisted instruction was a significant influence on resistance to change and adoption of the computer technology. Students with low self-efficacy were highly resistant to the alternative change.

Further studies by Ellen et al. (1991) sought to address the resistance to change. Ellen et al. (1991) found that as self-efficacy increased, resistance to change decreased, while gender did not relate to resistance to change. Paradoxically, low self-efficacy was a result of a difficult task.

In terms of instruction, Evans (1991) found that with a good learning environment and an integrated seating arrangement, gender differences no longer occurred and collaboration decreased. This study also found that self-efficacy was independent of performance.

Bauer (1991) listed five factors for increasing computer use: (a) connection of computer to career, (b) attitude of experimentation, (c) self-efficacy of computer use, (d) autonomous learning, and (e) organizational support. He said that roles, teaching responsibilities, work setting, subject matter, race, socioeconomic status, ethnic origin, and experience affected computer use in women. Bauer (1991) also identified self-efficacy as a barrier in the workplace.

Computer training must be tied to the organization. Therefore, it is imperative that

determinations be made of those job situations that affect computer use. Hershey (1992) surveyed 167 introductory psychology students and found that self-efficacy had significant influence on the adopted use of computers.

Bogom-Haselkorn (1992) investigated what effects audiotaped relaxation and cognitive anxiety reduction techniques had on college freshmen in computer classes. Bogom-Haselkorn (1992) said that with reduced anxiety, success rates and self-efficacy increase. In the study, variables such as previous computer experience and gender were found to affect computer self-efficacy. Computer self-efficacy also showed improvement over a period of time (Bogom-Haselkorn, 1992).

Garavan and McCracken (1993) indicated that trainers must take into account variations in backgrounds and skills for users to be proficient in a trained task. They suggested that users become more confident over time as experience and skills are developed. A potential computer user must not be provided with information beyond his/her capability of storage nor with inoperable equipment. Additionally, the content of the training program must be adequate for increasing job performance expectations of the employees and supervisors. Lack of time and follow-up assistance were outlined as the major barriers to effective use.

Hasset (1992) indicated that training content changes can delay the transfer of skills to the job site. Stewart and Hamlin (1993) believed that the delay is due to a lack of relevance for the employee, the job, and the organization.

Kennedy (1993) conveyed that recent increases in technology have resulted in the use of computers as a teaching tool available to instructors. Kennedy (1993) conducted

the study to determine if self-efficacy was related to the adoption of computers for instruction. She found that self-efficacy in faculty members at a medical school was related to computer use. Although computer instruction raises some hesitancy among traditional educators, self-efficacy is raised as educators adapt and become familiar with the technology (Smith, 1990). The literature further revealed the reluctance of individuals to adopt computer technology.

Hess (1993) studied the relationship between demographic factors such as attitudinal and experiential factors of computer use by higher education faculty. The results of the study were as follows:

1. There was great disparity of experience, attitude, rank, status, education, research, publication, and gender between faculty users and nonusers for research.
2. There were disparities among attitudes for faculty users and non-users in the classroom.
3. There were significant differences in experience, attitude, rank, education, and publications among faculty users and non-users for productivity.
4. There were significant differences in experience, attitude, rank, research, and publications among faculty users and non-users for home research.
5. There were significant difference in computer experience and attitudes among faculty users and nonusers for home preparation for teaching.
6. There were significant differences in computer experience and attitudes between faculty users and nonusers computing for home personal projects.

No differences were found in computer use with respect to age, number of classes taught,

and job tenure.

Shawareb (1993) did an additional study of computer use with gender, computer experience, age, and teacher attitude as the basic variables of the study. Gender was found to impact student attitude, with males scoring higher than females. His study also found that computer experience was more significant among younger students (Shawareb, 1993).

Even in training, gender differences occur regarding computers. Smith (1994) implemented hands-on practice in the classroom in an effort to increase performance and self-efficacy. He found that learning-by-doing was only effective for females.

Torkzadeh and Koufteros (1994) validated the CSE and examined the influence of computer training on computer self-efficacy. In this study, they surveyed 224 undergraduates at the beginning and end of an introductory computer course. They found that training significantly improved the computer self-efficacy of both males and females for all factors, but males showed higher pretraining self-efficacy.

Laier (1994) looked at how effective an enhanced computer training program was among older adults. Using an experimental design, younger or older adults could participate in either a controlled training group or an enhanced training group. Computer attitude, computer self-efficacy, general self-efficacy, self-esteem, working style, and affect were measured at the beginning of the study, and after the study they were measured again. Within the study a word processing training program was administered, followed by a post measure, and then a practice session.

The findings from the study relate to gender effects and are as follows:

1. Younger individuals had a lower self-esteem than the older individuals.
2. Younger subjects had higher computer self-efficacy throughout the study than older subjects.
3. Age was not a predictor in computer attitude.
4. Age did not affect general self-efficacy.
5. Younger adults outperformed older adults on post performance.
6. Computer self-efficacy was not significantly influenced by changed training conditions as compared to a control group.
7. No significant training condition affected post performance.
8. Self-efficacy was not found to be a covariate in post performance.
9. Training conditions did not influence self-efficacy over time.
10. Younger groups had a higher amount of negativism than older groups.
11. Training conditions did not affect working style over time.
12. Older trainees had significantly lower working style ratings.

In another study, Martocchio (1994) studied the effects of conceptions of ability on computer anxiety. Contrary findings were exhibited that stated that the effects of training were not dampened by computer anxiety and efficacy. Lewis (1986) also found that self-efficacy was not a predictor of taking a personal computer class.

Kandies (1995) studied the personal characteristics in use of electronic mail in a university setting and the relationship to attitudes and self-efficacy. Five hundred faculty members at Virginia Polytechnical Institute were used to determine that levels of self-efficacy inferred the use of electronic mail. Age was significant in its effect on social

use of electronic mail.

Computer Use

Mager (1992a) says that "people influence people" (p.3). He believes that the results of an activity are the influence of events that occur within the activity.

Self-efficacy and consequently, the skills and abilities performed with computers are often attributed to one's compatibility and degree of computer use.

Argyris (1964) said that increasing self-esteem for a given individual increases in a situation as they are able to define their own goals, when goals are related to his/her central needs or values, when she/he can define the path to such goals, and when the achievement of these goals represent an aspiration for the individual.

Smith and Rohrman (1970) attest that a regular practice of a task results in more mastery of the task. They ensure that learning computers and the degree of practice associated with this learning depends on the stage of learning computers and the task to be performed. They further note that covert practice of complex computer skills is most valuable in the early stages of learning. Bandura (1988) suggested that a program that encourages success experiences with new skills will reduce the problems of everyday life inefficiencies.

Kleinschrod, Kruk, and Turner (1980) indicate that the three key elements of word processing are people, equipment, and procedures. With people as a major component, individual psychological barriers can cause a resistance to the use of word processing in work responsibilities. They also disclose that management often makes

plans and expects employees to accept those plans which interferes with the use of computerized word processing in organizations. Argyris (1964) wrote that working class individuals have lower levels of aspirations and are viewed by management as bringing little to productivity.

Rubinstein and Hersh (1984) express the following items as determinants of a good relationship between users and information systems:

1. Amount of movement between computers and data
2. Number of users having access to information
3. Requirement of remote access
4. Data Restrictions

They concur that frequent users can remember more details of a system than infrequent users and that frequent users may require more help with assigned tasks.

Loyd and Gressard (1984) suspected that sex, age, and computer experience could affect computer attitudes and thus adoptive use. Using high school and college students, computer experience was found to be significantly related to positive attitudes. Follow-up procedures indicated that students with little or no experience with computers had increased computer anxiety.

Winfield (1986) initiated the concern of the changing characteristics of computer users. He developed a model that classified users and nonusers by experience levels and their degree of computer use as an occasional or regular user. He asserted that humans interact with computers with needs and aspirations. Arndt, Clevenger, and Meiskey (1985) said that "those who say the computer is pleasing, warm, effective, submissive, and

easy-to-use had more experience with the computer and saw it as more helpful with respect to employment" (p. 181). Casual users may not require more than to know how to operate the system. Experienced users tend to prefer using the computer as a tool. He says that these users perceive the computer as an aid to job accomplishment (Jones, 1989).

Flynn (1988) wrote that resulting performance of computer work is linked to the clarity of descriptions in the use of computers. She says that established career lines that indicate successful computer work are not available and this inevitably causes feelings of uncertainty in employees. Other uncertainties that affect the adoption of computers are the deskilling of tasks, the elimination of jobs, and the disruptions in traditional career ladders.

Canning (1988) explored the characteristics of successful adoption of computing by teachers who have integrated computing into their classroom practices. Her findings showed that teachers did not make their own decision to implement computers into the classroom and the purpose of computers in the classroom was for educational value. The availability of resources, compatibility of computers to existing needs, self-image, environment, degree of available practice, and self-efficacy had a significant relationship to adoption or use of computers in the classroom. Later, Foster (1989) studied the factors associated with computer use by high school teachers. Using all certified high school teachers in six Illinois school districts and building and district administrators for subject matter content, he concluded that a strong correlation (.75) existed between user categories (i.e., user, not presently using, and nonuser) and the degree of use. Other variables such as age, teaching experience, degree of computer use, and education were

not significantly correlated with computer use. However, he did discover significant differences in the degree of computer use by subject area taught. Business, work experience, and industrial arts/agriculture teachers were equivalent in the degree of use in the classroom. Perceived value of computers was significantly and positively correlated with degree of use. Self-efficacy was found to be highly correlated with degree of use, which suggested that those teachers who were confident that they could perform computer tasks were more apt to use computers in the classroom. It was suggested that the main reason teachers began using computers was to keep up with change in education and to perform more quickly and efficiently.

Foster (1989) detected that whether or not teachers owned computers was significantly correlated with their degree of computer use. In a later study, Faseyitan and Hirschbuhl (1992) used university faculty members as adopters and non-adopters of computer technology. They discovered significant differences in attitudes between the two groups. There were also significant differences between adopters and non-adopters in computer self-efficacy and computer utility beliefs.

Hoffner, Dobson, and Iggulden (1990) conveyed that how computers provide information for the user and how users prefer a presentation of information is significantly different. In additional studies regarding the design of computer technology and its effects on usability, Briggs (1990) made reference to studies indicating that users are better at identifying important information in the completion of a computer task. Users were also found to be less able to draw upon previous experience in completing computer tasks. More specifically, when users were instructed to save and print documents, they forgot the

steps necessary for completing the tasks. She regards lack of experience as the key factor in the poor performance.

A further study by Briggs (1990) included three groups of users with different degrees of experience and who were completing computer tasks. The first group included secretarial students with six months of word processing experience. The second group was students in business studies with only two weeks of word processing training but who had received training on other software packages. The third group was aspiring word processing trainers who had many years of experience with computers and information systems. The secretarial students, despite their experience, were not as knowledgeable as expected. However, experience did play a role when the quality of questions asked about a new computer system were evaluated.

Adler and Winograd (1992) said “all too often, new technologies are introduced into the workplace without sufficient planning for their implications in the workplace” (p. 3). Adler and Winograd emphasized that those who design computers are immune to the knowledge of user limitations. In today’s workforce, equipment designers must shift their abilities toward appeasing more knowledgeable workers rather than physical movement and motion. Adler and Winograd (1992) indicate that the direct user is essential to the future computer design processes. However, they so conclude that the need to have systems designed in a complex fashion to meet the needs of the consumer only enforces the need for more highly trained employees with broader job responsibilities.

Adler and Winograd (1992) also point out that negative usability of computers is manifested in the Tayloristic approach to employees. Managers do not wish to empower

individuals or broaden their job responsibilities and employees fear that they will lose their employment due to advancement in computer technology. They suggest that an apprenticeship environment can enhance the usability of computers because they learn as a whole and as a member of an apprenticeship community by being involved in authentic tasks that mentor other components of the community. Newcomers to work environments are reluctant to show their difficulties and can feel frustrated by their lack of knowledge but could be moved to a community of other newcomers which would increasingly change their confidence in working with computers. Sponaule (1993) used a sample of student in a university research class to determine if the interface of an editor influences usability of an electronic mail system. Over a nine-week period, it was decided that an interface of the assigned editor did not influence usability nor the usability of the electronic mail system.

Cavanaugh (1992) said that "a minimal amount of representational ability is a developmental prerequisite to computer use" (p. 18). Using a quasi-experimental nonequivalent control group design with two elementary schools including kindergarten through third grade students, she concluded that the introduction of computer training at the primary age may have eliminated any gender differences in computer self-efficacy. She also suggested that primary children who are learning to use computers must receive positive feedback from help sources in order for them to feel confident in using computers. Additionally, watching other students successfully use computers was found to increase student computer self-efficacy.

The importance of experience in relation to self-efficacy was furthered by Holt (1992), who used students from the University of California at Irvine and San Diego

locations who had a reduced emphasis on computers and who sought to determine the effect of research computer experience on research self-efficacy. He found that advanced research skills were more related to research experience than basic research skills. Research experience alone contributed to a significant amount of research self-efficacy.

Like other studies attempting to find explanations for computer use, Persichitte (1993) investigated computer use specifics in terms of type and amount of computer use and characteristics needed for learning to use computers. The participants were 253 high school students at the junior and senior level. She used a mixed design that divided computer use into three levels: conceptual, practical/application, and entertainment. She defined the amount of computer use as the average computer use in hours per week. Significant differences were found between each frequency of use in the practical/application category for both male and female students. Using gender as an independent variable and amount of computer use as the dependent variable, she discovered no significant difference in the amounts of computer use between male and female students. However, significant differences were uncovered in perceived computer self-efficacy and the perceived demand characteristic for learning to use computers. Perceived demand characteristic for learning to use computers contributed to the largest portion of variance in computer self-efficacy.

Davis (1994) studied the specific end-user computing population and the selection, training, and development characteristics affecting their advanced skills using six service-based organizations. Within her study she used demographic, situational, and cognitive variables such as gender, age, education, courses taken, number of years using

computers, the frequency of computer use at home and at work, years in the organization, and current position as independent variables. Each independent variable was significant in predicting the advanced computer self-efficacy score. Although no significant difference was found among gender, age, and skill groups.

Within the course of the study, the population was divided into novice and advanced end-users where a significant difference was found in computer self-efficacy between the two groups. Using a test of difference to distinguish between taking a computer programming course or not, no significant difference was found for taking a computer course and advanced end-user efficacy score. Previous specific courses relating to computer programming and word processing, however, did influence perceived advanced efficacy. Significant differences were also found among computer using groups. However, no significant differences were found in advanced self-efficacy due to the amount of computer use at work. Significant differences were found in the advanced computer self-efficacy of individuals who used a computer at home among all categories of use ranging from 0 to 30 hours (Davis, 1994).

In Davis' (1994) study, the strongest relationship with perceived advanced end user computing skill was the length of computer use. She suggested that retaining skilled employees would be a crucial part of human resource decision making regarding resource allocations and recruitment when trying to find employees who have completed several computer application courses, have had a long-life of experience, and who use computers at home and on the job. Shawareb (1993) concurred that computer ownership and previous experience with computers had a positive relationship to attitude of the

employee. In a similar study, Compeau (1992) found that past use of computers that was successful and rewarding generated higher self-efficacy scores and more improved performance outcomes. Moreover, she found that people who use computers often have a better sense of the computer's capabilities. Of these people, most used a computer daily for 2 and 4 hours and at home on weekdays and weekends with an average time spent of less than 30 minutes.

Using hospital employees, Henry and Stone (1994) found management support, ease of system use, and end-user experience have significance in predicting computer self-efficacy and outcome expectancy.

In South American computer training institutions, Duncan (1993) also examined how skills, beliefs, attitudes, and intentions reflect on the relationship between training and computer usage. In a test of four research models, skill was determined to be the factor contributing to the most computer usage and the most impact of training on usage. Intentions also accounted for some variance in usage. Duncan concedes that skill and the minimum skill requirements for effective usage should be an antecedent of usage in future computer usage models. Moreover, skill's impact influences perceived ease of use significantly, while attitude is an insignificant reflection on intentions.

Other studies by Marion (1993) regarding skill influences on computer usage and the effects of information technology focused on the jobs of support personnel positions. The population consisted of executive secretaries, administrative secretaries, administrative assistants, and general secretaries who used technologies in the financial institution environment. The results suggested that these employees perceived their jobs

as more enriched and meaningful when they were proficient in using text, data, and graphic technologies.

Kandies (1994), in a study of specific computer technology use, found attitudes of e-mail usefulness and self-efficacy with e-mail technology to be significant predictors of the general use of e-mail and other tasks associated with e-mail. Self-efficacy was also significant in predicting attitudes toward positive usefulness and comfort. With regard to skill, years spent using e-mail was significant in predicting the degree of e-mail use and self-efficacy.

Goodrich (1989) described that support staff positions required day-to-day computer use. The support staff personnel revealed the unnecessary training of all software particulars was irrelevant to their on-the-job needs.

Use and Transfer of Training

Prior points in the literature review show the importance of considering previous experience in determinations of computer use. Bandura (1988) asserted the need for adequate use and experience as being the key to a model of transfer. Sufficient use and transfer of new knowledge can be a result of other factors which several additional researchers have analyzed and which are presented here.

Pea (1987) concurred that new knowledge is encoded in memory and has multiple functions associated with future retrieval. His thinking is in accordance with the Gestalt approach which considers thinking to be an intellectual process in which a reorganization of aspects of problem situations are grouped for understanding and future retrieval. Gagne

(as cited by Pea, 1987) said that learning transfer is influenced by common cues between learning and the transfer situation. Transfer is enhanced when cues are available in the situation in which a transfer is desired. Pea (1987) stated that common elements theory or identical elements theory insists that learning will transfer if the trained tasks and the performed task share identical elements. Voss (1987) discovered that transfer was a function of how the information was acquired rather than a stimulus of what was learned. Retention is no longer a recall but a remembrance of a past experience. Retention is considered a transfer task in which an individual performs through referral to a previous acquisition of learning.

The Thorndike theory (as cited by Robertson, 1989) proposed that identical elements account for limited transfer opportunities of knowledge and skills to new situations. Thorndike (as cited by Robertson, 1989; Baldwin & Ford, 1989) said that mastery in performance rests on the variables in the training environment and their similarity to the performance situation.

Berger (as cited by Nelson, 1989) developed an impact formula that included the components that would most likely ensure that trained special education teachers would perform trained competencies in the classroom. The formula is as follows $(L \times LE) \times (B \times O) = \text{Impact}$. The basic components of this model consist of the learner, the learning environment, the boss, and the organization. The factors that affect the learner's ability to transfer consist of knowledge, skills, and cognition; attitudes and values; motivation; reaction to the training, and perception of usefulness of training. The learning environment consists of the learner's immediate surrounding, child or adult learning strategies,

instructional development, the evaluation of training, and compatible organizational and people objectives. Components that affect how the boss will effect transfer consists of organization desires, supportiveness, and positive reinforcement offered. The organization itself has a role in the impact of transfer through resource preparedness to use the trained skill, organization culture, and a supportive or coaching staff (Nelson, 1989).

