ATTITUDES TOWARD COMPUTER TECHNOLOGY BETWEEN
NURSING AND MEDICAL EDUCATORS

by

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A DISSERTATION

IN

EDUCATION

Submitted to the Graduate Faculty
of Texas Tech University in
Partial Fulfillment of
the Requirements for
the Degree of

DOCTOR OF EDUCATION

Approved

May, 1988

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1988
No. 16
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ACKNOWLEDGMENTS

I wish to express my gratitude to Dr. Clyde E. Kelsey, Jr. (Chairperson), Dr. Gerard J. Bensberg, Dr. Joe Cornett, Dr. Teddy Langford, and Dr. Mike Mezack, members of my dissertation committee, for each one's unique contribution to the design, implementation, and evaluation of this study. I wish to express my appreciation to Dr. Clyde E. Kelsey for his enduring support, encouragement, and guidance in the completion of this goal. Thank you for keeping me focused and motivated.

I also wish to acknowledge my nursing colleagues for their loyal support. To Dr. Kathryn Barnett, my first mentor, I thank you for your sustained support through the years. I extend my appreciation to my friend and colleague, Dr. Helen Cox, for burning the midnight oil with me and for providing invaluable assistance regarding research methodology and statistical analysis. To Dr. Pat Yoder Wise, many thanks for your constructive editorial critiques, humor, and perceptive encouragement. To Dr. Teddy Langford, I express my deepest gratitude for affording flexible opportunities to pursue a holistic approach to personal and professional growth and development. To

each, I express heartfelt thanks for serving as role models and setting the pace.

This dissertation is dedicated to my parents, Ben and Edwena Jordan, who planted the seed for personal and professional excellence and nourished its growth. To my sister, Karen, who also has experienced the discipline and perserverance required for graduate study, I offer many thanks for sharing her strength, joy, and faith. To all of my family and friends, thank you for your support and contributions.

In conclusion, I owe a special debt of gratitude to the nursing and medical educators of the State of Texas for their participation in the study. Many thanks to Sherry and David Smith for their typing of this manuscript and encouraging words.

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ABSTRACT

This descriptive study compared nursing and medical educators' attitudes toward computer technology. The primary assumption was that an individual's perception of, acceptance of, and resistance to automation was related to attitudes toward automation. The effect of demographic characteristics, previous experience and education regarding computer technology, and the usage of computer technology in educational and clinical environments was also addressed.

A belief exists that biomedical technological innovations are being diffused at a slow rate. The educator's mission is to prepare professionals to function in technologically-based health care delivery systems. Attitudes regarding the human-machine interface can impact the diffusion process and this mission. Reported research regarding attitudes toward computer technology does not compare nursing and medical educators' attitudes.

One hundred seventy-seven Texas nursing and medical educators responded to the Attitudes Toward Computers in General questionnaire and the Computer Attitude Profile. The results indicated no significant difference between nursing and medical educators' attitudes toward computer

technology. Demographic variables were not significant. Previous experience with computer technology was significant, but negatively correlated; whereas, education regarding computer technology was not. Usages of computer technology in educational and clinical practice environments were not significant. However, word processing and record keeping (educational environment) negatively correlated with attitude toward computers in general. In the clinical environment, diagnosing was positively correlated and patient assessment and network systems were negatively correlated with attitudes toward computers in general.

Recommendations for further study included investigation of: (1) the relationship of peer influence and the educators' role in professional networks on attitudes toward computer technology in educational and clinical practice environments; (2) educators' attitudes toward specific technological innovations perceived as enhancing or threatening the traditional professional roles in educational and clinical practice environments; and (3) the use of attitude assessment data as they impact technological innovation in the development of education, training, orientation, implementation, and attitude modification strategies. Other recommendations were included.

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CHAPTER I

THE PROBLEM AND ITS RELEVANCE

Introduction

During the last two decades, biomedical innovations have revolutionized health care delivery. Economic, consumer, governmental, legislative, political, and societal demands have resulted in the expansion of technological trends to meet the health care needs of society. Numerous and diverse applications of technological trends for health care delivery are now available. Nursing information systems, medical consultation programs, clinical databases, health care decision support systems, automated health care records, hospital information systems, patient and professional educational programs, and physiological patient monitoring systems are examples of technological realities (Stead, 1987). "The computer is the most important of any technological advances yet it is still considered to be in its infancy" (Bronzino, 1977, p. 57). Due to an information-intensive society, the continuing evolution of technology, and the knowledge explosion, technological advances made in the next two decades will far surpass previous technological developments for health care delivery.

Although the availability of biomedical technology is escalating at an unprecedented pace, health care professionals are not readily adopting or implementing computer technology for health care delivery. The process of biomedical innovation diffusion is slow and not clearly understood. Diversity of diffusion also exists regarding the type of technology, the rate of diffusion, and technological application. There is also diversity regarding the environmental and technological factors influencing biomedical innovation diffusion, and the characteristics of the health care professionals accepting or rejecting the technological innovations. The literature on technological innovations in the workplace emphasizes the significance of attitudes regarding the human-machine interface in facilitating or impeding the adoption and implementation (Anderson & Jay, 1987; Dowling, 1980; Grann, 1984; Kaplan, 1986; Kjerulff & Counte, 1984b).

"It will be increasingly difficult to qualify as a competent health professional in this decade or the future without experiencing at least an introduction to some of the new technologies and their application to the impact of patient care" (Bronzino, 1977, p. viii). Medical and nursing educators are responsible for preparing the generations of professionals in their health care fields. If the mission of nursing and medical education is to provide competent professionals, then health care

education must keep abreast of the present and future technological trends. "A student who graduates without being exposed to computers has had an incomplete education" (Molnar, 1979, p. 280). Many medical and nursing educators, however, are not adopting and implementing the advances in computer technology available for education or clinical practice.

Medical and nursing education are inextricably intertwined with theoretical and clinical components. Computer technology is altering the nature of both of these educational components. For example, computer-based simulations are changing the manner by which nursing and medical students learn about the problem-solving and decision-making process. Computer technology is improving the understanding of both the process and outcome of health care management. This, in turn, alters the content of health care education and is changing the role of the faculty member as technology enhances teaching methodologies. Continuing education is mandatory for educators to keep abreast of the rapid developments in technologically-based health care education and clinical practice environments. Furthermore, the development of integrated health care delivery systems raises complex technical, political, social, legal, financial, and ethical issues regarding access, security, confidentiality, control, and

management of health care information (Cox, Harsanyi, & Dean, 1987). As early as a decade ago, ". . . it was already too late to decide for or against computers . . ." (Ackerman, 1982, p. 64).

Purpose and Scope

The Problem

The literature pertaining to the biomedical innovation diffusion process emphasizes two primary stages: adoption and implementation. Positive or negative attitudes regarding technological innovation are generally first elicited during the adoption period. These attitudes impact the implementation period, thus resulting in the success or failure of technological innovations. During the adoption period, the individual assumes an active role in the innovation process by ". . . matching the innovation with a perceived organizational problem" (Anderson & Jay, 1987, p. 121). "The individual is believed to be a target of interventions and is critical to success or failure of an innovation" (Chang & Jordan-Marsh, 1983, p. 519). The literature on biomedical innovations in the workplace emphasized the significance of attitudes in facilitating or impeding adoption and implementation. The literature, however, also reflected a generally held belief that medical and nursing professionals and educators have been slow to incorporate biomedical innovations into educational and clinical practice

environments (Anderson & Jay, 1987; Dowling, 1980; Grann, 1982, 1984; Kjerulff & Counte, 1984b; Kjerulff, Counte, Salloway, & Campbell, 1981; Zaltman, Duncan, & Holbeck, 1973). Although numerous applications of diverse biomedical technological applications were cited in the literature, it was also evident that health care professionals and educators were not readily adopting or implementing technological innovations in educational and clinical practice environments (Anderson & Jay, 1987; Covvey & McAlister, 1980; Cox, Harsanyi, & Dean, 1987; Fisher, 1984; Friedman & Gustafson, 1977; Gordon & Fisher, 1975; Kaplan, 1982a; Kember, 1982; Krasnoff, 1967; Ledley, 1965; Levinson, 1985; Lindberg, 1979; Saba & McCormick, 1986; Sweeney, 1985).

The biomedical innovation diffusion process among health care professionals in the educational and clinical practice environments has not been clearly understood. Much of the biomedical innovation diffusion research does not address the diffusion of computer technology. The biomedical innovation diffusion literature also cited examples of diverse innovations being diffused at different rates. For example, the technique of chest percussion took almost 100 years to become widely accepted; however, the adoption of Roentgen's 1895 radiological discoveries occurred within a year (Fisher, 1984). The research regarding the characteristics of

technology reflected a pro-innovation bias (Banta, 1984; Tanon & Rogers, 1975). Research regarding the characteristics of the environment focused on such aspects as financing methods, market conditions, government programs, and patient need or demand (Banta, 1980; Banta, Behney, & Willems, 1981; Joskow, 1981; Russell, 1978; Urban & Bice, 1981). Concomitantly, controversy existed regarding the relationship between the adoption of innovations and the actual use of innovations (Anderson & Jay, 1987; Banta, 1984; Fisher, 1984; Kaplan, 1982a, 1982b; Kjerulff & Counte, 1984a). Factors influencing the use of technology included: professional autonomy, the social contract binding health care professionals with patients, professional specialization, malpractice issues, technological and health care industry promotion, the form of health care delivery, payment of services, and public and consumer influence (Banta et al., 1981; Committee on Technology and Health Care, Institute of Medicine, 1979; Mechanic, 1977; Russell, 1978; Schroeder & Showstack, 1978; Smith & Kaluzny, 1975).

Research regarding the characteristics of the adopter reflected conflicting results and views. Many researchers, however, concurred that physicians are the key decision makers, but they did not concur regarding the role of the physician in the innovation diffusion process (Anderson & Jay, 1985; Coleman, Katz, & Menzel, 1966;

Greer, 1977, 1981). Rogers and Shoemaker (1971) proposed that individual responses to innovation diffusion impact the process, and categories of adopters were identifiable. They classified adopters as innovators, early adopters, early majority adopters, late majority adopters, laggards, and rejectors. Other studies regarding the attitudes of health care professionals toward technological innovation provided diverse and conflicting results (Anderson & Jay, 1987; Banta, 1984; Greer, 1981; Young, 1984). "The success or failure of systems is frequently related to how well the human reaction to change is anticipated and handled" (Jacobsen & Fennell, 1983, p. 470). The literature revealed that scores on questionnaires regarding attitudes toward computer technology: (a) predicted adopters' adaptation to the subsequent phase of implementation; (b) identified groups with negative and positive attitudes; (c) identified the basic components of attitudes for attitudinal change strategies; (d) impacted employee retention and job satisfaction; (e) impacted professional role function, values, culture, and practice; (f) impacted user educational and training designs; and (g) measured attitudinal change over time (Anderson & Jay, 1987; Kaplan, 1982a; Kjerulff & Counte, 1984a, 1984b; Kjerulff, Counte, Salloway, & Campbell, 1983; Klonoff & Clark, 1975; Reznikoff, Holland, & Stroebel, 1967;

Startsman & Robinson, 1972; Theis, 1975; Zoltan & Chapanis, 1982).

Attitude assessment can contribute to an understanding of the human reaction toward change brought about by technological innovation. It also can contribute to an understanding of the biomedical innovation diffusion process. Attitude assessment among health care personnel was beginning to be addressed in the literature because of the problems associated with the human-machine interface in educational and clinical practice environments. Typically, however, previous research studies have not assessed and contrasted the attitudes toward computer technology between nursing and medical educators.

The Research Problem

The purpose of this study was to assess and compare the attitudes toward computer technology between nursing and medical educators. The study addressed only the existence of positive or negative attitudes toward computer technology in general. The study investigated: (a) the effect of demographic characteristics on positive or negative attitudes, (b) the effect of previous experience and education regarding computer technology on attitudes, and (c) the effect of the usage of computer technology in the educational and clinical environments on attitudes.

Review of Previous Research

A consensus regarding a definition of attitude did not exist; therefore, for the purposes of this study, the following definition was used. Attitude was defined as "a learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object" (Fishbein & Ajzen, 1975, p. 6). Attitudes were viewed as the antecedents of behavior. The measurement of attitudes toward technological innovations among health care professionals has been one component in the complex study of the biomedical innovation diffusion process encompassing adoption and implementation. What, then, were the attitudes toward computer technology of nursing and medical personnel and educators?

Attitudes of Physicians Toward Computer Technology

Previous studies regarding the attitudes of physicians toward computer technology cited conflicting results. Friedman and Gustafson (1977) concluded that physicians' attitudes can contribute to the insidious diffusion of computer technology in health care delivery. Startzman and Robinson's (1972) early study indicated that awareness of technological capability and importance did not necessarily result in a positive attitude among physicians. Several studies revealed that positive attitudes regarding computer technology for health care

delivery existed for applications regarding patient care management. Negative attitudes, however, existed regarding applications which threatened normal clinical practice, professional role, and professional status (Melhorn, Legler, & Clark, 1979; Singer, Sacks, Lucente, & Chalmers, 1983; Startzman & Robinson, 1972; Teach & Shortliffe, 1981). For example, computerized axial tomography, viewed by physicians as a valuable clinical tool, has been widely accepted. However, computerized axial tomography does not infringe on the physicians' clinical management role. On the other hand, automated history taking has been viewed as a threat to a historical and traditional medical function; therefore, it has not been widely accepted (Teach & Shortliffe, 1981). As early as 1970, Schwartz proposed that physicians would perceive computer technology as a threat to job security and professional stature (Schwartz, 1970).

