FACTORS ASSOCIATED WITH TRAINING MANAGERS' ADOPTION OF COMPUTERS AS A TEACHING TOOL IN THEIR TRAINING UNITS

by

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(ABSTRACT)

The purpose of this study was to determine if various predictor variables, the personal characteristics of training managers and the characteristics of the organizational training units represented by these individuals, exist in explaining a criterion variable, the adoption of computers as tools for training in business and industry. Another question addressed a combination of variables to predict training managers' utilization of computers in business and industry.

For collecting data, a 10% random sample was drawn from the 21,800 individuals who were 1984 members of the American Society for Training and Development. From this sample of individuals, those members who represent training units in business and industry and had titles of training executives, training managers, or training director were surveyed. Information concerning representation of training managers was found in the 1984 Who's Who in Training and Development.

A mailed questionnaire was used to collect data related to the personal characteristics of training managers and the organization training units that were represented by these managers. The questionnaire used in this research was designed so that the respondents could record their answers on the instrument. These data

were then transferred to a computer data file for statistical analysis using SPSSX.

Of the 505 individuals responding, 45.1% (n = 228) used computers in training and 54.9% (n = 277) were not using computers in training. Computer users most frequently indicated using microcomputers to deliver their training programs and the most often cited location for training was in decentralized areas. The tutorial instruction strategy was stated as being used by an excess of 90% of the respondents and over 75% indicated using either problem/test or drills. Also, over 50% indicated using the following computer-based training application: technical skills, management training, clerical training, computer literacy training and training management. Respondents utilizing computers noted that a mean of 14% of their total training effort was accomplished via the computer.

With regard to personal characteristics, age, training years experience, experience with present organization and level of education did not appear to be predictor variables in determining the adoption of computers by training managers. However, computer knowledge/skills seem to indicate predictor variables for determining adoption. This study identified six such variables: owning a personal computer, using a computer on the job, reading computer literature on training, participating in computer-assisted instructional programs, receiving computer-based training prior to being a training manager and writing computer programs. In addition, a significant difference was found between computer users and non-users on the attitude dimension of

whether computer-based training was welcomed into the organization's training delivery system and whether computer-based training would assist in making training managers more efficient at their job.

Characteristics of the organizational training units represented in this study appeared to indicate predictor variables for the adoption of computer-based training. The variables identified in this research were the size of the organization as indicated by the number of employees and the annual corporate income of the organization.

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CHAPTER 1

INTRODUCTION

One dilemma facing educators and trainers today is trying to determine what the world of work may be like in the next decade. Some jobs which exist now may soon be eliminated while other jobs may be developing. It is difficult to prepare an individual for a career that at the present time is not visualized or may depend on certain unforeseen developments in other fields (Carnevale, 1983; Choate, 1982).

It is most likely that the shifting pattern of career and/or job needs will continue. The education and training which one acquires in preparation for a career no longer assures an individual of adequate skills for a lifetime in that career. It is estimated that a segment of the population is going to need "retraining" every 10 to 15 years. In addition, some individuals may need to prepare for three or four career changes during a lifetime (Naisbitt, 1982).

Dr. Donald J. Senese, Assistant Secretary for Educational Research and Improvement, United States Department of Education, stated in a presentation before the 1984 National Conference on Technology and Education that society has shifted from the present "industrial age" into the "information age." In his view, the computer is an adjunct to the information age.

Senese (1984) further emphasized the existence of the computer, quoting from Nobel Prize winner Dr. Herbert A. Simon:

> Nobody really needs convincing these days that the computer is an innovation of more than ordinary magnitude, a one-in-several-centuries innovation and not a one-in-a-century innovation or one of these instant revolutions that are announced every day in the papers or on television. It really is an event of major magnitude. (p. 90)

Furthermore, the following statistics are impressive to even the most unaware computer novice. It is estimated that almost 80% of the present jobs involve some type of computer interaction (Kearsley, 1981). Also, Business Week (1982) projected that by the mid-1990s, 15 million workers are expected to earn their income at home using some form of computerized help.

James Hall-Sheehy (1984) states that as the number of computers increase in the work place so will the implications for training and information processing education. Included in Hall-Sheehy's six interrelated trends are:

1. Computers are affecting strategic planning for organizations.
2. The demand for user-friendly resources will increase as more individuals have access to computers.
3. The more individuals are exposed to computers, the more education will be needed to insure productive use.
4. Today's users will not be primary users of tomorrow.
5. The more individuals use computers, the greater the number of potential applications to be managed.
6. Computers do not belong exclusively to data processing.

In reacting to these computer issues, training and development departments in business and industry should be sensitive to the implications in order to assist their employees in reaching their full potential. Not only will the computer revolution require individuals who can manage information, but also individuals who can communicate to others about these business tools. Nevertheless, the following studies indicate a cautious approach to the use of computers.

A 1981 study conducted among the readership of Training magazine reported the following results:

1. 21.8% of the respondents did not use computers, but stated that they would be implementing computer-assisted instruction within a year;

2. 30% predicted the use of computer-assisted instruction within two years; and

3. the remaining 39.2% estimated implementation within five years.

There was agreement that the use of computers in training was expected. The "U.S. Training Census and Trends Report" of Training magazine revealed the training activities of organizations with 50 or more employees. The report of a 1982 survey indicated that of 991 respondents, 18.3% owned computers for training (Zemke, 1982, p. 42). Similar 1983 and 1984 census reports polled respondents use of computers as training devices. These percents were 32.2% and 46.4%, respectively (Zemke, 1983, p. 50; Zemke, 1984, p. 56).

TALMIS, an Oak Park, Illinois based research firm, conducted a study of Training magazine subscribers who were members of the American Society for Training and Development and data processing managers. This firm identified computer-based training veterans who had been using mainframe computers for training for a number of years and relative newcomers who were more likely to use computers for computer literacy or administrative purposes. TALMIS found among both groups that 71% used computers for administrative work, 86% provided computer literacy training, 40% provided computer-based training, and 14% provided interactive video training programs in their own study. Extrapolating Training's 1982 report and Dun & Bradstreet studies, they predict that expenditures for off-the-shelf computer-based training for microcomputers will grow from $35 million in 1984 to $88 million by 1987. Overall expenditures for computer-based training (including custom-developed computer-based training for micros and mainframes as well as off-the-shelf computer-based training) will increase from $165 million in 1983 to more than $500 million by 1987 (Gordon, 1984).

Computer-based training has become big business. The Association of Data Processing Service Organizations estimates that the multi-million-dollar training market will double every year over the next several years. In addition, corporations are finding that training individuals to use computers is more cost effective than losing productive labor hours by allowing employees to teach themselves. Training specialist Larry Oliver says that "even at $1,000 a day, it's cheaper to hire an outside consultant to teach classes" rather than depending on a training

package for self-instruction. Also, ongoing reinforcement of training is needed in order to keep computer skills up-to-date (Steidtmann, 1984).

Statement of the Problem

The literature suggests some applications of computers in training, but there is by no means general agreement concerning their use. Furthermore, there is even less reported on how training managers in training units are adopting the computer as a training tool for training individual job skills and human resource development (Greenberg, 1984).

Zemke (1983) contends organizational characteristics and personal characteristics of training directors affect the use of computers as a teaching tool within training units. However, no research studies to date have included these variables in a research design.

With the prevalence of computers in the business world, one might raise a question as to the current impact of computers in training. This study was to examine training managers' adoption of computers in training units in both job skills acquisition and human resource development in business and industry. The research considers both the influence of the personal characteristics of training managers and the organizational characteristics of training units upon adoption of computers as a method of instruction.

Purpose

The purpose of this study was to: (a) synthesize the literature related to the utilization of computers in training in business and

industry, (b) describe how training managers are using computers in business and industry for job skills acquisition and human resource development, (c) assess the personal characteristics and attitudes of training directors which influence the utilization of computers in training in business and industry, (d) assess the organizational characteristics of training units which influence the utilization of computers in training in business and industry, and (e) determine the relationship between personal characteristics of the training managers and organizational characteristics of training units which affect the adoption of computers in their training program.

Research Questions

As a result of this research, the following questions were answered.

1. Which organizations are using computers in training?

2. How are training managers using computers to train employees in business and industry?

3. What are the personal characteristics of training managers who adopt computers in training and those who do not?

4. Is there a difference between the personal characteristics of training managers who adopt computers in training and those who do not adopt?

5. What are the attitudes of training managers who adopt computers in training and those who do not adopt?

6. Is there a difference between the attitudes of training managers who adopt computers in training and those who do not adopt?

7. What are training organizational characteristics of training units using computers in training and those not using computers in training?

8. Is there a difference between the organizational characteristics of the training units who adopt computers in training and those who do not adopt?

Delimitation of the Study

1. This study was limited to training managers who are members of the American Society for Training and Development.

Need for the Study

While the number of computers in business and industry continues to increase, there is little information to describe how they are being adopted by training managers to teach specific job skills and human resource development. In addition, available research literature fails to provide training managers with personal characteristics of training managers and the organizational characteristics of training units, for examining the adoption of computers within their organizations. A need also exists to examine economic factors which influence training managers to adopt computers as a teaching tool.

The development and subsequent internal and external marketing of customer-oriented training programs need to be thoroughly researched and results provided to training managers for incorporation into their organizational strategies. A need exists not only for trainers to become computer literate and skilled in the science but due to rapid

technological changes in the computer industry, on-going development programs are required to avoid technical deterioration. This study assists training managers by providing solid baseline data on the status of complete computer-based training in training units in business and industry.

Definitions

Adoption: A decision to make full use of a new idea as the best course of action available (Rogers, 1962).

Attitude: The agreement or disagreement of training managers on the attitude dimension statements as defined in the organizational computer survey.

Computer-Assisted Instruction: Use of computers in the actual instructional process to supplement a human teacher (Blaisdell, 1976-77; Fauley, 1981; Selden, 1981; Reynolds, 1983; Reynolds & Davis, 1983).

Computer-Based Training: The "umbrella" word which includes all of the activities described by terms such as computer-assisted instruction and computer-managed instruction.

Computer-Managed Instruction: Management of instruction by the computer (Blaisdell, 1976-77).

Human Resource Development: A process of change through learning (Nadler, 1980, page 5).

Organizations: Private sector units of business and industry, including manufacturing, transportation/communication/utilities, wholesale trade, retail trade, finance/insurance/banking, health services, business services and public administration.

Organizational Characteristics: Includes type of business, annual corporate income, and size of organization.

Personal Characteristics: Includes age, years of professional experience in an organization, years in present organization, formal education, major field of study, computer experience toward computer-based training.

Situational Factors: Includes the size of organization, the type of business, the training budget of organization, the experience of the training director, and their perceived effectiveness of computers as a training tool.

Training Manager: Includes individuals with titles of training executive, training manager, training director, or training supervisor (Langer, 1983).

Organization of the Study

This study is organized around five chapters. The first chapter includes the introduction, a statement of the problem, a purpose statement, research question, limitations, definitions, and significance of the study. Chapter 2 contains a comprehensive review of the literature as it relates to the use of computers in training. Chapter 3 describes the design of the study, the instrumentation, the population sampling procedures, the research questions to be answered, and the procedures for analyzing the data. Chapter 4 includes a report of the findings and answers the research questions. Chapter 5 presents a summary of the findings, interpretations of the results, and recommendations for future research. A copy of the data collection instrument is in Appendix A.

CHAPTER II

REVIEW OF THE LITERATURE

In today's advanced technological society, training managers are constantly confronted with training innovations of both major and minor proportions. It seems that little research attention has been given to the diffusion of technological innovations. While attempting to utilize knowledge and techniques prescribed by others, individuals involved with the diffusion process fail to gain any perception of the adoption and the system within which they operate. For the purpose of informing training personnel about the implications certain innovations may have, those responsible for the innovation will have to rely on a variety of techniques. It is important that the proper techniques be implemented, as there often exists a lag between the development of a product and the adoption of the product by the trainer.

A review of the related literature was conducted for the purpose of conceptualizing and refining the basic problem, along with developing questions for the study. In addition, in order to provide a strong research base, it is important to see how others have approached the problem area. Studies are grouped into the following categories: (a) literature relating to the process of adoption of an innovation to provide a basis for examining the adoption of computers in training programs in business and industry, (b) the history of computer-based training systems, and (c) literature relating to the use of computers in training in business and industrial setting.