Elsma, Jeroen, and Bijlstra (1990) hold that transfer of a task mastery is achieved by sequencing learning situations in order to provide the learner with proper insight into the problem to be solved.

Jelsma et al. (1990) asserted that events that share properties are sorted by the learner and the learning of one event can be generalized to a subsequent one. Gattiker (1991) supported Thorndike by having written that an imitation of a learned response tends increase transfer. Carroll (1993) outlined the following as criteria for establishing a relationship between training and performance: (a) demonstrations of overcoming difficulty by effort, (b) demonstrations are similar to real-world situations, and (c) desired behavior has clear outcomes to equal a learned habit.

Baldwin and Ford (1988) defined positive transfer of learning as “the degree to which trainees effectively apply the knowledge, skill and attitudes gained in a training context to the job” (p.63). They further asserted that the degree to which learned behavior is generalized to the job context and is maintained over time enhances the transfer. They identified training inputs, including training design, as one factor affecting transfer. Baldwin and Ford (1988) developed a model of transfer process that insisted that the degree of application on the job of the trained skill is defined by how effectively

knowledge, skills, and attitudes gained in training context apply to the job. For transfer to have taken place, learned behavior must be generalized and maintained over a period of time (Baldwin & Ford, 1988). The three major ingredients of the model of the transfer process are training inputs, training outputs, and condition of transfer. The conditions of transfer include generalization and maintenance of learned material over a period of time. Training outcomes are the degree of original learning obtained and the retention of that material after the training program. Training input factors include the design of the training, learner characteristics, and applied work environment characteristics. The design factors consist of instructional characteristics and the relevance of training content. Trainee characteristics involve the individual's motivation and personality. Work environment characteristics include certain organizational culture factors such as supervisory support and the opportunity to perform learned behaviors on the job (Baldwin & Ford, 1988). Retention and learning are training outcomes which directly affect the transfer conditions. Trainee characteristics and work environment characteristics directly impact on transfer without the effects of learning or retention of the training program. However, training outcomes are affected by the inputs of design, trainee characteristics, and work environment.

Jelsma et al. (1990) developed the ADAPT (Apply Delayed Automatization for Positive Transfer), which was based on the notion of two human memories that interact. Jelsma et al. (1990) recognized that consistent practice was necessary to transfer procedural as well as declarative knowledge. Declarative training has the objective of generating immediate behavior, whereas procedural training encourages the trainees to be

able to repeat a performance when called upon. Jelsma et al. (1990) identified model assumptions as skill acquisition, instruction, declarative instruction, procedural instruction, procedure-overlap, analogy, relative importance of automatization or schematization, and transfer failure.

Phye (1990) considered memory to be the basis of transfer given two situations of training use. These two situations are delay and immediate use. Memory-based transfer required delayed timing between the training and the task to be accomplished. He stressed that when the task application is delayed, the learner is forced to induce memory retrieval for problem solving. Further studies by Phye (1991) found that individuals can generate from memory inferences about the use of a general procedure, and a domain-specific strategy performance at delayed transfer reflects the learner's ability to also use both a general domain procedure (advice) and domain-specific strategy (feedback) experience of training. Richey's model of industrial training research (1991) stems from the acknowledgment that individuals of various ages learn differently. Assessment of adult characteristics revealed that adults desire instructor-directed delivery, adults desire delivery based on past training, their perceptions of learning are based upon the organizational climate in which they work, and they wish to have their own experiences related to their learning. Rebov's study (1991) of contextualized instruction indicated that in a vocational setting, individuals learn in the context of meaningfulness and thus, the information is more useful. Relevant instruction provides utility to the student in practicality and adaptability.

In addition to these suggested components of transfer, early researchers

summarized a series of techniques available to enhance the transfer of knowledge process.

Millar (1985) wrote that, with regard to the Nuffiel O-level project, transfer only occurs in certain favorable circumstances. The student who develops feelings of enjoyment, inspiration, and interest is most likely to result in far-end transfer. Establishing a student mindset that provides hope for accomplishment and relevance will most likely result in transfer.

Zemke and Gunkler (1985) suggested that there are 28 techniques for maintaining transfer. These techniques are divided into five categories consisting of pretraining strategies, good training strategies, transfer-enhancing strategies, post-training strategies, and finessing strategies. Transfer enhancing strategies include using an overlearning strategy by repeating necessary knowledge or tasks; using lifelike situations in order to provide identical elements; providing confidence-building activities such as visualization; providing mechanisms for application on the job such as job aids, and providing participant action planning including steps for applying the newly learned knowledge and skill on the job. Post-training strategies include distributing follow-up letters for tracking the use of trained skills and knowledge; allowing a post-training discussion between supervisors and trainees; and establishing rehearsal opportunities for demonstrating training. Finessing strategies include: consideration for the need of job re-design; implementing interim projects for re-enforcing the use of the trained skill; providing confidence building activities that establish job enrichment for trainees; using job aids as memory extension for performance; and refraining from substituting on-the-job training.

Campbell and Cheek (1989) maintained that involvement by supervisors, adequate facilities, and equipment and tools are essential to transfer of training. Employee acceptance to change, personal motivation, and delayed use will determine whether or not application of the learned skill takes place; thus, training skills must be beneficial to the employee without contradiction to personal values. The new training should be associated with immediate use by the trainee.

CHAPTER III

PROCEDURES AND METHODOLOGY

This section describes the procedures used in the present study. Subsections include population and sample, research design, data collection and instrumentation, and data analysis.

Population and Sample

The population for the study consisted of 2,597 different University of Tennessee, Knoxville employees who had received computer training through the Office of Human Resources Management between May 1993 and August 1995. The population was chosen on a purposive basis so as to adequately assess the duration of self-efficacy between the time of training and survey time and given the constraints of the researcher. Registration lists of employee training during this time frame were provided by the Office of Human Resources Management.

Systematic random sampling was utilized to gather a sample size of 500 university employees who had received computer training through the Office of Human Resources Management. The sampling unit was the employee. The sample was drawn from the past 2 1/2 years of training from the time of the study, which encompassed the years 1993-1994 and 1994-1995. Systematic random sampling was performed by choosing every 10th individual on the registration lists of computer trainees. According to the research division of the National Education Association research bulletin (1960), an appropriate random sample for the above mentioned population to ensure a 95% confidence level would be

335. However, the researcher felt it prudent to have a random sample size of 500.

Research Design

The design of the study was descriptive and ex post facto in nature. Campbell and Stanley (1963) stated that causal inferences can be obtained from such a design through single instance implicit comparisons. Campbell and Stanley (1963) also inferred that controls for intrasession history are available through this design because of responses to a fixed instrument. Employees at The University of Tennessee, Knoxville, were selected and randomly surveyed by campus mail. According to Best (1977), descriptive research:

Describes and interprets what is. It is concerned with conditions or relationships that exist, opinions that are held, processes that are going on, effects that are evident, or trends that are developing. It is primarily concerned with the present, although it often considers past events and influences as they relate to current conditions (p.16).

Multivariate analysis of variance (MANOVA) and the Pearson r correlation coefficient were used for analyzing the data. Along with the MANOVA, the Wilks' lambda test statistic was used to determine differences in dependent variable means on each independent variable. Of all alternative methods used to test the null hypothesis in an analysis of variance with multiple dependent variables or a hypothesis of equal mean vectors, Wilks' lambda is the most widely used (Huck, Cormier, and Bounds, 1974). When significant differences were found with regard to the dependent variables among multiple level independent variables using the Wilks' lambda test, Tukey's Honestly

Significant Difference (HSD) all pairwise comparison test was used to determine where significant differences occurred. Aczel (1989) conveyed “the usefulness of the Tukey test is that it allows us to jointly perform all possible pairwise comparison of the population means using a single, “family” level of significance” (p. 372). MANOVA was used to analyze H_{01} - H_{012} . Tabachnick and Fidell (1983) said that “the goal of research using MANOVA is to discover whether behavior, as reflected by the dependent variables, is changed by manipulation (or other action) of the independent variables” (p. 225). MANOVA protects against a Type I error when two-tailed tests of significance are used (Huck et al., 1974). MANOVA is also appropriate when a study contains multiple dependent variables due to its consideration of correlations between dependent variables and the possibility of multiple factor comparisons (Huck et al., 1974). Tabachnik and Fidell (1983) said that “with all X’s discrete and all Y’s continuous, we have a situation usefully thought of in terms of multivariate analysis of variance (MANOVA)” (p.451). According to Tabachnik and Fidell (1983), MANOVA is the best test when the question is how groups differ among the dependent variables. Tabachnik and Fidell (1983) also stated that a “MANOVA which considers dependent variables in combination, may sometimes be more powerful than separate ANOVAs” (p. 222). MANOVA follows the analysis of variance model because score variances are partitioned into variance differences in scores within groups and among groups (Tabachnik and Fidell, 1983).

To answer H_{011} and H_{012} , a second MANOVA procedure was employed using the independent variables found significant with regard to individual dependent variables or by the results of the Wilks’ lambda in the first MANOVA procedure. In addition to being

used as main effects, the independent variables were considered in all possible two-way interactions. According to Tabachnik and Fidell (1983), "in multivariate situations the variables are correlated with each other (nonorthogonal). When dealing with human behavior, variables are usually correlated by individual differences, alertness, or motivation if nothing else" (p. 12). Williams (1979) suggested that variable correlation results in measurement overlap which can reduce variable descriptors to fewer variables and provide a more basic and economical characterization of the behavior being studied. Aczel (1989) posited the reduction in variables as being a reduction in the variation of the data. Williams (1979) asserted interaction effects are special additional effects due to a combination of factors or whatever group differences remain after main effect variations have been removed. The Wilks' lambda multiple comparison follow-up test was performed to answer H_{011} and H_{012} . A significant Wilks' lambda resulted in the use of Tukey's HSD post hoc test to determine where significant differences occurred among individual means.

Pearson r correlation coefficient was used to answer H_{013} . Tabachnick and Fidell (1983) indicated that correlations provide a measure of association by indicating the strength of the association or proportion of shared variances. Correlation measures the amount of relationship between two variables. Frequency counts, means, and standard deviations are provided for H_{01} - H_{012} .

Data and Instrumentation

The data were collected using the Computer Self-efficacy Scale (CSE) (see Appendix C), the Self-efficacy for Computer Technologies Scale (SCT) (see Appendix D),

and Background Information (see Appendix B) which were combined into a Computer Self- Confidence Assessment. The assessment was arranged according to the usefulness of the information to the respondent (Dillman, 1978) and required approximately ten minutes for employees to complete. Included in the assessment was an importance of the study section to give the reader familiarity with the information was to be used and the relevance of the input (see Appendix A). The background information and both instruments were administered/sent simultaneously as the Computer Self-Confidence Assessment to the employee's work address. The employees filled out the assessment at their leisure and sent the assessment back to the researcher through the campus mail system. The CSE was developed to measure the degree of confidence people have about computer knowledge and skills after a training experience (Murphy et al., 1988). The SCT was developed in response to the lack of instruments available for measuring self-efficacy of specific computer technologies such as word processing, electronic mail, and CD-ROM data bases (Kinzie & Delcourt, 1991). For the CSE, a Likert-type scale was provided on a 1- 5 basis to rate the degree of confidence an individual has in performing the listed computer activities. The scale values ranged from 1, for very little confidence, to 5, for quite a lot of confidence.

The CSE scale was originally developed by Christine Murphy, Delphine Coover, and Steven Owen. The items in the scale were generated from 42 items emphasized in course designs for teaching graduate students and practicing professionals how to use micro and mainframe computers. The original 42 items were submitted to a panel of five experts who taught computer courses. The experts considered the content, level of

difficulty, and comprehensiveness. Only 32 items evolved. The questionnaire was administered to five sections of business undergraduate courses in computers and information processing. Pre- and post-measures were taken. The instrument was divided among three components: beginning level computer skills, advanced level computer skills, and mainframe computer skills. The overall reliability from 414 undergraduates was determined to be .95. A factor analysis with oblique rotation of factors was used to assess a three-factor solution of high alpha reliability (Torkzadeh & Koufteros, 1994).

For the SCT, a Likert-type scale was provided on a 1-4 basis to rate the degree of agreement with the self-efficacy confidence statements. The scale was developed by Mable Kinzie and Marcia Delcourt, The University of Virginia. The scale contained a total of 27 items with subscales of 10 items on word processing, 10 items on electronic mail, and seven items on compact disc (CD-ROM) data bases. Items such as age, gender, education, prior computer use, employment, type of computer used, and previous training were added to the CSE scale for demographic information. Similarly, items such as age, gender, education, previous computer experience, and prior computer use were added to the SCT scale for demographic information. A panel of 17 experts consisting of computer technology instructors, measurement experts, educational consultants, and graduate students were used to pilot the instrument. In addition, a critique was provided by a university instrument review committee. The scale was administered to 313 undergraduate and graduate respondents across the United States at major universities. This instrument, too, was divided among three components; word processing, electronic mail, and CD-ROM data bases. The overall reliability was determined to be .84 from a three-factor

solution, but subscales were highly reliable at .97, .98, and .98, respectively.

The Background Information section of the assessment asked the employee for the independent variables of supervision responsibilities, previous classroom computer training, job tenure, type of computer use required on the job, frequency of computer use, home computer use, and training responsibilities. The independent variables of time, job type and campus unit of employment were not included on the Background Information section of the Computer Self-Confidence Assessment. These variables were determined from the registration lists provided by the Office of Human Resources Management after the sample had been determined.

An interval data score was totaled from each questionnaire and employee. Disagreements occur concerning the use of Likert scale information as interval or ordinal level data (Gardner, 1975). However, according to Huck et al. (1974), interval data is a common unit of measure such as a test score. Also, they stated that parametric statistical analysis should not be performed on nominal scale data. Parametric analysis was chosen based on the assumption that the population was normally distributed.

The dependent variables for H_{01} - H_{012} were the CSE and SCT scores. The dependent variable for H_{013} was the SCT scores. The independent variables considered for H_{01} - H_{012} were time (between training and survey time), supervision responsibilities, job type, campus unit of employment, previous classroom computer training, job tenure, computer use required on the job, frequency of computer use, home computer use, and training responsibilities, respectively. The independent variable for H_{013} was the computer self-efficacy scores. Tukey's HSD post hoc test was performed for determining where

significant differences occurred in multiple level significant independent variables. Tukey's HSD is considered as a post hoc test because of its commonality and its ability to control Type I experimentwise error rate (Younger, 1994). Huck et al. (1974) recommended Tukey's HSD because it only indicates means as significantly different when they are far apart.

The independent variable of time has five levels: 0-6 months, 6 months-1 year, 1 year-1 1/2 years, 1 1/2 years-2 years, and 2 years -2 1/2 years. The independent variable of job type has three levels: clerical/administrative, maintenance/technical, and faculty. The independent variable of supervision responsibility has two levels: yes and no. The independent variable of home use has two levels: yes and no. The independent variable of previous classroom computer training has six levels: which include database management, educational software, programming, spreadsheets, statistical procedures, and word processing. The independent variable of computer use required on the job has the same six levels as previous classroom computer training. The independent variable of training responsibilities has two levels: yes and no. The independent variable of job tenure has two levels: newcomers and incumbents. The independent variable of frequency of computer use has four categorical levels: never, seldom, frequently, and always. The independent variable of campus unit of employment has three levels: agriculture, hospital, and main. Administration of the Computer Self-Confidence Assessment followed Dillman's (1978) Total Design Method, which is noted for its systematic steps and high response rates.

The procedures for administering the assessment were as follows:

1. A meeting was held with the Director of The University of Tennessee, Knoxville

Human Resources Management to obtain support for the study.

2. Upon support, an initial study letter was drafted and sent by the Researcher to each employee participant to explain the need for participation (See Appendix E).

3. Surveys were sent to each sample participant at his/her work address, along with a cover letter (See Appendix F) detailing the purpose and benefits of the study. The participants were instructed to return the survey to the Researcher through campus mail.

4. A follow-up letter was sent one week later to all sample persons to serve as a reminder and thank you for their participation.

5. A second follow-up letter was sent two weeks after the first mailing to all current non-respondents which again included the cover letter (See Appendix F) and assessment (See Appendixes B, C, and D).

6. A third follow-up procedure was a phone call to non-respondents to find out the status of the assessment, to encourage their participation, or to gain completion of the assessment by phone (See Appendix G).

Each assessment was coded for the follow-up of delinquent respondents and to protect respondent confidentiality.

Data Analysis

The assessment information was analyzed using The University of Tennessee VMS/VAX mainframe system, which holds the SAS statistical software (SAS Institute Inc., 1985). The analysis included MANOVA with the Wilks' lambda test criteria and the Pearson r correlation coefficient results along with frequency tables, means, and standard

deviations of dependent and independent variables. Tukey's HSD post hoc test was performed for determining where significant independent variable differences occurred.

The following ten null hypotheses were combined and tested using MANOVA because of multiple independent variables of time, job type, supervision responsibilities, home use, previous classroom computer training, computer use required on the job, training responsibilities, job tenure, frequency of computer use, and campus unit of employment. The dependent variables for the following hypotheses were the CSE and SCT scores in interval form. The Wilks' lambda MANOVA criteria was used to determine preliminary evidence for further univariate analysis. Because independent variable results on the dependent variables were unrelated, MANOVA was an appropriate test (Tabachnick and Fidell, 1983).

Ho₁: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to time between training and survey time.

Ho₂: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to supervision responsibilities.

Ho₃: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to job type.

- HO₄: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to campus unit of employment.
- HO₅: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to type of previous classroom computer training.
- HO₆: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to job tenure.
- HO₇: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to type of computer use required on the job.
- HO₈: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to frequency of computer use.
- HO₉: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to home computer use.

Ho₁₀: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to training responsibilities.

When the MANOVA Wilks' lambda test criteria indicated significant differences in CSE and SCT scale scores due to the independent variables in answering Ho₁, Ho₃, Ho₄, Ho₅, Ho₇, and Ho₈, all pairwise comparison or post hoc tests were necessary. Tukey's HSD post hoc test was used to determine where the differences occurred in independent variables with more than two levels. Williams (1979) inferred it may be necessary to make some subsequent statistical comparisons between individual means when factors have more than two levels. Tukey's HSD was used only after the MANOVA Wilks' lambda multiple comparison follow-up procedure F test was shown to be significant (Ott, 1993).

Because the survey assessment asked respondents to choose all types of previous classroom computer training and computer use required on the job that apply for Ho₅ and Ho₇, each type was analyzed individually for significance using the MANOVA.