In comparing physicians' attitudes with other health care professionals, Reznikoff, Holland, and Stroebel's (1967) early study regarding attitudes of computer technology in health care delivery revealed that physicians held more favorable attitudes than did clerical, maintenance, housekeeping, or nursing personnel. The results also indicated that attitude was positively correlated with age, and men held more favorable attitudes than did women (Reznikoff et al., 1967). Startzman and Robinson

(1972) found similar indications that medical staff, faculty, and students possessed more positive attitudes than did nurses, interns, and ancillary personnel. Melhorn, Legler, and Clark (1979) basically replicated Startzman and Robinson's (1972) study and determined that a majority of hospital personnel possessed positive attitudes and portrayed a willingness and desire to learn about technological applications. In another early study, Johnson, Giannetti, and Nelson (1979) surveyed hospital personnel and determined that physicians did not think technology would enhance their professional prominence or their availability and time for patient therapy. Theis (1975) ranked physicians third in the demonstration of positive attitudes among hospital personnel in his measurement of attitudes toward computers pre- and post-implementation of a hospital information system.

In comparing physicians, lawyers, public accountants, and pharmacists, Zoltan and Chapanis (1982) determined physicians to be neutral in attitude. Lawyers were the most negative whereas public accountants and pharmacists were the most positive (Zoltan-Ford, 1984). More unfavorable attitudes were found among professional personnel, especially physicians, in Grann's (1982) measurement of resistance to an automated patient appointment system in a hospital's ambulatory care clinic. Personnel with less

than a college degree and younger personnel exhibited the most favorable attitudes (Grann, 1984).

Other researchers have also contributed to an understanding of physicians' attitudes toward computer technology in health care delivery. They assessed users' attitudes, perceptions, acceptance, or resistance of existing technologically-based health care delivery systems. "Past research that has focused on receptivity to computer applications in hospital settings found that potential users shied away from clinical uses and instead saw the greatest potential for computers in the administrative arena" (Dlugacz, Siegel, & Fischer, 1981, p. 800). It has been estimated that 45 percent of technologically-based medical information systems fail because of user attitudes, resistance, and sabotage (Dowling, 1980).

Teach and Shortliffe's (1981) study provided results to ". . . counter the common impression that physicians tend to be resistant to the introduction of clinical consultation systems" (p. 556). The results, however, also indicated that physicians possess more favorable attitudes toward technologically-based clinical aids that enhance patient management capabilities. In contrast, they oppose technologically-based clinical aids that encroach on their clinical management role (Teach & Shortliffe, 1981). This study is supported by Singer et al. (1983). Additionally, Dlugacz et al. (1981) studied

not only the physicians' attitudes toward a computerized drug review system, but also the clinical environment and the clinicians' job satisfaction. Their findings reflected a positive attitude toward the use of computers in the clinical practice arena (Dlugacz et al., 1981). In testing EMERGE, a rule-based expert system designed as a decision-making aid for analysis of patients with chest pain, Hudson and Cohen (1985) determined that user interface is the decisive component in the use of medical consultation systems by physicians. Johnson, Williams, Giannetti, Klinger, and Nakashima (1978) concluded that failure to prepare and provide a rationale for change contributed to clinicians' rejection of a computer system in a mental health facility. Barrett, Barnum, Gordon, and Pesut (1975) concluded that acceptance of hospital information systems was also somewhat dependent on the physicians' speciality and department of employment.

Research regarding attitude measurement during pre- and post-technological implementation revealed that attitudes can be meaningfully predicted regarding system implementation and training, and that attitudes can be constructively altered over a period of time (Counte, Kjerulff, Salloway, & Campbell, 1983; Kjerulff, Counte, Salloway, & Campbell, 1982, 1983; Kjerulff, Counte, Salloway, Campbell, & Noskin, 1984; McCracken, Stoner, Quinn, & Hokanson, 1982; Thoren, Smith, & Gould, 1969). A

negative attitude can result in resistance, refusal to use the system, and sabotage, thus affecting health care costs and quality of patient care management (Champion, 1975; Dowling, 1980; Hogdon & Hutchinson, 1979). In a survey of 32 clinical applications of technological systems reported in the medical literature over a five-year period, 19 percent were in routine use with 51 percent being abandoned (Friedman & Gustafson, 1977). However, a recent report by the United States General Accounting Office predicted that by 1990, 50 percent or approximately 900 of the larger short-term general hospitals with 200 plus beds will be installing hospital information systems (U.S. General Accounting Office (1980). In contrast, for physicians affiliated with hospitals using hospital management information systems, only 20 percent used the systems for medical order entry (Anderson, Gray-Toft, Lloyd, & Jay, 1981).

Dowling's (1980) three examples of sabotage illustrated five types of interference: passive, oral defamation, alleged inability to operate the system, data sabotage, and refusal to use the system. The measurement of attitudes during the adoption period makes it possible to identify health care personnel with negative attitudes. The information can be used to identify potential problem areas, plan for orientation programs or special training, predict employee retention and turnover, and assure

constructive participation during system implementation. Furthermore, the relative variability or stability of attitudes as measured over time can impact attitude modification strategies (Theis, 1975). Adaptation to system implementation occurs over an extended period of time; therefore, longitudinal studies are necessary. Over extended periods of time, modification of negative views can occur. However, some employees with negative views do choose to terminate their employment rather than cope with the subsequent changes accompanying system implementation (Kjerulff, Counte, & Salloway, 1986; Kjerulff et al., 1981). Thus, attitude measurement during the adoption and implementation period was evident in studies regarding pre- and post-technological implementation and in studies regarding the impact of technological systems on health care personnel and work performance.

In an early study of hospital personnel attitudes toward technologically-based systems and perceived contributions of system activities, the results suggested that attitudes can be anticipated through biographical data analysis, and new experiences with technology can readily modify existing attitudes (Theis, 1975). For example, attitude measurement revealed negative attitudes toward technology among small, rural hospital personnel. "Among personnel classifications, technicians exhibited the most positive attitudes toward computer-based systems, followed

by administrators, physicians, secretarial/clerical and nurses in that order" (Theis, 1975, p. 21). Furthermore, males were more positive than females. However, the researchers suggested that it was unclear whether sex was directly related to attitudes. Personnel with previous education, training, and/or experience regarding computer technology were positive on the average. From a statistical standpoint, however, these same personnel were not significantly different from personnel with no previous education, training, or experience. Positive attitudes were associated with education and employment in health care. No relationship was found between age and attitudes.

In contrast, Grann (1984) found age to be inversely related to positive attitudes, but age was confounded by the influence of education. Theis' (1975) results also suggested that current experience with technology was more influential than long-standing preconceptions. Accordingly, favorable experiences with technology could modify initial negative attitudes. However, without continuing positive reinforcement, initial positive attitudes could rapidly deteriorate (Theis, 1975).

In another study predicting employee adaptation to the implementation of a medical information system, Counte et al. (1983) and Kjerulff et al. (1982) concluded that individuals who accept change, prefer structure, and hold

a positive attitude toward computer technology tend to adapt to technological implementation. The results of one attitude instrument, used in assessing attitudes toward computers in general, prior to technological implementation, were a significant predictor of the degree of employees' positiveness toward job changes created by technological implementation and the degree of employees' desire for technological training. The results of another attitude instrument, used in assessing attitudes toward a specific technological system prior to implementation, were also a significant predictor of perceived competence at using the system and the overall evaluation of technological training (Kjerulff & Counte, 1984a, 1984b). In one longitudinal study of employees' attitudes over time, employees were positive toward computers in general, prior to implementation, and they were positive toward the specific technological system, prior to implementation, six months, and one year post-implementation. Although there was a decrease in favorability after implementation, the researchers suggested that the results reflected a realistic adjustment of technological expectations based on actual use of the system (Kjerulff & Counte, 1984a).

In another long-term study of a computerized drug review system, no relationship was found between perceptions of work conditions and attitudes toward computer technology. However, it was determined that physicians

who used the computerized drug review system held more positive attitudes than physicians who did not use the system (Alexander & Siegel, 1984; Dlugacz et al., 1981). Grann's (1984) results also supported the assumption that actual system users hold more favorable attitudes. Kaplan's (1986) multi-disciplinary longitudinal study regarding the impact of a technologically-based commercial clinical laboratory system in a Midwestern university medical center indicated that personnel's evaluation of system impact varied with their need perception.

Inherent in the body of literature regarding biomedical innovation diffusion and the significance of medical culture, practice, and social structure were three assumptions. The first assumption was that "the more compatible a medical computer application is with practices and culture (values) of medical worker, the more likely it is to be adopted" (Kaplan, 1982, p. 84). Second, differences in practice and values among specialties, such as internal medicine and surgery, in functional areas such as academic medicine and research, and in departmental products and operations impact adoption and implementation (Kaplan, 1982a). Third, "the more compatible a medical computer application is with the structure of medical institutions, the more likely it is to be adopted. American medical institutions characteristically are decentralized and have two lines of authority" (Kaplan, 1982a, p. 86).

Social network analysis, permitting the systematic description of stable relationship patterns among physicians, was used as a theoretical and empirical approach by researchers to explore factors affecting physician utilization of technological systems (Anderson & Jay, 1987; Coleman, Katz, & Menzel, 1966; Stross & Harlan, 1979); Use of this approach allowed for the examination of the effect of structures through which information and influence moved among physicians regarding technological system utilization. It also allowed for the predictability of physicians' acceptance and utilization of biomedical innovations, and it afforded the identification of influential physicians necessary for involvement in change orientations (Anderson, Gray-Toft, Lloyd, & Jay, 1981). Research indicated that ". . . physicians rely heavily upon their peers in medical decision making and for information concerning new medical practices" (Anderson, Jay, Schweer, Anderson, & Kassing, 1986, p. 1056).

Two distinct patterns were revealed using social network analysis of physician groups and utilization of technological systems. The first pattern was that direct physician involvement in the adoption and implementation decision of a hospital information management system leads to higher utilization. Second, physicians with heavy patient caseloads and direct involvement in house staff teaching also use technological systems more (Anderson,

Gray-Toft, Lloyd, & Jay, 1981). "Since the house staff are trained to use the computer system, they may have a significant effect on their mentors' attitudes toward and willingness to utilize the computer system" (Anderson, Gray-Toft, Lloyd, & Jay, 1981, p. 795). Two hypotheses of studies using social network analysis were supported. First, the physicians, who were located at the center of the physicians' social network, had a significant effect on other physicians' attitudes and practices. Second, physicians located on the periphery of the physicians' social network and who possessed looser collegial relationships were the least likely to support innovations (Anderson, Gray-Toft, Lloyd, & Jay, 1981).

Apparently, physician network location had a highly significant effect on computer utilization which was independent of the other variables such as individual characteristics of the physicians. In a study of 24 physicians, it was also determined that other significant influences were defined as: (a) participation in outside professional activities, (b) the physicians' speciality, and (c) the age and physicians' patient caseload. For example, older physicians who were internists and oncologists and had heavier patient caseloads had favorable attitudes toward utilization of the technological system (Anderson & Jay, 1985). Concomitantly, studies have shown that the insidious diffusion of biomedical

innovation was related also to physicians' perceptions of the technological systems' effects on clinical practice (Anderson & Jay, 1987). Interaction with colleagues also significantly influenced these perceptions of effects on clinical practice (Anderson, Jay, Schweer, & Anderson, 1985). In a study of 270 physicians on the medical staff of a large, private, teaching hospital, physician attitudes: (a) influenced the use of a hospital information system, and (b) influenced decisions to develop personal order sets for tailoring the system to the physicians' individual practice (Anderson, Jay, Schweer, & Anderson, 1985).

Attitudes of Nurses Toward Computer Technology

It has been generally accepted that the implementation of technological innovations would benefit nursing education, administration, research, and clinical practice. It was evident from a historical review of the nursing literature regarding technological innovation diffusion that a beginning awareness of the significance of technological innovations existed. In 1961, the first article describing the advent of automated patient care monitoring appeared in the nursing literature which addressed nursing practice (Chow, 1961). By the 1970s, descriptions of nursing information systems and hospital information systems were beginning to appear also in the

nursing literature (Cook & McDowell, 1975; Somers, 1971). Concomitantly, nursing educators were addressing the use of technological innovations in the educational environment (Bitzer, 1966; Bitzer & Boudreaux, 1969; Geis & Anderson, 1963; Reed, Collart, & Ertel, 1972; Seedor, 1963). By the 1980s, special technological innovation interest groups were formed, and nurses were presenting papers at local, state, national, and international conferences regarding biomedical innovations (Blum, 1982; Dayhoff, 1983; Stead, 1987).

Awareness of computer technology, however, did not necessarily result in the adoption and implementation of technological innovations. Although there was evidence in the nursing literature of a beginning awareness of technological innovations, there was also evidence of an insidious diffusion of technological innovations for educational, administrative, research, and clinical practice purposes in nursing. The debate, sparked by Birckhead (1978), has continued regarding the human-machine interface and the "technetronic age." The nursing literature revealed that attitudes regarding the human-machine interface was one factor influencing the slow diffusion of technological innovations among nursing personnel and educators. "Computer technology is here to stay and nursing education and nursing educators have

some catching up to do in this dynamic technology" (Pocklington, 1981, p. 768).

Numerous individual variables have been proposed to effect the adoption and implementation of technological innovation. Three variables which have been cited repeatedly in the literature were cognitive style, age of the subject, and previous computer experience. In regards to age, younger subjects were more likely to have been exposed to technological innovations. They were more likely also to express more favorable attitudes toward computer technology. The results regarding the significance of age, however, were inconsistent. Age has impacted attitudes toward computer technology in both positive and negative ways (Aydin, 1986; Ball & Hannah, 1984; Kerr & Hiltz, 1982; Reznikoff, Holland, & Stroebel, 1967; Schmitz, 1979; Startzman & Robinson, 1972; Zmud, 1982).