Literature Relating to the Process of Adoption of an Innovation

Until recently, most of the literature on the adoption of innovations has focused on the characteristics of the innovation itself and the individual adopter. Organizational variables and the organization as the unit of adoption have been given little attention. Simple product-type innovations such as new drugs, communication devices and electronic games have been studied extensively, whereas complex "process" innovations of interest to educators have received little attention. Rogers and Shoemaker (1971) stress the importance of communication patterns and the relationship of innovation and user characteristics to rates of adoption in documenting the traditional "diffusionist" approach.

The value and validity of the diffusionist approach is well documented. However, in explaining the factors involved in the adoption of innovations by organizations or organizational subunits such as training units in business and industry, one often needs to seek additional explanations. As Baldridge and Burnham (1975) have stated, most education or social innovations are complex, difficult to implement and difficult to evaluate. Furthermore, significant innovations are seldom adopted by isolated individuals. A prior organizational commitment is usually involved. Computer-assisted instruction, computer-managed instruction, computer-based training labs and numerous other innovations involve organizational as well as individual decisions at all stages of the adoption process.

As the Rogers and Shoemaker (1971) approach suggest, a need exists to assess the characteristics of the innovative individuals. It has

been noted that within any group there are those who tend to evaluate new ideals and expel ones that are threatening. In some instances these persons are appointed, while others gravitate to this position. For anyone involved in the diffusion process, it is important to know who these key individuals are and what characteristics they exhibit. Therefore, the various mental and physical attributes one has acquired through past experience, education, and acculturation should be examined in relation to one's willingness to accept or reject innovative practices (Blanton, Hull, & Russell, 1971; Carlson, 1965; Hensel & Johnson, 1969; McClosky, 1958).

In a review and analysis of the individual characteristics that relate to the dissemination-utilization process, Havelock et al. (1969) found that personality, feelings of threat, fears, attitudes, self-expectations, and past experiences affect the tendency to accept or reject new knowledge. Carson (1965) and Ross (1958) found that those who read relevant literature tended to adopt innovations at a faster rate than peers who did not keep current on literature in their field.

Various studies have demonstrated that an individual's attitudes are important when considering the adoption process. Rogers and Shoemaker (1971) state that a specific attitude has a carryover effect from one innovation to another succeeding innovation and a particular inclination toward one innovation facilitates a favorable attitude toward another. Dohmann (1970); Gill (1970); Miller (1965); and Rogers and Shoemaker (1971) found favorable attitudes toward the innovation as predictors of adoption. This research focuses on the variables considered important in establishing degrees of adoption proneness.

Significantly important is the need to assess the characteristics of the innovative organization or organizational subunits. Are larger organizations more or less likely to adopt an innovation than smaller ones? Are affluent organizations more innovative than poor ones? These and similar questions are important not only for advancing systematic knowledge about the organizational context of the innovation, but for improving professional practice as well. For example, knowledge of the organizational variables that facilitate or impede innovations can help research and development specialists develop more effective strategies for disseminating improved products and practices to practitioners.

While a particular innovation may not improve educational practice, organizations that fail to adapt to a changing environment through planned change are likely to decline in effectiveness. Innovation is one means by which organizations change and adapt and this is a significant measure of organizational effectiveness and vitality.

Historical Development

According to Blaisdell (1976-77), the roots of computer-assisted instruction probably reaches as far back in history as Aristotle and Plato. Certainly, many of the techniques and ideas practiced two thousand years ago are prevalent today. For example, implications of Aristotle's ideas of association were used to develop concepts of memory, levels of consciousness, learning, and forgetting. Consequently, from the early nineteenth century onward, research and theory in psychology and in education have developed predictions,

explanations, and measuring devices for investigation of learning and memory of mental, verbal and manual skills.

Blaisdell states that the chief contributions of Socrates and Aristotle to computer-assisted instruction were pedagogical and theoretical. The Socratic principle of individualized instruction is the basic postulate of computer-assisted instruction. The idea is to assist the student to advance rather than teach the advancement process (Blaisdell, 1976-77; Jamison, Suppes & Wells, 1974).

Computer-assisted instruction originated in the late 1950's as the computer industry itself began using it to develop trained computer personnel. Initially, teletypes and electric typewriters were linked to computers in order to send programmed instruction modules that were stored on magnetic tape back to the learner. However, students at the early stages could only give one-syllable responses (Blaisdell, 1976-77; McLagan & Sandborgh, 1977; Suppes, Jerman & Brian, 1968).

Without the availability of high-level "authoring languages" (programming language that a lay person can learn and use) at this time, early courses were written by computer programmers, not educators. It became apparent that in order to become a feasible technology, computer-assisted instruction had to become easier to program to develop its technological capabilities (Blaisdell, 1976-77; McLagan, & Sandborgh, 1977).

By 1960 IBM had accepted the challenge and developed the first computer-assisted instruction author language, Coursewriter I. As a result, an educator or subject-matter specialist could write the

computer-assisted instruction lesson while computer programmers wrote the computer program (Blaisdell, 1976-77; McLagan, & Sandborgh, 1977). Then in 1966, the IBM 1500 system that was introduced widened the range of symbols computer-assisted instruction could present. Movement and sound were added to data displays. This system was tested in two critical projects. The first was the Brentwood-Computer-Assisted Instruction Drill and Practice Laboratory which was directed by Drs. Patrick Suppes and Richard Atkinson. The project involved a multi-grade computer-assisted instruction drill and practice in reading, language, and arithmetic arts (Blaisdell, 1976-77; McLagan, & Sandborgh, 1977).

The second IBM project, directed by Dr. Vincent Cieri at the U.S. Army Signal School, Fort Monmouth, New Jersey, was a multi-year electronic project. Since the late 1960's this project has provided a number of cost/benefit data for computer-assisted instruction/computer-managed instruction systems developers (Blaisdell, 1976-77; McLagan, & Sandborgh, 1977).

During this period Sperry Univac was also experimenting with computer-assisted instruction/computer-managed instruction systems developers. Their first landmark computer-assisted instruction/computer-managed instruction system was developed jointly by the Chicago Board of Education, Sperry Univac, the U.S. Department of Health and Human Service (HHS) and the Computer Curriculum Corporation. This system demonstrated that a computer dedicated exclusively to computer-assisted instruction could be effective and affordable if enough students used it (Blaisdell, 1976-77; McLagan, & Sandborgh, 1977).

By the early 1970's, computer-assisted instruction applications began to spread. Many computer companies had developed small-scale computer-assisted instruction systems with lower start-up costs. However, these systems sacrificed some of the flexibility and capabilities of the larger systems in order to have computer-assisted instruction (Blaisdell, 1976-77; McLagan, & Sandborgh, 1977).

Currently two major systems available are PLATO (Programmed Logic to Automated Teaching Operators) and TICCIT (Time-shared, Interactive, Computer-controlled, Information Television). The PLATO system was begun by Dr. Donald Bitzer of the University of Chicago and is now extended and packaged by Control Data Corporation. The TICCIT system was developed by Dr. Victor Bunderson at Brigham Young University and the Mitri Corporation and distributed by the Hazeltime Corporation. While PLATO uses a special terminal to enable the most extensive graphic capabilities possible, TICCIT uses television as an integral part of the system in an attempt to link computer-assisted instruction with mass media. Both of these systems represent the current move of computer-assisted instruction toward a more sophisticated and varied terminal capabilities. It is also important to add that a number of manufacturers of large business computers now offer computer-assisted instruction as "add-on" packages for their system. This "add-on" is of great potential interest to business. The widespread application of computers in management, information systems and data processing suggest more in-house capability for computer-assisted instruction. In addition, there is a greater likelihood for acceptance because of the lower start-up cost (Blaisdell, 1976-77; McLagan, & Sandborgh, 1977).

The idea of a computer revolution in training departments is almost two decades old. Once the computer industry started using computers in personnel training in the late 1950's, trainers began to think about a computer age in industrial education. They envisioned training rooms in which computers would serve as tutors, examiners, and instructors. Thus, trainers would be free to work individually with their learners. Furthermore, students would be free to follow their own path and schedule in learning (Kulik, Kulik, & Cohen, 1980). However, we have no way of knowing the progress of trainers toward this idealized model of computer-assisted training. Therefore, this study will examine the extent to which training directors are using computers as a teaching tool in business and industry.

Also, private foundations, commercial organizations and government agencies have tried for more than a decade to make computer-assisted instruction a reality. Since 1965, for example, the Exxon Foundation, the Sloan Foundation, and other private agencies have made awards to numerous colleges for the development of computer-based learning approaches to teaching and learning. Research and development units of computer corporations have poured millions of dollars into the creation of hardware and software for computer-assisted instruction. In addition, the United States Office of Education and the National Science Foundation have funded hundreds of computer projects in education (Kulik, Kulik, & Cohen, 1980).

However, not everyone shares this vision of a favorable computer revolution. To some critics computers are expensive gadgets that increase the cost and complexity of instruction without increasing its quality.

Others worry that the rigidity of programmed machines might force all learners into the same mold and stifle their creativeness. Some trainers also fear that computer requirements would effect the choice of instructional content. Instructors using computers might be tempted to teach only those things that could be taught easily by machine. As a result of these controversial issues, a need exists to examine factors which are influencing the adoption of computers in business and industry in training programs.

Computer-Based Training Systems

Blaisdell (1976-1977) identifies five general elements that must be combined to form a computer-based training system that will perform instructional and administrative functions. These are computer-assisted instruction personnel (authors, system operators, administrators and evaluators, curriculum developers, maintenance/repairmen and students); courseware; software; hardware; and an authoring language. Reynolds (1983) adds computer-support learning resources as an additional component to the five elements included in Blaisdell's computer-based training system. This component is the supporting elements of the computer-based training systems which neither directly teach computer-assisted instruction nor perform management functions. It is typically a data base source of information and instructional communications.

Computer-assisted instruction is defined as being the use of computers in the actual instructional process (Blaisdell, 1976-77; Fauley, 1981; Selden, 1981; Reynolds, 1983). Whereas, computer-

managed instruction is most often referred to as the management of instruction by the computer.

Further terminology for computer-based training elements and sub-categories can be found in the literature. Sheldon Fisher, Vice-President and General Manager of Applied Performance Training of Dallas, Texas, who designs training programs to help people interface with automated systems labels his work as "computer augmented training" rather than computer-assisted instruction. The difference is the contrast between large computers already used for instruction and the microcomputers just now breaking into the field (Smith, 1979). Terms such a microcomputer-aided instruction and microcomputer-management instruction are used by Hodgetts (1983) in a paper presented at the 1983 Plant Engineering and Maintenance Show to illustrate the use of microcomputers in the instruction process.

Sub-categories of computer-based training systems are also beginning to surface. An example cited by Judson Smith (1981) involves using audio-visual computer interfacing for increasing the value of training. For instance, by plugging an AT&T personal computer into one side of a video monitor and a 1/2-inch or 3/4-inch video recorder into the other side produces what is referred to as a computer-assisted video interface which allows alternate display of video information on a single television screen. Thus, the trainee views lesson segments on the videotape and then responds to questions asked by the computer. Based on the student's response, the computer tells the video player what video selection to play next.

William E. Neher and Leopold Hauser III (1982) focus on another aspect of computer-based learning. They advocate that there is a difference between computer-assisted instruction and computer-aided adult learning. The major difference is a set of assumptions that we make about the learner and the learning environment. These authors view computer-assisted instruction as grounded in child development and child education. In contrast, they propose that computer-assisted adult learning should be based both on the "street knowledge" of industrial trainers and on formal research related to the "mid-life" adult.

Neher and Hauser believe that because mid-life adults are the target of the vast majority of today's business training, that there is a need to be certain that instructional programs and delivery systems are geared to their level. In their view four factors relate directly to the ideal match between adult learning and the computer. According to these authors a well-done computer-assisted adult learning program and delivery system must include: autonomy (self-directed and self-designed learning strategies), utility (response to learner questions), integration (integration of new information with previous learning) and security (insurance of the right to learn with privacy and dignity).