To answer Ho₁₁ and Ho₁₂, those independent variables and levels of independent variables (types of previous classroom computer training and types of computer use required on the job) found to be significant in the first MANOVA procedure (Ho₁ - Ho₁₀), on either individual dependent variable or by the Wilks' lambda criteria, were included as independent variables and two-way interaction independent variables of all possible combinations in another MANOVA statistical test. In order to determine if a variable can be further tested, it must be significant in an analysis of variance test procedure (Ott,

1993). In this study, all independent variables were categorical, therefore, a MANOVA was appropriate. In a MANOVA test of difference, all independent variables can be discrete and all dependent variables can be continuous (Tabachnik and Fidell, 1983). To use an interaction in a MANOVA test of significance difference, each variable within the interaction must occur separately in the analysis of variance (Ott, 1993).

Ho₁₁: There is no significant interaction among the independent variables of time between training and survey time, supervision responsibilities, job type, campus unit of employment, previous classroom computer training, job tenure, type of computer use on the job, frequency of computer use, home computer use, and training responsibilities, as measured by the Computer Self-Confidence Assessment, with regard to computer self-efficacy or self-efficacy of computer technologies.

Ho₁₂: There is no significant difference between computer self-efficacy, self-efficacy of computer technologies, time, job type, campus unit of employment, previous classroom computer training, job tenure, supervision responsibilities, home computer use, frequency of computer use, computer use required on the job, and training responsibilities among university employees, as measured by the Computer Self-Confidence Assessment.

The independent variables and interaction variables in the MANOVA were tested using the multiple comparison Wilks' lambda follow-up criterion procedure. Tukey's HSD post hoc test was performed on all significant variables in order to determine where significant differences occurred.

To test null hypothesis number thirteen, the Pearson r correlation coefficient was

used to determine if a significant relationship existed between the CSE and SCT instruments. The Pearson r correlation coefficient was applied because of its use as a parametric test on continuous data and because it expresses a degree of relationship or the strength of the correlation (Huck et al., 1974).

HO₁₃: There is no significant relationship between computer self-efficacy and self-efficacy of computer technologies among university employees as measured by the Computer Self-Confidence Assessment.

The resulting F-values from the MANOVA and Wilks' lambda techniques were tested at the .05 significance level.

CHAPTER IV

ANALYSIS OF DATA AND RESULTS

The primary purpose of this study was to investigate work situation and transfer of training influences of computer self-efficacy and self-efficacy on training programs that meet individual and organization objectives of university personnel. This was accomplished by assessing the computer self-efficacy and self-efficacy of computer technologies of employees subsequent to training and its duration as it pertains to training usefulness. Additionally, the computer self-efficacy and self-efficacy of computer technologies assessment sought to determine influences on computer use for human resource placement information and to determine present training needs.

A questionnaire survey using the previously described Computer Self-Confidence Assessment was used to accomplish these purposes. Within this chapter are the results of that assessment.

Response Rate

Computer Self-Confidence Assessment questionnaires were sent through campus mail to 500 University of Tennessee employees who received training through the Office of Human Resources Management in a 2 1/2 year time period (May 1993 - November 1995). Forty-five questionnaires were associated with trainees who were no longer at the university and seven were on extended leave. Of the resulting total of 448 useable questionnaires 357 were returned. Dillman (1978) indicated response rate is determined by dividing the number of questionnaires returned by the number in the sample minus those

participants who were ineligible or unreachable. This yielded an overall response rate of 80%. There were 91 (20%) non-respondents after follow-up attempts. A table of demographic data describing the study participants is shown in Table 1. Missing values were noted in Table 1 to further signify the number of non-responses for each variable. Subsequent tables with comparisons of the demographic information describe the demographic profiles of respondents. These subsequent tables also show very high standard deviations which indicate a wide disparity or variance in self-efficacy scores.

Research Question One

Does computer self-efficacy (CSE) or self-efficacy of computer technologies (SCT) differ among university employees, as measured by the Computer Self-Confidence Assessment, with regard to time between training and survey time?

For research question one, the time between training and survey time was resolved from registration lists (May 1993 - August 1995) granted by the Office of Human Resources Management at The University of Tennessee, Knoxville, and the survey distribution date of November 1, 1995.

Table 2 shows frequency of responses regarding the independent variable time. Of the 357 respondents, 113 (32%) received training within 1.5 to 2 years of the survey, 98 (27%) received training within 2 to 2.5 years of the survey, 58 (16.3%) received training within 6 months to 1 year of the survey, 57 (16%) received training within 1 to 1.5 years of the survey, and 31 (8.7%) received training within 0 to 6 months of the survey.

Table 1**Demographic Data of Respondents**

Variable and Level of Responses	Frequency	Percent
Time		
0-6 months	31	8.7
6 months-1 year	58	16.3
1 year-1.5 years	57	16
1.5 years-2 years	113	32
2 years-2.5 years	98	27
Total	357	100
Supervision Responsibility		
No	202	56.6
Yes	142	39.8
Missing Values	13	3.6
Total	357	100
Job Type		
Clerical/Administrative	327	92
Maintenance/Technical	16	4
Faculty	14	4
Total	357	100
Campus Unit		
Main	308	86
Agriculture	38	11
Hospital	11	3
Total	357	100

(table continues)

Table 1 *(continued)***Demographic Data of Respondents**

Variable and Level of Responses	Frequency	Percent
Previous Classroom Computer Training		
Database Management		
Yes	122	34
No	197	55
Missing Values	38	11
Total	357	100
Word Processing		
Yes	259	72.6
No	60	16.8
Missing Values	38	10.6
Total	357	100
Statistical Processing		
Yes	14	4
No	305	85.4
Missing Values	38	10.6
Total	357	100
Spreadsheets		
Yes	181	50.7
No	138	38.7
Missing Values	38	10.6
Total	357	100

(table continues)

Table 1 *(continued)***Demographic Data of Respondents**

Variable and Level of Responses	Frequency	Percent
Programming		
Yes	300	84
No	19	5.4
Missing Values	38	10.6
Total	357	100
Educational Software		
Yes	38	10.6
No	281	78.8
Missing Values	38	10.6
Total	357	100
Job Tenure		
Incumbent	331	92.7
Newcomer	7	2
Missing Values	19	5.3
Total	357	100
Type of Computer Use Required on the Job		
Database Management		
Yes	126	35.3
No	197	55.2
Missing Values	34	9.5
Total	357	100

(table continues)

Table 1 *(continued)***Demographic Data of Respondents**

Variable and Level of Responses	Frequency	Percent
Word Processing		
Yes	282	79
No	41	11.5
Missing Values	34	9.5
Total	357	100
Statistical Processing		
Yes	20	5.5
No	303	85
Missing Values	34	9.5
Total	357	100
Spreadsheets		
Yes	163	45.7
No	160	44.8
Missing Values	34	9.5
Total	357	100
Programming		
Yes	297	83.2
No	26	7.3
Missing Values	34	9.5
Total	357	100

(table continues)

Table 1 *(continued)***Demographic Data of Respondents**

Variable and Level of Responses	Frequency	Percent
Educational Software		
Yes	24	6.7
No	299	83.8
Missing Values	34	9.5
Total	357	100
Frequency of Computer Use		
Always	189	53
Frequently	131	36.7
Seldom	19	5.3
Never	8	2.2
Missing Values	10	2.8
Total	357	100
Home Computer Use		
Yes	179	50.2
No	168	47
Missing Values	10	2.8
Total	357	100
Training Responsibility		
Yes	32	9
No	311	87.1
Missing Values	14	3.9
Total	357	100

(table continues)

Table 2

Frequency Count of Total Respondents by Time

Time	Frequency	Percent
0-6 months	31	8.7
6 months-1 year	58	16.3
1 year-1.5 years	57	16
1.5 years-2 years	113	32
2 years-2.5 years	98	27

Null Hypothesis One

Ho₁: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to time between training and survey time.

Analysis of hypothesis one was performed using the time between training and survey time to determine whether there was a difference in Computer Self-Efficacy (CSE) or Self-Efficacy of Computer Technologies (SCT). A multivariate analysis of variance (MANOVA) was used to test null hypothesis one.

Results of the multivariate analysis Wilks' lambda follow-up procedure indicated a multivariate F-value for group comparison on the independent variable of time for 8 numerator and 686 denominator degrees of freedom was .9592. This value was not significant at the .05 level. Based on these results, no follow-up post hoc test was necessary and Ho₁ was not rejected.

Mean CSE and SCT scores and standard deviations for participants grouped by time are shown in Table 3. Given the F-values for time on both CSE and SCT scales, the levels of time had similar mean values among the CSE and SCT scales.

Research Question Two

Does computer self-efficacy or self-efficacy of computer technologies differ among university employees, as measured by the Computer Self-Confidence Assessment, with regard to supervision responsibilities?

In order to answer research question two, the participants were asked to provide

Table 3**CSE and SCT Means and Standard Deviations for Variable of Time**

Variable	n ^a	Mean	SD
CSE			
0-6 months	31	114.71	27.54
6 months-1 year	58	114.33	32.17
1 year-1.5 years	57	112.42	28.46
1.5 years-2 years	113	114.98	30.86
2 years-2.5 years	98	110.20	32.83
SCT			
0-6 months	31	64.58	17.55
6 months-1 year	58	68.90	18.48
1 year-1.5 years	57	67.30	18.96
1.5 years-2 years	113	67.51	18.89
2 years-2.5 years	98	68.00	18.23

^aTotal n = 357

*Significant p < .05

Background Information as part of the Computer Self-Confidence Assessment which included an indication of whether or not the participant supervised other workers. Of the 357 assessments returned, 344 (96%) were usable for this variable.

A total of 202 (59%) participants indicated that they did not supervise other workers. A total of 142 (41%) participants indicated that they did supervise other workers. Frequency counts describing the participant responses on this independent variable are shown in Table 4.

Null Hypothesis Two

Ho₂: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to supervision responsibilities.

Analysis of hypothesis two used assessment Background Information to determine if differences existed in CSE or SCT scores according to whether or not they supervised other workers. MANOVA was used to test this hypothesis. Results of the multivariate analysis Wilks' lambda follow-up procedure indicated a multivariate F-value for group comparison on the independent variable of supervision responsibilities for 2 numerator and 341 denominator degrees of freedom was .2860. This value was not significant at the .05 level. Based on these results no follow-up post hoc test was necessary and Ho₂ was not rejected.

Mean CSE and SCT scores and standard deviations for participants grouped by supervision responsibilities are shown in Table 5. Since the F-values for supervision

Table 4

Frequency Count of Total Respondents by Supervision Responsibility

Supervision Responsibility	Frequency ^a	Percent
No	202	59
Yes	142	41

^aTotal frequency missing (non-responses) = 13

Table 5

CSE and SCT Means and Standard Deviations for Variable of Supervision

Responsibility

Variable	n ^a	Mean	SD
CSE			
No	202	112.20	32.16
Yes	142	114.53	29.50
SCT			
No	202	67.43	18.83
Yes	142	68.08	18.09

^aTotal n = 344

Total missing values (non-responses) = 13

*Significant $p < .05$

responsibilities on both CSE and SCT scales was found to be not significant by the MANOVA, the levels for supervision responsibilities had similar mean values among the CSE and SCT scales.

Research Question Three

Does computer self-efficacy or self-efficacy of computer technologies differ among university employees, as measured by the Computer Self-Confidence Assessment, with regard to job type?

In order to answer research question three, job type was determined from registration lists provided by the Office of Human Resources Management at The University of Tennessee, Knoxville. The demographic data describing the participants regarding this independent variable of job type are shown in Table 6. Out of the 357 respondents, 327 (92%) had a job type of clerical/administrative, 16 (4%) had a job type of maintenance/technical, and 14 (4%) had a job type of faculty.

Null Hypothesis Three

H₀₃: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to job type.

Analysis of hypothesis three was performed using job type to determine whether there was a difference in CSE or SCT scores. MANOVA was used to test null hypothesis three. Results of the MANOVA indicated a multivariate F-value on the independent

Table 6

Frequency Count of Total Respondents by Job Type

Job Type	Frequency	Percent
Clerical/Administrative	327	92
Maintenance/Technical	16	4
Faculty	14	4

value of job type against the dependent variable of CSE for 2 degrees of freedom was 3.47 as shown in Table 7. This value was significant at the .05 level indicating a predictive relationship exists between job type and computer self-efficacy. A multivariate F-value on the independent variable of job type against the dependent variable of SCT for 2 degrees of freedom was 1.52 as shown in Table 7. This value was not significant at the .05 level. To consider the independent variable of job type against both dependent variables simultaneously, it was necessary to use the Wilks' lambda follow-up test criteria. The results of this multivariate procedure indicated an F-value for group comparison on the independent variable of job type for 4 numerator and 690 denominator degrees of freedom was 2.7877 as shown in Table 8. This value was significant at the .05 level. Based on these results, H_{03} was rejected. Therefore, a predictive relationship exists between job type and computer self-efficacy and self-efficacy of computer technologies.

Mean scores and standard deviations grouped by job type are shown in Table 9. Given the influence of job type on computer use self-efficacy and the multiple levels of job type, it was necessary to perform Tukey's HSD post hoc test to determine where significant differences occurred. Results of Tukey's HSD analysis are reported in Table 10. The Tukey analysis resulted in simultaneous confidence intervals for both the CSE and SCT scales. Those confidence intervals that do not contain zero are considered to have significant differences (Huck et al., 1974). As shown in Table 10, the Tukey HSD post hoc detected a significant difference in CSE mean scores among clerical/administrative and faculty employees. Thus, clerical/administrative employees had higher computer self-efficacy scores than faculty. No significant differences were detected

Table 7

Multivariate Analysis of Variance for CSE and SCT Scores of Respondents

Classified by Job Type

	df	SS	F	Pr > F
CSE				
Job Type	2	6523.796	3.47	.0323*
SCT				
Job Type	2	1030.731	1.52	.2209

* $p < .05$

Table 8

Multivariate Analysis of Variance for Mean Scores of Respondents Classified by Job Type

	Wilks' Lambda	df	F	Pr > F
Job Type	.9684	4, 690	2.7877	.0257*

* $p < .05$

Table 9

CSE and SCT Means and Standard Deviations for Variable of Job Type

Variable	n ^a	Mean	SD
CSE*			
Clerical/Administrative	327	114.41	30.02
Maintenance/Technical	16	100.50	38.35
Faculty	14	97.43	36.03
SCT			
Clerical/Administrative	327	68.02	18.06
Maintenance/Technical	16	59.88	24.27
Faculty	14	66.43	19.74

^aTotal n = 357

*Significant $p < .05$

Table 10

**Tukey's Honestly Significant Difference (HSD)^a Procedure (Simultaneous
Confidence Intervals) for Comparisons of Subscale Means for Variable of Job Type**

Job Type Subscale	Lower	Mean	Upper
	Confidence		Confidence
	Limit		Limit
CSE*			
CA ^b - MT ^b	-13.836	2.860	19.556
CA - F ^b	7.263	20.765	34.267*
MT - F	-3.158	17.905	38.967
SCT			
CA - MT	-11.190	-.480	10.230
CA - F	-4.681	3.980	12.641
MT - F	-9.051	4.460	17.972

^aControlling for Type I experimentwise error rate at .05 level of significance

^bJob Type: CA = Clerical/Administrative, MT = Maintenance/Technical, F = Faculty

*Group means are significantly different

in SCT mean scores among participants by job type.

Research Question Four

Does computer self-efficacy or self-efficacy of computer technologies differ among university employees, as measured by the Computer Self-Confidence Assessment, with regard to campus unit of employment?

In order to answer research question four, campus unit was determined from registration lists provided by the Office of Human Resources Management at The University of Tennessee, Knoxville.

The demographic data describing the participants regarding this independent variable of campus unit are shown in Table 11. Out of the 357 respondents, 308 (86%) worked on the main campus, 38 (11%) worked on the agriculture campus, and 11 (3%) worked at The University of Tennessee Medical Center (hospital).

Null Hypothesis Four

H₀₄: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to campus unit of employment.

Analysis of hypothesis four was performed using campus unit of employment to determine whether there was a difference in CSE or SCT scores. MANOVA was used to test null hypothesis four. Results of the MANOVA multiple comparison follow-up procedure indicated a multivariate F-value for group comparisons on the independent

Table 11

Frequency Count of Total Respondents by Campus Unit

Campus Unit	Frequency	Percent
Main	308	86
Agriculture	38	11
Hospital	11	3

variable of campus unit for 4 numerator and 690 denominator degrees of freedom was 2.1874. This value was slightly not significant at the .05 level. Based on these results, no follow-up post hoc tests were required and H_{04} was not rejected.

Mean CSE and SCT scores and standard deviations for participants grouped by campus unit are shown in Table 12. Since the F-values for campus unit on both CSE and SCT scales were found not significant by the MANOVA, the levels of campus unit had similar mean values among the CSE and SCT scales.

Research Question Five

Does computer self-efficacy or self-efficacy of computer technologies differ among university employees, as measured by the Computer Self-Confidence Assessment, with regard to type of previous classroom computer training?

In order to answer research question five, previous computer training was determined from the Computer Self-Confidence Assessment results when participants were asked to indicate of all previous types of classroom computer training. Of the 357 assessments returned, 319 (89%) were useable for this variable. A total of 197 (62%) did not have previous database management training, 122 (38%) had previous training on database management, 60 (19%) did not have previous word processing training, 259 (81%) had previous word processing training, 305 (96%) did not have previous statistical processing training, 14 (4%) had previous statistical processing training, 138 (43%) did not have previous classroom computer training in spreadsheets, 181 (57%) had previous training in spreadsheets, 19 (6%) did not have previous classroom computer training in

Table 12

CSE and SCT Means and Standard Deviations for Variable of Campus Unit

Variable	n ^a	Mean	SD
CSE			
Main	308	113.79	29.57
Agriculture	38	106.61	37.47
Hospital	11	116.27	40.96
SCT			
Main	308	68.08	18.19
Agriculture	38	65.84	19.82
Hospital	11	60.19	20.86

^aTotal n = 357

*Significant $p < .05$

programming, 300 (94%) had previous training in computer programming, 281 (88%) did not have previous training in educational software, while 38 (12%) had previous training in educational software. Table 13 shows frequency counts for all participant responses by type of previous classroom computer training.

Null Hypothesis Five

H₀₅: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to type of previous classroom computer training.