Previous experience, exposure, and knowledge regarding technological innovations have been repeatedly hypothesized as resulting in favorable attitudes toward computer technology. However, results have been diverse (Aydin, 1986; Hodge, 1977; Kerr & Hiltz, 1982; Startzman & Robinson, 1972). Furthermore, consensus also did not exist regarding the significance of cognitive style on attitudes toward computer technology (Aydin, 1986; Morin,

1982; Zmud, 1982). On the other hand, using the Myers-Briggs Type Indicator, Aydin (1986) determined cognitive style to be the only significant predictor of the use of a hospital medical information system among nurses.

Three early studies concluded that nursing personnel were more negative toward computer technology than physicians and other hospital personnel. Another conclusion was that previous experience, exposure, and knowledge of computer technology resulted in favorable attitude toward computer technology. Reznikoff et al. (1967), using a 35-item Likert attitude scale, concluded that staff nurses and nursing students held negative attitudes toward computer technology in the area of loss of control and fear of dehumanization. The results also revealed that males, older subjects, and subjects with some college education held positive attitudes. Employees of the psychiatric institution for more than 10 years and less than one year also held negative attitudes (Reznikoff et al., 1967). Several other later studies also concurred that positive attitudes toward computer technology among health care professionals were correlated with high levels of education (Brodt & Stronge, 1986; Friel, Reznikoff, & Rosenberg, 1969; Theis, 1975).

A follow-up experimental study using a quasi-experimental design regarding exposure to computer technology by student nurses revealed no significant difference in

attitudes toward computer technology prior to exposure. The experimental group, however, which was exposed to computer technology, demonstrated a significant positive change in attitude after exposure (Rosenberg, Reznikoff, Stroebel, & Ericson, 1967). Third, a study of hospital personnel at the University of Southern California revealed that nursing personnel and nursing students were more negative than physicians. Education was also determined to be a significant background variable. Interestingly, the type of education such as a liberal arts focus versus a nonliberal arts focus was a significant correlate with attitudes toward computer technology. Nursing personnel also perceived computer technology as an employment threat, were the least willing to use it, and did not perceive computer technology as a solution to health care delivery problems (Startsman & Robinson, 1972).

A later study by Friel, Reznikoff, and Rosenberg (1969), measuring nursing personnel's attitudes, determined that duration of employment and level of education were significant variables. Negative attitudes were held by nurses employed more than 10 years and less than 1 year. Favorable attitudes were also held by employees with higher levels of education (Friel et al., 1969). A replication of the Startsman and Robinson (1972) study seven years later, in another large medical center, revealed similar results regarding nursing personnel and

nursing students' attitudes. The majority of hospital personnel exhibited a positive attitude, and the subjects with positive attitude scores also had previous experience, exposure, and knowledge regarding computer technology. An interactional model was proposed from the results of a study of the effects of a structured course regarding computer technology on personnel's attitudes and knowledge (Klonoff & Clark, 1975). Favorable computer attitudes and relevant computer attitudes comprised the two dependent variables while involvement and knowledge were the two independent variables. In addition, the results also determined that the most significant differences in personnel's attitudes were related to lack of efficiency, problems in the work environment, and fear of dehumanization (Klonoff & Clark, 1975). Klonoff and Clark's (1975) results also supported the conclusions of Rosenberg, Reznikoff, Stroebel, and Ericson (1967) and of Melhorn, Legler, and Clarke (1979) that exposure to applications of technology for health care delivery resulted in more favorable attitudes toward computer technology.

Educational preparation, the type of nursing unit, and the length of service in the nursing profession were also determined to be significant variables in a recent study of nurses' attitudes toward computerization in a Midwestern community hospital (Brodt & Stronge, 1986).

The finding of educational preparation as a significant variable supported previous studies demonstrating that more favorable attitudes were associated with higher levels of education (Friel, Reznikoff, & Rosenberg, 1969; Reznikoff, Holland, & Robinson, 1967; Startzman & Robinson, 1972; Theis, 1975). The second significant finding regarding the correlation between more favorable attitudes and greater number of years in the nursing profession supported Theis' (1975) results. In Theis' (1975) study, using a Thurstone attitude scale to measure 146 hospital employees' attitudes, employment in the health care field, employment at the given hospital, and high levels of education were correlated with positive attitudes. Nurses also held more negative attitudes than other hospital employees (Theis, 1975). The third finding which had not been documented before in the literature was that nursing unit type was significant in the attitude demonstrated. For example, medical-surgical nurses held more negative attitudes than did rehabilitation-pediatric nurses and nurses in administration (Brodt & Stronge, 1986).

In contrast, a survey of personnel at El Camino Hospital, Mountain View, California, regarding the retention of an implemented medical information system revealed positive attitudes among 316 nurses. Physicians, however, held the least favorable attitude (Giebink & Hurst, 1975;

Hodge, 1977). Role ambiguity, personality attributes, previous history of job mobility, the subject's work shift, and attitudes toward computers in general were significant variables in a study determining 68 employees' attitudes prior to implementation of a management information system and six months after implementation. These variables explained the variance in adaptability to the implementation of the management information system (Counte, Kjerulff, Salloway, & Campbell, 1983).

One purpose of Higdon's (1973) study of both military and civilian professional medical personnel in Southern California was to determine the variation of professional medical personnel's attitudes toward the use of computer technology in four patient management areas: record handling, diagnosis, patient monitoring, and treatment planning. The results demonstrated that once again exposure to the use of computer technology resulted in positive attitudes toward computer technology. Acceptance of computer technology use in a specific patient management area was also dependent upon the professional medical personnel's specific occupation. For example, physicians were accepting of automated record keeping, but they were not accepting of automated medical diagnoses. In contrast, nurses were accepting of automated diagnoses but not of automated record keeping (Higdon, 1973). During the initial implementation of a computerized arrhythmia

monitoring system in a critical care unit at St. Joseph Hospital in Omaha, Nebraska, the nursing staff expressed negative attitudes toward the technology. These negative attitudes were attributed to three factors: (a) extensive education and training requirements in system operations, (b) time consuming system interfaces, and (c) system reliability. Through operational modifications based on nursing staff feedback and extensive inservice educational programs, positive attitudes toward the system developed (Badura, 1980).

What were nurses' attitudes toward a medical information system five years post-implementation? This was the question asked by nursing administration at Methodist Hospital, Indianapolis, Indiana. The goal was to assess, for redesign purposes, the nursing staff's attitudes toward the Technicon Medical Information System. Favorable attitudes toward the system were determined from the survey. Adequate training, support, periodic inservice education programs, and effective back-up and recovery procedures were also identified as salient components of effective implementation (Brown, 1984). Pillar (1985) assumed a different approach by conducting a pilot study to test a Likert-type instrument measuring technological anxiety. The rationale for the study was based on the assumption that technological anxiety exist. Three reasons were cited for the need of an instrument measuring

technological anxiety. First, the nursing profession must understand and cope with the phenomenon in an effort to ensure quality care and employment satisfaction. Second, the tool could be used for diagnostic purposes to identify personnel experiencing difficulty adjusting to a technologically-based environment. Third, the instrument could be used to measure one component of the nursing unit environment (Pillar, 1985).

Research regarding technological innovations in nursing education has primarily focused on educators' and students' attitudes, knowledge, and experience regarding technologically-based instructional methodology such as computer assisted instruction. Research also has addressed the effectiveness and specific uses of technologically-based instructional methodology (Cleveland, 1985; Conklin, 1983; Delaney, 1986; Felton & Brown, 1985; Merrow, 1984; Ronald, 1982; Thiele & Baldwin, 1985). Murphy (1985) identified five constraints regarding faculty use of computer technology as: cost for hardware and software, time required for instructional development, cost of maintaining equipment, lack of available appropriate software, and lack of faculty expertise in computer technology. In 1985, only three percent of the nursing programs surveyed in the NLN-Faculty Census reported faculty prepared to use technological innovations in nursing education (Goethler, 1985).

Delaney's (1986) findings regarding the acceptance of computer technology as a technological innovation by administrators and faculty in 35 accredited baccalaureate nursing programs in independent colleges in the Midwest supported Ronald (1982) and Johnson's (1983) findings. Attitudes toward computer technology were measured in relation to compatibility, complexity, relative advantage, observability, and divisibility. Attitudes toward computer technology were more positive than negative in all five areas, thus acceptance of computer technology as a technological innovation was evident. Positive attitudes related to the relative advantage of computer technology were significantly correlated with doctoral preparation which also supported the findings of Friel, Reznikoff and Rosenberg (1969), Brodt and Stronge (1986), and Reznikoff, Holland, and Stroebe (1967) regarding the significance of education. The presence of a mainframe computer also influenced positive attitudes related to relative advantage. Other positive findings regarding perceived relative advantage of computer technology in terms of convenience, economic factors, time, costs, benefits, and role change supported the findings of Rogers and Shoemaker (1971). Rogers and Shoemaker (1971) concluded that groups or individual perception of advantage is more salient than the actual or objective advantage. Although acceptance was evident, adoption and implementation of computer

technology as a technological innovation was minimal (Delaney, 1986).

The literature revealed that attitudes toward computer technology among nursing educators and administrators also impacted the educators' desire to become computer literate. Computer literacy among nursing educators and administrators was uncommon (Cox, Harsanyi, & Dean, 1987; Hardin & Skiba, 1982; Ronald, 1983a, 1983b; Saba & McCormick, 1986; Skiba, 1983; Sweeney, 1985). Nursing educators were reluctant to become knowledgeable about computer technology (Armstrong, 1983; Fields, 1983; Mikan, 1984; Ronald, 1982; Spector, 1984; Ziemer, 1983). A criticism of the studies regarding computer literacy among nursing educators and administrators was the lack of use of standardized tests to measure computer literacy learning needs. Basically, the studies relied on attitude measurement and perception of levels of computer literacy (Delaney, 1986). Both Johnson (1983) and Spector (1984) reported that the majority of nursing deans surveyed had minimal knowledge of computer technology and did not judge themselves to be computer literate. Eighty-eight percent of the nursing deans reported faculty fear regarding the adoption and implementation of technologically-based instructional tools (Johnson, 1983).

In support, Thomas (1985) reported that 90 percent of the nursing deans and directors surveyed reported nursing

faculty as functioning at the novice skill level. The Southern Council on Collegiate Education for Nursing survey in 1983 of administrative heads of associate and baccalaureate degree programs in the South supported the need for nursing educators to learn to use computers, learn to develop, select, and evaluate software, and to overcome fears of computer technology (Spector, 1984). Armstrong (1986), in determining present and future competencies for nurse educators in basic and continuing education, identified the need for nurse educators to:

. . . (a) develop an increased awareness concerning technology in health care; (b) obtain skills to operate a microcomputer and to run the various instructional programs, and (c) create more positive attitudes toward microcomputers for their professional development and for sharing with their learners. (p. 39)

In an effort to develop a curriculum framework for faculty development, Ronald (1982), using the Startzman and Robinson Attitude Scale (1972), investigated nursing educators' attitudes toward computer technology and learning need perceptions regarding curriculum content about computer technology.

Positive attitudes were evident for the dimension regarding general evaluation of whether computers were necessary, good, and efficient, Factor I. Willingness to use or accept the use of computer technology, Factor II, produced the least positive attitudes. The findings regarding Factors I and II also supported Startzman and

Robinson's (1972) and Melhorn, Legler, and Clarke's (1979) findings. The nurse educators also reported having a low level of knowledge about computer technology but desired a high level of knowledge (Ronald, 1982). Variables such as age, previous computer related instruction, or the program in which they taught produced no significant difference in the educators' attitudes toward computer technology. In Ronald's (1983a, 1983b) guidelines for the development of computer literacy programs for nursing educators and students, self-assessment regarding attitudes, knowledge, and experience with computer technology was identified as a major component.

Kadner (1984) identified attitudinal change among a 30-member faculty of the University of Texas at El Paso College of Nursing as necessary for the introduction of computer-assisted instruction. "The traditional conservative academic community is not exempt from negative attitudes, often related to fear of the unknown" (Kadner, 1984, p. 349). The implementation of persuasive and re-educative strategies was successful in modifying faculty attitudes. The diverse strategies addressed the nursing educators' fears, concerns, learning needs, and included recognition of the value of the educators' professional experience and knowledge (Kadner, 1984).

Furthermore, a 1984 Nursing Life poll of nurses in the United States and Canada regarding their views toward

computer technology, suggested that planning for technological change should address nurses' fears, concerns, learning needs, and attitudes. Poll results indicated that nurses also favored participation in the design, implementation, and evaluation of technological systems (Editors, Nursing Life, 1985a, 1985b). Additional strategies, designed to foster positive attitudes and decrease fear, could include: (a) using formal and informal communication channels to obtain feedback and provide information, (b) presenting technological innovations in a non-threatening manner, (c) emphasizing technology as a tool, and (d) emphasizing the potential of automation thus enhancing nursing personnel's ability to formulate conclusions regarding the affect on nursing activities (Charters, 1981).

In contrast, Merrow's (1984) study compared nursing educators and nursing service personnel's knowledge and attitudes toward computer technology usage in nursing practice. The results indicated no significant difference between the nursing educators and nursing service personnel's attitudes. More specifically, nursing educators held more neutral attitudes than did the nursing service personnel. Furthermore, no significant relationship was found between nursing educators and nursing service personnel's level of knowledge and attitudes toward computer technology usage in nursing practice. In another

study regarding knowledge of computer technology, Happ (1983) studied the influence of previous exposure to automation on knowledge of computer technology outside the formal training of female senior nursing students. The conclusion was that knowledge was not significantly influenced by prior experience.