As the field of computer-based training continues to grow and develop, the evolution of new terminology will continue. However, at the present time, the most often cited categories of a computer-based training system include the terms computer-assisted instruction and computer-managed instruction. Thus, the focus of this research will center around the development of the computer-assisted instruction/

computer-managed instruction of computer-based learning systems as a technological training tool in the industrial environment.

Computer-assisted instruction always directly involves teaching and learning. When computer-assisted instruction is prescribed as a medium of instruction, it is usually implemented in one of six modes: tutorial, drill and practice, instruction game, modeling, simulation, and problem solving (Lee, 1982; Reynolds, 1983).

The tutorial mode is the most familiar to persons new to computer-based instruction. In this mode, the learner interacts one-on-one with the computer program. A good tutorial is illustrated by the process of presenting a lesson which is comprised of a series of information segments and then checking for understanding. This process is repeated throughout the lesson. Based on the acquisition of knowledge, or lack of it, the learner is either branched to a path to review the information or given new material (Reynolds, 1983).

Another familiar mode of computer-assisted instruction, drill and practice, is the repetitive presentation of problems to the learner. After a given number of questions has been presented, the learner is informed of the number of correct or incorrect responses (Lee, 1982; Reynolds, 1983).

Instructional games are also a professional and valid method of stimulating learning. Although they are well accepted by instructional technologists, the term "game" is often associated with frivolous activity. While instructional games often do contain elements of entertainment, the focus is on learning (Lee, 1982; Reynolds, 1983).

When the computer-based training system is used to present another process or system, it is called modeling. The learner can change values and observe the operation of the system. For instance, consider a population model. The learner can manipulate the demographic variables such as infant birth or death rate in the model. The model calculates and displays the results that such changes would create. The learner can observe the effects on the population over a period of time. A population model might be used in learning the techniques of planning. The essential difference between modeling and simulation is the degree of realism. Modeling usually implies that a realistic representation of the system modeled is either not attempted or impossible. The population model just described is one which is accurate but does not lend itself to a realistic form of representation (Lee, 1982; Reynolds, 1983).

Representation of a system, sub-system device or situation with a degree of realism is called simulation. This mode enables the learner to become familiar with the operation of equipment without damaging it or harming themselves or others. Simulation can be done manually or by combining manual and computer methods. Although it is possible to do some human resource development simulation without a computer, the speed and complexity inherent in this mode prevented its use as a practical reality for most human resource development organizations prior to availability of computing power (Lee, 1982; Reynolds, 1983).

As an alternate form, the development of a "part task" simulation on a computer-based training terminal is a proven technique for training. In this form, a complex system is broken into smaller segments and

presented one at a time. When mastery of each segment of the system occurs, the learner then enters the big simulator for demonstrating their overall skill mastery (Reynolds, 1983).

The problem solving mode as a tool to solve problems is becoming a more common technique as computers are utilized in training. In the past this method has been used basically with data processing training. However, applications in math and science are becoming more prevalent (Lee, 1982; Reynolds, 1983).

The following studies represent the current research regarding the adoption of computers as a training tool. This literature, although limited in scope, provides a foundation for this research project.

Current Research Studies

Selden and Schultz (1982) report finding citations for more than 4,500 articles dealing with research in computer-assisted instruction. Although their citations discuss only a portion of this published literature, they indicate that most industrial applications of computer-assisted instruction have not undergone rigorous experimental examination. This type of research is designed to uncover fundamental principles across all potential populations and may be applied in general to the question of computer-assisted instruction's effectiveness in industrial training (Selden & Schultz, 1982, p. 61).

D.B. Thomas's study of differences in achievement levels for computer-assisted instruction courses and traditional courses discovered at least equivalence in effectiveness. There were cases where positive increases did not appear in favor of computer-assisted instruction and in

some instances varied from 10% to 50%. However, in at least two of the cases computer-assisted instruction showed positive results when supplementary course material and lecture were added. Effectiveness declined to more equivalence when it stood alone in comparison to traditional training in these studies (Thomas, 1978, p. 109).

The Thomas study (1978) consistently found computer-assisted instruction trainees learning up to twice as fast as traditional methods of instruction. These figures were confirmed by S. Abrahamson (1969), reporting a 40% quicker time of completion; Soloman's (1974) finding of a 33% to 40% increase in time of completion and J.A. Fletcher and colleagues (1982) citing that trainees learned 100% more material using computer-assisted instruction methods as compared with the traditional methods in reading instruction.

Hodgetts (1983) also cited studies which significantly enhanced training effectiveness. Included are: The Plato project investigated by the Computer Center of Florida State University, 1979, showing a 83.3% reduction in learning acquisition time; Feasibility Study of Computer Based Instruction, Vol. I & II researched by the Office of Management Systems, United States Department of Transportation, Federal Aviation Administration, 1979, indicating 24% reduction in learning acquisition time; Results of Computer-Based Training Revision tested by United Airlines, 1978, reporting 37% reduction in learning acquisition time; a Cost/Benefit Analysis of computer-assisted instruction studied by Kemper Insurance Company, 1980-81, illustrating a reduction in training time of 65%. Most of these studies were of programs using a "mainframe" computer

with remote terminal access. Although Hodgetts sees little doubt of the effectiveness of the computer as an instructional mode, if used properly, he cautions against comparing the training of computer-assisted instruction with that of conventional training. The key factor is that good instructional design must be common to both in order for the comparison to be valid.

A number of findings reported by Selden and Schultz (1982) in their review of retention of learning show that Thomas' survey found no differences in retention level between computer-assisted instruction and traditional training methods. Lally indicated that a computer-assisted instruction course improved skill levels on word-recognition task 120% compared to a 34% increase with traditional methods (Selden & Schultz, p. 64).

Hodgetts reported on a poll of a number of well-established instructional designers. Each of these designers had experience not only in the development and preparation of computer-assisted instruction, but also in its validation and effectiveness assessment. Each was requested to assess and identify those advantages a computer brings to a training course which would either not be possible or very burdensome using the conventional techniques. These experts were asked to assign 100 points over twelve computer-assisted instruction advantages with respect to their individual perception of importance (Figure 1). In addition, they were asked to do the same things to a list of computer and program capabilities necessary to facilitate achievement of the training advantages previously identified (Figure 2) (Hodgetts, 1983, p. 13).

	Training Rank	Experts Points
Individualizes Instruction	1	19
Immediate Diagnostic Feedback	2	16
Inherently More Interesting and Fun	3	14
Easy Retrieval of Contingent Information	4	14
Highly Interactive	5	12
Provides Another Medium for Instruction	6	6
Impossible to Cheat	7	6
Reading Duties Revealed in Short Bursts	8	4
Automatically Keeps Records	9	4
Computers are the "In" Thing	10	3
Student Versus Computer Motivation	11	2
Improves Attention Span	12	0

FIGURE 1: Computer-assisted Instruction Advantages

SOURCE: Hodgetts, G.L., and Mallory, W.J. (1983). Papers presented at the 1983 Plant Engineering and Maintenance Show. ASA: The Problem Solvers. Pennsylvania: Applied Science Associates, Inc.

	Training Rank	Experts Points
Branching	1	21
Diagnostic Feedback	2	18
Clear Legible Screen Characters	3	18
Graphics	4	15
Direction to Remedial Study (e.g., workbook)	5	6
Multiple-Choice questions	6	6
Interaction with Videotape or Disc	7	5
Remedial Study Presented by Computer	8	4
Diagnosing and Accepting Misspelled but Correct Responses	9	3
Animation	9	2
Color	10	2

FIGURE 2: Desired Computer and Program Capabilities

SOURCE: Hodgetts, G.L., and Mallory, W.J. (1983). Papers presented at the 1983 Plant Engineering and Maintenance Show. ASA: The Problem Solvers. Pennsylvania: Applied Science Associates, Inc.

To determine how extensive computers are being used in training, Harold F. Rahmlow, of American College, Bryn Mawr, PA, surveyed over 400 companies and made personal on-site inspections of 50 computer installations in the United States and Great Britain. He classified these applications into three categories: simulation of computer-based systems, simulation of non-computer-based systems and computer-managed instructions (Smith, 1979).

Rahmlow cited numerous instances where simulations of computer-based systems were being used in order entry for food products company, claims processing for an insurance company, airline reservation training and bank teller training. In his findings of simulations of non-computer-base activities, Rahmlow reported airlines using computer simulations in lieu of full simulation training, an electric utility and a petrochemical company simulating operations and a financial organization doing business simulations. He also found Control Data Corporation's PLATO system being used to simulate DC-10 cockpit systems for flight-crew training (Smith, 1979).

Rahmlow also noted a number of companies using computers to manage nationwide learning systems. Computer-managed instruction was used by one insurance company to control videotape-based training programs in 50 locations and another used computer-managed instruction to assess readiness for face-to-face training sessions (Smith, 1979).

A number of commonalities surfaced within these companies which reported cost-effectiveness in their use of computer-assisted instruction:

1. The training problem was investigated prior to implementation of a computer solution.

2. A strong consideration for the individual need of the learners was programmed into the solution.

3. The integration of support materials such as face-to-face instruction, books, video or some combination strengthened the training.

4. Integration of training within the work environment produced successful units.

5. A heavy interaction of learner participation with the computer occurred (Smith, 1979).

Other recent signs of solid acceptability are evident by the announcement of major computer-assisted instruction projects in a numerous array of organizations. Although these cases are by no means exhaustive, they represented the diversity of applications for computer-based training techniques.

Early in 1977, Cleveland Twist Drill, an Acme-Cleveland, Ohio based company took its first look at computer-assisted instruction. Their interest came from the need to train more than 6,000 people spread all over the United States and Canada in order to sell a long list of specialized items with competence and enthusiasm. Cleveland Twist Drill manufactures more than 40,000 regular stock items and sells to approximately 600 industrial distributors. Consequently, they compete not only with other cutting tool manufacturers, but with the other lines sold by industrial distributors (Training, 1981).

To deal with their training needs, Cleveland Twist Drill secured assistance from Control Data Education Company. This resulted in a

multimedia training program called TECHTUTOR. The basic approach established a dialogue with the trainee using printed material and audio visuals as the basic training tool with PLATO serving to reinforce and test (Training, 1981). According to R.B. Bugley, Cleveland Twist Drill vice-president of sales, TECHTUTOR was an instant success. He states two major contributions: computer-assisted training equipped distributors with essential knowledge and strengthened the confidence of distributors in Cleveland Twist Drill. In the first 18 months over 1,800 distributors took one or more of the three available units. In addition, some 200 Cleveland Twist Drill personnel who probably would have been unable to attend traditional week long training programs utilized the TECHTUTOR course (Training, 1981).

The Western Bancorporation teller-training case is an example of an exceptionally clever and cost-effective computer-based training system. Western Bancorporation, a 22-bank, 11-state operation trained 6,800 tellers and 1,500 bank officers to use the bank's remote clearing System Three--Teller Stem Processing System in 778 different locations. In addition, training occurred simultaneously with normal production operation of the system without noticeable disruption in the production environment (Smith, 1978, 1979).

Manpower, Inc., the world's largest supplier of temporary office workers in Milwaukee, Wisconsin, developed a skills training program to deal with the expected increase in demand for word processing operators. This program, Skillware, is a copyrighted series comprised of six computer diskettes used to teach typists to operate six common office

machines. The time required to learn one operation is approximately 8 hours. Presently, word processing equipment is being installed in 550 of Manpower's U.S. offices, and Skillware is offered to Manpower employees. Mitchell S. Fromstein, president of the company, reports that Skillware is enjoying success so far and is contemplating putting the program on the market (Training, 1983).

Interactive learning experiments also promise big payoff. David Hon, national training manager for the American Heart Association combined a micro and a manikin to develop a tried-and-true simulator, "Resusci-Annie". This cardiopulmonary resuscitation utilizes two video monitors, an Apple II microcomputer, a Sony videodisc player and a custom-built, random-access audio system (Smith, 1981).

Summary

Although organizations differ in their utilization of computer-based training, it is evident that in our modern paced society that this technological tool is here to stay. Just as individuals who learned visual fluency in the past decades demanded more mixed-media training methods when they come into the business world, so will adults who have learned computer fluency demand that training methods of the future take advantage of the power and potential of the computer in order to help them learn skills they need to work in a world where the computer is part of the work environment.