Analysis of hypothesis five was performed using types of previous classroom computer training to determine whether there was a difference in CSE or SCT scores. MANOVA was used to test null hypothesis five. Results of the MANOVA indicated a multivariate F-value on the subscale independent variable of database management against the dependent variable of CSE for 1 degree of freedom was 18.31 as shown in Table 14. This was significant at the .05 level. Therefore, those employees with previous classroom computer training in database management are likely to have higher computer self-efficacy scores than those having other types of computer training. A multivariate F-value on the subscale independent variable of word processing compared against the dependent variable of CSE for 1 degree of freedom was 1.77 as shown in Table 14. This value was not significant at the .05 level. A multivariate F-value on the subscale independent variable of statistical processing against the dependent variable of CSE for 1 degree of freedom was 2.42 as shown in Table 14. This value was not significant at the .05 level. A

Table 13**Frequency Count of Total Respondents by Type of Previous Classroom Computer Training Subscales**

Type of Previous		
Classroom Computer Training	Frequency	Percent
Database Management		
Yes	122	38
No	197	62
Word Processing		
Yes	259	81
No	60	19
Statistical Processing		
Yes	14	4
No	305	96
Spreadsheets		
Yes	181	57
No	138	43
Programming		
Yes	300	94
No	19	6
Educational Software		
Yes	38	12
No	281	88

Table 14

**Multivariate Analysis of Variance for CSE Scores of Respondents Classified by
Type of Previous Classroom Computer Training Subscales**

	df	SS	F	Pr > F
CSE				
Database Management	1	14332.097	18.31	.0001*
Word Processing	1	1387.785	1.77	.1840
Statistical Processing	1	1890.600	2.42	.1211
Spreadsheets	1	305.946	.39	.5323
Programming	1	2219.990	2.84	.0931
Educational Software	1	201.959	.26	.6118

* $p < .05$

multivariate F-value on the subscale independent variable of spreadsheets against the dependent variable of CSE for 1 degree of freedom was .39 as shown in Table 14. This value was not significant at the .05 level. A multivariate F-value on the subscale independent variable of programming against the dependent variable of CSE for 1 degree of freedom was 2.84 as shown in Table 14. This value was not significant at the .05 level. A multivariate F-value on the subscale independent variable of educational software against the dependent variable CSE for 1 degree of freedom was .26 as shown in Table 14. This value was not significant at the .05 level.

Results of the MANOVA indicated a multivariate F-value on the subscale independent variable of database management against the dependent variable of SCT for 1 degree of freedom was 20.39 as shown in Table 15. This value was significant at the .05 level. Thus, those employees with previous computer training in database management are likely to have higher self-efficacy in computer technologies. A multivariate F-value on the subscale independent variable of word processing against the dependent variable of SCT for 1 degree of freedom was 1.16 as shown in Table 15. This value was not significant at the .05 level. A multivariate F-value on the subscale independent variable of statistical processing against the dependent variable of SCT for 1 degree of freedom was 3.93 as shown in Table 15. This value was significant at the .05 level. This means that employees with previous training in statistical processing are likely to have higher self-efficacy in computer technologies. A multivariate F-value on the subscale independent variable of spreadsheets against the dependent variable of SCT for 1 degree of freedom was 2.01 as shown in Table 15. This value was not significant at the .05 level. A multivariate F-value

Table 15

**Multivariate Analysis of Variance for SCT Scores of Respondents Classified by
Type of Previous Classroom Computer Training Subscales**

	df	SS	F	Pr > F
SCT				
Database Management	1	5531.120	20.39	.0001*
Word Processing	1	315.771	1.16	.2814
Statistical Processing	1	1064.938	3.93	.0484*
Spreadsheets	1	544.999	2.01	.1573
Programming	1	626.512	2.31	.1296
Educational Software	1	403.057	1.49	.2238

* $p < .05$

on the subscale independent variable of programming against the dependent variable of SCT for 1 degree of freedom was 2.31 as shown in Table 15. This value was not significant at the .05 level. A multivariate F-value on the subscale independent variable of educational software against the dependent variable of SCT for 1 degree of freedom was 1.49 as shown in Table 15. This value was not significant at the .05 level.

To consider the independent variable subscales against both dependent variables simultaneously, it was necessary to use the Wilks' lambda follow-up test criteria. The results of the multivariate procedure indicated an F-value for group comparison on the subscale independent variable of database management for 2 numerator and 311 denominator degrees of freedom was 11.2333 as shown in Table 16. This value was significant at the .05 level. The F-value for group comparison on the subscale independent variable of word processing for 2 numerator and 311 denominator degrees of freedom was .8977 as shown in Table 16. This value was not significant at the .05 level. The F-value for group comparison on the subscale independent variable of statistical processing for 2 numerator and 311 denominator degrees of freedom was 1.9719 as shown in Table 16. This value was not significant at the .05 level. The F-value for group comparison on the subscale independent variable of spreadsheets for 2 numerator and 311 denominator degrees of freedom was 1.7858 as shown in Table 16. This value was not significant at the .05 level. The F-value for group comparison on the subscale independent variable of programming for 2 numerator and 311 denominator degrees of freedom was 1.5085 as shown in Table 16. This value was not significant the .05 level. The F-value for group comparison on the subscale independent variable of educational software for 2 numerator

Table 16**Multivariate Analysis of Variance for Mean Scores of Respondents Classified by
Type of Previous Classroom Computer Training Subscales**

	Wilks' Lambda	df	F	Pr > F
Database Management	.9326	2, 311	11.2333	.0001*
Word Processing	.9943	2, 311	.8977	.4086
Statistical Processing	.9875	2, 311	1.9719	.1409
Spreadsheets	.9889	2, 311	1.7858	.1899
Programming	.9904	2, 311	1.5085	.2229
Educational Software	.9943	2, 311	.8871	.4129

* $p < .05$

and 311 denominator degrees of freedom was .8871 as shown in Table 16. This value was not significant at the .05 level. Based on these results, H_{05} was rejected. Those employees with previous training in database management are likely to have higher self-efficacy in computers and computer technologies. While, those employees with previous training in statistical processing are likely to have higher self-efficacy in computer technologies.

Mean CSE and SCT scores and standard deviations for participants grouped by types of previous classroom computer training are shown in Tables 17 and 18.

Research Question Six

Does computer self-efficacy or self-efficacy of computer technologies differ among university employees, as measured by the Computer Self-Confidence Assessment, with regard to job tenure?

In order to answer research question six, job tenure was determined from the Background Information provided by the participants on the Computer Self-Confidence Assessment. Of the 357 survey instruments returned, 338 (95%) were usable for this item. A total of 331 (98%) participants reported themselves to be incumbents (more than 1 year in present type position) in their jobs. A total of 7 (2%) participants reported themselves to be newcomers (less than 1 year in present type position) in their jobs. Table 19 shows the frequency counts of responses by job tenure.

Table 17**CSE Means and Standard Deviations for Subscales of Variable Type of Previous Classroom Computer Training**

Variable Subscale	n ^a	Mean	SD
CSE			
Database Management*			
Yes	122	125.34	25.11
No	197	109.09	29.88
Word Processing			
Yes	259	113.07	27.73
No	60	124.95	33.44
Statistical Processing			
Yes	14	129.79	16.65
No	305	114.65	29.50
Spreadsheets			
Yes	181	118.34	29.16
No	138	111.33	28.94
Programming			
Yes	300	115.55	28.79
No	19	111.47	35.75
Educational Software			
Yes	38	117.87	34.69
No	281	114.96	28.43

^aTotal n = 319

Total missing values (non-responses) = 38

*Significant $p < .05$

Table 18**SCT Means and Standard Deviations for Subscales of Variable Type of Previous Classroom Computer Training**

Variable Subscale	n ^a	Mean	SD
SCT			
Database Management*			
Yes	122	74.57	15.86
No	197	65.78	17.08
Word Processing			
Yes	259	68.03	16.37
No	60	73.95	19.58
Statistical Processing*			
Yes	14	78.93	13.05
No	305	68.70	17.19
Spreadsheets			
Yes	181	69.34	17.32
No	138	68.88	16.96
Programming			
Yes	300	69.30	16.79
No	19	66.68	22.42
Educational Software			
Yes	38	70.82	21.08
No	281	68.92	16.57

^aTotal n = 319

Total missing values (non-responses) = 38

*Significant $p < .05$

Table 19

Frequency Count of Total Respondents by Job Tenure

Job Tenure	Frequency	Percent
Incumbent	331	98
Newcomer	7	2

Null Hypothesis Six

Ho₆: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to job tenure.

Results of the MANOVA multiple comparison follow-up procedure indicated a multivariate F-value for group comparison on the independent variable of job tenure for 4 numerator and 670 denominator degrees of freedom was 1.5937. This value was not significant at the .05 level. Based on these results no follow-up post hoc test was required and Ho₆ was not rejected.

Mean CSE and SCT scores and standard deviations for participants grouped by job tenure are shown in Table 20. Since the F-values for both CSE and SCT scales were found not significant by the MANOVA, the two levels of job tenure had similar mean values among the CSE and SCT scales.

Research Question Seven

Does computer self-efficacy or self-efficacy of computer technologies differ among university employees, as measured by the Computer Self-Confidence Assessment, with regard to type of computer use required on the job?

In order to answer research question seven, type of computer use required on the job was determined from the Computer Self-Confidence Assessment results when participants were asked to provide and indicate of all types of computer use required on the job.

Table 20

CSE and SCT Means and Standard Deviations for Variable of Job Tenure

Variable	n ^a	Mean	SD
CSE			
Incumbent	331	113.06	30.97
Newcomer	7	120.29	32.69
SCT			
Incumbent	331	67.53	18.58
Newcomer	7	80.00	18.65

^aTotal n = 338 Total missing values (non-responses) = 19

*Significant $p < .05$

Of the 357 assessments returned, 323 (90%) were useable for this variable. A total of 197 (61%) did not have database management as a requirement on the job, 126 (39%) did have database management required on the job, 41 (13%) did not have word processing required on the job, 282 (87%) had word processing required on the job, 303 (94%) did not have statistical processing as a requirement on the job, 20 (6%) had statistical processing required on the job, 160 (50%) did not have spreadsheets required on the job 163 (50%) had spreadsheets as a requirement on the job, 26 (8%) did not have programming required on the job, 297 (92%) had programming required on the job, 299 (93%) did not have educational software use required on the job, and 24 (7%) had educational software required on the job. Table 21 shows frequency counts for all types of computer use required on the job.

Null Hypothesis Seven

Ho₇: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to type of computer use required on the job.

Analysis of hypothesis seven was performed using types of computer use required on the job to determine whether there was a difference in CSE or SCT scores. MANOVA was used to test null hypothesis seven. Results of the MANOVA indicated a multivariate F-value on the subscale independent variable of database management against the dependent variable of CSE for 1 degree of freedom was 20.36 as shown in Table 22. This value was significant at the .05 level. A multivariate F-value on the subscale independent

Table 21**Frequency Count of Total Respondents by Type of Computer Use Required on the Job Subscales**

Type of Computer		
Use Required on the Job	Frequency	Percent
Database Management		
Yes	126	39
No	197	61
Word Processing		
Yes	282	87
No	41	13
Statistical Processing		
Yes	20	6
No	303	94
Spreadsheets		
Yes	163	50
No	160	50
Programming		
Yes	297	92
No	26	8
Educational Software		
Yes	24	7
No	299	93

Table 22

**Multivariate Analysis of Variance for CSE Scores of Respondents Classified by
Type of Computer Use Required on the Job Subscales**

	df	SS	F	Pr > F
CSE				
Database Management	1	13960.812	20.36	.0001*
Word Processing	1	208.771	.30	.5815
Statistical Processing	1	2871.897	4.19	.0415*
Spreadsheets	1	13627.338	19.87	.0001*
Programming	1	4553.439	6.64	.0104*
Educational Software	1	3381.843	4.93	.0271*

* $p < .05$

variable of word processing against the dependent variable of CSE for 1 degree of freedom was .30 as shown in Table 22. This value was not significant at the .05 level. A multivariate F-value on the subscale independent variable of statistical processing against the dependent variable of CSE for 1 degree of freedom was 4.19 as shown in Table 22. This value was significant at the .05 level. A multivariate F-value on the subscale independent variable of spreadsheets against the dependent variable of CSE for 1 degree of freedom was 19.87 as shown in Table 22. This value was significant at the .05 level. A multivariate F-value on the subscale independent variable of programming against the dependent variable of CSE for 1 degree of freedom was 6.64 as shown in Table 22. This value was significant at the .05 level. A multivariate F-value on the subscale independent variable of educational software against the dependent variable CSE for 1 degree of freedom was 4.93 as shown in Table 22. This value was significant at the .05 level.

Results of the MANOVA indicated a multivariate F-value on the subscale independent variable of database management against the dependent variable of SCT for 1 degree of freedom was 6.75 as shown in Table 23. This value was significant at the .05 level. A multivariate F-value on the subscale independent variable of word processing against the dependent variable of SCT for 1 degree of freedom was .11 as shown in Table 23. This value was not significant at the .05 level. A multivariate F-value on the subscale independent variable of statistical processing against the dependent variable of SCT for 1 degree of freedom was 5.38 as shown in Table 23. This value was significant at the .05 level. A multivariate F-value on the subscale independent variable of spreadsheets against the dependent variable of SCT for 1 degree of freedom was 3.40 as shown in Table 23.

Table 23

Multivariate Analysis of Variance for SCT Scores of Respondents Classified by
Type of Computer Use Required on the Job Subscales

	df	SS	F	Pr > F
SCT				
Database Management	1	1730.186	6.75	.0098*
Word Processing	1	27.069	.11	.7454
Statistical Processing	1	1380.465	5.38	.0210*
Spreadsheets	1	870.975	3.40	.0662
Programming	1	2941.893	11.48	.0008*
Educational Software	1	1549.418	6.04	.0145*

* $p < .05$

This value was not significant at the .05 level. A multivariate F-value on the subscale independent variable of programming against the dependent variable of SCT for 1 degree of freedom was 11.48 as shown in Table 23. This value was significant at the .05 level. A multivariate F-value on the subscale independent variable of educational software against the dependent variable of SCT for 1 degree of freedom was 6.04 as shown in Table 23. This value was significant at the .05 level.

To consider the independent variable subscales against both dependent variables simultaneously, it was necessary to use the Wilks' lambda follow-up test criteria. The results of the multivariate procedure indicated an F-value for group comparison on the subscale independent variable of database management for 2 numerator and 315 denominator degrees of freedom was 10.4716 as shown in Table 24. This value was significant at the .05 level. The F-value for group comparison on the subscale independent variable of word processing for 2 numerator and 315 denominator degrees of freedom was .1556 as shown in Table 24. This value was not significant at the .05 level. The F-value for group comparison on the subscale independent variable of statistical processing for 2 numerator and 315 denominator degrees of freedom was 2.8538 as shown in Table 24. This value was not significant at the .05 level. The F-value for group comparison on the subscale independent variable of spreadsheets for 2 numerator and 315 denominator degrees of freedom was 11.5449 as shown in Table 24. This value was significant at the .05 level. The F-value for group comparison on the subscale independent variable of programming for 2 numerator and 315 denominator degrees of freedom was 5.7572 as shown in Table 24. This value was significant at the .05 level. The F-value for group

Table 24

**Multivariate Analysis of Variance for Mean Scores of Respondents Classified by
Type of Computer Use Required on the Job Subscales**

	Wilks' Lambda	df	F	Pr > F
Database Management	.9377	2, 315	10.4716	.0001*
Word Processing	.9990	2, 315	.1556	.8559
Statistical Processing	.9822	2, 315	2.8538	.0591
Spreadsheets	.9317	2, 315	11.5449	.0001*
Programming	.9647	2, 315	5.7572	.0035*
Educational Software	.9798	2, 315	3.2515	.0400*

* $p < .05$

comparison on the subscale independent variable of educational software for 2 numerator and 315 denominator degrees of freedom was 3.2515 as shown in Table 24. This value was significant at the .05 level. Based on these results, H_{07} was rejected. A predictive relationship exists between computer use required on the job and self-efficacy of computers and computer technology. Overall, those employees who use database management, spreadsheets, programming, and educational software on the job are likely to have higher self-efficacy in computers and computer technology.

Mean CSE and SCT scores and standard deviations for participants grouped by types of computer use required on the job are shown in Tables 25 and 26.

Research Question Eight

Does computer self-efficacy or self-efficacy of computer technologies differ among university employees, as measured by the Computer Self-Confidence Assessment, with regard to frequency of computer use?

In order to answer research question eight, frequency of computer use was determined from the Background Information provided by the participants on the Computer Self-Confidence Assessment. Of the 357 survey instruments returned, 347 (97%) were useable for this item.

A total of 189 (54.5%) participants reported themselves as always using computers, 131 (37.8%) indicated that they used computers frequently, 19 (5.5%) reported that they seldom used computers, 8 (2.3%) indicated that they never used computers. Table 27 shows frequency counts of responses by frequency of computer use.

Table 25**CSE Means and Standard Deviations for Subscales of Variable Type of Computer Use Required on the Job**

Variable Subscale	n ^a	Mean	SD
CSE			
Database Management*			
Yes	126	124.61	27.48
No	197	110.79	27.98
Word Processing			
Yes	282	116.11	27.35
No	41	116.63	36.18
Statistical Processing*			
Yes	20	133.40	20.36
No	303	115.04	28.68
Spreadsheets*			
Yes	163	124.06	24.96
No	160	108.16	29.80
Programming*			
Yes	297	116.93	27.44
No	26	107.58	38.76
Educational Software*			
Yes	24	130.17	26.31
No	299	115.06	28.47

*Total n = 323

Total missing values (non-responses) = 34

*Significant $p < .05$

Table 26**SCT Means and Standard Deviations for Subscales of Variable Type of Computer****Use Required on the Job**

Variable Subscale	n ^a	Mean	SD
SCT			
Database Management*			
Yes	197	72.17	16.87
No	126	67.85	16.61
Word Processing			
Yes	282	69.89	16.05
No	41	67.12	21.47
Statistical Processing*			
Yes	20	79.95	12.54
No	303	68.85	16.86
Spreadsheets			
Yes	163	71.79	15.93
No	160	67.24	17.44
Programming*			
Yes	297	70.40	15.95
No	26	59.69	22.85
Educational Software*			
Yes	24	74.79	18.93
No	299	69.12	16.60

Total n = 323*Total missing values (non-responses) = 34*****Significant p < .05**

Table 27

Frequency Count of Total Respondents by Frequency of Computer Use

Frequency of Computer Use	Frequency	Percent
Always	189	54.5
Frequently	131	37.8
Seldom	19	5.5
Never	8	2.3

Null Hypothesis Eight

H_{08} : There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to frequency of computer use.

Analysis of hypothesis eight was performed using frequency of computer use to determine whether differences existed in CSE or SCT scores. MANOVA was used to test null hypothesis eight. Results of the MANOVA indicated a multivariate F-value on the independent variable of frequency of computer use against the dependent variable of CSE for 3 degrees of freedom was 50.69 as shown in Table 28. This value was significant at the .05 level. A multivariate F-value on the independent variable of frequency of computer use against the dependent variable of SCT for 3 degrees of freedom was 36.94 as shown in Table 28. This value was significant at the .05 level. To consider the independent variable of frequency of computer use against both dependent variables simultaneously, it was necessary to use the Wilks' lambda follow-up test criteria. The results of this multivariate procedure indicated an F-value for group comparison on the independent variable of frequency of computer use for 64 numerator and 684 denominator degrees of freedom was 24.3380 as shown in Table 29. This value was significant at the .05 level. Based on these results, H_{08} was rejected. Therefore, there is a predictive relationship between frequency of computer use and self-efficacy in computers and computer technologies. With frequent use of computers, employees are likely to be more confident in computers and computer technologies.