Societal demands, intraprofessional decisions, inter-professional expectations and demands, and a pervasive climate of change in society have all contributed to the changes in a profession such as nursing. The nursing profession is an information intensive profession; therefore, technological innovations have created significant changes. "An important aspect of effecting educational change is to consider how values may be threatened by the proposed innovation" (Murphy, 1985, p. 218). The diffusion of technological innovations has been impacted by the nursing profession's culture, values, and clinical practice. Other factors influencing adoption and implementation have included organizational factors, timing, and individual responses to the technological innovation. For example, organizational norms, complexity, degree of formalization, the locus of authority and decision making, the organization's ability to cope with conflict, and interpersonal relations have been cited as significant factors in the innovation diffusion process (Berman & McLaughlin, 1975; Coleman, Katz, & Menzel, 1966; Derr,

1972; Duttweiler, 1983; Hage & Aiken, 1970; Rogers, 1962; Watson, 1967; Wilson, 1966; Zaltman, Duncan, & Holbeck, 1973). Time has been cited as necessary for the diffusion of technological innovations. The significance of timing has included the appropriateness of the technological innovation (1) at a particular time and (2) to the potential adopter and implementer (Rogers & Shoemaker, 1971). In regards to the individual responses of adopters, Hage and Aiken (1970) concluded that subject job satisfaction was related to adoption and implementation of technological innovations.

Aydin (1986) investigated the "relative effects of individual employee traits and social influence on both attitudes toward a medical information system and the use of the system" (Aydin, 1986, p. 2). The subjects were nurses working in similar nursing units. "Social information was defined as the respondents' perceptions of the attitudes of workplace friends, co-workers, and managers toward the MIS" (Aydin, 1986, p. 1). Age, cognitive style, type and level of nursing education, tenure at the hospital, job title, previous computer experience, and number of years in nursing comprised the individual traits measured. Cognitive style was determined to be the only predictor of computer technology use. In addition, social information cues were highly predictive of the respondents' attitudes. There was no significant relationship

between self-reported management information system use and attitudes.

The diffusion of technological innovations in educational and clinical practice environments was also cited as creating role changes for nurse educators (Cox, Harsanyi, & Dean, 1987). Attitudes toward computer technology have facilitated or hindered role changes for nurse educators. Cleveland (1985) proposed that nursing educators' attitudes were one possible restraining force affecting role change in computer-based nursing curricula. Cleveland (1985) described nursing educators' attitudes toward technological innovations in programs where technology had and had not been incorporated into the curricula. Both groups of nursing educators believed that computer technology was the wave of the future and was a medium allowing for individualized instruction/learning and the enrichment of nursing education. The nursing educators in programs where incorporation of computer technology had not occurred also believed that computer technology was an unavoidable technological change (Cleveland, 1985).

Summary

In summary, physicians, in general, possessed positive attitudes toward computer technology. The most favorable attitudes were exhibited toward technology which enhanced patient care delivery. In contrast, the least

favorable attitudes were exhibited toward technology which infringed on the physicians' management role or threatened traditional clinical practice, professional role, and professional status. Because physicians are viewed as key decision makers, their attitudes can impact the adoption and implementation of technological systems. The result could be possible resistance, rejection, sabotage, acceptance, or usage of computer technology. Physicians' attitudes could also be successfully predicted regarding adoption and implementation and could be constructively altered over time. In addition, the majority of literature available regarding attitudes toward technological innovations among physicians did not specifically address medical educators' as a subject population. Furthermore, none of the studies compared and contrasted the attitudes toward computer technology between nursing and medical educators.

Although the nursing literature revealed a beginning awareness of the significance of technological innovations, it was apparent that an insidious diffusion of technological innovations existed in the nursing profession. Nursing personnel, nursing students, and nursing educators comprised the subject population of studies regarding attitudes toward computer technology among nurses. In contrast to physicians, nurses, in general, held negative attitudes toward computer technology.

Research regarding technological innovations in nursing education focused primarily on educators' and nursing students' attitudes, knowledge, and experience regarding technologically-based instructional methodology such as computer assisted instruction. Although acceptance of technological innovations as efficient, necessary, and unavoidable was evident among nursing educators, adoption and implementation of technological innovations was minimal. In addition, computer literacy among nursing faculty and administrators was uncommon. Although results were diverse, education, age, cognitive style, and previous exposure, experience, and knowledge were the most frequently cited variables. Attitudes toward technological innovations were also impacted by nursing culture, values, and clinical practice. A major concern cited among nurses was the fear of the dehumanization of nursing care delivery.

Based on the findings that attitudes can be predicted and constructively altered, attitude modification and change strategies were numerous. First, specific groups with positive or negative attitudes can be readily identified. Second, identification of the basic components of attitudes can occur. Third, influential medical or nursing educators with positive attitudes can be readily identified, thus facilitating the change process. Fourth, attitude modification and change strategies can be

effectively designed, implemented, and evaluated. Orientation, educational, and training programs can also be effectively designed, implemented, and evaluated. It was evident from a review of literature regarding attitudes toward computer technology that the insidious diffusion of biomedical technology in educational and clinical practice environments will continue to occur unless the impact of nursing and medical educators' attitudes on the human-machine interface is addressed.

Research Questions

The questions regarding this research study were:

1. Is there a difference between nursing and medical educators' attitudes toward computer technology in general?
2. What effect do demographic variables have on nursing and medical educators' attitudes toward computer technology in general?
3. Are nursing and medical educators' attitudes toward computer technology in general influenced by previous experience and education regarding computer technology?
4. Does the use of computer technology in the clinical practice environment influence nursing and medical educators' attitudes toward computer technology in general?

5. What effect does the use of computer technology in the educational environment have on nursing and medical educators' attitudes toward computer technology in general?

In an attempt to focus on these questions, the following hypotheses were posed:

1. There will be no difference between nursing and medical educators' attitudes toward computer technology in general.

2. Demographic variables will have no significant effect on nursing and medical educators' attitudes toward computer technology in general.

3. Previous experience and education regarding computer technology will have a significant effect on nursing and medical educators' attitudes toward computer technology in general.

4. The use of computer technology in the clinical practice environment will have a significant effect on nursing and medical educators' attitudes toward computer technology in general.

5. The use of computer technology in the educational environment will have a significant effect on nursing and medical educators' attitudes toward computer technology in general.

Definition of Terms

The following definitions were used for the purpose of this study.

Attitude--"A learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object" (Fishbein & Ajzen, 1975, p. 6).

Computer Technology in General--Any computer-based technology (e.g., hardware, software or system) used for personal or professional use (e.g., word processing, data analysis, or record keeping). "In general" connotes multiple purposes rather than a specific product, system, or use.

Nurse Educator--A registered professional nurse teaching part time or full time in a School of Nursing offering a baccalaureate degree in nursing.

Medical Educator--A licensed physician teaching part time or full time in a School of Medicine offering a medical degree.

Experience with Computer Technology--The number of formal contact hours spent using computer technology for personal or professional purposes.

Education About Computer Technology--The number of contact hours spent learning about computer technology for personal or professional purposes.

Clinical Applications of Computer Technology--The use of computer technology in nursing or medicine for the purpose of health care delivery.

Educational Applications of Computer Technology--The use of computer technology in a school of nursing or medicine for the purpose of education.

Attitudes Toward Computers in General--A 20 bipolar semantic differential rating scale designed by Kjerulff and Counte (1984b) to measure attitudes toward the general concept of computers.

Computer Attitude Profile--A profile designed by Harsanyi (1987) to obtain information regarding demographic variables, experience with computer technology, education about computer technology, clinical applications of computer technology, and educational applications of computer technology.

Conceptual Framework

Innovation was defined as ". . . an idea, practice, or object perceived as new by an individual or other relevant unit of adoption" (Anderson & Jay, 1987, p. 114). Diffusion was defined as "the process by which a technology (or procedure) enters and becomes part of the health care system" (Banta, 1984, p. 65). It was generally assumed that research and development precede the diffusion stage.

Several models were evident in the innovation diffusion literature: the linkage model (Havelock, 1969), the problem-solving model (Jung & Lippitt, 1967; Lewin, 1947, 1951; Lippitt, Watson, & Westley, 1958; Watson, 1966), and the social interaction model (Coleman, Katz, & Menzel, 1966; Rogers, 1962). The classic innovation diffusion model emphasized four primary components: time, communication channels, the innovation, and the members of the social system. The literature regarding research on innovations in organizations revealed a shift from the classic model focusing on organizational innovativeness to a new approach focusing on the innovation process (Anderson & Jay, 1987; Rogers, 1981).

Roger's (1962) theory of diffusion and adoption, extrapolated from Lewin's work, was the social interaction model used for this study's conceptual framework. The five stages of Roger's theory included the following: awareness, interest, evaluation, trial, and adoption. Rogers described the awareness stage as occurring when:

. . . the individual is exposed to the innovation but lacks complete information about it. The individual is aware of the innovation, but is not yet motivated to seek further information. The primary function of the awareness stage is to initiate the sequence of later stages that lead to eventual adoption or rejection of the innovation. (Rogers, 1962, pp. 81-82)

The interest stage, closely linked with the evaluation stage, was characterized by a general favoring of the

innovation, but the utility of the innovation for the individual's specific situation was not yet determined. During this stage, interest resulted in the acquisition of more information about the innovation. This was the stage at which positive or negative attitudes were generally first elicited (Rogers, 1962).

Rogers described the evaluation stage as a period when ". . . the individual mentally applies the innovation to this present and anticipated future situation, and then decides whether or not to try it" (Rogers, 1962, p. 82). The evaluation process was also characterized by five aspects: relative advantage, compatibility, complexity, divisibility, and observability (Rogers & Shoemaker, 1971). In the determination of the relative advantage, the perception of the innovation advantages was more salient than the actual or pragmatic innovation advantages. The rapidity of adoption was directly influenced by the perceived innovation advantages (Rogers & Shoemaker, 1971). Evaluation using compatibility was typically based on economic factors, convenience, role/system change, and time issues. Complexity regarded innovation characteristics which created the level of learning difficulty for the individual or group. Complexity was inversely related to the rate of adoption. Divisibility regarded the innovation's ability to be tested or tried on a small scale. Innovations tested on a small scale

initially have a higher rate of being accepted at a later date. Observability related to the degree of visibility of the innovation to the adopters as well as to outsiders. Highly visible results of the innovation lead to an enhanced adoption rate (Rogers, 1962, 1981; Rogers & Shoemaker, 1971).

The trial state occurred when:

. . . the individual uses the innovation on a small scale in order to determine its utility in his/her own situation. The main function of (this) stage is to demonstrate the (innovation) in the individual's own situation and determine its usefulness for possible adoption. (Rogers & Shoemaker, 1971, p. 85)

The adoption stage was defined as the ". . . continued use of the innovation in the future" (Rogers, 1962, p. 84). The results of the trial stage influenced the decision to adopt or reject the innovation.

In summary, Roger's social interaction model was used for this study. The study focused on the members of the health care delivery social system, medical and nursing educators, and their attitudes regarding computer technology in general. It also focused on the particular characteristics of the adopters. Rationale existed for (a) comparing the attitudes toward computer technology in general between medical and nursing educators, (b) recognizing the influence of demographic factors, (c) recognizing the influence of previous experience and education regarding computer technology, and (d) recognizing the

influence of the usage of computer technology in educational and clinical practice environments.

In conclusion, numerous technological applications for health care delivery are cited in the literature, but there remains an insidious diffusion of biomedical innovations among health care professionals and educators. The literature on biomedical innovations emphasizes the significance of attitudes toward computer technology in facilitating or impeding the adoption and implementation of computer technology. Problems regarding attitudes toward computer technology presented by the human-machine interface create the necessity for attitude assessment. It is the challenge of health care professionals to use technological innovations to creatively meet society's health care needs. It is the responsibility, accountability, and authority of nursing and medical educators to prepare the present and future generations of health care professionals to accept this challenge.

CHAPTER II

METHODS AND PROCEDURES

The focus of this descriptive study was to assess and compare the attitudes toward computer technology between nursing and medical educators. The study was also designed to investigate: (a) the significance of demographic characteristics on positive or negative attitudes, (b) the significance of previous experience and education regarding computer technology on attitudes, and (c) the significance of the usage of computer technology in the educational and clinical environments on attitudes.

Assumptions

Certain assumptions were made in selecting the research design and the subjects for this study. They were as follows:

1. An individual's perception of, acceptance of, and resistance to automation is undoubtedly related to his attitude toward automation (Hoppe & Berv, 1967).

2. The "Attitudes Toward Computers in General" questionnaire accurately measured nursing and medical educators' attitudes regarding the general concept of computers (Kjerulff & Counte, 1984b).

3. The "Computer Attitude Profile" accurately determined information regarding demographic variables, experience with computer technology, education about computer technology, clinical applications of computer technology, and educational applications of computer technology (Harsanyi, 1987).

4. The subjects' self-report responses on both the "Computer Attitude Profile" and the "Attitudes Toward Computers in General" were credible when the following conditions were met: (a) the form in which the answers were to be given was appropriate, (b) the questions were clearly stated, and (c) the subjects had the background necessary to answer the questions.

Instrumentation

The instrument chosen to measure nursing and medical educators' attitudes toward computer technology in general in this study was the "Attitudes Toward Computers in General" questionnaire developed by Kjerulff and Counte (1984b) (see Appendix A). It was developed to measure attitudes toward the general concept of computer technology. The questionnaire was developed and used initially as a primary instrument in research regarding the attitudes of health care personnel toward computer technology prior to computer exposure, training, and pre-implementation of a technologically-based system. Research in which the instrument was used indicated that

pre-existing attitudes toward computer technology among health care personnel contributed significantly in the prediction of adaptation to the implementation of technologically-based systems (Counte, Kjerulff, Salloway, & Campbell, 1983; Kjerulff & Counte, 1984a, 1984b; Kjerulff, Counte, & Salloway, 1986; Kjerulff, Counte, Salloway, & Campbell, 1981, 1982, 1983; Kjerulff, Counte, Salloway, Campbell, & Noskin, 1984; Kjerulff & Pillar, 1984). The items selected for the questionnaire were chosen on the basis of face validity. The Cronbach's Alpha for the instrument was determined to be .85 (Kjerulff and Counte, 1984b). To examine the reliability and validity of the "Attitudes Toward Computers in General" questionnaire, the instrument was also used in a study with 45 senior nursing students to examine the reliabilities and convergent validities of five different instruments measuring attitudes toward computer technology. The Cronbach's Alpha for the instrument in this study was .87 (Kjerulff & Pillar, 1984). The instrument was also used by this researcher in a pilot study of 38 Texas Tech University Health Sciences Center's nursing and medical educators.