Moreover, it is important to emphasize that the existence of a technology and the recognition of its possibilities are not themselves sufficient to guarantee that it will be used widely or that it will be

used with maximum efficiency. Problems often begin when it is recognized that the technology is ready for application and that there is a lack of understanding on how it should be used.

Training Magazine (1982) "U.S. Training and Census Report" indicated that the ownership of computers in training units of the organizations that they surveyed was 18.3%. In addition, if the "U.S. Training Census and Trends Report" of Training Magazine is an indication of current use of computers in training in business and industry, utilization ranges from 32.2% to 46.4% (Zemke, 1983, 1984). A study by an Illinois based research firm reported the use of computer-based training to be 40% (Training, 1984). Neither of these studies considered the personal or organizational characteristics of the population being studied which may explain some of the discrepancy in utilization figures.

However, with studies reporting that computer assisted instruction trainees are learning up to twice as fast as with traditional methods of instruction (Abrahamson, 1969; Fletcher, 1982; Solomon, 1974; Thomas, 1978) and other studies reporting cost effectiveness (Blaisdell, 1976-77; Hodgetts, 1983; McLagan & Sandborgh, 1977), one raises the question as to factors that affect the adoption of this method of instruction by training managers in business and industry.

Most training practitoners in the human resources field recognize the need to become familiar with this method of training. However, debates exist on its usefulness and future impact. A wait-and-see attitude among many training managers appears to evolve as a result of equipment cost, unfamilar techniques and untested technology. In addition, many key

individuals appear to be unaware that such new technologies are available or affordable (Zemke, 1982; 1983).

There has been little programmatic study of the implementation of computer-based training in business and industry, even though both powerful technology and creative ideas about how it may enhance training are now available. In addition, little evidence is available on the adoption of this delivery system for training managers in their training units. Thus, this research was to study training managers' adoption of computers in training units in both job skills acquisition and human resource development in business and industry. The research also considers both the influence of the personal characteristics of training managers and the organizational characteristics of training units upon the adoption of computers as a technological device for training.

CHAPTER III

METHODOLOGY

This study was designed to describe the adoption of computers in training by training managers in business and industry. A survey instrument was used to determine how these training managers are using computers for job skills acquisition and human resource development. The personal characteristics of the training managers and the organizational characteristics of the training units were assessed in this study.

The review of the literature and a pilot study of the Valleys of Virginia Chapter of American Society for Training and Development were used to develop the instrument. The instrument was then mailed to individuals who are members of the American Society for Training and Development and who are listed in the directory as training managers in business and industry. Information concerning training managers representation was found in the 1984 Who's Who in Training and Development (American Society for Training and Development, 1984).

Research Design

The research method selected for this study was a descriptive survey. The research design according to Best (1970):

> 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. 116)

The survey was conducted using a modified design of Dillman's (1978) Method for Surveys. Dillman's design was modified in step 4 by sending a letter and questionnaire by regular mail instead of certified mail. Dillman's total design survey method is grounded in the social exchange theories of Homan, Blau and Thibant and Kelly (Dillman, 1978, p. 21). The procedures recommended by Dillman are as follows:

1. A cover letter explained the subject of the study, its benefits to the respondents and the importance of the individual respondent to the success of the study. Enclosed in the letter was the questionnaire with a stamped-return envelope.

2. A follow-up postcard was sent one week later to all persons on the original mailing list. This card serves as a thank you to respondents and a reminder to nonrespondents.

3. A second follow-up was sent three weeks after the original mailing to nonrespondents. This mailing contained a second cover letter, a replacement questionnaire and a return envelope.

4. A letter and questionnaire were sent seven weeks later to the remaining nonrespondents.

All initial and follow-up procedures recommended by Dillman were used in the study with the exception of certified mailings. Each questionnaire was coded with an identification number in order to follow-up on the respondents. Individuals wishing to receive a summary of the results of the study were asked to place their names and addresses on the back of the return envelopes.

Training managers in business and industry who were members of the American Society for Training and Development were surveyed by mail. The training managers were asked to respond to questions concerning how they were using computers for teaching job skills and human resource development. In addition, the personal characteristics of training managers and organizational characteristics of training units were assessed. Statistical analyses were used to describe relationships among these variables.

Population

The population surveyed in this study consisted of training managers who were 1984 members of the American Society for Training and Development. The 1984 membership of this organization totaled 21,800; however, not all members were selected for the study. From a 10% random sample of these members, individuals who represented training units in business and industry were chosen. Only members who had titles of training executive, training manager, training director or training supervisor were selected. The final sample numbered 745.

For collecting data, a 10% random sample was drawn from the 21,800 individuals who were 1984 members of the American Society for Training and Development. From this sample of individuals those members who represent training units in business and industry and had titles of training executive, training manager, training director or training supervisor were surveyed. Information concerning representation of training managers was found in the 1984 Who's Who in Training and Development.

Instrumentation

A questionnaire was used in this research. It was sent to the sample of training managers who were members of American Society for Training and Development and work in business and industry (excluding those who participated in the pilot test). This questionnaire had three parts. The first section identified the extent to which computers were being adopted by training managers in their training programs for job skills and human resource development. The second section collected information concerning the personal characteristics of the training managers. The third section collected organizational characteristics.

Research Questions and Analysis

The questionnaire used in this research was designed so that the respondents could mark their responses on the instrument. This data was then transferred to a computer data file for statistical analysis using the Statistical Package for Social Sciences User's Guide (SPSSX, 1983).

Research questions noted in Chapter I are outlined in this section.

Question One: Which organizations are using computers in training?

Question Two: How are training managers using computers to train employees?

Question Three: What are the personal characteristics of training managers who adopt computers in training programs and those who do not adopt?

Question Four: Is there a difference between the personal characteristics of training managers who adopt computers in training and those who do not adopt?

Question Five: What are the attitudes of training managers concerning computers in training?

Question Six: Is there a difference between the attitudes of training managers who adopt computers in training and those who do not adopt?

Question Seven: What are the organizational characteristics of training units using computers in training and those not using computers in training?

Question Eight: Is there a difference between the organizational characteristics of the training units who adopt computers in training and those who do not adopt?

In these questions descriptive statistics were reported. These data will include frequencies, means, percents and chi-square computations.

In this chapter the research, design, population, instrumentation, research questions and analyses have been discussed. The following chapter will present a report of findings and answers to the research quesions.

CHAPTER IV

RESULTS OF THE STUDY

This study utilized a survey of training managers who were members of the American Society for Training and Development. Each respondent received by mail a questionnaire which consisted of the following: (a) a cover letter explaining the nature of and purpose of the investigation, a promise of confidentiality, and a request that the recipient participate in the study; (b) a three-part questionnaire regarding personal characteristics, organizational characteristics and attitudes of training managers; and (c) a business reply return envelope (copies in Appendices A and B). A first mailing was sent to subjects in March 1985; a week later, a follow-up postal card was mailed to all who had been selected. Three weeks after the original mailing, a follow-up letter and questionnaire was sent to all who had failed to respond at that time. By April 1985, 546 questionnaires were returned.

A total of 41 questionnaires were discarded for the following reasons:

1. Twelve were received after the deadline established for data collection.

2. Twenty-seven were categorized by respondents as being unable to complete survey (i.e., new to position, no longer employed as training manager, no longer employed with organization). A total of 505 useable questionnaires were returned. Thus, the response rate was 68%. A total of 30 non-respondents was selected at random to participate in a telephone

survey. These individuals were asked to respond to seven questions. A Chi-square test for diffferences between respondents and non-respondents was conducted and no statistical difference was found.

Research Questions and Data Analyses

Respondents marked their answers on the questionnaires. These data were then transferred to a computer data file for statistical analysis using Statistical Package for Social Sciences User's Package (SPSSX). Descriptive statistics including frequencies, mean scores, percentages and standard deviations were calculated.

Research Question One: Which organizations are using computers in training?

Of a total of 505 subjects, 45.1% (n = 228) used computers in training and 54.9% (n = 277) were not using computers in training. Table 1 shows frequencies and percents for the variable computer use in training.

Table 2 is a summary of the use of computers by type of organization. Eight respondents failed to report their organizational classification. The use of computers in training in the 497 responding organizations ranged from a high of 55.6% in finance/banking/insurance to a low of 27.3% in the wholesale trade business.

Research Question Two: How are training managers using computers to train employees?

The earliest year indicated by training managers for beginning the use of computer-based training was 1950. Only 6.7% of the 461 respondents

TABLE 1

COMPUTER USERS IN TRAINING

Computer Users	Frequency	%
Yes--Computer Base Training	228	45.1
No--Computer Based Training	277	54.9
TOTALS	505	100.0

TABLE 2

ORGANIZATIONAL USE OF COMPUTERS IN TRAINING

Type of Organization	n	Percent Using Computers in Training	Percent Not Using Computers in Training
Manfacturing	171	43.9	56.1
Transportation/ Comm/Utilities	47	53.2	46.8
Wholesale Trade	11	27.3	72.7
Retail Trade	22	45.4	54.5
Finance/Bank/ Insurance	81	55.6	44.4
Health Services	28	37.7	64.3
Business Services	15	40.0	60.0
Public Admin.	8	50.0	50.0
*Other (A)	114	50.4	49.6
TOTALS	497		

*This category was comprised of approximately fifty separate organizations which the respondents felt could not be properly classified within the other eight business choices. Since the percent breakdown followed the same trend as the other business selections there was no attempt to reclassify the respondents analyses.

indicated starting to use computer-based training prior to 1980. From 1980 to 1984 an increase to 27.6% was noted. In the year 1985, 65.7% of the respondents cited that they introduced computers into their training units.

Training managers were asked to indicate types of computer equipment, computer management methods and methods of software acquisition that they used. Of the individuals responding to type(s) of computer equipment used in training 90.5% (n = 210) indicated using microcomputers, 64.8% (n = 193) mainframe computers, and 48.2% (n = 168) interactive video. Table 3 shows these frequencies and percents.

Individuals responding to the methods for managing the location of computers in training cited 47.3% (n = 131) centralized in a laboratory, 62.1% (n = 124) decentralized and 63.3% (n = 166) both centralized in a laboratory and decentralized. Table 4 shows frequencies and percents.

When asked to report the methods used to obtain training software, managers noted 79.3% (n = 188) developed internally, 88.1% (n = 201) purchased "off the shelf" and 51.4% (n = 148) custom developed. Table 5 shows frequencies and percents. It should be noted that respondents may have acquired software by all methods, therefore the percents do not equal 100 percent.

Of the 216 training managers responding to whether they were considering purchasing software within the next 12 months, 39.4% (n = 85) responded no and 60.6% (n = 131) stated yes. The mean expenditure for those planning to purchase training software was $6,282.

TABLE 3

TYPES OF COMPUTER EQUIPMENT USED IN TRAINING

Equipment Type	Frequency	Percent Yes	Percent No
Microcomputers	210	90.5	9.5
Mainframe Computers	193	64.8	35.2
Interactive Video	168	48.2	51.8

TABLE 4

METHODS OF MANAGING COMPUTER-BASED TRAINING

Management Methods	Frequency	Percent Yes	Percent No
Centralized in Laboratory	131	47.3	52.7
Decentralized	124	62.1	37.9
Both	166	63.3	36.7
Other	68	20.6	79.4

TABLE 5

METHODS OF ACQUIRING TRAINING SOFTWARE

Method of Software Acquisition	Frequency	Percent Yes	Percent No
Developed Internally	188	79.3	20.7
Purchased	201	88.1	11.9
Custom Developed by Outsiders	148	51.4	48.6

In addition, information about training units total training budget and total computer-based training budget was gathered. The mean total training budget reported was $1,771,275, whereas the mean computer-based training budget was $36,282. It should be noted that the computer-based training budget does include an extreme score of $35 million reported by one respondent. To supplement these findings respondents were asked to indicate the percent of the total training effort that was accomplished using the computer. The mean response was 14.05%.