Mean scores and standard deviations grouped by frequency of computer use are

Table 28

Multivariate Analysis of Variance for CSE and SCT Scores of Respondents

Classified by Frequency of Computer Use

	df	SS	F	Pr > F
CSE				
Frequency of Use	3	101746.575	50.69	.0001*
SCT				
Frequency of Use	3	28909.943	36.94	.0001*

* p < .05

Table 29

**Multivariate Analysis of Variance for Mean Scores of Respondents Classified by
Frequency of Computer Use**

	Wilks' Lambda	df	F	Pr > F
Frequency of Use	.6791	6, 684	24.3380	.0001*

* $p < .05$

shown in Table 30. Given the influence of frequency of computer use on computer use self-efficacy and the multiple levels of frequency of use, it was necessary to perform Tukey's HSD post hoc test to determine where significant differences occurred. Results of Tukey's HSD analysis are reported in Table 31. The Tukey analysis resulted in simultaneous confidence intervals for both the CSE and SCT scales. Those confidence intervals that do not contain zero are considered to have significant differences (Huck et al., 1974). As shown in Table 31, the Tukey HSD post hoc detected significant differences in CSE mean scores among those participants using computers always and those using computers frequently, never, and seldom. Significant differences were also noted between those using computers frequently and those using computers seldomly and never. Also, as shown in Table 31, significant differences were detected in SCT mean scores among participants by frequency of use. Significant differences were noted between those using computers always and those using computers frequently, seldom, and never. SCT mean scores also differed between those using computers frequently and those using computers seldomly and never. Therefore, those employees who use computers always and frequently are more likely to have higher computer self-efficacy and self-efficacy of computer technologies than those who use computers seldom or never.

Research Question Nine

Does computer self-efficacy or self-efficacy of computer technologies differ among university employees, as measured by the Computer Self-Confidence Assessment, with regard to home computer use?

Table 30

CSE and SCT Means and Standard Deviations for Variable of Frequency of Computer Use

Variable	n ^a	Mean	SD
CSE*			
Always	189	126.36	22.94
Frequently	131	103.72	27.45
Seldom	19	66.16	30.78
Never	8	69.63	47.20
SCT*			
Always	189	74.28	15.00
Frequently	131	63.37	16.60
Seldom	19	40.16	17.16
Never	8	45.75	29.35

^aTotal n = 347

Total missing values (non-responses) = 10

*Significant $p < .05$

Table 31

Tukey's Honestly Significant Difference (HSD)^a Procedure (Simultaneous Confidence Intervals) for Comparisons of Subscale Means for Variable of Frequency of Computer Use

	Lower		Upper
	Confidence		Confidence
Frequency of Use Subscales	Limit	Mean	Limit
CSE*			
A ^b - F ^b	15.050	22.642	30.234*
A - N ^b	32.630	56.735	80.840*
A - S ^b	44.130	60.202	76.274*
F - N	9.772	34.093	58.413*
F - S	21.166	37.560	53.954*
N - S	-24.678	3.467	31.613
SCT*			
A ^b - F ^b	6.174	10.914	15.654*
A - N ^b	13.480	28.530	43.581*
A - S ^b	24.088	34.123	44.158*
F - N	2.431	17.616	32.802*
F - S	12.973	23.209	33.444*
N - S	-11.981	5.592	23.165

^aControlling for Type I experimentwise error rate at .05 level of significance

^bFrequency of Computer Use: A = Always, F = Frequently, S = Seldom, N = Never

* Group means are significantly different

In order to answer research question nine, home computer use was determined from the Background Information provided by the participants on the Computer Self-Confidence Assessment. Of the 357 survey instruments returned, 347 (97%) were useable for this item.

A total of 179 (52%) participants reported they used a computer at home, while 168 (48%) indicated they did not use a computer at home. Table 32 shows frequency counts of responses by home computer use.

Null Hypothesis Nine

H₀₉: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to home computer use.

Analysis of hypothesis nine was performed using home computer use to determine whether there were differences in CSE or SCT scores. MANOVA was used to test null hypothesis nine. Results of the MANOVA indicated a multivariate F-value on the independent variable of home computer use against the dependent variable of CSE for 1 degree of freedom was 16.24 as shown in Table 33. This value was significant at the .05 level. A multivariate F-value on the independent variable of home computer use against the dependent variable of SCT for 1 degree of freedom was 15.68 as shown in Table 33. This value was significant at the .05 level. To consider the independent variable of home computer use against both dependent variables simultaneously, it was necessary to use the Wilks' lambda follow-up test criteria. The results of this multivariate procedure indicated

Table 32

Frequency Count of Total Respondents by Home Computer Use

Home Computer Use	Frequency	Percent
Yes	179	52
No	168	48

Table 33

Multivariate Analysis of Variance for CSE and SCT Scores of Respondents

Classified by Home Computer Use

	df	SS	F	Pr > F
CSE				
Home Computer Use	1	14904.148	16.24	.0001*
SCT				
Home Computer Use	1	5150.388	15.68	.0001*

* $p < .05$

an F-value for group comparison on the independent variable of home computer use for 2 numerator and 344 denominator degrees of freedom was 9.0429 as shown in Table 34. This value was significant at the .05 level. Based on these results, H_{09} was rejected. There is a predictive relationship between home computer use and self-efficacy of computers and computer technologies. If employees use computers at home they are likely to be more confident in computers and computer technologies.

Mean scores and standard deviations grouped by home computer use are shown in Table 35. Although home computer use on computer use self-efficacy was significant, it only had two levels, which made it unnecessary to perform Tukey's HSD post hoc test to determine where significant differences occurred.

Research Question Ten

Does computer self-efficacy or self-efficacy of computer technologies differ among university employees, as measured by the Computer Self-Confidence Assessment, with regard to training responsibilities?

In order to answer research question ten, training responsibility was determined from the Background Information provided by the participants on the Computer Self-Confidence Assessment. Of the 357 survey instruments returned, 343 (96%) were useable for this item.

A total of 311 (91%) participants reported that they did not conduct computer training, 32 (9%) indicated that they did conduct computer training. Table 36 shows frequency counts of responses by training responsibilities.

Table 34

Multivariate Analysis of Variance for Mean Scores of Respondents Classified by
Home Computer Use

	Wilks' Lambda	df	F	Pr > F
Home Computer Use	.9500	2, 344	9.0429	.0001*

* $p < .05$

Table 35**CSE and SCT Means and Standard Deviations for Variable of Home Computer Use**

Variable	n ^a	Mean	SD
CSE*			
Yes	179	119.53	27.80
No	168	106.42	32.75
SCT*			
Yes	179	71.35	17.18
No	168	63.64	19.08

^aTotal n = 347 Total missing values (non-responses) = 10

*Significant $p < .05$

Table 36

Frequency Count of Total Respondents by Training Responsibility

Training Responsibility	Frequency	Percent
Yes	32	9
No	311	91

Null Hypothesis Ten

Ho₁₀: There is no significant difference in computer self-efficacy or self-efficacy of computer technologies among university employees, as measured by the Computer Self-Confidence Assessment, with regard to training responsibilities.

Analysis of hypothesis ten was performed using training responsibilities to determine whether there were differences in CSE or SCT scores. A MANOVA was used to test null hypothesis ten. Results of the MANOVA indicated a multivariate F-value on the independent variable of training against the dependent variable of CSE for 1 degree of freedom was 10.90 as shown in Table 37. This value was significant at the .05 level. A multivariate F-value on the independent variable of training against the dependent variable of SCT for 1 degree of freedom was 5.88 as shown in Table 37. This value was significant at the .05 level. To consider the independent variable of training against both dependent variables simultaneously, it was necessary to use the Wilks' lambda follow-up test criteria. The results of this multivariate procedure indicated an F-value for group comparison on the independent variable of training for 2 numerator and 340 denominator degrees of freedom was 5.4529 as shown in Table 38. This value was significant at the .05 level. Based on these results, Ho₁₀ was rejected. Thus, a predictive relationship exists between training responsibilities and self-efficacy of computers and computer technologies. An employee who trains others in the use of computers is likely to have more confidence with computers and computer technologies.

Mean scores and standard deviations grouped by training responsibilities are shown in Table 39. Although training on computer use self-efficacy was significant, it only

Table 37

Multivariate Analysis of Variance for CSE and SCT Scores of Respondents

Classified by Training Responsibility

	df	SS	F	Pr > F
CSE				
Training	1	10175.198	10.90	.0011*
SCT				
Training	1	1987.332	5.88	.0158*

* $p < .05$

Table 38

Multivariate Analysis of Variance for Mean Scores of Respondents Classified by Training Responsibility

	Wilks' Lambda	df	F	Pr > F
Training	.9689	2, 340	5.4529	.0047*

* $p < .05$

Table 39

CSE and SCT Means and Standard Deviations for Variable of Training

Responsibility

Variable	n ^a	Mean	SD
CSE*			
Yes	32	130.22	37.22
No	311	111.49	29.80
SCT*			
Yes	32	75.13	22.49
No	311	66.85	17.92

^aTotal n = 343

Total missing values (non-responses) = 14

*Significant $p < .05$

had two levels, which made it unnecessary to perform Tukey's HSD post hoc test to determine where significant differences occurred.

Research Question Eleven

Does an interaction exist between the independent variables of time between training and survey time, supervision responsibilities, job type, campus unit of employment, previous classroom computer training, job tenure, type of computer use on the job, frequency of computer use, home computer use, and training responsibilities, as measured by the Computer Self-Confidence Assessment, with regard to computer self-efficacy or self-efficacy of computer technologies?

The Computer Self-Confidence Assessment Background Information included responses to independent variables: (a) supervision responsibility, (b) previous classroom computer training, (c) job tenure, (d) type of computer use required on the job, (e) frequency of computer use, (f) home computer use, and (g) training responsibility. Independent variables and independent variable subscales of job type, previous computer training (database management and statistical processing), computer use required on the job (database management, statistical processing, spreadsheets, programming, and educational software), frequency of computer use, home use, and training were found significant in $H_{01} - H_{010}$, thus proven viable for further interaction analysis (Huck et al., 1974). Job type had three levels: (a) clerical/administrative, (b) maintenance/technical, and (c) faculty. Previous classroom computer training had six levels or subscales: (a) database management, (b) word processing, (c) statistical processing, (d) spreadsheets,

(e) programming, and (f) educational software. Computer use required on the job had the same six subscale levels as the variable previous classroom computer training. Frequency of computer use had four levels: (a) never, (b) seldom, (c) frequently, and (d) always. Home use had two levels: (a) yes and (b) no. Training had two levels: (a) yes and (b) no.

Of the 357 total responses, 357 (100%) were completed for job type. For the previous classroom computer training independent variable subscales (database management and statistical processing), a total of 319 (89%) were completed. For independent variable subscales for computer use required on the job (database management, statistical processing, spreadsheets, programming, and educational software), 323 (90%) were completed. For the variable frequency of computer use, a total of 347 (97%) were completed and useable. For the variable home use, a total of 347 (97%) were completed and useable. For the variable training, 343 (96%) were completed and useable. Tables 6, 13, 21, 27, 32, and 36 provide frequency counts and applicable percentages for total participants for each independent variable and independent variable subscales.

Null Hypothesis Eleven

HO₁₁: There is no significant interaction among the independent variables of time between training and survey time, supervision responsibilities, job type, campus unit of employment, previous classroom computer training, job tenure, type of computer use on the job, frequency of computer use, home computer use, and training responsibilities, as measured by the Computer Self-Confidence Assessment, with regard to computer

self-efficacy or self-efficacy of computer technologies.

The MANOVA was used to determine if there was an interaction among the independent variable of time, supervision responsibilities, job type, campus unit of employment, previous classroom computer training, job tenure, type of computer use required on the job, frequency of computer use, home use, and training responsibilities. Through the MANOVA tests in H_{01} - H_{010} , the necessary preceding analysis was performed for determining which main effect variables were significant to be placed into an interaction analysis. According to Huck et al. (1974) and Tabachnik and Fidell (1983), those variables considered as interactions must be significant in previous univariate analyses and must be included as main effects in an interaction variable general linear model. This analysis was necessary to support proceeding with all possible two-way interactions. Those independent variables and subscales of independent variables found significant in the MANOVA tests of H_{01} - H_{010} were job type, previous classroom computer training (database management and statistical processing), computer use required on the job (database management, statistical processing, spreadsheets, programming, and educational software), frequency of computer use, home use, and training.

The results of the MANOVA reported multivariate F-values on each independent variable, independent variable subscales, and interaction of variables against each dependent variable CSE and SCT. To consider the main effects and interaction effects on the dependent variables simultaneously, multivariate F-values were reported using Wilks' lambda multiple comparison follow-up procedure. The F-values for the interactions

against the CSE are presented in Table 40.

The following interactions were found significant at the .05 level: (a) job type by previous classroom computer training (database management) with $F = 4.77$ and $Pr > F = .0299$, (b) job type by computer use required on the job (database management) with $F = 4.15$ and $Pr > F = .0428$, (c) previous classroom computer training (database management) by computer use required on the job (programming) with $F = 5.43$ and $Pr > F = .0206$, (d) job type by frequency of use with $F = 3.31$ and $Pr > F = .0208$, (e) computer use required on the job (programming) by frequency of use with $F = 7.99$ and $Pr > F = .0051$, (f) computer use required on the job (programming) by home use with $F = 5.65$ and $Pr > F = .0183$, and (g) computer use required on the job (programming) by training with $F = 6.72$ and $Pr > F = .0101$.

The F-values for the interactions against the SCT are presented in Table 41. The following interactions were found significant at the .05 level: (a) computer use required on the job (database management) by computer use required on the job (educational software) with $F = 4.06$ and $Pr > F = .0452$, (b) job type by frequency of use with $F = 3.26$ and $Pr > F = .0223$, (c) computer use required on the job (programming) by frequency of use with $F = 8.69$ and $Pr > F = .0035$, and (d) computer use required on the job (programming) by home use with $F = 7.36$ and $Pr > F = .0072$.

The Wilks' lambda multiple comparison follow-up multivariate F-values for all interaction variables are noted in Table 42. The Wilks' lambda F-values for the following interactions were found significant at the .05 level: (a) job type by frequency of computer use with $F = 2.3420$ and $Pr > F = .0308$, (b) computer use required on the job

Table 40

Multivariate Analysis of Variance for CSE Scores of Respondents Classified by
Significant Main Effect and Subscale Interactions

Source	df	SS	F	Pr > F
Type ^a x DM ^b	1	2084.621	4.77	.0299*
Type x SP ^c	1	129.760	.30	.5862
Type x DM2 ^d	1	812.570	4.15	.0428*
DM x DM2	1	.009	0.00	.9964
SP x DM2	1	353.477	.81	.3692
Type x SP2 ^e	1	367.712	.84	.3597
DM x SP2	1	1548.972	3.55	.0609
DM2 x SP2	1	473.364	1.08	.2989
Type x S2 ^f	2	874.572	1.00	.3689
DM x S2	1	8.670	.02	.8881
SP x S2	1	71.874	.16	.6853
DM2 x S2	1	16.998	.04	.8438
SP2 x S2	1	413.958	.95	.3312
DM x P2 ^g	1	2372.963	5.43	.0206*
DM2 x P2	1	1.023	0.00	.9614
S2 x P2	1	554.285	1.27	.2611
Type x ES2 ^h	1	181.892	.42	.5193
DM x ES2	1	442.589	1.01	.3151
DM2 x ES2	1	717.666	1.64	.2011
SP2 x ES2	1	817.992	1.87	.1724
P2 x ES2	1	4.980	.01	.9150

(table continues)

Table 40 (continued)

Multivariate Analysis of Variance for CSE Scores of Respondents Classified by
Significant Main Effect and Subscale Interactions

Source	df	SS	F	Pr > F
Type x Frequese ⁱ	3	4340.718	3.31	.0208*
DM x Frequese	1	219.401	.50	.4791
SP x Frequese	1	263.942	.60	.4377
DM2 x Frequese	1	3.060	.01	.9334
SP2 x Frequese	1	540.542	1.24	.2670
S2 x Frequese	1	51.881	.12	.7306
P2 x Frequese	1	3489.568	7.99	.0051*
ES2 x Frequese	1	1212.675	2.78	.0970
Type x Home Use ^j	1	950.652	2.18	.1414
DM x Home Use	1	1169.686	2.68	.1031
SP x Home Use	1	590.138	1.35	.2462
DM2 x Home Use	1	259.763	.59	.4413
SP2 x Home Use	1	782.967	1.79	.1819
S2 x Home Use	1	270.512	.62	.4320
P2 x Home Use	1	2466.262	5.65	.0183*
ES2 x Home Use	1	64.689	.15	.7007
Frequese x Home Use	1	355.475	.81	.3679
Type x Train ^k	1	1013.850	2.32	.1289
DM x Train	1	441.946	1.01	.3154
DM2 x Train	1	377.861	.87	.3532

(table continues)

Table 40 (continued)

Multivariate Analysis of Variance for CSE Scores of Respondents Classified by Significant Main Effect and Subscale Interactions

Source	df	SS	F	Pr > F
SP2 x Train	1	672.515	1.54	.2159
S2 x Train	1	914.215	2.09	.1493
P2 x Train	1	2934.788	6.72	.0101*
ES2 x Train	1	776.875	1.78	.1836
Frequese x Train	1	482.458	1.11	.2943
Home Use x Train	1	206.389	.47	.4924

Note. Missing information due to non-responses eliminated analysis of interactions DM x SP, SP x SP2, Type x P2, SP x P2, SP x ES2, S2 x ES2, SP x Train.