A 20-bipolar semantic differential type rating scale comprised the "Attitudes Toward Computers in General" questionnaire. The subjects responded to a cue, "Computers are, in general." Seven-point rating scales, such as good 1 2 3 4 5 6 7 bad, were used. A total score for

each subject was derived by reversing the negative items and summing over the 20 items. In the questionnaire, numbers 1, 2, 3, 5, 7, 9, 10, 11, 14, 16, 19, and 20 were the items which were reversed. The range of scores could be 20, indicating extremely negative attitudes, to 140, indicating extremely positive attitudes toward computer technology. A score of 80 indicated a neutral point (Kjerulff & Counte, 1984b).

The subjects were also asked to complete the "Computer Attitude Profile" developed by Harsanyi (1987) to obtain information regarding demographic variables, experience with computer technology, education about computer technology, clinical applications of computer technology, and educational applications of computer technology (see Appendix A). Questions one through nine addressed basic demographic information. Demographic information included the following: age, sex, highest level of education, profession, position title, years as an educator, years as a physician or nurse, and area of clinical specialty/practice. The choices for age ranged from 25-30 to 76+, and 14 choices for the highest level of education were included. Because subjects were representative of only two groups, the profession category included only two choices: medical educator or nursing educator. Due to the anticipated diversity of academic titles and areas of clinical specialties/practices, the

subjects were asked to write in the requested information. Choices from 0-5 to 30+ were the choices available for the category regarding years as an educator, nurse, and physician.

Questions 10 and 11 addressed previous experience with computer technology for personal use or for health care delivery and/or health care education purposes, and the subjects were to answer either "yes" or "no." The number of contact hours of formal education regarding computer technology, encompassing both theoretical and actual "hands on" education, was addressed in questions 12 and 13. Continuing education, faculty development, in-service education, workshops, and lectures were used as examples of formal education regarding computer technology. The number of contact hours ranged from none to 42+. Questions 14 and 15 addressed the use of computer technology in clinical practice. The subjects were to check as many of the 18 choices as applied and were also requested to identify the number of hours the technology was used in clinical practice. Question 16, including 16 options, and question 17 addressed the type of technology used in the educational environment and the number of hours computer technology was used for education purposes.

Research Design

This descriptive study used a comparative, correlational survey design and a stratified random sampling

technique. Descriptive research was defined as present-oriented research accurately describing what is and analyzing facts obtained regarding the problem under study. Further research designs can then be developed and tested experimentally, thus contributing to further theory development (Notter, 1974). The advantages of a descriptive design were: (a) exploration of natural setting conditions without influencing the subjects' characteristics, (b) association of diverse factors with one another, (c) effective and efficient methods for collecting large volumes of data, and (d) application of natural setting results to other actual situations. The major disadvantage of the descriptive research design was the inability to establish casual relationships due to the inability to control extraneous variables (Cornett & Beckner, 1975; Notter, 1974; Waltz & Bausell, 1981). The comparative descriptive survey design was chosen because the same information, attitudes toward computer technology in general, was obtained from a representative sample of two groups, nursing and medical educators, and their attitude scores were compared. The correlational descriptive survey design was selected because the study determined the significance of the following independent variables on attitudes toward computer technology in general: demographic characteristics, previous experience and education regarding computer technology, and the usage of computer

technology in educational and clinical environments. A pilot study was conducted to assist in the refinement of the problem, hypotheses, data collecting methods, and instrumentation.

Subjects

The subjects in this study were full-time or part-time nursing and medical educators teaching in a school of nursing, offering a baccalaureate degree in nursing, or in a school of medicine in the State of Texas. There were approximately 6,322 medical faculty and 801 nursing faculty in 8 medical schools and 25 schools of nursing offering baccalaureate programs in the State of Texas (see Appendix B). The total approximate number of 7,123 faculty was determined by counting the number of medical and nursing faculty listed in the faculty rosters in the most current university or college catalogs available from each of the medical and nursing schools. A roster of names was compiled from this source and comprised the total population for this study.

Data Collection

The sampling procedure was accomplished by implementing a stratified random sampling technique. To include approximately seven to eight percent of this total population, every thirteenth faculty name was selected from the faculty rosters. This process resulted in a total of 486

medical faculty and 62 nursing faculty as the subjects of this study. A survey packet was mailed in October 1987 to the 486 medical faculty subjects and the 62 nursing faculty subjects, thus resulting in a total of 548 mailed survey packets. The survey packet included a cover letter, the "Attitudes Toward Computers in General," and the "Computer Attitude Profile" (see Appendix A). Anonymity of subjects' responses was assured, and a self-addressed, stamped envelope was included for response returns. Copies of the study results were also offered to the subjects if they indicated such in their survey returns. The requested return date was November 6, 1987, and 131 medical faculty and 46 nursing faculty returned the questionnaires for a N of 177 subjects and a 32.3 percent return rate. A follow-up survey was not implemented.

Variables

The score obtained from the "Attitudes Toward Computers in General" questionnaire was the dependent metric variable. Subjects quantified their attitudes toward computer technology through their responses on the "Attitudes Toward Computers in General," a 20 bipolar semantic differential type rating scale developed by Kjerulff and Counte (1984b). Seven-point rating scales, such as good 1 2 3 4 5 6 7 bad, were used. A total score for each subject was derived by reversing the negative items and

summing over the 20 items. In the questionnaire, numbers 1, 2, 3, 5, 7, 9, 10, 11, 14, 16, 19, and 20 were the items which were reversed. The total scores could range from 20 to 140. A score of 80 indicated a neutral point, a score of 20 an extremely negative attitude, and a score of 140 an extremely positive attitude (Kjerulff & Counte, 1984b). The independent variables were as follows: the demographic data, experience and education regarding computer technology, and the usage of computer technology in educational and clinical environments. Demographic information included the following: age; sex; highest level of education; profession; position title; years as an educator, physician, or nurse; and area of clinical specialty/practice. The data regarding the independent variables were obtained from the "Computer Attitude Profile."

Statistical Methods

The comparison of the attitudinal differences between nursing and medical educators was determined by the use of a t-test. The attitudinal scores, the dependent variable, were used as an indicator of attitudinal differences. The dependent variable was determined by the overall score on the "Attitudes Toward Computers in General questionnaire."

The parametric statistic, stepwise regression, was used to determine the significance of the demographic

characteristics, previous experience and education regarding computer technology, and the usage of computer technology in educational and clinical environments. The determination of the composite or combination of independent variables as related to the dependent variable was accomplished by using stepwise multiple regression (Cornett & Beckner, 1975; Notter, 1974; Waltz & Bausell, 1981). Due to extreme diversity of answers provided for questions 5 and 9, no statistical analysis was conducted for position/title for area of clinical specialty/practice. Hypotheses were rejected or accepted at the .05 level of significance.

To investigate the attitudes toward computer technology among nursing and medical educators, a descriptive research design was used. The research design was based on four assumptions. A stratified random sampling technique was used to select 548 full-time and part-time nursing and medical educators in Texas. A survey packet which included a cover letter, the "Attitudes Toward Computers in General" questionnaire, and the "Computer Attitude Profile" was mailed and resulted in a N of 177, 131 medical educators and 46 nursing educators. A t-test was used to compare the differences on attitudinal scores between nursing educators and medical educators. A parametric statistic, stepwise regression, was used to determine the significance of demographic characteristics,

previous experience and education regarding computer technology, and the usage of computer technology in educational and clinical practice environments.

CHAPTER III

PRESENTATION AND ANALYSIS OF DATA

This chapter focuses on the report of the findings resulting from the statistical treatment of data collected from the survey. Survey packets were mailed to 548 educators in Texas, 486 medical faculty and 62 nursing faculty. One hundred and thirty-one medical faculty and 46 nursing faculty returned the survey for a N of 177 and a return rate of 32.3 percent. The data were those collected from the questionnaire, "Attitudes Toward Computers in General," a 20-item bipolar semantic differential rating scale and from the "Computer Attitude Profile," a profile pertaining to demographic variables, previous experience and education regarding computer technology, and usage of computer technology in educational and clinical practice environments. A t-test and stepwise regression analysis were the statistics of choice based on the hypotheses. The characteristics of the subjects are presented, and each of the five hypotheses are analyzed in sequence.

Characteristics of the Subjects

The "Computer Attitude Profile" addressed demographic variables, previous experience and education regarding

computer technology, and usage of computer technology in educational and clinical practice environments. The data collected from this profile were used to describe the characteristics of the subjects. The respondent population was comprised of 177 subjects, 131 (74.0%) medical educators and 46 (26.0%) nursing educators in Texas. The disproportion of medical educators to nursing educators was reflective of the actual proportions of medical educations to nursing educators in Texas. The demographic data included the following: age, sex, highest level of education, profession, position/title, years as an educator, years as a physician, years as a nurse, and area of clinical specialty/practice. The possibility of age range options was between 25-30 to 76+. The majority of the respondents was between the ages of 31-55 (83.6%). The mean age of the subjects was 41 to 45 (24.9%). Two respondents did not indicate their ages. In regard to sex, the study population included 62 (35%) females and 114 (64.4%) males. One respondent did not indicate sex. The majority of respondents (61.6%) had completed the medical doctor (M.D.) degree as the highest level of education. Fourteen options were available for selection, and the options ranged from baccalaureate degree to doctoral level degrees. In regard to years as an educator, 82.5 percent of the respondents had 20 years or less years of experience as an educator with the mean

years of experience being 11 to 15 years. The highest percentage of physicians (27.9%) had been in practice 11 to 15 years with a possible range of less than 1 year to over 30 years. The highest percentage of nurses (33.3%) had been in practice 16 to 20 years with a possible range of less than 1 year to over 30 years. Question 5, position/title, and 9, area of clinical specialty/practice, were not analyzed due to the extreme diversity of responses provided.

In addition, 81.4 percent of the respondents (N = 144) had used computer technology such as word processing and spreadsheets for their personal use. For professional use, 81.4 percent (N = 144) had also used computer technology in educational and clinical practice environments. Additionally, 51.4 percent of the respondents indicated no hours of instruction for professional use and 25.4 percent indicated only one to six hours. In "hands-on" instructional education, 50.3 percent indicated no contact hours and an additional 23.2 percent indicated one to six hours.

Table 1, "Use of Computers in Clinical Practice Environments by Nursing and Medical Educators," reflects the frequencies and percentages of the types of usage of computer technology by nursing and medical educators in educationally related clinical practice environments, while Table 2, "Use of Computers in Educational Environments by Nursing and Medical Educators," reflects the

TABLE 1

Use of Computers in Clinical Practice Environments
by Nursing and Medical Educators

Factor	Frequency	Percentage
Record Keeping	72	40.7+
Patient Billing	57	32.2+
Patient Assessment	13	7.3
Diagnosing	9	5.1
Medical/Nursing Documentation	22	12.4
Financial	51	28.8
Communication Systems	38	21.5
Network Systems	16	9.0
Treatment Planning	13	7.3
Patient Monitoring	23	13.0
Patient Education	9	5.1
Discharge Planning	10	5.6
Administration	34	19.2
Robot Systems	4	2.3
Expert Systems	4	2.3
Information Systems	60	33.9+
Admissions	36	20.3
*Other	25	14.1

*Even though asked to specify what this other use was, the respondents failed to do so. "Word processing" was indicated; otherwise, the line was left blank.

+Highest percentages.

TABLE 2

Use of Computers In Educational Environments
by Nursing and Medical Educators

Factor	Frequency	Percentage
Authoring Software	11	6.2
Record Keeping	68	38.4
Interactive Video Systems	14	7.9
Computer Managed Instruction	11	6.2
Computer Literary Instruction	10	5.6
*Computer Assisted Instruction	19	10.7
Integration of Computer Concepts Into Curriculum	19	10.7
Word Processing	105	59.3++
Research	79	44.6++
Library Network Systems	75	42.4++
+Other	10	5.6

*Computer Assisted Instruction is broken down into exact types in Table 3.

+Even though asked to specify what this other use was, the respondents failed to do so.

++Highest percentages.

frequencies and percentages regarding the ways nursing and medical educators use of computer technology in the educational environment. Table 3, "Types of Computer Assisted Instruction," provides the frequency and percentages for each of the types of computer assisted instruction. Types of computer assisted instruction include such items as drill and practice, tutorials, simulations, games, and dialogues. In addition, Table 4, "Frequency of Use in Clinical and Educational Environments by Nursing and Medical Educators," combines the responses from questions 15 and 17 from the "Computer Attitude Profile" and allows a comparison of the frequency of use by nursing and medical educators in both clinical and educational environments. Table 4 reflects fairly equal frequency of use in both areas.