Futhermore, individuals were asked to identify the number of employees in their organization that were trained using computer-based training. The largest number of employees cited as receiving computer-based training was in the number categories as follows: less than 50, 20.6%; 50-100, 19.1%; 100-500, 26%. A summary is presented in Table 6.

Respondents were also asked to rate how often they used specific computer-based training applications and computer-based instruction strategies. The frequency dimension used was rated on a three-point ordinal scale including never, sometimes, and always. Tables 7 and 8 show the breakdown of these data.

Training managers scored technical skills training as the most often used computer-based training application with a mean of 2.0 on a three-point scale (3 = always). Approximately 64% of this group reported using technical skills training sometimes. In addition, four other application types: management training, clerical training,

TABLE 6

NUMBER OF EMPLOYEES IN ORGANIZATIONS USING COMPUTER-BASED TRAINING

Number Employee	n	Percent
Less than 50	42	20.6
50-100	39	19.1
100-500	53	26.0
500-1,000	20	9.8
1,000-5,000	20	9.8
5,000-10,000	5	2.5
10,000 or more	11	5.3
No Response	14	6.9
TOTAL	204	100.0

TABLE 7

COMPUTER-BASED TRAINING APPLICATIONS

Type Applications	n	Percent		
		Never	Sometimes	Always
Sales Training	188	64.4	31.4	4.3
Technical Skills Training	206	14.6	64.1	21.4
Management Training	195	43.6	52.8	3.6
Clerical	192	37.5	52.6	9.9
Training Management	190	30.5	53.2	16.3
Computer Lit. Training	207	21.7	52.7	25.6

TABLE 8

COMPUTER-BASED TRAINING STRATEGIES

Type Strategies	n	Percent		
		Never	Sometimes	Always
Simulation/Gaming	192	30.7	57.8	11.5
Tutorial	214	9.8	63.6	26.6
Drills	194	24.2	56.7	19.1
Problems/Test	202	17.8	64.4	17.8

computer literacy, and training management were rated as being used sometimes by over 50% of the respondents. The use of sales training was indicated as being used sometimes by only 31.4% of the training individuals.

Subjects identified the tutorial mode of instruction as the most often used computer-based strategy. A mean score of 2.2 on a three-point scale was found. The use of tutorial was indicated as being utilized either sometimes or always by 90.2% of the respondents, whereas problems/test was reported by 82.2%. The use of drill as a method of instruction was cited as being used sometimes or always by 75.8% and simulation/gaming by 69.3%.

To determine how many hours of computer-based training an employee received per year, training managers were asked to indicate their average number of both training hours and computer-based training hours. The sales representative employee was identified by respondents as receiving the greatest amount of training hours per year. A mean of 50.0 training hours was noted for these individuals. Employees in customer service, production work and first line supervision all received a mean of 40 or above hours of training per year. Mean training hours of 30 or above were cited for executives, middle managers, office/secretarial and senior managers. The largest amount of computer-based training per year was reported for customer service employees followed by employees in office/secretarial positions. A mean of 14.7 computer-based training hours was indicated for customer service employees and a mean of 14.4 computer-based training hours was noted for office/secretarial employees.

Also, production workers and sales representatives were cited as receiving a mean of over 10 computer-based training hours, while executives, first line supervisors, middle managers, and senior managers were reported as receiving a means of less than 10 computer-based training hours. Table 9 depicts a summary of these results.

Research Question Three: What are the personal characteristics of training managers who adopt computers in training and those who do not adopt?

Analyses of training manager characteristics are presented in Table 10. Of the computer users the age categories were: under 25, 0% (n = 0); 25-34, 26% (n = 58); 35-44, 45.03% (n = 101); 45-54, 20.1% (n = 45); 55-64, 8.1% (n = 18); over 65, 4% (n = 1). Non-computer users were identified in similar age categories. For example, non-computer users age levels were as follows: under 25, 1.5% (n = 4); 25-34, 25.7% (n = 69); 35-44, 45.2% (n = 121); 45-54, 17.9% (n = 48); 55-64, 8.6% (n = 23); over 65, 1.1% (n = 3).

On the variable of the number years of experience as a training manager, both groups responded with common answers. For instance, 41.5 of the computer users reported having from 5-10 years of experience as a training manager, while 41.3% of the non-computer users noted this range of years.

More differences were identified between the groups on the number of years of experience the individual had with their present organization. Computer users indicated 39.5% had from 0-4 years experience with their present organization, whereas non-computer users cited 51.4% in this

TABLE 9

TRAINING HOURS AND COMPUTER-BASED TRAINING HOURS

EMPLOYEES	n	Mean Training Hours	n	Mean CBT Training Hours
Customer Service	83	47.6	80	14.7
Executives	76	32.6	58	7.0
First Line Supvr/Foreman	102	40.0	78	9.5
Middle Managers	101	36.8	80	9.9
Office/Secretarial	97	33.2	84	14.4
Production Workers	63	47.0	51	11.3
Sales Representative	73	50.0	55	12.8
Senior Managers	72	30.4	49	6.8

TABLE 10

TRAINING MANAGER CHARACTERISTICS

Characteristics	n	Use Computers in Training Program	n	Do Not Use Computers in Training Program
Age				
Under 25	0	0.4	4	1.5
25-34	58	26.0	69	25.7
35-44	101	45.0	121	45.2
45-54	45	20.1	48	17.9
55-64	18	8.1	23	8.6
65 & Over	1	0.4	3	1.1
Total	223	100.0	268	100.0
Years Experience as Training Professional				
0-4	51	22.8	77	28.4
5-10	93	41.5	112	41.3
11-24	71	31.7	69	25.5
25+	9	4.0	13	4.8
Total	224	100.0	271	100.0
Years Experience in Present Organization				
0-4	89	39.5	138	51.4
5-10	76	33.8	56	20.8
11-24	47	20.9	55	20.4
25+	13	5.8	20	7.4
Total	225	100.0	269	100.0
Level of Education				
High School Graduate	15	6.8	24	9.1
Bachelor's Degree	43	19.4	57	21.5
Some Graduate Study	42	18.9	53	20.0
Master's Degree	98	44.1	110	41.5
Doctorate Degree	24	10.8	21	7.9
Total	222	100.0	265	100.0

category. Also 33.8% of the computer users had from 5-10 years experience with their present organization, while non-computer users indicated 20.8% in the same category.

When asked to present level of education, groups again reported similar responses. The greatest number of individuals reported obtaining a master's degree. Computer users noted 44.1% obtaining a master's degree and non-computer users cited 41.5% with a master's degrees. Degrees earned by training managers were most often in the field of business, education, industrial psychology, or a technical profession such as computer science or engineering. Degrees in which at least one person listed included: speech/theater, anthropology, biology, forestry, travel, geology, theology, linguistics, history, animal science and pre-law.

Managers of training were asked to respond to a series of questions indicating their personal knowledge of computers. Of the respondents using computers in training 47.9% reported that they owned a personal home computer while non-computer users indicated 33.2% had a personal home computer. Frequent computer users reported that they used computers on the job, read computer magazines, participated in computer-assisted programs, wrote computer programs, and had received computer-based training prior to becoming a training manager. Sixty-six percent of the computer users rated their computer skill level average or above, whereas only 36.7% of the non-computer users rated their skill level at average or above. The results are shown in Table 11.

TABLE 11

TRAINING MANAGER KNOWLEDGE/SKILL OF COMPUTERS

Knowledge/Skill	n	Percent Computer Users Yes	Computer Users No	Non-Computer Users Yes	Non-Computer Users No
*PC at Home	487	47.9	52.1	33.2	66.8
If "NO" will buy in 12 months	226	34.8	65.2	35.0	65.0
*Use Computers on Job	485	81.9	18.1	46.5	53.5
*Read Computer Literature on Training	483	82.6	17.4	57.6	42.4
*Participated in CAI Programs	491	82.4	17.6	52.6	47.4
*Written Computer Program	492	52.9	47.1	35.7	64.3
*Received CBT Prior to Being Training Manager	489	40.3	59.7	25.4	74.6
*Present Computer Skill Level	490				
Above Average		25.6		9.4	
Average		40.4		27.3	
Below Averge		34.0		63.3	

*Knowledge/skill that were found statistically significant at the .001 level.

In addition, a variety of answers were given in response to "How has your role as a training manager changed as a result of the implementation of computer-based training?" Following were the most frequent reported effects of CBT:

1. Computer-based training has made training more efficient by providing better controls over training sessions, developing more useful data and requiring administrative procedures be better planned.

2. Computer-based training has required the development of better technical and marketing skills.

3. Computer-based training has more involved the trainee with the learning process.

A small number (less than 6%) indicated there was very little change in their role after computer-based training was introduced.

Research Question Four: Is there a difference between the personal characteristics of training managers who adopt computers in training and those who do not adopt?

A cross tabulation was used to analyze the characteristics of computer users with non-computer users. Using a Chi-square test, no significant statistical difference was found between the age, years of experience in training, years experience in present organization and level of education of managers who use computers in training and those who do not use computers in training.

A significant difference was, however, found on seven of the knowledge/skills statements of non-computer users and computer users. Computer users and non-computer users were found statistically different

at the .001 level of significance on the variable of personal ownership of a computer. The data indicated that training managers who owned a computer were more likely to utilize computer-based training in their training unit than training managers who did not own a computer. At the .001 level of significance computer users and non-computer users were found statistically different in their use of a computer on the job. In this case the data indicated that training managers who used computers in their current job more often utilized computers in their training unit than individuals who did not use a computer in their current job.

Also, computer users and non-computer users were found statistically different at the .001 level of significance on the variable noting whether individuals read current literature on computer applications to training. According to the data, it appeared that training managers who read current literature more frequently used computers in their training unit than those who did not read current computer literature.

Another .001 level of significance was found between computer users and non-computer users on the variable noting respondents personal participation in computer-assisted instructional programs. Training managers who participated in computer-assisted instruction more frequently utilized computers in their training unit than those who did not participate in computer-assisted instruction.

In addition a statistical difference, at the .001 level of significance was reported between computer users and non-computer users on the variable indicating whether training managers had personally written a computer program. Training managers who had written a computer

program more frequently reported using computers in training than those who had not written a computer program.

Statistical significance was found at the .001 level between computer users and non-computer users on the variable indicating whether they had received computer-based training prior to being a training manager. Managers who had received computer-based training prior to being a training manager more frequently reported using computers in their training unit. Computer users and non-computer users rated their present computer skill statistically different at the .001 level of significance. Training managers who rated their skill level above average and average more often utilized computers in their training unit than training managers who rated their present computer skill below average. A summary of these variables are reported in Table 11.

Research Question Five: What are the attitudes of training managers concerning computers in training?

Respondents were asked to rate their agreement or disagreement on statements concerning the use of computers in training. Originally this attitude scale was rated on a six-point ordinal as follows: strongly disagree (SD); disagree (D); tend to disagree (TD); tend to agree (TA); agree (A); and strongly agree (SA). However, strongly disagree and disagree (SD/D) were collapsed into one category due to the small percent in each cell. Within this attitude grouping, 56.9% of the computer users either strongly agreed or agreed that computer-based training would assist in making them more efficient in their job as a training manager, whereas non-computer users reported 42.5% on the same variable. Training

managers cited strong agreement or agreement that 81.5% of them welcomed the implementation of computer-based training into their organization, while non-computer users noted 61.2% welcomed the implementation of computer-based training into their organization. Over 75% of both groups indicated either strong agreement or agreement that computers are useful in managing training activities. In addition 68.3% of the computer users reported either strong agreement or agreement that computer-based training was not a threat to their job security while non-computer users noted 55.8% was not a threat to their job security. See Table 12 for results.

Less than 36% strong agreement or agreement was evidenced from individuals on their attitudes toward computer-based training becoming the most prevalent method of delivery system within the next 5-10 years and that the adoption of computer-based training creates more training jobs than it eliminates.

Non-computer users were asked to respond to reasons for not adopting computers for training in their organization. Table 13 shows results. Over 50% of the respondents either agreed or tend to agree that the use of computers in training are not presently cost efficient or that the current software is not suitable for their organization. Also, an excess of 60% reported they agree or tended to agree that there was insufficient information concerning application of computer-based training to their organization and that the development time needed for computer-based training was too long.