^a Job Type

^b Type of Previous Classroom Computer Training (Database Management)

^c Type of Previous Classroom Computer Training (Statistical Processing)

^d Type of Computer Use Required on the Job (Database Management)

^e Type of Computer Use Required on the Job (Statistical Processing)

^f Type of Computer Use Required on the Job (Spreadsheets)

^g Type of Computer Use Required on the Job (Programming)

^h Type of Computer Use Required on the Job (Educational Software)

ⁱ Frequency of Computer Use

^j Home Computer Use

^k Training Responsibility

* $p < .05$

Table 41

Multivariate Analysis of Variance for SCT Scores of Respondents Classified by Significant Main Effect and Subscale Interactions

Source	df	SS	F	Pr > F
Type ^a x DM ^b	1	442.676	2.46	.1179
Type x SP ^c	1	287.645	1.60	.2071
Type x DM2 ^d	1	.013	0.00	.9933
DM x DM2	1	7.880	0.04	.8343
SP x DM2	1	171.288	.95	.3299
Type x SP2 ^e	1	4.655	.03	.8723
DM x SP2	1	1.475	.01	.9279
DM2 x SP2	1	401.302	2.23	.1364
Type x S2 ^f	2	477.364	1.33	.2669
DM x S2	1	16.044	.09	.7653
SP x S2	1	211.009	1.17	.2796
DM2 x S2	1	307.647	1.71	.1920
SP2 x S2	1	36.029	.20	.6547
DM x P2 ^g	1	601.338	3.35	.0686
DM2 x P2	1	31.461	0.18	.6760
S2 x P2	1	41.773	.23	.6301
Type x ES2 ^h	1	245.009	1.36	.2441
DM x ES2	1	283.396	1.58	.2104
DM2 x ES2	1	728.899	4.06	.0452*
SP2 x ES2	1	8.595	.05	.8271
P2 x ES2	1	247.005	1.37	.2422

(table continues)

Table 41 (continued)

Multivariate Analysis of Variance for SCT Scores of Respondents Classified by
Significant Main Effect and Subscale Interactions

Source	df	SS	F	Pr > F
Type x Frequese ⁱ	3	758.458	3.26	.0223*
DM x Frequese	1	1.950	.01	.9171
SP x Frequese	1	186.031	1.04	.3100
DM2 x Frequese	1	1.970	.01	.9167
SP2 x Frequese	1	201.338	1.12	.2909
S2 x Frequese	1	3.058	.02	.8963
P2 x Frequese	1	1560.631	8.69	.0035*
ES2 x Frequese	1	245.012	1.36	.2441
Type x Home Use ^j	1	40.004	.22	.6375
DM x Home Use	1	560.378	3.12	.0787
SP x Home Use	1	228.826	1.27	.2603
DM2 x Home Use	1	382.569	2.13	.1459
SP2 x Home Use	1	.764	0.00	.9481
S2 x Home Use	1	61.293	.34	.5598
P2 x Home Use	1	1322.201	7.36	.0072*
ES2 x Home Use	1	3.967	.02	.8820
Frequese x Home Use	1	508.679	2.83	.0938
Type x Train ^k	1	525.182	2.92	.0887
DM x Train	1	394.106	2.19	.1400
DM2 x Train	1	191.007	1.06	.3036

(table continues)

Table 41 (continued)

Multivariate Analysis of Variance for SCT Scores of Respondents Classified by

Significant Main Effect and Subscale Interactions

Source	df	SS	F	Pr > F
SP2 x Train	1	389.836	2.17	.1421
S2 x Train	1	289.891	1.61	.2053
P2 x Train	1	679.145	3.78	.0531
ES2 x Train	1	627.218	3.49	.0630
Frequese x Train	1	622.750	3.47	.0639
Home Use x Train	1	27.581	.15	.6956

Note. Missing information due to non-responses eliminated analysis of interactions DM x SP, SP x SP2, Type x P2, SP x P2, SP x ES2, S2 x ES2, SP x Train.

^a Job Type

^b Type of Previous Classroom Computer Training (Database Management)

^c Type of Previous Classroom Computer Training (Statistical Processing)

^d Type of Computer Use Required on the Job (Database Management)

^e Type of Computer Use Required on the Job (Statistical Processing)

^f Type of Computer Use Required on the Job (Spreadsheets)

^g Type of Computer Use Required on the Job (Programming)

^h Type of Computer Use Required on the Job (Educational Software)

ⁱ Frequency of Computer Use

^j Home Computer Use

^k Training Responsibility

*p < .05

Table 42

Multivariate Analysis of Variance for Mean Scores of Respondents Classified by
Significant Main Effect and Subscale Interactions

	Wilks' Lambda	df	F	Pr > F
Type ^a x DM ^b	.9785	2, 225	2.4712	.0868
Type x SP ^c	.9928	2, 225	.8138	.4445
Type x DM2 ^d	.9744	2, 225	2.9592	.0539
DM x DM2	.9997	2, 225	.0307	.9698
SP x DM2	.9829	2, 225	1.9570	.1437
Type x SP2 ^e	.9955	2, 225	.5048	.6043
DM x SP2	.9790	2, 225	2.4113	.0920
DM2 x SP2	.9899	2, 225	1.1453	.3200
Type x S2 ^f	.9860	4, 450	.7954	.5286
DM x S2	.9996	2, 225	.0449	.9561
SP x S2	.9946	2, 225	.6112	.5436
DM2 x S2	.9908	2, 225	1.0498	.3517
SP2 x S2	.9958	2, 225	.4777	.6208
DM x P2 ^g	.9747	2, 225	2.9161	.0562
DM2 x P2	.9990	2, 225	.1110	.8949
S2 x P2	.9943	2, 225	.6460	.5251
Type x ES2 ^h	.9836	2, 225	1.8707	.1564
DM x ES2	.9925	2, 225	.8555	.4264
DM2 x ES2	.9822	2, 225	2.0402	.1324
SP2 x ES2	.9859	2, 225	1.6125	.2017
P2 x ES2	.9904	2, 225	1.0916	.3375

(table continues)

Table 42 (continued)

Multivariate Analysis of Variance for Mean Scores of Respondents Classified by
Significant Main Effect and Subscale Interactions

	Wilks' Lambda	df	F	Pr > F
Type x Frequese ⁱ	.9404	6, 450	2.3420	.0308*
DM x Frequese	.9973	2, 225	.3092	.7343
SP x Frequese	.9952	2, 225	.5487	.5784
DM2 x Frequese	.9998	2, 225	.0198	.9804
SP2 x Frequese	.9933	2, 225	.7576	.4700
S2 x Frequese	.9988	2, 225	.1328	.8757
P2 x Frequese	.9546	2, 225	5.3548	.0053*
ES2 x Frequese	.9875	2, 225	1.4265	.2423
Type x Home Use ^j	.9897	2, 225	1.1680	.3129
DM x Home Use	.9837	2, 225	1.8661	.1571
SP x Home Use	.9926	2, 225	.8424	.4320
DM2 x Home Use	.9907	2, 225	1.0608	.3479
SP2 x Home Use	.9881	2, 225	1.3562	.2597
S2 x Home Use	.9971	2, 225	.3244	.7233
P2 x Home Use	.9639	2, 225	4.2165	.0159*
ES2 x Home Use	.9993	2, 225	.0767	.9262
Frequese x Home Use	.9876	2, 225	1.4099	.2463
Type x Train ^k	.9852	2, 225	1.6959	.1858
DM x Train	.9902	2, 225	1.1173	.3290
DM2 x Train	.9813	2, 225	2.1393	.1201

(table continues)

Table 42 (continued)

Multivariate Analysis of Variance for Mean Scores of Respondents Classified by Significant Main Effect and Subscale Interactions

	Wilks' Lambda	df	F	Pr > F
SP2 x Train	.9892	2, 225	1.2112	.2998
S2 x Train	.9894	2, 225	1.2014	.3027
P2 x Train	.9695	2, 225	3.5343	.0308*
ES2 x Train	.9842	2, 225	1.8032	.1671
Frequese x Train	.9849	2, 225	1.7258	.1804
Home Use x Train	.9979	2, 225	.2354	.7904

Note. Missing information due to non-responses eliminated analysis of interactions DM x SP, SP x SP2, Type x P2, SP x P2, SP x ES2, S2 x ES2, SP x Train.

^a Job Type

^b Type of Previous Classroom Computer Training (Database Management)

^c Type of Previous Classroom Computer Training (Statistical Processing)

^d Type of Computer Use Required on the Job (Database Management)

^e Type of Computer Use Required on the Job (Statistical Processing)

^f Type of Computer Use Required on the Job (Spreadsheets)

^g Type of Computer Use Required on the Job (Programming)

^h Type of Computer Use Required on the Job (Educational Software)

ⁱ Frequency of Computer Use

^j Home Computer Use

^k Training Responsibility

*p < .05

(programming) by frequency of computer use with $F = 5.3548$ and $Pr > F = .0053$, (c) computer use required on the job (programming) by home use with $F = 4.2165$ and $Pr > F = .0159$, and (d) computer use required on the job (programming) by training with $F = 3.5343$ and $Pr > F = .0308$. Based on these results, H_{011} is rejected. Thus, there are interactions which predict an employee's self-confidence in computers and computer technologies.

Research Question Twelve

Does computer self-efficacy, self-efficacy of computer technologies, time, supervision responsibilities, job type, campus unit of employment, previous classroom computer training, job tenure, computer use required on the job, frequency of computer use, home computer use, and training responsibilities differ among university employees as measured by the Computer Self-Confidence Assessment?

The independent variables and independent variable subscales considered significant by the MANOVA tests in $H_{01} - H_{010}$ were used to answer research question twelve. Independent variables and independent variable subscales of job type, previous computer training (database management and statistical processing), computer use required on the job (database management, statistical processing, spreadsheets, programming, and educational software), frequency of computer use, home use, and training were found significant in $H_{01} - H_{010}$. Job type had three levels: (a) clerical/administrative, (b) maintenance/technical, and (c) faculty. Previous classroom computer training had six levels or subscales: (a) database management, (b) word

processing, (c) statistical processing, (d) spreadsheets, (e) programming, and (f) educational software. Computer use required on the job had the same six subscale levels as the variable previous classroom computer training. Frequency of computer use had four levels: (a) never, (b) seldom, (c) frequently, and (d) always. Home computer use had two levels: (a) yes and (b) no. Training had two levels: (a) yes and (b) no.

Of the 357 total responses, 357 (100%) were completed for job type. For the previous classroom computer training independent variable subscales (database management and statistical processing), a total of 319 (89%) were completed. For independent variable subscales for computer use required on the job (database management, statistical processing, spreadsheets, programming, and educational software), 323 (90%) were completed. For the variable frequency of computer use, a total of 347 (97%) were completed and useable. For the variable home computer use, a total of 347 (97%) were completed and useable. For the variable training, 343 (96%) were completed and useable. Tables 6, 13, 21, 27, 32, and 36 provide frequency counts and applicable percentages for total participants by each independent variable and independent variable subscales.

Null Hypothesis Twelve

H₀₁₂: There is no significant difference between computer self-efficacy, self-efficacy of computer technologies, time, supervision responsibilities, job type, campus unit of employment, previous classroom computer training, job tenure, computer use required on the job, frequency of computer use, home computer use, and training

responsibilities among university employees, as measured by the Computer Self-Confidence Assessment.

The MANOVA procedure was used to determine if differences existed between CSE, SCT, time, job type, campus unit of employment, previous classroom computer training, job tenure, supervision responsibilities, home computer use, frequency of computer use, computer use required on the job and training responsibilities. Through the MANOVA test in $H_{01} - H_{010}$, the necessary preceding analysis was performed for determining which independent variables (based on significance) could be used for further study. Those independent variables and independent variable subscales found significant in the MANOVA test for $H_{01} - H_{010}$ were job type, previous classroom computer training (database management and statistical processing), computer use required on the job (data base management, statistical processing, spreadsheets, programming, and educational software), frequency of computer use, home computer use, and training. All of these independent variables and independent variable subscales were included in a second MANOVA general linear model with all possible two-way interactions to determine if they remained significant.

The MANOVA results are reported in Table 43 in terms of the Wilks' lambda F-values. Job type at 4 numerator and 450 denominator degrees of freedom and a F-value of 2.5256 was significant at the .05 level. Previous classroom computer training (database management) at 2 numerator and 225 denominator degrees of freedom and an F-value of .0440 was not significant at the .05 level. Previous classroom computer training (statistical processing) at 2 numerator and 225 denominator degrees of freedom and an

Table 43

Multivariate Analysis of Variance for Mean Scores of Respondents Classified by
Significant Main Effects and Independent Variable Subscales

	Wilks' Lambda	df	F	Pr > F
Job Type	.9566	4, 450	2.5256	.0402*
Previous Computer Training ^a				
Database Management	.9996	2, 225	.0440	.9570
Statistical Processing	.9863	2, 225	1.5639	.2116
Computer Use Required on the Job				
Database Management	.9738	2, 225	3.0216	.0507
Statistical Processing	.9905	2, 225	1.0748	.3431
Spreadsheets	.9891	2, 225	1.2394	.2915
Programming	.9686	2, 225	3.6510	.0275*
Educational Software	.9779	2, 225	2.5487	.0804
Frequency of Computer Use	.9897	6, 450	.3895	.8858
Home Computer Use	.9966	2, 225	.3812	.6835
Training Responsibility	.9975	2, 225	.2796	.7563

^aPrevious Classroom Computer Training

*p < .05

F-value of 1.5639 was found not significant at the .05 level. Computer use required on the job (database management, 2 numerator and 225 denominator degrees of freedom and $F = 3.0216$; statistical processing, 2 numerator and 225 denominator degrees of freedom and $F = 1.0748$; spreadsheets, 2 numerator and 225 denominator degrees of freedom and $F = 1.2394$; programming, 2 numerator and 225 denominator degrees of freedom and $F = 3.6510$, and educational software, 2 numerator and 225 denominator degrees of freedom and $F = 2.5487$) only found programming remained significant at the .05 level. The independent variable frequency of computer use with 6 numerator and 450 denominator degrees of freedom and an F-value of .3895 was not significant at the .05 level. The independent variable of home use with 2 numerator and 225 denominator degrees of freedom and an F-value of .3812 was not significant at the .05 level. The independent variable of training at 2 numerator and 225 denominator degrees of freedom and F-value of .2796 was not significant at the .05 level.

Given that job type and computer use required on the job (programming) were significant in the MANOVA test, it was necessary to perform Tukey's post hoc follow-up test to control for Type I experimentwise error rate and to determine where significant difference occurred. As noted in Table 44, the Tukey analysis resulted in simultaneous confidence intervals for job type for both CSE and SCT scales. Those confidence intervals that do not contain zero are considered significantly different (Huck et al., 1974). As shown in Table 44, the Tukey post hoc test detected significant differences in CSE mean scores among clerical/administrative and faculty employees. Also, no significant differences were found in SCT mean scores among participants by job type.

Table 44

**Tukey's Honestly Significant Difference (HSD)^a Procedure (Simultaneous
Confidence Intervals) for Comparisons of Subscale Means for Variable of Job Type**

Job Type Subscale	Lower Confidence Limit	Mean	Upper Confidence Limit
CSE*			
CA ^b - MT ^b	-13.836	2.860	19.556
CA - F ^b	7.263	20.765	34.267*
MT - F	-3.158	17.905	38.967
SCT			
CA - MT	-11.190	-.480	10.230
CA - F	-4.681	3.980	12.641
MT - F	-9.051	4.460	17.972

^aControlling for Type I experimentwise error rate at .05 level of significance

^bJob Type: CA = Clerical/Administrative, MT = Maintenance/Technical, F = Faculty

* Group means are significantly different

The Tukey HSD post hoc test, in Table 45, notes significant differences in CSE and SCT scores between those who had programming required on the job and those who did not. Based on these results, H_{012} is rejected. Overall, a predictive relationship does exist between job type and programming use required on the job and self-efficacy of computers and computer technologies. Those employees using programming on the job are more likely to have a higher self-efficacy in using computers and computer technologies than those who do not. Clerical/administrative employees are also more likely to have higher computer self-efficacy and self-efficacy of computer technologies than faculty.

Research Question Thirteen

Does a relationship exist between computer self-efficacy and self-efficacy of computer technologies among university employees as measured by the Computer Self-Confidence Assessment?

As part of the Computer Self-Confidence Assessment, participants were asked to respond to the CSE and SCT scales. Of the 357 survey instruments returned, 351 (98%) completed usable information for the CSE scale and 349 (98%) completed usable information for the SCT scale.

Null Hypothesis Thirteen

H_{013} : There is no significant relationship between computer self-efficacy and self-efficacy of computer technologies, among university employees, as measured by the

Table 45

**Tukey's Honestly Significant Difference (HSD)^a Procedure for Comparisons of
Subscale Means (Programming) for Variable of Computer Use Required on the Job**

Computer Use Required on the Job Subscales	Mean
CSE	
Programming	
A ^b (Yes)	117.94
B ^c (No)	107.00
SCT	
Programming	
A ^b (Yes)	70.99
B ^c (No)	60.73

^aControlling for Type I experimentwise error rate at .05 level of significance

^bTukey Grouping for those who had Programming required on the job

^cTukey Grouping for those who did not have Programming required on the job

* Group means are significantly different

Computer Self-Confidence Assessment.

The Pearson r correlation coefficient was used to determine if there was a relationship between the two dependent variables of CSE and SCT. The Pearson r correlation coefficient was appropriate based on decisions of interval data, linearity, and number of variables. The Pearson r correlation coefficient for the predictor variable CSE and the criterion variable SCT was .77 with a level of significance of $p = .0001$ as noted in Table 46. Therefore, H_{013} was rejected at the .05 level of significance. Based on this test, there is a strong positive correlation (relationship) between the two dependent variable CSE and SCT scales.

Table 46

Pearson r Correlation Matrix for CSE and SCT Scores

	CSE	SCT
CSE	1.0000 a(0.0)	.77087 (.0001)*
SCT	.77087 (.0001)*	1.0000 (0.0)

^aValues in parentheses indicate significance levels

* $p < .05$

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS, RECOMMENDATIONS, AND CONCLUDING REMARKS

This chapter presents a culmination of the research study. A summary of dominant points, major findings, researcher conclusions, and recommendations for future research are provided based on the results of the study.

Summary

The primary purpose of this study was to investigate work situation and transfer of training influences of computer self-efficacy and self-efficacy on training programs that meet individual and organization objectives of university personnel. This was accomplished by assessing the computer self-efficacy and self-efficacy of computer technologies of employees subsequent to training and its duration as it pertains to training usefulness. Additionally, the computer self-efficacy and self-efficacy of computer technologies assessment sought to determine influences on computer use for human resource placement information and to determine present training needs.

To achieve these purposes, the Computer Self-Efficacy (CSE) and the Self-Efficacy of Computer Technologies (SCT) scales were administered, via a Computer Self-Confidence Assessment, to University of Tennessee, Knoxville, employees who had been trained in the past 2 1/2 years (May 1993 - November 1995) through the Office of Human Resources Management. The intent of the assessment was to assess computer self-efficacy or computer self-efficacy with respect to specific technologies. Information

on the employee's supervision responsibilities, types of previous classroom computer training, job tenure, type of computer use required on the job, frequency of computer use, home computer use, and training responsibilities gathered through the Background Information section of the Computer Self-Confidence Assessment as well as information on time, job type, and campus unit obtained from the registration lists of the Office of Human Resources Management were used to determine the presence of any significant differences and relationships.