Table 5, "Item Analysis of Attitudes Toward Computers in General," records the results from the 20-item bipolar semantic differential rating scale regarding attitudes toward computers in general. To determine the general attitude toward computer technology in general, a total score mean was calculated at 99.7. Based on the original determination of 80 (neutral), 140 (extremely positive), and 20 (extremely negative), this finding would indicate a slightly positive attitude among the respondents. Analysis of individual items on this scale revealed that the respondents indicated they believed computers to be

TABLE 3
Types of Computer Assisted Instruction

Factor	Frequency	Percentage
Drill and Practice	14	7.9
Tutorial	16	9.0
Simulation	16	9.0
Games	5	2.8
Analysis	2	1.1

TABLE 4
Frequency of Computer Use in Clinical and Educational
Environments by Nursing and Medical Educators

Factor	Clinical	Education
Daily	24.9	24.3
Weekly	22.0	30.5
Monthly	14.7	14.7
Total	61.6	69.5
No Answer	38.4	30.5

TABLE 5

Item Analysis of Attitudes Toward Computers in General

Factor	$\bar{x}$	Frequency	Percentage
At 1	6.2		
Value 1 (Bad)		1	.6
2		0	0
3		3	1.7
4		19	10.7
5		5	2.8
6		43	24.3
7 (Good)		100	56.5*
No Response		6	3.4
At 2	3.7		
Value 1 (Inhumane)		32	18.1
2		14	7.9
3		9	5.1
4		75	42.4
5		8	4.5
6		9	5.1
7 (Humane)		21	11.9
No Response		9	5.1
At 3	6.3		
Value 1 (Inefficient)		2	1.1
2		1	.6
3		2	1.1
4		5	2.8
5		12	6.8
6		53	29.9
7 (Efficient)		99	55.9*
No Response		3	1.7
At 4	6.0		
Value 1 (Slow)		4	2.3
2		6	3.4
3		5	2.8
4		13	7.3
5		11	6.2
6		48	27.1
7 (Fast)		87	49.2
No Response		3	1.7

TABLE 5 (Continued)

Factor	$\bar{x}$	Frequency	Percentage
At 5	6.1		
Value 1 (Not Useful)		5	2.8
2		8	4.5
3		2	1.1
4		9	5.1
5		7	4.0
6		39	22.0
7 (Useful)		105	59.3*
No Response		2	1.1
At 6	4.8		
Value 1 (Overpowering)		4	2.3
2		14	7.9
3		20	11.3
4		37	20.9
5		27	15.3
6		44	24.9
7 (Easy to Control)		29	16.4
No Response		2	1.1
At 7	5.7		
Value 1 (Time Consuming)		3	1.7
2		11	6.2
3		7	4.0
4		16	9.0
5		18	10.2
6		46	26.0
7 (Time Saving)		73	41.2
No Response		3	1.7
At 8	3.4		
Value 1 (Complicated)		17	9.6
2		39	22.0
3		43	24.3
4		34	19.2
5		20	11.2
6		13	7.3
7 (Uncomplicated)		9	5.1
No Response		2	1.1

TABLE 5 (Continued)

Factor	$\bar{x}$	Frequency	Percentage
At 9	6.2		
Value 1 (Not Helpful)		3	1.7
2		1	.6
3		9	5.1
4		15	8.5
5		60	33.9
6		87	49.2
7 (Helpful)		2	1.1
No Response		0	0
At 10	3.3		
Value 1 (Cold)		39	22.0
2		21	11.9
3		8	4.5
4		75	42.4
5		7	4.0
6		8	4.5
7 (Warm)		9	5.1
No Response		10	5.6
At 11	5.2		
Value 1 (Not Fun)		8	4.5
2		8	4.5
3		2	1.1
4		34	19.2
5		33	18.6
6		43	24.3
7 (Fun)		44	24.9
No Response		5	2.8
At 12	5.5		
Value 1 (Boring)		5	2.8
2		5	2.8
3		7	4.0
4		25	14.1
5		22	12.4
6		60	33.9
7 (Interesting)		51	28.8
No Response		2	1.1

TABLE 5 (Continued)

Factor	$\bar{x}$	Frequency	Percentage
At 13	3.9		
Value 1 (Rigid)		27	15.3
2		25	14.1
3		18	10.2
4		34	19.2
5		25	14.1
6		24	13.6
7 Flexible)		22	12.4
No Response		2	1.1
At 14	4.0		
Value 1 (Not Creative)		31	17.5
2		18	10.2
3		11	6.2
4		46	26.0
5		20	11.3
6		14	7.9
7 (Creative)		31	17.5
No Response		6	3.4
At 15	6.1		
Value 1 (Destructive)		3	1.7
2		0	0
3		1	.6
4		26	14.7
5		9	5.1
6		47	26.6
7 (Useful)		88	49.7
No Response		3	1.7
At 16	4.4		
Value 1 (Costly)		12	6.8
2		16	9.0
3		20	11.3
4		40	22.6
5		32	18.1
6		29	16.4
7 (Economical)		24	13.6
No Response		4	2.3

TABLE 5 (Continued)

Factor	$\bar{x}$	Frequency	Percentage
At 17	2.9		
Value 1 (Competent)		41	23.2
2		36	20.3
3		21	11.9
4		54	30.5
5		4	2.3
6		6	3.4
7 (Incompetent)		5	2.8
No Response		10	5.6
At 18	5.3		
Value 1 (Frightening)		5	2.8
2		6	3.4
3		10	5.6
4		38	21.5
5		29	16.4
6		34	19.2
7 (Non-Frightening)		53	29.9
No Response		2	1.1
At 19	6.1		
Value 1 (Harmful)		2	1.1
2		3	1.7
3		1	.6
4		12	6.8
5		16	9.0
6		53	29.9
7 (Helpful)		87	49.2
No Response		3	1.7
At 20	5.5		
Value 1 (Unexciting)		4	2.3
2		9	5.1
3		1	.6
4		28	15.8
5		34	19.2
6		46	26.0
7 (Exciting)		53	29.9
No Response		2	1.1
Total - $\bar{x}$	99.7		
- Mode	105.0		
- Median	101.0		

*Highest percentage.

good, efficient, and useful. Based on the expectations provided by the authors of this instrument, the "Attitudes Toward Computers in General" questionnaire, 2 respondents expressed neutral attitudes, 15 expressed negative attitudes, and 158 expressed slightly positive attitudes toward computers in general. There were two missing cases reported.

Statistical Analysis of the Data

This section focuses on the report of the findings resulting from the statistical treatment of the data collected in the study. Each of the five hypotheses is analyzed in sequence.

Hypothesis 1

The first hypothesis was that there will be no difference between nursing and medical educators' attitudes toward computer technology.

To test Hypothesis 1 concerning the differences in attitude between the two subject groups, a t-test was performed utilizing the mean score of nursing educators versus the mean score of medical educators on the "Attitudes Toward Computers in General" questionnaire. Based on the results of the t-test, Table 6, "Differences Between Nursing and Medical Educators' Attitudes," this hypothesis was accepted.

TABLE 6

Differences Between Nursing Educators
and Medical Educators' Attitudes

Variable	$\bar{x}$	t	Df	Prob
Group 1 (Nursing Educators)	102.26	1.34	173	0.182
Group 2 (Medical Educators)	98.78			

Hypothesis 2

The second hypothesis was that demographic variables will have no significant effect on attitudes toward computer technology in general.

In analyzing the effects of demographic variables on attitudes toward computers in general, no valid cases were found; therefore, this hypothesis was accepted.

Hypothesis 3

The third hypothesis was that previous experience and education regarding computer technology will have a significant effect on attitudes toward computer technology in general.

Data analysis was completed through the use of the Statistical Package for the Social Sciences-SPSSX, sub-program regression. Table 7, "Correlation Matrix: Previous Experience and Education Regarding Computer Technology," represents the correlation matrix for previous experience and education. The significant level of correlation coefficient at the 0.5 level with 80 degrees of freedom is .217. With a total N of 177, the significant correlation coefficient would be below .217. The correlation coefficient of .250 or above was accepted as being significant (Cornett & Beckner, 1975).

The findings as illustrated in Table 7 reflect a negative correlation between previous experience regarding

TABLE 7

Correlation Matrix: Previous Experience and
Education Regarding Computer Technology

	CPT	CTH	CONPROHR	CONHANHR	ATCIG
Computer Technology for Personal Use	1.00	.156	-.058	-.134	<u>-.268</u>
Computer Technology for Professional Use, Health Care Delivery or Education		1.00	-.058	-.147	<u>-.326</u>
Contact Hours of Instruction			1.00	.439	.130
Contact Hours of Hands-On Education				1.00	.130
Attitude Toward Computer In General					1.00

Significant correlations with the dependent variable are underlined.

computer technology and attitudes toward computers in general. Education regarding computer technology, however, showed no correlation with attitudes toward computers in general. Determination of how much of the variance of attitudes toward computers in general could be contributed or predicted by the previous experience variables regarding computer technology was answered by use of the stepwise regression program. Table 8, "Regression Summary Table Regarding Personal and Professional Use of Computer Technology," presents the summary table of the regression program.

The combined effect of previous personal experience and previous professional experience explained 15.4 percent of the variance of attitudes toward computers in general. The largest amount of variance in the relationship between previous experience and attitudes toward computers in general was the professional experience with computer technology in health care delivery and education. The correlation matrix, Table 7, shows that this was a negative relationship, that is, as previous experience increases, attitudes toward computers in general decrease. Based on these data, the first part of this hypothesis was accepted regarding previous experience. The second part of this hypothesis was rejected regarding previous education. The negative correlation may be explained by the nature of the type of previous experience encountered.

TABLE 8

Regression Summary Table Regarding Personal and
Professional Use of Computer Technology

Independent Variables	Multiple R	R Square	RSQ Change	Single R	B	Beta
Computer Technology for Professional Use, Health Care Delivery or Education	.326	.106	.106	-.326	-11.281	-.291
Computer Technology for Personal Use	.392	.154	.048	-.268	-8.599	-.222
(Constant)					123.507	

For example, the quality or quantity of experience may have been poor. Furthermore, the availability of software for health care education and clinical practice may have been very fragmented and limited. Health care delivery is an integrated process, and the current availability of integrated software or technologically-based systems is minimal for educational and clinical practice environments.

Hypothesis 4

The fourth hypothesis was that the use of computer technology in the clinical practice environment will have a significant effect on attitudes toward computer technology in general.

Table 9, "Correlation Matrix: Use of Computer Technology in a Clinical Practice Environment by Nursing and Medical Educators," presents the correlation matrix for the use of computer technology in the clinical environment. Table 9 reflects a negative correlation between network system use of computers and attitudes toward computers in general, a positive correlation between using computers for diagnosing and attitudes toward computers in general, and a negative correlation between using computers for patient assessment and attitudes toward computers in general.

Determination of how much of the variance of attitudes could be contributed or predicted by the clinical

TABLE 9

Correlation Matrix: Use of Computer Technology in Clinical
Practice Environments by Nursing and Medical Educators

	Com1	Com2	Com3	Com4	Com5	Com6	Com7	Com8	Com9	Com10	Com11	Com12	Com13	Com14	Com15	Com16	Com17	Com18	Clin Freq	Clin Mist	ATCIC
Record Keeping	1.000	.495	.138	.067	.144	.455	.224	.022	-.161	-.127	.019	.097	-.006	-.033	.054	.054	.040	.098	.303	-.089	-.129
Patient Billing		1.000	.162	.176	-.111	.490	.283	.100	-.003	-.066	-.061	.070	-.053	-.020	-.001	-.001	-.020	.089	.224	.096	.089
Patient Assessment			1.000	.546	.211	.114	.089	.290	-.096	.137	.010	.090	.109	.060	.109	-.165	-.066	.240	.246	.031	-.130
Diagnosing				1.000	.154	.055	.062	.327	-.132	.122	-.016	.168	.187	.091	.166	-.050	.089	.158	.210	-.002	.143
Medical/Nursing Documentation					1.000	.101	.226	.058	-.142	.153	-.115	.221	.249	.040	.225	-.079	.128	.193	.121	.050	-.098
Financial						1.000	.219	.016	-.067	-.036	-.080	.106	.135	.238	-.110	.144	-.048	.010	.096	.032	-.129
Communication Systems							1.000	.413	-.228	-.023	.050	.190	.142	.303	.021	.021	.143	.072	.102	.016	-.158
Network Systems								1.000	-.096	-.046	-.155	.194	.109	.128	.109	.109	.109	.373	-.051	-.010	-.236
Other									1.000	-.086	-.043	-.050	-.132	-.138	-.079	-.079	-.126	.771	-.042	.111	-.078
Treatment Planning										1.000	.109	.317	.573	.079	-.062	.118	-.038	.061	.070	.019	.051
Patient Planning											1.000	.068	.190	.217	-.071	-.071	.216	.131	.044	-.027	-.027
Patient Education												1.000	.425	.227	.356	.151	.121	.130	.103	-.057	.032
Discharge Planning													1.000	.260	-.050	-.050	.089	.241	.163	.018	-.029
Administration														1.000	.037	.172	.055	.077	-.016	-.138	-.038
Robot Systems															1.000	-.030	-.048	.029	.180	-.118	.106
Expert Systems																1.000	-.048	.029	-.114	-.111	.049
Information Systems																	1.000	.144	-.073	-.117	-.073
Admissions																		1.000	.086	-.240	-.039
Frequency of Use In Clinical Practice																			1.000	.153	.136
Clinical Hours																				1.000	.058
Attitudes Toward Computers In General																					1.000

variables was once again analyzed by the use of the step-wise regression program. Table 10, "Significant Independent Variables in the Clinical Practice Environment," presents the summary table of the regression program. Network systems, diagnosing, and patient assessment were the only three variables that loaded into the multiple regression programs. Of these three independent variables, 16.6 percent of the variance was explained by the combined effect. The largest amount of variance in the relationship between clinical use and attitudes toward computers in general was the independent variable, network systems. The correlation matrix demonstrates that two of the variables, network systems and patient assessment, were negative while the other independent variable, diagnosing, showed a positive relationship. Based on this information, the hypothesis was rejected. The results of the data analysis would seem to indicate the same general trend as other findings in this study. That is, medical and nursing educators are sophisticated health care professionals who understand what computer technology can do for them. Software development and technologically-based systems for education and clinical practice, however, have yet to meet their expectations.

TABLE 10

Significant Independent Variables in the
Clinical Practice Environment

Independent Variables	Multiple R	R Square	RSQ Change	Single R	B	Beta
Network Systems	.236	.056	.056	-.236	-13.018	-.307
Diagnosing	.331	.110	.054	.143	20.950	.398
Patient Assessment	.407	.166	.056	-.130	-12.007	-.283
(Constant)					108.961	

Hypothesis 5

The fifth hypothesis was that the use of computer technology in the educational environment will have a significant effect on attitudes toward computer technology in general.