TABLE 12

TRAINING MANAGERS ATTITUDES TOWARD COMPUTERS

Attitudes	Use of Computers in Training Program (Percent)					Do Not Use Computers in Training Program (Percent)				
	n	SD/D	TD	TA	A	SA	n	SD/D	TD	TA	A	SA
Computer based training assists in making me more efficient at my job as a training manager.	(183)	7.1	7.7	28.4	36.1	20.8	(120)	14.1	9.2	34.2	34.2	8.3
Computers are useful in managing training activities, i.e., testing, reporting, prescription generation.	(207)	0.5	1.4	18.4	38.6	41.1	(230)	1.7	2.2	19.1	36.5	40.4
The implementation of computer-based training into my organization's training-delivery system is welcomed by me as a training manager.	(211)	1.4	3.8	13.3	35.5	46.0	(232)	5.2	7.3	26.3	36.6	24.6
Computer-based training will be the most prevalent method of delivering training within the next 5-10 years.	(217)	19.1	27.5	26.3	19.1	8.0	(251)	17.5	21.2	31.8	14.7	14.7
Adoption of computer-based training will create more training jobs than it eliminates.	(210)	8.1	24.3	32.4	23.8	11.4	(243)	6.5	26.3	34.6	25.1	7.4
Computer-based training is not a threat to the job security of individual training personnel.	(215)	3.2	10.2	18.1	42.3	26.0	(250)	4.0	12.0	26.0	35.6	22.2

SD/D = Strongly Disagree/Disagree
TD = Tend to Disagree
TA = Tend to Agree
A = Agree
SA = Strongly Agree

TABLE 13

REASONS CITED FOR NOT USING COMPUTERS IN TRAINING

		Percent					
		Do Not Use Computers in Training Program					
	n	SD	D	TD	TA	A	SA
Too expensive	(240)	5.0	22.1	19.2	27.5	18.3	7.9
Insufficient information concerning application to our orgnization	(241)	2.9	10.8	10.0	28.2	33.2	14.9
Not presently cost efficient	(239)	2.5	11.3	15.5	24.3	35.1	11.3
Resistance to use of computers for instruction by employees	(234)	6.0	31.6	31.6	16.2	9.8	4.7
Long development time needed for computer-based courseware	(230)	3.0	8.7	11.7	29.6	34.8	12.2
Current software not suitable for our organization	(226)	2.7	9.7	19.0	25.7	25.7	17.3

SD = Strongly Disagree
D = Disagree
TD = Tend to Disagree
TA = Tend to Agree
A = Agree
SA = Strongly Agree

Training managers were asked to indicate their agreement or disagreement with four factors that Neher and Hauser identified as being needed to insure that computer training programs were geared to the needs of adult learners. These factors were:

1. Autonomy (self-directed, self-designed learning strategies).
2. Utility (response to learner questions).
3. Integration (integration of new information with previous learning).
4. Security (insurance of the right to learn with privacy and dignity).

Respondents reporting either strongly agreed or agreed on these factors were: (a) autonomy, 60.7%), (b) utility, 78.5%, (c) integration, 79%, and (d) security, 57.1%. When combining strongly agree, agree, and tend to agree, individuals rated each category with over 85%. Table 14 depicts results.

Research Question Six: Is there a difference between the attitudes of training managers who adopt computers in training and those who do not adopt?

Cross tabulations were computed to analyze the attitudes of computer users with those of non-computer users. A significant difference was found on the attitude dimension of computer-based training assists in making training managers more efficient at their job. Also, a significant difference was found between the two groups on the attitude dimension of whether computer-based training was welcomed into the organization's training delivery system. Computer users and

TABLE 14

TRAINING MANAGERS ATTITUDES TOWARD COMPUTER TRAINING PROGRAM'S RESPONSE TO ADULT LEARNERS

Response to Adult Learner's Program	n	Percent					
		SD	D	TD	TA	A	SA
Autonomy (Self-directed, Self-designed Learning Strategies).	463	.9	2.4	7.3	28.7	43.2	17.5
Utility (Response to Learner Questions)	461	.7	1.3	1.3	18.2	48.6	29.9
Integration (Integration of New Information with Prevous Learning)	459	1.5	0.4	1.5	17.4	50.5	28.5
Security (Insurance of the Right to Learn with Privacy and Dignity)	459	1.8	2.6	9.2	29.3	35.7	21.4

SD = Strongly Disagree
D = Disagree
TD = Tend to Disagree
TA = Tend to Agree
A = Agree
SA = Strongly Agree

non-computer users were found statistically different at the .01 level of significance on the attitude variable that computer-based training would assist in making training managers more efficient at their job. The data indicated that training managers who used computers in their training unit more frequently strongly agreed or agree that computers would assist in making them more efficient at their job than training managers who did not use computers in their training unit. In addition, computer users and non-computer users were found statistically different at the .001 level of significance on the attitude variable that the implementation of computer-based training was welcomed into the organization's training delivery system by training managers. According to the data, it appeared that training managers who used computers in their training unit more often strongly agreed or agreed that the implementation, of computer-based training was welcomed into their organization's training delivery system then training managers who did not use computers in their training unit. Tables 15 and 16 identify the results of the Chi-square tests for each attitude that revealed significant difference.

Research Question Seven: What are the organizational characteristics of training units using computers in training and those not using computers in training?

Individuals using computer training and those not using computers in training differed in the number of employees within the organization. The largest difference was in the categories with 500-1,000 employees and more than 25,000 employees. Table 17 summarized these findings.

TABLE 15

COMPUTER USERS AND NON-COMPUTER USERS

ATTITUDE 5: Computer based training assists me in making me more efficient at my job as a training manager.

Groups		Percent					
		SD	D	TD	TA	A	SA
Computer Users	Count	1	12	14	52	66	38
	Row %	0.5	6.6	7.7	28.4	36.1	20.8
Non-Computer Users	Count	7	10	11	41	41	10
	Row %	5.8	8.3	9.2	34.2	34.2	8.3

Note: Chi-square = 16.11550. Significance = 0.0065.
Degrees of Freedom = 5.

TABLE 16

COMPUTER USERS AND NON-COMPUTER USERS

ATTITUDE 7: The implementation of computer-based training into my organization's training delivery system is welcomed by me as a training manager.

Groups		Percent					
		SD	D	TD	TA	A	SA
Computer Users	Count	2	1	8	28	75	97
	Row %	0.9	0.5	3.8	13.3	35.5	46.0
Non-Computer Users	Count	3	9	17	61	85	57
	Row %	1.3	3.9	7.3	26.3	36.6	24.6

Note: Chi-square = 32.16736. Significance = 0.0000.
Degrees of Freedom = 5.

TABLE 17

BREAKDOWN OF ORGANIZATIONAL CHARACTERISTICS BY NUMBER OF EMPLOYEES AND CORPORATE INCOME

Characteristic	n	Percent	
		Non-Computer Users	Computer Users
Total Employees in Organization			
1-10	11	3.3	0.9
10-20	3	0.7	0.4
20-50	8	1.1	2.2
50-100	11	3.0	1.3
100-500	57	13.6	8.9
500-1,000	68	18.0	8.5
1,000-5,000	150	29.8	30.8
5,000-15,000	82	15.4	17.9
15,000-25,000	38	6.6	9.0
More than 25,000	68	8.5	20.1
Totals	496	100.0	100.0
Total Annual Income			
Under $300,000	10	0.5	0.5
$300,000-$500,000	4	1.4	0.5
$500,000-$750,000	0	0.0	0.0
$750,000-$1 million	3	0.5	1.0
$1-$5 million	29	9.2	4.6
$5-$25 million	34	9.5	6.6
$25-$100 million	54	13.0	12.6
$100-$500 million	72	18.1	17.2
$500 million-$3 billion	134	32.0	32.8
$3 billion or more	81	15.8	24.2
	421	100.0	100.0

Of the 496 responding to the number of employees in the organization, 8.5% of the organizations using computers indicated having from 500-1,000 employees, whereas in the same size category non-computer users reported 18%. Furthermore, computer users in the category of over 25,000 employees noted 20.1% while non-computer users in this category reported only 8.5%.

After looking at the total annual corporate income for organizations, differences were also noted between computer users and non-computer users. In the income category of over $3 billion computers users reported 24.2% while non-computer users cited 15.8% in this income bracket. However, there was no significant difference between the commitment of top management to computer-based training in the organization using computers and those not using computers.

Research Question Eight: Is there a difference between the organizational characteristics of the training units who adopt computers in training and those who do not adopt?

Cross tabulations were computed to analyze the organizational characteristics of training units who adopt computers in training and those who do not adopt. A significant difference was found in the organizational dimension of corporate income and number of employees. Tables 18 and 19 report the results.

Computer users and non-computer users were found statistically different at the .001 level of significance on the variable of number of employees in the organization. Generally, computer users reported higher percentage in the categories with 1,000 or more employees, while

TABLE 18

COMPUTER USERS AND NON-COMPUTER USERS ORGANIZATIONAL CHARACTERISTICS: NUMBER OF EMPLOYEES

		Number of Employees						
Group		1-100	100 to 500	500- to 1,000	1,000 to 5,000	5,000 tO 15,000	15,000 to 25,000	25,000+
Non-Computer Users	Count	22	37	49	81	42	18	23
	Row %	8.0	13.6	18.0	29.8	15.4	6.6	8.5
Computer Users	Count	11	20	19	69	40	20	45
	Row %	4.8	8.9	8.5	30.8	17.9	8.9	20.1

Note: Chi-square = 24.33536. Significance = 0.00045. Degrees of Freedom = 6.

TABLE 19

COMPUTER USERS AND NON-COMPUTER USERS ORGANIZATIONAL CHARACTERISTICS: ANNUAL CORPORATE INCOME

		Annual Corporate Income						
GROUPS		Under 300,000 to 1 million	1 million to 5 million	5 million to 25 million	25 million to 100 million	100 million to 500 million	500 million to 3 billion	3 billion plus
Non-Computer Users	Count	13	20	21	29	38	69	33
	Row %	5.7	9.0	9.4	30.0	17.0	30.9	14.8
Computer-Users	Count	4	9	13	25	34	65	48
	Row %	2.0	4.5	6.6	12.6	17.2	32.8	24.2

Note: Chi-square = 12.79573. Significance = 0.0464. Degrees of Freedom = 6.

non-computer users indicated higher percents in the categories 1,000 or less employees.

Also, computer users and non-computer users were found statistically different at the .05 level of significance on the variable of annual corporate income of the organization. Computer users cited larger percents in the $100 million and over categories of annual corporate income while non-computer users noted slightly higher percents in the $100 million and below annual income categories.

CHAPTER V

SUMMARY AND CONCLUSIONS

The problem identified for purposes of this study was that very little was known about the use of computers in training units in business and industry. Even less has been reported on how training managers are adopting the computer as a training tool for teaching job skills and human resource development. Furthermore, the relationship of computer-based training to the personal characteristics of training managers and the organizational characteristics of training units had not been studied. This study addressed the problem through the use of survey research to determine the use of computers in training, personal characteristics and attitudes of training managers and organizational characteristics of training units who were members of the American Society for Training and Development.

This chapter will be devoted to discussion, conclusions and recommendations of the following five dimensions of this study: organizational adoption of computers in training, use of computers in training units, personal characteristics and attitudes of training managers, and organizational characteristics of training units in business and industry. This chapter will also include interpretations and research implications for further research where warranted.

Organizational Adoption of Computers in Training

There were more organizations reported not using computers in training than those using computers. Computer users accounted for 45.1% of those responding while non-computer users accounted for 54.9%.

The organizations responding were in the following categories: manufacturing, transportation/communication/utilities, wholesale trade, retail trade, finance/insurance/banking, health services, business services, and public administration. There was no significant difference between the type of organization and whether they used or did not use computers in training.

Thus, it would appear that the training managers' attitudes, knowledge and information concerning the implementation of computers in their organizations are controlling factors for adoption of computer-based training. This finding is reflected in the attitudes and knowledge skill profile summarized later in this study.