The University of Tennessee, Knoxville employees who had been trained on computers through the Office of Human Resources Management in the past 2 1/2 years (May 1993 - November 1995) were chosen by the systematic random sampling procedure. From this procedure 500 employees were chosen and 357 employees returned assessments for analysis.

To accomplish the purposes of the study, 13 null hypotheses were developed from 13 research questions. The first 10 null hypotheses developed from research questions focused on the demographic variables used in the study. Each research question focused on the demographics of the population as it related to the associated null hypothesis. Null hypothesis one focused on whether there were any significant differences in computer self-efficacy or self-efficacy of computer technologies among respondents categorized by time between training and survey time. Null hypothesis two focused on whether there were any significant differences in computer self-efficacy or self-efficacy of computer technologies among respondents categorized by supervision responsibilities. Null hypothesis three focused on whether there were any significant differences in computer

self-efficacy or self-efficacy of computer technologies among respondents categorized by job type. Null hypothesis four focused on whether there were any significant differences in computer self-efficacy or self-efficacy of computer technologies among respondents categorized by campus unit of employment. Null hypothesis five focused on whether there were any significant differences in computer self-efficacy or self-efficacy of computer technologies among respondents categorized by type of previous classroom computer training. Null hypothesis six focused on whether there were any significant differences in computer self-efficacy or self-efficacy of computer technologies among respondents categorized by job tenure. Null hypothesis seven focused on whether there were any significant differences in computer self-efficacy or self-efficacy of computer technologies among respondents categorized by type of computer use required on the job. Null hypothesis eight focused on whether there were any significant differences in computer self-efficacy or self-efficacy of computer technologies among respondents categorized by frequency of computer use. Null hypothesis nine focused on whether there were any significant differences in computer self-efficacy or self-efficacy of computer technologies among respondents categorized by home computer use. Null hypothesis ten focused on whether there were any significant differences in computer self-efficacy or self-efficacy of computer technologies among respondents categorized by training responsibilities.

Research question and null hypothesis eleven focused on whether there were any significant interactions among the independent variables of time between training and survey time, supervision responsibilities, job type, campus unit of employment, previous classroom computer training, job tenure, type of computer use on the job, frequency of

computer use, home computer use, and training responsibilities. Research question twelve and null hypothesis twelve focused on whether there were any significant differences between computer self-efficacy, self-efficacy of computer technologies, time, job type, campus unit of employment, previous classroom computer training, job tenure, supervision responsibilities, home computer use, frequency of computer use, computer use required on the job, and training responsibilities. Research question and null hypothesis thirteen focused on whether a significant relationship existed between the CSE and SCT scales included in the Computer Self-Confidence Assessment.

The Computer Self-Confidence Assessment was mailed to sample participants using the campus mail system and administered by first gaining verbal permission from the Director of The University of Tennessee, Knoxville, Office of Human Resources Management. From this verbal agreement, an initial study letter was drafted and sent by the Researcher to each employee participant, at their work address, to explain the need for participation (See Appendix E). The surveys, along with a cover letter (See Appendix F) detailing the purpose and benefits of the study were also sent to the participant's work address with a request to return the survey to the Researcher through campus mail. Follow-up letters were sent at one week and two weeks after the first mailing. The second follow-up included a cover letter (See Appendix F) and assessment (See Appendixes B, C, and D) sent to all current non-respondents. A third follow-up attempt included a phone call to non-respondents to find out the status of the assessment, to encourage their participation, or to gain completion of the assessment by phone (See Appendix G). Each assessment was coded for the follow-up of delinquent respondents and to protect

respondent confidentiality.

After the Computer Self-Confidence Assessments were collected and compiled, data analyses were performed using The University of Tennessee, Knoxville, VMS/VAX mainframe computer system. The specific statistical analysis was performed using the SAS® (SAS Institute, 1985) statistical software residing on the VMS/VAX system.

Demographic information generated frequency results on time between training and survey time, supervision responsibilities, job type, campus unit of employment, type of previous classroom computer training, job tenure, type of computer use required on the job, frequency of computer use, home computer use, and training responsibilities. Mean scores and standard deviations were calculated for each demographic item.

The independent variables controlled in the study were time between training and survey time, supervision responsibilities, job type, campus unit of employment, types of previous classroom computer training, job tenure, types of computer use required on the job, frequency of computer use, home computer use, and training responsibilities. The dependent variables of the study were computer self-efficacy and self-efficacy of computer technologies scores.

Multiple analysis of variance (MANOVA) was used to test null hypotheses one through twelve. The Wilks' lambda multiple comparison follow-up procedure was applied on each test of the independent variables on the dependent variables in order to determine if significant mean differences occurred. Those independent variables and independent variable subscales found significant by the first MANOVA and Wilks' lambda tests were used in a second MANOVA procedure for testing null hypotheses eleven and twelve. The

Wilks' lambda follow-up criterion test was again used to determine if significant mean differences occurred. For significant differences found by the Wilks' lambda, the Tukey HSD post hoc test was used to make all pairwise comparisons among the independent variable subscales. For null hypothesis thirteen, the Pearson r correlation coefficient was used to determine whether a significant relationship existed between the CSE and SCT scales combined in the Computer Self-Confidence Assessment.

To augment the analysis of this study, a summary is provided in Appendix H. This appendix more clearly illustrates MANOVA and Tukey results and to supplement the major findings which follow.

Major Findings

This section presents the major findings resulting from the study. Essentially, the data analysis revealed that hypotheses three, five, seven, eight, nine, ten, eleven, twelve, and thirteen should be rejected at the $p < .05$ level and should be considered significant findings. The major findings of the study are as follows:

1. The study revealed that it had been 1 1/2 to 2 years and 2 years to 2 1/2 years since most employees (32%) had received computer training.

2. There was no significant difference in CSE or SCT scores among university employees with respect to time between training and survey time as measured by the Computer Self-Confidence Assessment. The mean subscale CSE scores for respondents reporting computer training 1 1/2 to 2 years before the survey time were higher than other time subscales. Those mean subscale CSE scores for respondents reporting computer

training 2 to 2 1/2 years before the survey time showed almost a five-point drop from the 1 1/2 to 2 year subscale mean CSE scores. Those respondents reporting mean subscale CSE scores 0 to 6 months and 6 months to 1 year were close to that of those mean subscale scores of those reporting 1 1/2 to 2 years. Those mean subscale CSE scores for respondents reporting computer training 1 year to 1.5 years before the survey time showed a decline in mean subscale CSE scores from those reporting computer training 6 months to 1 year before the survey time. The mean subscale SCT scores for respondents reporting computer training 1 1/2 to 2 years before the survey time were not as high as those reporting computer training 6 months to 1 year before survey time. Those mean subscale SCT scores for respondents reporting computer training 0 to 6 months before the survey time had the lowest mean SCT scores of all subscale groups. Those respondents reporting mean subscale SCT scores from computer training 6 months to 1 year before the survey time had the highest mean SCT scores among all subscale groups. Those mean subscale SCT scores for respondents reporting computer training 1 year to 1 1/2 years before the survey time showed a decline in mean subscale SCT scores from those reporting computer training 6 months to 1 year before the survey time and those reporting computer training 1 1/2 to 2 years before the survey time.

3. Most of the respondents indicated they had no supervision responsibilities.

4. There was no significant difference in CSE or SCT scores among university employees with respect to supervision responsibilities as measured by the Computer Self-Confidence Assessment. The mean subscale scores for respondents reporting supervision responsibilities had higher CSE and SCT mean scores than those who did not

supervise other employees.

5. Most of the respondents indicated a job type of clerical/administrative.

6. There was a significant difference in CSE and SCT scores among university employees with respect to job type as measured by the Computer Self-Confidence Assessment. The mean subscale scores for clerical/administrative had higher CSE and SCT mean scores than those who were employed in maintenance/technical and faculty jobs. Tukey's HSD procedure did detect significant differences in CSE mean scores for respondents classified by job type for the subscales of clerical/administrative and faculty. No significant differences in SCT mean scores were noted among job type subscales.

7. Most respondents indicated that their work was performed on the main University of Tennessee Campus as opposed to those who work on the agriculture and medical center (hospital) campuses.

8. There was no significant difference noted in CSE or SCT scores among university employees categorized by campus unit of employment, as measured by the Computer Self-Confidence Assessment. However, those working on the medical center campus had higher CSE scores than those working on the agriculture and main campuses. Those working on the main campus had higher mean SCT scores than those working on the agriculture and medical center campuses. The respondents working at the medical center campus maintained the lowest mean SCT scores of the campus unit subscales.

9. Most respondents did not have previous classroom computer training in database management, statistical processing, and educational software. The respondents did mostly have previous classroom computer training on word processing, spreadsheets,

and programming.

10. There was a significant difference in both CSE and SCT scores among university employees categorized by previous classroom computer training (database management). There was a significant difference in CSE scores among university employees categorized by type of previous computer training (database management) as measured by the Computer Self-Confidence Assessment. There was a significant difference in SCT scores among university employees categorized by type of previous computer training (database management and statistical processing) as measured by the Computer Self-Confidence Assessment. The mean subscale CSE scores for previous classroom computer training in database management, statistical processing, spreadsheets, programming, and educational software were higher than those who had not had this previous training. Those not having received previous classroom computer training in word processing had higher mean CSE scores than those who had received previous classroom computer training in word processing. The mean subscale SCT scores for previous classroom computer training in database management, statistical processing, spreadsheets, programming, and educational software were higher than those who had not had this previous training. Those not having received previous classroom computer training in word processing had higher mean SCT scores than those who had received previous classroom computer training in word processing.

11. The majority of respondents in the study reported they were incumbents on the job or employed more than one year in their present type of position.

12. There was no significant difference in CSE or SCT scores with respect to job

tenure among university employees as measured by the Computer Self-Confidence Assessment. The mean subscale scores for newcomers or less than one year in the present type of position had higher CSE and SCT scores than those who were incumbents.

13. Most respondents did not have database management, statistical processing, and educational software use required on the job. Mostly, respondents did have word processing, spreadsheets, and programming required on the job.

14. There was a significant difference in both CSE and SCT scores among university employees categorized by type of computer use required on the job (database management, spreadsheets, programming, and educational software) as measured by the Computer Self-Confidence Assessment. There was a significant difference in CSE scores among university employees categorized by type of computer use required on the job (database management, statistical processing, spreadsheets, programming, and educational software) as measured by the Computer Self-Confidence Assessment. With respect to type of computer use required on the job (database management, statistical processing, programming, and educational software), there was a significant difference in SCT scores as measured by the Computer Self-Confidence Assessment. The mean subscale CSE scores for those who had database management, statistical processing, spreadsheets, programming, and educational software required on the job were higher than those who did not have this computer use required on the job. Those respondents reporting they did not have word processing required on the job had slightly higher mean CSE scores than those who had word processing required on the job. The mean subscale SCT scores for those who had database management, word processing, statistical processing,

spreadsheets, programming, and educational software required on the job were higher than those who had not had this computer use required on the job.

15. The majority of respondents in the study regarded their frequency of computer use as always. The second largest number of subscale respondents regarded their frequency of computer use as frequently.

16. There was a significant difference in CSE and SCT scores among university employees with regard to frequency of computer use as measured by the Computer Self-Confidence Assessment. The mean subscale CSE and SCT scores for those always using computers were higher than those who use computers frequently, seldom, and never. The mean subscale CSE and SCT scores for those frequently using computers were higher than those who use computers seldom and never. The mean subscale CSE and SCT scores for those seldomly using computers were lower than those who use computers on a never basis. Tukey's HSD procedure detected significant differences in mean CSE and SCT scores for respondents with respect to frequency of computer use for the subscales of always and frequently, always and never, always and seldom, frequently and never, and frequently and seldom. No significant differences were detected in CSE or SCT mean scores between those using computers on a never and seldom basis.

17. Home computer use among the population was almost equal between those who did and did not use computers at home. However, 52% as opposed to 48% did use computers at home.

18. There was a significant difference in CSE and SCT scores among university employees with respect to home computer use as measured by the Computer

Self-Confidence Assessment. The mean subscale CSE and SCT scores for those using computers at home were higher than those who did not use computers at home.

19. Most of the population did not conduct computer training.

20. There was a significant difference in CSE and SCT scores among university employees with regard to whether or not they conducted computer training. The mean subscale CSE and SCT scores for those conducting computer training were higher than those who did not conduct computer training.

21. There were significant interactions in both CSE and SCT scores among independent variables. The following interactions were significant in both CSE and SCT scores:

- (a) Job type x frequency of computer use
- (b) Computer use required on the job (programming) x frequency of computer use
- (c) Computer use required on the job (programming) x home computer use
- (d) Computer use required on the job (programming) x training responsibilities

The following interactions were significant in CSE scores:

- (a) Job type x previous computer training (database management)
- (b) Job type x computer use required on the job (database management)
- (c) Previous computer training (database management) x computer use required on the job (programming)
- (d) Job type x frequency of computer use
- (e) Computer use required on the job (programming) x frequency of computer use
- (f) Computer use required on the job (programming) x home computer use

(g) Computer use required on the job (programming) x training responsibilities.

The following interactions were significant in SCT scores:

(a) Computer use required on the job (database management) x computer use required on the job (educational software)

(b) Job type x frequency of computer use

(c) Computer use required on the job (programming) x frequency of computer use

(d) Computer use required on the job (programming) x home computer use.

22. There was a significant difference in CSE and SCT scores among university employees when categorized by job type and computer use required on the job (programming) when job type, previous computer training (database management and statistical processing), computer use required on the job (database management, statistical processing, spreadsheets, programming, and educational software), frequency of computer use, home computer use, and training responsibility were included in a MANOVA model with interaction variables. Post hoc tests indicated a significant difference in mean CSE and SCT scores for clerical/administrative and faculty jobs. Additionally, post hoc tests indicated a significant difference in mean CSE and SCT scores for those who are required to use programming on the job and those employees who are not required to use programming on the job.

23. There was a significant relationship between CSE and SCT scales among university employees as measured by the Computer Self-Confidence Assessment.

Conclusions

The conclusions drawn from this study are the result of data collection and analyses from the study's participants and the use of the Computer Self-Confidence Assessment. To the extent data and findings were valid and reliable, the conclusions of the study are as follows:

1. The time between training and survey time, supervision responsibilities, campus unit, and job tenure do not have a predictive relationship to computer self-efficacy or self-efficacy of computer technologies. Computer self-efficacy and self-efficacy of computer technologies remains relatively stable or does not fluctuate regardless of how long ago training was received across a 2 1/2-year time span. Computer self-efficacy and self-efficacy of computer technologies were only slightly different across a 2 1/2-year time frame. An employee's supervision responsibilities, campus unit, and job tenure do not have a predictive relationship to their computer self-efficacy or self-efficacy of computer technologies.

2. A university employee's job type has a predictive relationship to computer self-efficacy and self-efficacy of computer technologies. Employees are likely to have higher computer self-efficacy if they work in clerical/administrative jobs than if they hold faculty positions. However, employees of all job types are likely to have similar self-efficacy in computer technologies.

3. Computer self-efficacy and self-efficacy of computer technologies has a predictive relationship to previous classroom computer training in database management. Computer self-efficacy is related to previous classroom computer training in database

management whereas self-efficacy in specific computer technologies is related to previous classroom computer training in database management and statistical processing. Those employees reporting previous classroom computer training in database management are more likely to have higher computer self-efficacy and self-efficacy of computer technologies. Those employees reporting previous classroom computer training in database management are more likely to have higher computer self-efficacy. Those employees reporting previous classroom computer training in database management and statistical processing are more likely to have higher self-efficacy in specific computer technologies.

4. Computer use in database management, spreadsheets, programming, and educational software required on the job have a predictive relationship to computer self-efficacy and self-efficacy of computer technologies. Computer use in database management, statistical processing, spreadsheets, programming, and educational software required on the job have a predictive relationship to computer self-efficacy. Computer use in database management, statistical processing, programming, and educational software required on the job have a predictive relationship to self-efficacy in specific computer technologies. Employees who have database management, spreadsheets, programming, and educational software required on the job are likely to have higher computer self-efficacy and self-efficacy of computer technologies. Employees who have database management, statistical processing, spreadsheets, programming, and educational software required on the job maintain higher scores in computer self-efficacy. Employees who have database management, statistical processing, programming, and educational software use

required on the job maintain higher self-efficacy in specific computer technologies.

5. Frequency of computer use has a predictive relationship to computer self-efficacy and self-efficacy of computer technologies. An employee's basic computer self-efficacy and self-efficacy of specific computer technologies depends on how frequently the employee uses computers. Thus, the more frequently an employee uses computers the higher their computer self-efficacy and self-efficacy of computer technologies will be. Those employees who reported they always use computers have higher computer self-efficacy and self-efficacy of specific computer technologies than those who use computers on a frequent, seldom, and never basis. Those employees using computers on a frequent basis have higher scores in computer self-efficacy and self-efficacy of specific computer technologies than those who use computers on a seldom and never basis. Those employees using computers on a never and seldom basis maintain relatively the same computer self-efficacy and self-efficacy of computer technologies.

6. Whether or not an employee uses a computer at home has a predictive relationship to computer self-efficacy and self-efficacy of computer technologies. Those employees using computers at home have a higher computer self-efficacy and self-efficacy of specific computer technologies.

7. Computer self-efficacy and self-efficacy of computer technologies has a predictive relationship to whether or not an employee conducts computer training. Those employees who conducted computer training had higher computer self-efficacy and self-efficacy of specific computer technologies.

8. The following differential effects occurred in computer self-efficacy and

self-efficacy of computer technologies: (a) the way job type affects CSE and SCT depends on the frequency of computer use, (b) the way programming use required on the job affects CSE and SCT depends on the frequency of computer use and home computer use, and (c) the way programming use required on the job affects CSE and SCT depends on whether or not the employee conducts computer training. The following differential effects occurred in computer self-efficacy: (a) the way job type affects CSE depends on previous computer training in database management, (b) the way job type affects CSE depends on database management use being required on the job, (c) the way previous computer training in database management affects CSE depends on programming use being required on the job, (d) the way job type affects CSE depends on how often an employee uses computers, (e) the way programming use required on the job affects CSE depends on the frequency of computer use and home computer use, and (f) the way programming use required on the job affects CSE depends on whether or not the employee conducts computer training. The following differential affects occurred in the self-efficacy of computer technologies: (a) the way database management use required on the job affects SCT depends on the use of educational software required on the job, (b) the way job type affects SCT depends on how often an employee uses computers, (c) the way programming use required on the job affects SCT depends on the frequency of computer use, and home computer use.

9. When CSE and SCT scores were analyzed by job type, previous database management and statistical processing computer training, database management, statistical processing, spreadsheets, programming, and educational software use required on the job,

frequency of computer use, home computer use, and training responsibility; job type and programming use required on the job had a predictive relationship to computer self-efficacy and self-efficacy of computer technologies. Clerical/administrative employees had higher computer self-efficacy and self-efficacy of specific computer technologies than those in faculty positions. Those employees who had programming use required on the job had higher computer self-efficacy and self-efficacy of computer technologies than those who did not have programming required on the job.