Table 11, "Correlation Matrix: Use of Computer Technology in Educational Environments by Nursing and Medical Educators," presents the correlation matrix for the use of computer technology in the educational environment. As previously stated, a correlation coefficient of .250 or above was accepted as significant. Table 11 reflects a negative correlation between the use of computer technology in the educational environment and attitudes toward computers in general. Record keeping and word processing, in that order, were the only two significant correlations. Determination of how much of the variance of attitudes toward computers in general could be contributed or predicted by the education variables was answered by the stepwise regression program. Table 12, "Significant Independent Variables in the Educational Environment," presents the summary table of the regression program.

Variance (19%) was explained by the combined effect of the use of computer technology for record keeping and word processing in the educational environment. The largest amount of variance in the relationship between

TABLE 11

Correlation Matrix: Use of Computer Technology in Educational Environments by Nursing and Medical Educators

	EdCom1	EdCom2	EdCom3	EdCom4	EdCom5	EdCom6	EdCom7	EdCom8	EdCom9	EdCom10	EdCom11	EdCom12	EdCom13	EdCom14	EdCom15	EdCom16	EdFreq	EdHrs	ATCIG
Authority Software	1.00	.104	.308	-.081	.372	.168	.152	.371	.327	-.037	-.037	.323	.175	-.051	.158	-.076	.123	.038	-.199
Record Keeping		1.00	.038	.168	.191	.062	.146	.088	.122	.004	.004	.248	.260	.136	.100	-.058	.130	-.042	-.349
Interactive Video Systems			1.00	.104	.380	.337	.482	.355	.420	-.045	-.045	.379	.035	.004	.080	.122	-.096	-.410	.009
Computer Managed Instruction				1.00	.487	.354	.206	.275	.327	.210	.210	.235	.105	.013	.032	.304	-.048	-.224	-.079
Computer Literary Instruction					1.00	.237	.477	.524	.503	-.039	-.039	.464	.118	.040	.241	.282	-.051	-.213	-.194
Computer Assisted Instruction						1.00	.573	.593	.523	.140	.140	.384	.132	.023	.000	.190	-.133	-.197	-.064
Drill and Practice							1.00	.598	.599	.164	-.045	.529	.155	.004	.080	.122	.050	-.297	-.031
Tutorial								1.00	.630	.148	.148	.335	.176	-.051	.076	.202	-.030	-.216	-.006
Simulations									1.00	-.043	-.043	.482	.143	-.022	.167	.245	-.019	-.254	-.037
Games										1.00	.492	-.055	.080	-.009	-.130	-.035	.066	-.236	.117
Dialoque											1.00	.128	.080	-.139	-.130	-.035	.155	-.204	-.017
Integration of Computer Concepts Into Curriculum												1.00	.154	.065	.140	.075	.024	-.183	-.231
Word Processing													1.00	.135	.019	.015	.282	.004	-.349
Research														1.00	.334	-.018	-.045	-.184	-.101
Library Network Systems															1.00	.067	-.102	-.103	-.119
Other																1.00	-.091	-.231	-.083
Frequency of Computer Use In Education																	1.00	.160	-.067
Hours of Computer Use In Education																		1.00	-.036
Attitudes Toward Computer In Education																			1.00

TABLE 12

Significant Independent Variables in the
Educational Environment

Independent Variables	Multiple R	R Square	RSQ Change	Single R	B	Beta
Record Keeping	.349	.121	.121	-.349	-8.89	-.277
Word Processing	.439	.193	.072	-.349	-9.93	-.277
(Constant)					128.033	

educational use and attitudes toward computers in general was the use of the computer for record keeping. Again, the correlation matrix shows that this was a negative relationship. Based on this finding, the hypothesis was rejected.

CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this descriptive study was to assess and compare the attitudes toward computer technology between and medical educators. The study was also designed to investigate: (a) the effect of demographic characteristics on positive or negative attitudes, (b) the effect of previous experience and education regarding computer technology on attitudes, and (c) the effect of the usage of computer technology in the educational and clinical environments on attitudes. Although there were four assumptions for this study, the primary assumption was that an individual's perception of, acceptance of, and resistance to automation was related to attitudes toward automation. Rogers' (1962) theory of adoption and diffusion was used as the conceptual framework for the study. There existed in the literature a generally held belief that biomedical technological innovations were being diffused at a slow rate among health care professionals and educators. The biomedical innovation diffusion literature also emphasized the significance of attitudes toward computer technology in facilitating of

or impeding the adoption and implementation of technological innovations in educational and clinical practice environments.

Stratified random sampling was used to select 548 Texas medical and nursing educators as subjects. One hundred and seventy-seven respondents, 131 medical educators and 46 nursing educators, responded to the mail survey. The survey return rate was 32.3 percent. The "Attitudes Toward Computers in General Questionnaire," a 20-item bipolar semantic differential rating scale, was used to measure the educators' attitudes. The "Computer Attitude Profile" was used to collect data regarding the following independent variables: demographic characteristics, previous experience and education regarding computer technology, and usage of computer technology in educational and clinical practice environments. The statistical techniques used for data analysis were the t-test and stepwise regression. In a review of the literature, no study to date compared the attitudes toward computer technology between medical and nursing educators.

Findings

Analysis of data was the basis for decisions about the five hypotheses. Two of the hypotheses were accepted, two rejected, and one, Hypothesis 3, was accepted regarding previous experience and rejected regarding previous education. The first hypothesis regarding the difference

between nursing and medical educators' attitudes toward computer technology in general was accepted. Hypothesis 2 regarding the effect of demographic variables on attitudes toward computer technology in general was also accepted. The effect of previous experience and education on attitudes toward computer technology in general, Hypothesis 3, was accepted regarding previous experience and partially rejected regarding education. Hypothesis 4, the effect of the use of computer technology in the clinical practice environment by nursing and medical educators, and Hypothesis 5, the effect of the use of computer technology in the educational environment by nursing and medical educators, were both rejected.

Conclusions

Based on the findings, the following conclusions are warranted:

1. Nursing and medical educators possess a slightly positive attitude toward computer technology in general. The most positive aspects are that computers were good, efficient, and useful. Nursing and medical educators are slightly positive toward computer technology in general. However, the negative correlation of previous experience with current attitudes toward computers in general appears to illustrate that software development and technologically-based systems, reflecting the necessary integration for the health care delivery process, are not keeping pace

with the educators' needs, desires, and demands for educational and clinical practice environments.

2. There is no significant difference between medical and nursing educators' attitudes toward computer technology in general. The mean scores, however, indicate that nursing educators are slightly more positive toward computers in general than medical educators.

3. Demographic variables do not significantly affect nursing and medical educators' attitudes toward computer technology in general.

4. Previous education regarding computer technology is not related to nursing and medical educators' attitudes toward computer technology in general. Results, which show nonparticipation in continuing education activities over the past year, indicate, when compared to the years of previous experience in using computers, a moderately high level of comfort with the use of computer technology for personal and professional use in health care delivery and education.

5. Previous experience regarding computer technology is related to nursing and medical educators' attitudes toward computer technology in general. It is, however, negatively correlated with attitudes toward computers in general. The quality and quantity of the previous experience could explain this negative correlation. Furthermore, frustration may be experienced because of the lack

of availability of integrated software and technologically-based systems for educational and clinical practice environments.

6. The use of computer technology in the educational environment does not affect the attitudes of nursing and medical educators regarding computer technology in general. Record keeping and word processing, in that order, are the only two significant education variables to impact nursing and medical educators' attitudes toward computer technology in general. These two variables, however, are negatively correlated with educators' attitudes toward computer technology in general. Record keeping and word processing enhance the traditional faculty role especially in regard to research and publication expectations. Educators, however, are not using computer technology as a tool for instructional purposes. Health care delivery is an integrated process, and the lack of available integrated software and integrated technologically-based systems for the educational environment provides a potential explanation for this negative correlation.

7. The use of computer technology in the clinical practice environment does not significantly affect nursing and medical educators' attitudes toward computer technology in general. Diagnosing, network systems, and

patient assessment, in that order, are the only significant clinical practice variables. Patient assessment and networking are negatively correlated and diagnosing is positively correlated with attitudes toward computers in general. This finding appears to indicate a desire to use computer technology for these activities, but it also appears to indicate a disappointment in the results achieved when using computer technology.

Recommendations

The following are recommendations as a result of the review of the literature, the conceptual framework, and the findings in this study. There is no significance to the order in which the recommendations appear.

1. Nursing and medical educators should be involved in the design, implementation, evaluation, and purchase decisions regarding software, hardware, and technologically-based systems for educational and clinical practice environments.

2. Content and "hands-on" educational experiences for nursing and medical educators should focus on the use of technological innovations as tools for instructional methodologies.

3. Schools of nursing and medicine should foster faculty's development regarding the design, implementation, and evaluation of technological innovations as they relate to the faculty role. This would enhance the

transfer of technological knowledge to other health care roles and environments.

4. This study should be replicated using different independent variables, such as: faculty involvement in the design, implementation, evaluation, and selection of hardware, software and technologically-based systems; faculty training, orientation, and continuing education regarding technological innovations; and the type of hardware, software, and technologically-based systems available for faculty use in educational and clinical practice environments.

5. Schools of nursing and medicine should conduct studies similar to this one to analyze the development, implementation, and evaluation of local, regional, and state plans for the use of technological innovations in educational and clinical practice environments.

6. Health care agencies, such as hospitals and clinics, should determine the capability for technological interfacing with schools of medicine and nursing, thus fostering linkages of technological and intellectual resources for educational and health care delivery purposes.

7. Schools of nursing and medicine should contact software, hardware, and technologically-based system developers to request serving as a beta site, thus facilitating the development of integrated technological

innovations for educational and clinical practice environments.

8. Nursing and medical educators' attitudes toward specific technological innovations which are perceived as enhancing or threatening traditional professional roles in educational and clinical practice environments should be investigated.

9. Attitude assessment data regarding technological innovations should be used in the development of education, training, orientation, implementation, and attitude modification strategies.

10. Longitudinal studies should be conducted regarding nursing and medical educators' attitudes toward technological innovations over extended periods of time.

11. The significance of professional peer influence and the educators' role in professional networks on attitudes toward technological innovations in educational and clinical practice environments should be investigated.

REFERENCES

- Ackerman, W. B. (1982). Technology and nursing education: A scenario for 1990. Journal of Advanced Nursing, 7, 59-68.
- Alexander, M. J., & Siegel, C. (1984). Opinions and feelings: The validity of attitudes toward computers. In G. S. Cohen (Ed.), Proceedings from the Eighth Annual Symposium on Computer Applications in Medical Care, 8, 540-542.
- Anderson, J. G., Gray-Toft, P., Lloyd, F. P., & Jay, S. (1981). Factors affecting physician utilization of a computerized hospital medical information system: A social network analysis. In H. G. Heffernan (Ed.), Proceedings from the Fifth Annual Symposium on Computer Applications in Medical Care, 5, 791-796.
- Anderson, J. G., & Jay, S. J. (1985). Computers and clinical judgment: The role of physician networks. Social Science and Medicine, 20(10), 969-979.
- Anderson, J. G., & Jay, S. J. (Eds.). (1987). Use and impact of computers in clinical medicine. New York: Springer-Verlag.
- Anderson, J. G., Jay, S. J., & Schweer, H. M. (1985). Physician perceptions of the potential effects of computers on medical practice. In A. H. Levy, & B. T. Williams (Eds.), Proceedings of the American Association for Medical Systems and Informatics Congress, 3, 12-16.
- Anderson, J. G., Jay, S. J., Schweer, H. M., & Anderson, M. M. (1985). Perceptions of the impact of computers on medical practice and physician use of a hospital information system. In M. J. Ackerman (Ed.), Proceedings of the Ninth Annual Symposium on Computer Applications in Medical Care, 9, 565-569.
- Anderson, J. G., Jay, S. J., Schweer, H. M., & Anderson, M. M. (1986). Why doctors don't use computers: Some empirical findings. Journal of the Royal Society of Medicine, 79, 142-144.

- Armstrong, M. L. (1983). Paving the way for more effective computer usage. Nursing and Health Care, 4, 557-560.
- Armstrong, M. L. (1986). Present and future computer competencies for nurse educators in basic and continuing education. Dissertation Abstracts International, 47/04B, 1484. (University Microfilms No. 86-14718)
- Aydin, C. E. (1986). Social information processing and individual differences in information system attitudes and use. Unpublished manuscript. University of Southern California, Annenberg School of Communications, Los Angeles, CA.
- Badura, F. K. (1980). Nurse acceptance of a computerized arrhythmia monitoring system. Heart and Lung, 9(6), 1044-1048.
- Ball, M. J., & Hannah, K. J. (1984). Using computers in nursing. Reston, VA: Reston Publishing Company, Inc.
- Banta, H. D. (1980). The diffusion of the computer tomography (CT) scanner in the United States. International Journal Health Services, 10, 251-269.
- Banta, H. D. (1984). Embracing or rejecting innovations: Clinical diffusion of health care technology. In S. J. Reiser, & M. Anbar (Eds.), The machine at the bedside (pp. 65-92). New York: Cambridge University Press.
- Banta, H. D., Behney, C. J., & Willems, J. S. (1981). Toward rational technology in medicine. New York: Springer.
- Barrett, J., Barnum, R., Gordon, B., & Pesut, R. (1975). Evaluation of the implementation of a medical information system in a general community hospital. Springfield, VA: National Technical Information Service.
- Berman, P., & McLaughlin, M. W. (1975). Federal programs supporting educational change: Vol. 1--Model of educational change. Santa Monica: The Rand Corporation.
- Birckhead, R. M. (1978). The need for nurse support systems in affecting computer systems. Journal of Nursing Administration, 8, 51-53.