Organizational Use of Computers in Training

Computer users most frequently indicated using microcomputers to deliver their training programs. The mainframe computer was the next choice with the last being interactive video. In terms of location for training, a decentralized approach was cited most frequently. However, over 60 percent of the individuals indicated using both centralized training locations and decentralized training locations in their organizations.

Furthermore, over 50 percent of these groups indicated using the following computer-based training applications:

1. teaching technical skills,
2. management training,
3. clerical training,
4. computer literacy training, and
5. training management.

Sales training was reported as being used by approximately 36% of the respondents.

The tutorial instructional strategy was stated as being used by an excess of 90 percent of respondents and over 75 percent indicated using either problems/tests or drills. Simulation was noted as being used the least often as an instructional strategy.

The average number of training hours and the average number of computer-based training hours received each year by an employee were assessed. As expected, the number of training hours including all training methods was considerably higher than the average number of computer-based training hours. It appeared from the data that employees received approximately one-fourth of their training via the computer. However, office/secretarial employees were reported to be receiving training using the computer almost one-half of the time.

Training Magazine's (1982) "U.S. Training and Census Report" indicated that the ownership of computers in training units of the organization's that they surveyed was 18.3%. The 1983 and 1984 annual report of Training Magazine reported a 14.2% growth rate in the number of organizations using computers to train employees. These percents were 32.2% and 46.4% respectively. This study found that the use of computers for training has declined to 45.1%. This finding supports market research conclusions that the computer industry's rapid growth is slowing. The signs of sluggishness is impacting on the major segments of the computer market (Alexander, 1985; Pauley, 1985; Wise & Lewis, 1985). Grant Bushee, a market analyst, states that for the

first time in its 30-year history, the industry is lagging while the economy continues to grow (Kneale , Marcom, & Smith, 1985).

This study also found that computer users most frequently use microcomputers to deliver training programs. This is consistent with the finding that the decentralization approach is the most common method for managing computer-based training. In addition, this study found that technical skills training and computer literacy training ranked number one and two respectively as the most often used computer-based training applications. Zemke's 1982 findings differed by ranking management training as the number one application and technical skills training number two. The respondents in this study ranked management training as fifth. This variation may represent a significant shift in computer training. Perhaps many organizations began initiating computer-based training on a top-down basis and are now concentrating on levels below managements.

There is little comparable literature regarding the total number of training hours an employee receives per year and the total number of computer-based training hours received. However, in the writer's opinion the 25% training via computers of total available training hours suggest that this is a viable method of training.

Training managers using computer-based training used a variety of resources for assessing the feasibility of computer-based training in their units. The principal sources of information identified by computer users were: (a) computer magazines, (b) trade and technical publications, (c) professional organizations, (d) outside consultants,

(e) vendors, (f) internal experts and (g) personal contacts. The results of this study revealed several findings in the use of computers for training. Teaching technical skills has replaced management training as the number one computer training application; training managers are most frequently using microcomputers in a decentralized area; currently tutorial is the most popular training mode; and training managers that implement computer-base training are more inclined to review information resources concerning computer technology and strategies.

Personal Characteristics: (Age, training years experience, experience with present organization and major.)

Most of the training managers in this study were in the age category from 35-44 with 5-10 years as a training manager and from 0-4 years experience in their present organization. No significant difference was found between these variables with respect to whether individuals used computers in training or did not use computers in training.

Degrees earned by training managers were most often in the field of business education, industrial psychology or a technical profession such as computer science or engineering.

Computer users and non-computer users differed significantly on their knowledge/skills characteristics. For example, individuals using computers in training were more inclined to:

own a personal computer at home,

use computers on the job,

read computer magazines,

participate in computer-assisted programs,

write computer programs, and

have received computer-based training prior to becoming a training manager.

In addition, these individuals most often rated their computer skill level average or above, while non-computer users rated their computer skill as average or below average.

This study found that past computer knowledge/skill affected the use of computers in training units by managers. Subsequently, this finding supports Havelock et al. (1969) in relating individual characteristics to the dissemination-utilization process. An additional finding was that those who read and kept current of relevant literature tend to adopt innovations at a faster rate. This supports the research of Carson (1965) and Ross (1958).

Rogers and Shoemaker (1971) stress the importance of communication patterns and the relationship of innovation and user characteristics to rates of adoption. In addition, the diffusion process involves identifying key individuals and what characteristics they exhibit when studying the adoption of an innovation. Thus, various mental and physical attributes, past experiences and education should be examined. This study supports Rogers and Shoemaker's study of the importance of the knowledge/skill characteristics of computer-based training users.

Training (1984) found that age is a factor that seems unrelated to trainers' attitudes toward the acceptance of computer-based training. This study of training managers supported that finding. In addition,

other variables which also appeared to be unrelated were: (a) training years experience, (b) experience with present organization and (c) education.

It was interesting that Training Magazine's (1984) "Industry Report" stated that the least likely trainer to accept computers was a male, 39.3 years of age, the holder of a master's degree and employed in the service sector by an organization with 1,000 to 2,500 employees. Most of the training managers that reported using computer-base training in this study were in the 35-44 age bracket, the holder of a master's degree and employed in the finance/banking/insurance sector with 1,000 to 5,000 employees. Also, training managers using computer-based training noted several changes in their role as a result of implementing this new training device. For example, respondents reported having more control over training sessions, acquiring more useful data, needing better technical and marketing skills and involving the trainee more with the learning process.

Attitudes

This study found that computer users and non-computer users differed significantly on the following two attitude dimension statements:

1. Computer-based training would assist in making me more efficient at my job as a training manager.

2. The implementation of computer-based training into my organization's training delivery system is welcomed by me as a training manager.

As expected, computer users more strongly agreed that computer-based training would assist in making them more efficient in their job than non-computer users. Also, computer users more strongly agreed that computer-based training was welcomed into their organization than non-computer users.

There was no statistical difference between computer users and non-computer users on the four other attitude dimensions noted below:

1. computers are useful in managing training activities;

2. computer-based training will be the most prevalent method of delivering training within the next five to ten years;

3. adoption of computer-based training will create more training jobs that it eliminates; and

4. computer-based training is not a threat to the job security of individual training department personnel.

Over 50 percent of both groups agreed that computer-based training is not a threat to job security. There was less than 36 percent strong agreement or agreement from both groups that computer-based training will become the most prevalent method of delivery system within the next 5-10 years and that the adoption of computer-based training creates more jobs than it eliminates.

Dohmann (1970), Gill (1970), Miller (1965), and Rogers and Shoemaker (1971) found favorable attitudes toward the innovation as predictors of adoption. This study supports the findings of these researchers.

With regard to the learning needs of adults, respondents rated computer-based training as to how well they insured autonomy, utility,

integration and security. Of the training managers in this study over 57 percent either agreed or strongly agreed that each of the above factors were incorporated into computer-based training programs. When the category "tend to agree" was added to the agree and strongly agree groups, the percent changed to 85 percent agreement.

Non-computer users responded to a series of statements identifying their reasons for not using computer-based training. The greatest concern cited was the extensive development time needed for courseware development. Moderate concern was also indicated in three areas.

1. Insufficient information applicable to specific organizations.
2. Not presently cost efficient.
3. Current software not suitable for specific organization.

Respondents indicated little concern that expense or the resistance on the part of employees use was a reason for not using computers in their training units.

Organizational Characteristics: (Total employees in organization, total annual corporate income.)

Training managers using computers in training and those not using computers in training differ significantly on their organization's annual corporate income and number of employees. Organizations with 1,000 or more employees and an annual corporate income exceeding $100 million reported a greater percent using computer-based training. Conversely, organizations with less than 1,000 employees and incomes below $100 million were less inclined to use computers for training. However, there was no significant difference between top management

commitment to computer-based training in those organizations using computers in training and those not using computers in training.

Baldridge and Burnham (1975) stated that most education and social innovations are complex and seldom adopted by isolated individuals. Thus, the need exists to seek additional factors for explaining the adoption of a new innovation. This study tended to substantiate their research. Factors other than the personal characteristics of the training managers and their attitudes toward computer-based training affected the adoption of computers in training. In this study, there was a significant difference in the annual corporate income of an organization and the size of the organization between computer-users and non-computer users.

This study was designed to provide a data base from which to answer several research questions. However, this data base proved larger than the questions it was designed to answer. The real impact of this study can be gathered from a few subjective interpretations. The first of these is that the use of computers in training units in business and industry is relatively new and is in the process of evolving and establishing functional parameters. Training managers' roles seem to be affected by the implementation of computer-based training. It is not clear from this study exactly what future roles training managers will experience with the arrival of computer-based training.

However, the real importance of this study is not in these findings which reflect a moment of time, but the knowledge that computer-based

training does impact the roles of training managers. With training needs defined, further evaluation of the use of computers as a training tool can be conducted. Thus, models can be established for in-service activities and direction can be given for professional organizations to offer workshops, publish relevant literature and commission topical papers.

As a result of this study, it is recommended that organizations provide training managers with training opportunities and experiences to facilitate their computer skills and understanding in order to better prepare these individuals for making decisions related to the appropriateness of computer-based training in their training units. It is further recommended that professional organizations such as the American Society for Training Development continue to provide workshops, seminars, and other in-service activities in the area of computer-based training.

Also, based on the findings of this study, which suggest change in training deliveries due to a better informed audience, it is recommended that non-computer users review and seek the assistance of those organizations who use a variety of methods and resources when considering the adoption of computer-based training. With respect to this study principal sources of information were: outside consultants, vendors, internal experts, personal contacts, computer magazines, professional organizations and trade and technical publications. Thus, training managers wishing to assess the feasibility of computer-based training in their training units should consider these resources.

In addition, it is recommended that non-computer users who are considering the use of computer-based training should carefully examine the knowledge and skill levels of training managers in organizations that have successfully implemented computers in their programs. Knowledge and skills indicated in this study to be predictors of training managers use of computers in their training unit were: owning a personal computer, using computers on the job, reading computer magazines, participating in computer-assisted programs, writing computer programs and receiving computer-based training prior to becoming a training manager. Consequently, training managers interested in implementing computer-based training need to explore possibilities for allowing individuals in their training units opportunities for obtaining the knowledge and skills.

It is apparent from this study that training managers' attitudes influence decisions relating to the adoption of computer-based training in their units. Thus, training managers need to be aware of the attitudes of persons in their training unit concerning computer-based training in order to recognize those factors which may be barriers.

Furthermore, it is recommended that non-computer users exhibiting similar organizational characteristics of computer users seek additional information from these organizations in an effort to analyze their computer-based training needs. In this study, annual corporate income and size of the organization were predictor variables indicating the use of computers for training.

Future Research

This study was descriptive in nature and, as such, was designed to gather base-line data. Questions emanating from this study regarding the use of computers in training units by training managers have been alluded to earlier in this chapter. More specificity will be provided in this section.

1. It is recommended that research be conducted to determine which organizations have developed successful computer-based training programs and to identify elements of these programs which are most conducive to success.

2. A study should be undertaken to determine the roles of training managers as computer-based training is adopted into the training unit.

3. In view of the fact that the use of computers in training is relatively new and is in the process of evolution, it is recommended that another study collecting similar data be conducted within five years to determine what changes have occurred over time.

Summary

The purpose of this study was to describe how training managers are using computers in business and industry. In addition this study was designed to access personal characteristics of training managers and appraise organizational characteristics of training units to determine the relationships between these characteristics and the adoption of computers in training programs.

In regard to use of computers in business and industry the results show that there was no significant difference between the type of organization and whether they used or did not use computers in training. It was also determined that training managers most frequently use microcomputers in decentralized areas using the tutorial instructional strategies. In addition, this study found that teaching technical skills has replaced management training as the number one training application.

With regard to personal characteristics, age, training years experience, experience with present organization, and level of education did not appear to be predictor variables in determining the adoption of computers by training managers. However, computer knowledge/skill such as owning a personal computer, using computers on the job, reading computer magazines, participating in computer-assisted programs, writing computer-assisted programs and receiving computer-based training prior to becoming a training manager seem to indicate predictor variables for determining the adoption of computers by training managers. This study also supported the research findings that favorable attitudes were predictors for the adoption of computer based-training.

The relationship between organizational characteristics and the adoption of computers in training programs was found to be significant predictor variables for implementing computers in training. The organizational variables identified in this research were number of employees and annual corporate income.