10. Computer self-efficacy and self-efficacy of computer technologies scales are causally linked. Computer self-efficacy had a positive and strong relationship to self-efficacy of computer technologies.

Recommendations

Based on the findings and conclusions of this study, the following recommendations are offered:

1. With 32% of employees receiving their last training 1 1/2 to 2 years ago, the Office of Human Resources Management should determine present employee computer skill levels and ensure their match with current computer job needs. In doing so, the Office of Human Resources Management and UTK can ensure that training received will be used on the employee's job on a frequent basis. By gaining this information, appropriate skill training could be provided to employees, the university skill base could increase, and organizational performance could improve through improved skill use.

2. Further studies should take a longitudinal approach to see if receiving training

beyond a 2 1/2-year period influences self-efficacy, given evidence of a decline in self-efficacy at the 2 year to 2 1/2-year mark. Such a study, should also investigate changes in job duties, especially faculty, to see how they impact computer self-efficacy and self-efficacy of computer technologies and to provide some explanation for lower computer technology confidence within 6 months of training and higher self-efficacy after a 6 month distance from training.

3. A replication of this study should consider collecting data immediately after training in order not to influence the job tenure choice of employees.

4. Another area for future study would be to investigate specific job tasks for their impact on computer self-efficacy. These job tasks could be within the medical profession in order to explain medical employee self-efficacy differences in CSE and SCT. Word processing job tasks could be studied to determine the degree to which previous training in word processing impacts SCT.

5. Efforts should be made to develop a new computer self-efficacy instrument by:
(a) combining CSE and SCT scales, (b) keeping the framework of the two scales (Beginning, Advanced, Mainframe; Word Processing, Electronic Mail, and CD-ROM), and (c) making it specific enough to detect computer self-efficacy differences in departments. With no differences in computer self-efficacy across campus units, indications and assumptions are made that all computer requirements are the same across The University of Tennessee, Knoxville. In developing a new scale, statistical processing and database management training should be examined for specific tasks that influence self-efficacy of computer technologies.

6. The Office of Human Resources Management should use the Computer Self-Confidence Assessment as an instrument for determining supervisor qualifications. Supervisors typically manage clerical/administrative personnel who use computers and are the largest group of employees in the population. Therefore, a supervisor should possess a higher degree of self-efficacy than their subordinates in order to motivate and train their lower level employees. Supervisors who are confident in their own skills and the skills of their employees are likely to be better respected by the employees. Employees are also more likely to perform better and thus, establish a cohesive work environment.

7. A further study should investigate types of training (formal or informal) for their impact on computer self-efficacy and self-efficacy of computer technologies.

8. A future study should examine how various types of home computer use influence computer self-efficacy and self-efficacy of computer technologies..

Concluding Remarks

1. It should be recognized that for every independent variable in the study, standard deviations were notably high indicating large disparities in computer self-efficacy and self-efficacy of computer technologies scores.

2. Work situation and training environments are considered sources of self-efficacy information.

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APPENDIXES

APPENDIX A

Survey Importance of the Study

IMPORTANCE OF THE STUDY

The performance of organizations are affected by human forces rather than technical capabilities. For nearly a century, organizations have searched for the means to best achieve their organizational objectives. However, they have overlooked the effects of employee beliefs of self-confidence toward the technologies of the workplace as a component of achieving organizational success.

Your completion of this assessment will help provide The University of Tennessee with information to better meet your computer training needs and to determine a framework for a productive working environment. Most of all, this assessment allows your beliefs and your confidence about job performance to be considered in addressing your individual development and career needs.

Sincerely,

Carol A. Decker
Project Director

APPENDIX B

Survey Background Information

BACKGROUND INFORMATION

The following background information will help to better categorize your individual employee beliefs of self-confidence with regard to computers.

Directions: Please check () or fill in the appropriate answer for each of the following items. Your completion of this assessment implies your acceptance that the information will be used for research purposes only and that the information will remain confidential.

Age: _____

Do You Use a Computer at Home: ☐ Yes
☐ No

Gender: ☐ Female
☐ Male

Do You Supervise Other Workers: ☐ Yes
☐ No

Education: ☐ High School Graduate
☐ AD/AS Degree
☐ BA/BS Degree
☐ MA/MS Degree
☐ EdD/PhD

Do You Conduct Computer Training: ☐ Yes
☐ No

Job Tenure: ☐ Incumbent: More than 1 year in present type position
☐ Newcomer: 0-1 year in present type position

How Often Do You Use a Computer: ☐ Never
☐ Seldom
☐ Frequently
☐ Always

Type of Previous Classroom Computer Training: ☐ Database Management, e.g. Dbase, AskSam
(Check all that apply)

☐ Educational Software, e.g. Teaching Typing
☐ Programming, e.g. Basic, Cobol
☐ Spreadsheets, e.g. Lotus, Excel
☐ Statistical Procedures, e. g. SPSSX, SAS
☐ Word Processing, e.g. WordPerfect

Type of Computer Use Required on the Job: ☐ Database Management, e.g. Dbase, AskSam
(Check all that apply)

☐ Educational Software, e.g. Teaching Typing
☐ Programming, e.g. Basic, Cobol
☐ Spreadsheets, e.g. Lotus, Excel
☐ Statistical Procedures, e. g. SPSSX, SAS
☐ Word Processing, e.g. WordPerfect

(OVER PLEASE)

APPENDIX C

Computer Self-efficacy Scale (CSE)

Directions:

The following statements relate to your self-confidence with computers. Please use the following scales and, for each statement, circle the response that best describes your current belief. Please respond to all items on both scales.

	Very Little Confidence			Quite a Lot of Confidence	
1. Working on a personal (microcomputer)	1	2	3	4	5
2. Getting the software up and running	1	2	3	4	5
3. Logging onto a mainframe computer system	1	2	3	4	5
4. Working on a mainframe computer	1	2	3	4	5
5. Using the user's guide when help is needed	1	2	3	4	5
6. Entering and saving data (numbers or words) into a file	1	2	3	4	5
7. Escaping/Exiting from the program software	1	2	3	4	5
8. Logging off the mainframe computer system	1	2	3	4	5
9. Calling-up a data file to view on the monitor screen	1	2	3	4	5
10. Understanding terms/words relating to computer hardware	1	2	3	4	5
11. Understanding terms/words relating to computer software	1	2	3	4	5
12. Handling a floppy disk correctly	1	2	3	4	5
13. Learning to use a variety of programs (software)	1	2	3	4	5
14. Learning advanced skills within a specific program (software)	1	2	3	4	5
15. Making selections from an on-screen menu	1	2	3	4	5
16. Using the computer to analyze number data	1	2	3	4	5

(NEXT PAGE)

	Very Little Confidence			Quite a Lot of Confidence	
17. Using a printer to make a "hard-copy" of my work	1	2	3	4	5
18. Copying a disk	1	2	3	4	5
19. Copying an individual file	1	2	3	4	5
20. Adding and deleting information from a data file	1	2	3	4	5
21. Moving the cursor around the monitor screen	1	2	3	4	5
22. Writing simple programs for the computer	1	2	3	4	5
23. Using the computer to write a letter or essay	1	2	3	4	5
24. Describing the function of computer hardware (keyboard, monitor, disk drives, computer processing unit)	1	2	3	4	5
25. Understanding the three stages of data processing: input, processing, output	1	2	3	4	5
26. Getting help for problems in the computer system	1	2	3	4	5
27. Storing software correctly	1	2	3	4	5
28. Explaining why a program (software) will or will not run on a given computer	1	2	3	4	5
29. Using the computer to organize information	1	2	3	4	5
30. Getting rid of file when they are no longer needed	1	2	3	4	5
31. Organizing and managing files	1	2	3	4	5
32. Troubleshooting computer problems	1	2	3	4	5

(OVER PLEASE)

APPENDIX D

Self-efficacy of Computer Technologies Scale (SCT)

		Strongly Disagree		Strongly Agree	
Word Processing					
I am confident...					
1.	...using a word processing program to write a letter or an essay.	1	2	3	4
2.	...accessing previous files with a word processing program.	1	2	3	4
3.	...making corrections while word processing.	1	2	3	4
4.	...formatting text (e.g., bold, underlining) while word processing.	1	2	3	4
5.	...moving blocks of text while word processing.	1	2	3	4
6.	...using the spelling checker while word processing.	1	2	3	4
7.	...using the searching feature in a word processing program.	1	2	3	4
8.	...printing out files I've written while word processing.	1	2	3	4
9.	...saving documents I've written with a word processing program.	1	2	3	4
10.	...renaming a word processing file to make a back-up copy.	1	2	3	4

Electronic Mail

I am confident...					
11.	...logging on to e-mail.	1	2	3	4
12.	...reading mail messages on e-mail.	1	2	3	4
13.	...responding to mail messages on e-mail.	1	2	3	4
14.	...deleting messages received on e-mail.	1	2	3	4

(NEXT PAGE)

		Strongly Disagree			Strongly Agree
15.	...sending mail messages on e-mail.	1	2	3	4
16.	...sending the same mail message to more than one person on e-mail.	1	2	3	4
17.	...responding privately to messages sent to more than one person on e-mail.	1	2	3	4
18.	...forwarding messages received on e-mail.	1	2	3	4
19.	...logging off of e-mail.	1	2	3	4

CD-ROM Data Bases

I am confident...

20.	...using a data base on compact disc, such as ERIC or Psych Abstracts.	1	2	3	4
21.	...selecting the right data base on compact disc for a specific topic.	1	2	3	4
22.	...selecting search terms for a data base literature search.	1	2	3	4
23.	...getting into data base on compact disc and starting a literature search.	1	2	3	4
24.	...using descriptors from a data base literature search to obtain new search terms.	1	2	3	4
25.	...using the print function in a data base search on compact disc.	1	2	3	4

APPENDIX E

Letter of Introduction to Study Participants



Department of Human Resource Development
Knoxville, Tennessee 37996-2755
(615) 974-2574
FAX (615) 974-2048
HRD@UTK.VX.UTK.EDU

October 25, 1995

TO: Study Participants

SUBJECT: Computer Self-Confidence Assessment

Computer training is becoming more crucial as new technological implementations come so rapidly. Your self-confidence beliefs with regard to performing computer tasks is vital to the determinations that we make in future computer training design. As an employee of The University of Tennessee, you are uniquely positioned to assist us in a meaningful assessment on the computer self-confidence beliefs of employees.

This assessment will be conducted in the coming months. This effort is jointly conducted with the Department of Human Resource Development. We need your assistance in providing us with the completion of a short assessment.

The assessment is designed to obtain information on your basic computer self-confidence. Your responses will help us to better meet your computer training, individual, and career needs. Your assistance in this matter is very important. Your responses will be kept confidential.

Your participation in this effort is vital to the end results and your individual development resources. Thank you for your support in this study. If you have any questions, please feel free to contact me, Carol Decker. I can be reached at 423/974-2574 or 423/481-2929. The mailing address is Carol Decker, Computer Self-Confidence Project Director, 1914 Andy Holt Ave., 383 HPER Bldg., Department of Human Resource Development, University of Tennessee, Knoxville, TN 37996-2755.

Sincerely,

A handwritten signature in cursive script, appearing to read "Carol Decker".

Carol Decker
Computer Self-Confidence Project Director
Department of Human Resource Development

APPENDIX F

Cover Letter for Administration of Computer Self-Confidence Assessment



November 1, 1995

Department of Human Resource Development
Knoxville, Tennessee 37996-2755
(615) 974-2574
FAX (615) 974-2048
HRD@UTKVX.UTK.EDU

TO: Study Participant

You recently received a letter discussing an upcoming assessment of computer self-confidence to be conducted with the Department of Human Resource Development. You have been selected as a participant of this study. The following information details the importance of the study, the importance of your input, and instructions for completing the assessment.

The performance of organizations are affected by human forces rather than technical capabilities. For nearly a century, organizations have searched for the means to best achieve their organizational objectives. However, they have overlooked the effects of employee beliefs toward the technologies of the workplace as a component of achieving organizational success.

Your completion of this assessment will help provide The University of Tennessee with information to better meet your computer training needs and to determine a framework for a productive working environment. Most of all, this assessment allows your beliefs and your confidence about computers to be considered in addressing your individual development and career needs.

The assessment will take approximately 10 minutes of your time. The assessment is designed to obtain information on your basic computer self-confidence. Also, additional background information is requested in order that your responses can be more readily categorized. Your responses will help us to better meet your computer training, individual, and career needs. Your assistance in this matter is very important.

Your responses will be kept confidential. Your name is not required on the assessment, but the background information is very much needed.

Before answering the assessment, please read the directions carefully. **Please return the assessment as soon as possible through UTK's campus mail to Carol A. Decker, Human Resource Development, 383 HPER Bldg., Mail Code 2755.** This address is positioned on the back cover of the assessment for your convenience. With the address being located on the back cover, you may simply staple the assessment together and send it through campus mail. Your completion of this assessment implies your consent to participate.

Your participation in this effort is vital to the end results and your individual development resources. If your responses are not received promptly, you will be personally contacted for your input. Thank you for your support in this study. If you have any questions, please feel free to contact me at 423/974-2574 or 423/481-2929. The mailing address is Carol Decker, Computer Self-Confidence Project Director, 1914 Andy Holt Ave., 383 HPER Bldg., Department of Human Resource Development, University of Tennessee, Knoxville, TN 37996-2755.

Sincerely,

A handwritten signature in cursive script, appearing to read "Carol A. Decker".

Carol A. Decker
Computer Self-Confidence Project Director

APPENDIX G

Script for Telephone Follow-Up of Non-Respondents

Script for Telephone Follow-Up of Non-Respondents

Hello. My name is Carol Decker. I am the project director for the computer self-confidence study being conducted by The University of Tennessee. I am following up on the Computer Self-Confidence Assessment that I recently sent you. Have you had a chance to complete and return the assessment? If so, I appreciate your participation. If not, could you take just 10 minutes of your time to complete the survey for me? Your input is very important to the accuracy of the results of the study as well as your future training opportunities.

APPENDIX H

Summary of MANOVA and Tukey HSD Results

Summary of MANOVA and Tukey HSD Results

1st MANOVA

Independent Variables	Dependent Variables		Wilks' Λ	Tukey's HSD
	CSE	SCT		
Time			NS	NO
Supervision			NS	NO
Type	S	NS	S	YES
Unit			NS	NO
Previous Classroom Computer Training				
DM	S	S	S	NO
WP	NS	NS	NS	NO
SP	NS	S	NS	NO
S	NS	NS	NS	NO
P	NS	NS	NS	NO
ES	NS	NS	NS	NO
Computer Use Required on the Job				
DM	S	S	S	NO
WP	NS	NS	NS	NO
SP	S	S	NS	NO
S	S	NS	S	NO
P	S	S	S	NO
ES	S	S	S	NO
Tenure			NS	NO

(table continues)

Summary of MANOVA and Tukey HSD Results

(continued)

1st MANOVA

Independent Variables	Dependent Variables		Wilks' Λ	Tukey's HSD
	CSE	SCT		
Frequency of Computer Use	S	S	S	YES
Home Computer Use	S	S	S	NO
Training	S	S	S	NO

2nd MANOVA

Independent Variables	Dependent Variables		Wilks' Λ	Tukey's HSD
	CSE	SCT		
Type			S	Yes
Previous Classroom Computer Training				
DM			NS	NO
SP			NS	NO
Computer Use Required on the Job				
DM			NS	NO
SP			NS	NO
S			NS	NO
P			S	Yes
ES			NS	NO
Frequency of Computer Use			NS	NO

(table continues)

Summary of MANOVA and Tukey HSD Results (continued)

2nd MANOVA

Independent Variables	Dependent Variables		Wilks' Λ	Tukey's HSD
	CSE	SCT		
Home Computer Use			NS	NO
Training			NS	NO
All Possible Two-Way Interactions of the Above		As reported in Tables 40, 41 and 42		

S = Significant at .05

NS = Not Significant at .05

Yes = Performed and significance found

No = Not Performed

VITA

Carol Ann Decker was born in Loudon, Tennessee on August 11, 1963 to James David Decker and Juanita Wiggins Decker. She graduated from Sweetwater High School, in Sweetwater, Tennessee, in June of 1981. Upon graduation, she immediately began working on an undergraduate degree at The University of Tennessee, Knoxville. In 1985, she graduated with a Bachelor of Science degree in Business Administration with a major in Marketing.

After graduation, she accepted a managerial position with the Sherwin Williams Company in Nashville, Tennessee. While in this position, she was transferred to Athens, Tennessee, where she completed another undergraduate degree in Accounting at Tennessee Wesleyan College (TWC). During most of her employment with Sherwin Williams, she worked toward a Master of Business Administration at The University of Tennessee, Chattanooga (UTC). While employed with Sherwin Williams, she managed all operations including human resource development issues and designed, developed, and delivered training to local industries.

Toward the completion of the Master's degree, she became a graduate assistant in the Audit and Management Services department at UTC. Her efforts in this position included operational audits of university functional units. She received a Master of Business Administration degree in August of 1992.

Upon graduation, she accepted the position of a Legislative Auditor for the State of Tennessee, where she conducted financial and compliance audits of colleges, universities, and JTPA programs, as well as trained fellow auditors. During her

employment with State Audit, she decided to pursue doctoral studies in Human Resource Development and Industrial Training.

She was accepted by the Graduate School at The University of Tennessee, Knoxville, in August 1993. As a doctoral student, she served as a graduate teaching, research assistant, and research associate in the Department of Human Resource Development. Her teachings consisted of Computer Business Applications and Principles of Business and Marketing for Trainers. Other duties in these positions consisted of being the department representative for the College of Education, the graduate student representative for Business/Marketing faculty search committee, the department computer lab instructor/facilitator, and the developer and designer of the department newsletter.

Since August of 1993, she has authored several articles relating to business training, cost-effectiveness of training, organizational development, and computer instruction. She has also published several instructional modules relating to determining the cost-effectiveness of training, project management, records management, and general managerial skills.

She is currently a member of the American Society for Training and Development, the American Vocational Association, Omicron Tau Theta (President-Elect), and Phi Kappa Phi. She received her Doctor of Philosophy with a major in Human Resource Development in May of 1996.

The researcher is currently employed as an Instructional Technologist for Science Applications International Corporation (SAIC) in Oak Ridge, Tennessee, and as an adjunct faculty member for TWC in Athens, Tennessee. Her efforts at SAIC consist of

designing, developing, and delivering training programs for environmental restoration records management and project management initiatives. She is also currently conducting computer accounting information system (SAP R/3) training for the entire SAIC Oak Ridge location. Her teachings at TWC include organizational management, human resource management, cost accounting, auditing, and accounting information systems.