In conclusion, there appeared to be a relationship between the adoption of computers and the personal characteristics and attitudes of

training managers. Also organizational characteristics seem to indicate factors that affected adoption of computers in training.

Computers offer trainers and educators an interesting new tool. The challenge becomes one of harnessing the power and potential of computers to meet the needs of the adult learner in the work place and the community.

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APPENDIX A

ORGANIZATIONAL COMPUTER SURVEY

Cover Letters
Questionnaire

VALLEYS OF VIRGINIA CHAPTER
AMERICAN SOCIETY FOR TRAINING AND DEVELOPMENT

March 4, 1985

Dear Training Manager:

There is no general agreement concerning how computers are used in training. In fact, little is reported on how training managers are adopting the computer as a tool for individual job skills development or human resource development. The extensive use of computers in the business world raises the question: How is this technological tool being used in training.

I am currently conducting a study supported by the Valleys of Virginia Chapter of ASTD in corporation with Virginia Polytechnic Institute and State University. The study focuses on the adoption of computer-based training in business and industry. I need the benefit of your expertise and experience to complete this study successfully. You will find enclosed a questionnaire designed to elicit information regarding the use of computers in your training unit. It can be completed in 20 minutes or less.

All responses will be handled in a confidential manner and will become anonymous in the analysis of data and the subsequent report. The questionnaire has an identification number for follow-up purposes only.

Once the data have been collected and analyzed, the results will be available to you upon request. I look forward to hearing from you by March 15, 1985.

Thank you. It is only through the willing cooperation of individuals such as yourself that we can learn more about how the business sector uses computers in training.

Sincerely,

Janie S. Johnson

dedicated to the development of human potential

JSJ/jw
Enclosure

VALLEYS OF VIRGINIA CHAPTER
AMERICAN SOCIETY FOR TRAINING AND DEVELOPMENT

March 18, 1985

About three weeks ago, I wrote to you seeking information on the utilization of computers in your training department. I am writing to you again because of the significance each questionnaire has to the usefulness of this study. In order for the results of this national study to be truly representative of the opinions of all training managers, it is essential that each person return the questionnaire.

In the event that your questionnaire has been misplaced, a replacement is enclosed.

I look forward to hearing from you by March 29, 1985. It is through the willing cooperation of individuals such as yourself that we can learn more about how the business sector uses computers in training.

Sincerely,

Janie S. Johnson

JSJ/jw

Enclosure

VALLEYS OF VIRGINIA CHAPTER
AMERICAN SOCIETY FOR TRAINING AND DEVELOPMENT

April 18, 1985

This is a gentle reminder that I have not yet received your completed questionnaire on the use of computers in training in the business sector. This study is a very important one, and I feel that you would not want to miss the opportunity to be a part of it.

I know it is very easy for busy people such as yourself to lay aside questionnaires, fully intending to complete them later. Sometimes they get misplaced. For this reason, I am enclosing another questionnaire. I will be most appreciative if you can complete and return it by April 22 so it can be included in data analysis.

If requested, I will send you a copy of the results. Simply put your name, address, and "copy of results requested" on the back of the return envelope. I expect to have them ready to send in June.

Your contribution to the success of this study is greatly appreciated.

Sincerely,

Janie S. Johnson

JSJ/jw

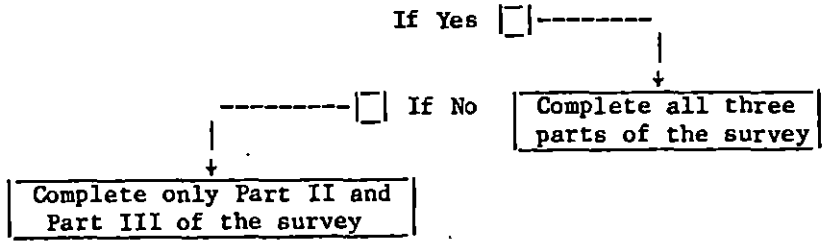
Enclosure

ORGANIZATIONAL COMPUTER SURVEY

Dear Respondent:

Following is a survey on the utilization of computers in training in business and industry. Please answer each question as fully and completely as possible. Skip questions if instructed. Be sure to complete the entire parts of the survey that applies to you. There is space at the end of the questionnaire for additional comments. Please feel free to use it to make any comments you may have. Thank you for your cooperation.

Does your organization use computers in training? (Check appropriate box.)



PART I: USE OF COMPUTERS IN PERSONNEL TRAINING

1. Indicate which type(s) of computer equipment you use in training.

Microcomputers	_____ Yes	_____ No
Mainframe Computers	_____ Yes	_____ No
Interactive Video	_____ Yes	_____ No

2. Does your organization manage computer-based training in the following methods?

Centralized in a laboratory	_____ Yes	_____ No
Decentralized by department	_____ Yes	_____ No
Both centralized and decentralized	_____ Yes	_____ No
Other (please specify _____)	_____ Yes	_____ No

3. Does your organization obtain training software by each of the following methods?

Developed internally	_____ Yes	_____ No
Purchased "off the shelf"	_____ Yes	_____ No
Custom developed by outside consultant	_____ Yes	_____ No
Other (please specify _____)	_____ Yes	_____ No

4. Is top management committed to the adoption of computer-based training in your organization?

_____ Yes _____ No

5. Is your organization considering the purchase of software training programs within the next 12 months?

_____ Yes _____ No

If "yes," approximately what will be your expenditure? $_____

6. Indicate the average number of both training hours and computer-based training hours a typical employee in each of the following receives per year:

	Average number of training hours	Average number of computer-based hours
Customer service	_____	_____
Executives	_____	_____
First-line Supervisors/Foreman	_____	_____
Middle Managers	_____	_____
Office/Secretarial	_____	_____
Production worker	_____	_____
Sales representative	_____	_____
Senior managers	_____	_____
Other (please specify)	_____	_____

7. Indicate how often you utilize the following computer-based training applications. (Circle number.)

	Never	Sometimes	Always
Sales training	1	2	3
Technical skills training	1	2	3
Management training	1	2	3
Clerical	1	2	3
Training management (including testing/record keeping)	1	2	3
Computer literacy training	1	2	3
Other (Please specify _____)	1	2	3

8. Indicate how often you utilize the following computer-based instruction strategies. (Circle number.)

	Never	Sometimes	Always
Simulation/Gaming	1	2	3
Tutorial	1	2	3
Drills	1	2	3
Problems/Tests	1	2	3
Other (Please specify _____)	1	2	3

9. As your organization investigated the use of computer-based training, what were your principal source(s) of information?

_____

_____

10. When did you begin using computer-based training in your current organization?

_____

11. How has your role as a training manager changed as a result of the implementation of computer-based training?

_____

_____

PART II: TRAINING MANAGER CHARACTERISTICS

1. What is your age?

_____ under 25
_____ 25-34
_____ 35-44
_____ 45-54
_____ 55-64
_____ 65 or over

2. How many years have you been a training and development professional?

_____ 0-4 years
_____ 5-10 years
_____ 11-24 years
_____ 25 + years

3. How many years have you been in your present organization?

_____ 0-4 years
_____ 5-10 years
_____ 11-24 years
_____ 25 + years

4. Indicate your highest level of formal education attainment.

_____ Some high school
_____ High school graduate
_____ Bachelor's degree
_____ Some graduate study
_____ Master's degree
_____ Doctorate degree

Indicate major field of study:

_____
_____
_____
_____

Directions: Indicate your agreement or disagreement with each of the following statements on a scale of (1) Strongly Disagree (SD); (2) Disagree (D); (3) Tend to Disagree (TD); (4) Agree (TA); (5) Agree (A); (6) Strongly agree; and (7) Not Applicable (NA):

	SD	D	TD	TA	A	SA	NA
5. Computer-based training assists in making me more efficient at my job as a training manager.	1	2	3	4	5	6	7

	SD	D	TD	TA	A	SA	NA
6. Computers are useful in managing training activities, i.e, testing, reporting, prescription generation.	1	2	3	4	5	6	7
7. The implementation of computer-based training into my organization's training-delivery system is welcomed by me as a training manager.	1	2	3	4	5	6	7
8. Computer-based training will be the most prevalent method of delivering training within the next five years to ten years.	1	2	3	4	5	6	7
9. Adoption of computer-based training will create more training jobs than it eliminates.	1	2	3	4	5	6	7
10. Computer-based training is not a threat to the job security of individual training department personnel.	1	2	3	4	5	6	7

11. If your organization is not using computers for training indicate your agreement or disagreement for each of the following reasons.

	SD	D	TD	TA	A	SA
Too expensive	1	2	3	4	5	6
Insufficient information concerning application to our organization	1	2	3	4	5	6
Not presently cost effective	1	2	3	4	5	6
Resistance to use of computers for instruction by employees	1	2	3	4	5	6
Long development time needed for computer-based courseware	1	2	3	4	5	6
Current software not suitable for our organization	1	2	3	4	5	6
Not applicable	1	2	3	4	5	6
Other (please specify _____)	1	2	3	4	5	6

12. Some researchers feel that four factors are needed to insure that computer training programs are geared to the needs of adult learners. Indicate your agreement or disagreement for each of the following factors.

	SD	D	TD	TA	A	SA
Autonomy (self-directed, self-designed learning strategies)	1	2	3	4	5	6
Utility (response to learner questions)	1	2	3	4	5	6
Integration (integration of new information with previous learning)	1	2	3	4	5	6
Security (insurance of the right to learn with privacy and dignity)	1	2	3	4	5	6

13. Do you have a personal computer in your home?

_____ Yes
_____ No

If "no," do you intend to obtain a personal computer for home use in the next 12 months?

_____ Yes
_____ No
_____ Undecided

14. Do you use a computer in your current job assignment?

_____ Yes
_____ No

15. Do you read current literature on computer applications to training?

_____ Yes List: _____
_____ No _____

16. Have you personally participated in any computer-assisted instructional programs?

_____ Yes
_____ No

17. Have you ever written a computer program?

_____ Yes
_____ No

18. Did you receive any computer-based training prior to being a training manager?

_____ Yes
_____ No

19. How would you rate your present computer skill level? Check appropriate space below:

_____ Above average
_____ Average
_____ Below average

PART III: GENERAL INFORMATION

1. Which of the following BEST describes the nature of your business?

_____ Manufacturing
_____ Transportation/Communication/Utilities
_____ Wholesale Trade
_____ Retail Trade
_____ Finance/Insurance/Banking
_____ Health Service
_____ Business Services
_____ Public Administrative
_____ Other (Describe _____)

2. Total number of employees in your organization:

_____ 1-10
_____ 10-20
_____ 20-50
_____ 50-100
_____ 100-500
_____ 500-1,000
_____ 1,000-5,000
_____ 5,000-15,000
_____ 15,000-25,000
_____ more than 25,000

3. Estimated total annual corporate income:

_____ Under $300,000	_____ $5-$25 million
_____ $300,000-$500,000	_____ $25-$100 million
_____ $500,000-$750,000	_____ $100-$500 million
_____ $750,000-$1 million	_____ $500 million - $3 billion
_____ $1-$5 million	_____ $3 billion or more

4. What is your training unit's total budget?

$_____

What percentage of your training unit's total effort is accomplished by using the computer?

_____%

What is your training budget for computer-based training (including salary, hardware, software, courseware)?

$_____

5. Approximately how many employees in your organization are trained using computer-based training?

_____ None
_____ less than 50
_____ 50-100
_____ 100-500
_____ 500-1,000
_____ 1,000-5,000
_____ 5,000-10,000
_____ 10,000 or more

COMMENTS:

APPENDIX B

POSTCARD FOLLOW-UP TO QUESTIONNAIRE

Last week a questionnaire seeking information on your utilization of computers in training was mailed to you. If you have already completed and returned it, please accept my sincere thanks. If not, please do so today. It is extremely important that you participate in the study in order for the results to accurately represent training directors' adoption of computers in the business sector.

This study is supported by the Valley of Virginia Chapter of ASTD in cooperation with Virginia Polytechnic Institute and State University.

If by chance you did not receive the questionnaire, or it was misplaced, please call me and I will mail another copy.

Sincerely,

Janie S. Johnson

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