- Bitzer, M. D. (1966). Clinical nursing instruction via the PLATO simulated laboratory. Nursing Research, 15(2), 144-150.
- Bitzer, M. D., & Boudreaux, M. (1969). Using a computer to teach nursing. Nursing Forum, 8, 234-254.
- Blum, B. I. (Ed.). (1982). Proceedings of the sixth annual symposium on computer applications in medicine. Los Angeles, CA: IEEE Computer Society Press.
- Brodt, A., & Stronge, J. H. (1986). Nurses' attitudes toward computerization in a midwestern community hospital. Computers in Nursing, 4, 82-86.
- Bronzino, J. D. (1977). Technology for patient care. St. Louis, MO: C. V. Mosby.
- Brown, V. T. (1984). Survey of user satisfaction: Nursing's attitude toward MIS. In G. S. Cohen (Ed.), Proceedings from the Eighth Annual Symposium on Computer Applications in Medical Care, 8, 601-604.
- Chang, B. L., & Jordan-Marsh, M. (1983). Nursing expectations of computers in the hospital. In R. E. Dayhoff (Ed.), Proceedings of the Seventh Annual Symposium on Computer Applications in Medical Care, 7, 519-522.
- Champion, D. J. (1975). The sociology of organizations. New York: McGraw Hill.
- Charters, K. G. (1981). Computers as management tools: Acceptance by nursing personnel. In H. G. Heffernan (Ed.), Proceedings from the Fifth Annual Symposium on Computer Applications in Medical Care, 5, 725-727.
- Chow, R. (1961). Patient monitoring is more than just a dream. American Journal of Nursing, 61, 60-62.
- Cleveland, L. M. (1985). Computer utilization within nursing curriculum. Dissertation Abstracts International, 46/10A, 2902. (University Microfilms No. 85-26856).
- Cook, M., & McDowell, W. (1975). Changing to an automated information system. American Journal of Nursing, 75, 46-51.

- Coleman, J. S., Katz, E., & Menzel, H. (1966). Medical innovation: A diffusion study. Indianapolis, MD: Bobbs-Merill.
- Committee on Technology and Health Care, Institute of Medicine. (1979). Medical technology and the health care system. Washington, DC: National Academy of Sciences.
- Conklin, D. N. (1983). A study of computer-assisted instruction in nursing education. Journal of Computer Based Instruction, 9, 98-107.
- Cornett, J., & Beckner, W. (1975). Introductory statistics for the behavioral sciences. Columbus, OH: Bell and Howell.
- Counte, M. A., Kjerulff, K. H., Salloway, J. C., & Campbell, B. C. (1983). Implementation of a medical information system: Evaluation of adaptation. Health Care Management Review, 8, 25-33.
- Covvey, H. D., & McAlister, N. H. (1980). Computers in the practice of medicine: Vol. 2--Issues in medical computing. Reading, MA: Addison-Wesley.
- Cox, H., Harsanyi, B., & Dean, L. (1987). Computers and nursing: Application to practice, education and research. East Norwalk, CT: Appleton and Lange.
- Dayhoff, R. E. (Ed.). (1983). Proceedings of the seventh annual symposium on computer applications in medical care. Los Angeles: IEEE Computer Society Press.
- Delaney, C. J. (1986). Administrator and faculty acceptance of the computer as a technological innovation in baccalaureate nursing programs in independent colleges in the Midwest. Dissertation Abstracts International, 47/07A, 2388. (University Microfilms No. 86-22760)
- Derr, C. B. (1972). Conflict resolution in organizations: Views from the field of educational administration. Public Administrative Review, 32, 495-502.
- Dlugacz, Y. D., Siegel, C., & Fischer, S. (1981). Physician/computer interaction. In H. G. Heffernan (Ed.), Proceedings from the Fifth Annual Symposium on Computer Applications in Medical Care, 5, 797-801.

- Dowling, A. F. (1980). Do hospital staff interfere with computer system implementation? Health Care Management Review, 5(4), 23-32.
- Drucker, P. (1968). The age of discontinuity guidelines to our changing society. New York: Harper and Row.
- Duttweiler, P. C. (1983). Barriers to optimum use of educational technology. Educational Technology, 23(11), 37-40.
- Editors of Nursing Life. (1985, March/April). What nurses think of computers: Part I. Nursing Life, pp. 30-32.
- Editors of Nursing Life. (1985, May/June). What nurses think of computers: Part II. Nursing Life, pp. 28-30.
- Egdahl, R. H., & Gertman, P. M. (1978). Technology and the quality of health care. Germantown, MD: Aspen Systems Corp.
- Evans, C. (1979). The micromillennium. New York: The Viking Press.
- Felton, G., & Brown, B. (1985). Application of computer technology in two colleges of nursing. Journal of Nursing Education, 24, 5-9.
- Fields, M. (1983). Computer literacy: Required baccalaureate content. Journal of Nursing Education, 22, 223.
- Fishbein, M., & Ajzen, I. (1975). Belief, attitude, behavior: An introduction to theory and research. Reading, MA: Addison Wesley.
- Fisher, J. H. (1984). Innovation in medical system design: The computer-human interface. In G. S. Cohen (Ed.), Proceedings from the Eighth Annual Symposium on Computer Applications in Medical Care, 8, 561-563.
- Friedman, R. B., & Gustafson, D. H. (1977). Guest editorial: Computers in medicine: A critical review. Computers and Biomedical Research, 10(3), 199-204.
- Friel, P. B., Reznikoff, M., & Rosenberg, M. (1969). Attitudes toward computers among nursing personnel in a general hospital. Connecticut Medicine, 33, 307-308.

- Geis, G. L., & Anderson, M. C. (1963). Programmed instruction in nursing education. Nursing Outlook, 11, 592-594.
- Giebink, G. A., & Hurst, L. L. (1975). Computer projects in health care. Ann Arbor: Health Administration Press.
- Goethler, A. N. (1985). Nursing education update: Computer technology. Nursing and Health Care, 6, 509-510.
- Gordon, G., & Fisher, G. L. (Eds.). (1975). The diffusion of medical technology: Policy and research planning perspectives. Cambridge, MA: Ballinger.
- Grams, S., Dvorak, R. M., Pryor, T. A., & Childs, B. W. (1984). Panel: Trends in health care information systems. In G. S. Cohen (Ed.), Proceedings from the Eighth Annual Symposium on Computer Applications in Medical Care, 8, 139-142.
- Grann, R. P. (1982). Measuring resistance to a computer system among hospital personnel. In B. Blum (Ed.), Proceedings from the Sixth Annual Symposium on Computer Applications in Medical Care, 6, 433-437.
- Grann, R. P. (1984). Attitudes and effective use of computers among hospital personnel. In G. S. Cohen (Ed.), Proceedings of the Eighth Annual Symposium on Computer Applications in Medical Care, 8, 543-547.
- Greer, A. L. (1977). Advances in the study of diffusion of innovation in health care organizations. MMFQ Health Society, 55, 505-532.
- Greer, A. L. (1981). Deus ex machina: Physicians in the adoption of hospital medical technology. Unpublished manuscript, the University of Wisconsin, Urban Research Center, Milwaukee, WI.
- Hage, J., & Aiken, M. (1970). Social change in complex organizations. New York: Random House, Inc.
- Happ, B. (1983). Should computers be used in the nursing care of patients? Nursing Management, 14(7), 31-35.
- Hardin, R. C., & Skiba, D. J. (1982). A comparative analysis of computer literacy education for nurses. In B. Blum (Ed.), Proceedings of the Sixth Annual Symposium on Computer Applications in Medicine, 6, 525-530.

- Harsanyi, B. (1987). Computer attitude profile. Unpublished questionnaire.
- Havelock, R. G. (1969). Planning for innovation: A comparative study of the literature on the dissemination and utilization of scientific knowledge (HEW Publication No. OEC-3-7-070028-2143). Washington, DC: U.S. Government Printing Office.
- Heffernan, H. G. (Ed.). (1981). Proceedings of the fifth annual symposium on computer applications in medical care. Los Angeles: IEEE Computer Society Press.
- Higdon, J. C., & McBride, J. E. (1973). An empirical analysis of professional medical personnel's attitudes toward the use of computers in the delivery of health care. Unpublished master's thesis, United States International University, USA.
- Hodge, M. H. (1977). Medical information systems. Germantown, MD: Aspen Sysetms Corporation.
- Hogdon, J. D., & Hutchinson, D. J. (1979). Preparation for and implementation of automated hospital information systems. Springfield, VA: National Technical Information Service.
- Hoppe, R. A., & Berv, E. J. (1967). Measurement of attitudes toward automation. Personnel Psychology, 20, 65-70.
- Houle, C. O. (1980). Continued learning in the professions. San Francisco: Jossey Bass.
- Hudson, D. L., & Cohen, M. E. (1985). The role of user interface in a medical expert system. In M. J. Ackerman (Ed.), Proceedings from the Ninth Annual Symposium on Computer Applications in Medical Care, 9, 232-236.
- Jacobsen, T. J., & Fennell, S. E. (1983). Systems life cycle: Strategy for managing the impact of information systems on nursing. In R. E. Dayhoff (Ed.), Proceedings of the Seventh Annual Symposium on Computer Applications in Medical Care, 7, 469-471.
- Johnson, B. M. (1983). Microcomputers in the nursing dean's office. Washington, DC: American Association of Colleges of Nursing.

- Johnson, J. H., Williams, T. A., Giannetti, R. A., Klinger, D. E., & Nakashima, S. R. (1978). Organizational preparedness for change-staff acceptance of an on-line computer-assisted assessment system. Behavior Research Methods and Instrumentation, 10(2), 186-190.
- Joskow, P. L. (1981). Controlling hospital costs: The role of government regulation. Cambridge, MA: MIT Press.
- Jung, C., & Lippitt, R. (1967). Utilization of scientific knowledge for change in education. Ann Arbor: CRUSK, University of Michigan.
- Kadner, K. (1984). Change: Introducing computer-assisted instruction (CAI) to a college of nursing faculty. Journal of Nursing Education, 23(8), 349-350.
- Kaplan, B. (1982a). The influence of medical values and practices on medical computer applications. In B. Blum (Ed.), Proceedings from the Sixth Annual Symposium on Computer Applications in Medical Care, 6, 83-88.
- Kaplan, B. (1982b). User acceptance of medical computer applications: A diffusion approach. In B. Blum (Ed.), Proceedings from the Sixth Annual Symposium on Computer Applications in Medical Care, 6, 398-402.
- Kaplan, B. (1986). Impact of a clinical laboratory computer system: Users' perceptions. In R. Salamon, B. Blum, & M. Jorgensen (Eds.), Medinfo 86 (pp. 1057-1061). North Holland: Elsevier Science Publishers.
- Kember, N. F. (1982). An introduction to computer applications in medicine. London: Edward Arnold.
- Kerr, E. B., & Hiltz, S. R. (1982). Computer mediated systems. New York: Academic Press.
- Kjerulff, K. H., & Counte, M. A. (1984a). A look at the relationship between employee attitudes and adaptation to computerization. Unpublished manuscript.
- Kjerulff, K. H., & Counte, M. A. (1984b). Measuring attitudes towards computers: Two approaches. In G. S. Cohen (Ed.), Proceedings from the Eighth Annual Symposium on Computer Applications in Medical Care, 8, 529-535.

- Kjerulff, K. H., Counte, M. A., & Salloway, J. C. (1986). Attitudes toward computers and employee turnover during implementation of a pharmacy information system. In R. Salamon, B. Blum, and M. Jorgensen (Eds.), Medinfo 86 (pp. 1046-1051). North Holland: Elsevier Science Publishers.
- Kjerulff, K. H., Counte, M. A., Salloway, J. C., & Campbell, B. C. (1981). Understanding employee reactions to a medical information system. In H. G. Heffernan (Ed.), Proceedings from the Fifth Annual Symposium on Computer Applications in Medical Care, 5, 802-805.
- Kjerulff, K. H., Counte, M. A., Salloway, J. C., & Campbell, B. C. (1982). Predicting employee adaptation to the implementation of a medical information system. In B. Blum (Ed.), Proceedings from the Sixth Annual Symposium on Computer Applications in Medical Care, 6, 392-397.
- Kjerulff, K. H., Counte, M. A., Salloway, J. C., & Campbell, B. C. (1983). Measuring adaptation to medical technology. Hospital and Health Services Administration, 28, 30-40.
- Kjerulff, K. H., Counte, M. A., Salloway, J. C., & Campbell, B. C. (1984). Medical information system training: An analysis of the reactions of hospital employees. Computers and Biomedical Research, 17, 303-310.
- Kjerulff, K. H., & Pillar, B. (1984). An examination of five inventories designed to assess attitudes toward computers. Unpublished manuscript.
- Klassen, D. L. (1981). Computer literacy. In D. Moursand (Ed.), Topics in computer education in elementary and secondary schools (pp. 66-70). New York: Association for Computing Machinery.
- Klonoff, H., & Clark, C. (1975). Measuring staff attitudes toward computerization. Hospital and Community Psychiatry, 26, 823.
- Krasnoff, S. O. (1967). Computers in medicine: A primer for the practicing physician. Springfield, IL: Charles C. Thomas.
- Ledley, R. S. (1965). Use of computers in biology and medicine. New York: McGraw Hill.

- Levinson, D. (Ed.). (1985). Computer applications in clinical practice: An overview. New York: Macmillan Publishing Company.
- Lewin, K. (1951). Field theory in social science. New York: Harper and Row.
- Lewin, K. (1947). Frontiers in group dynamics: Concepts, method and reality in social science: Social equilibria and social change. Human Relations, 1, 5-41.
- Lindberg, D. A. B. (1979). The growth of medical information systems in the United States. Lexington, MA: Heath.
- Lippitt, R., Watson, J., & Westley, B. (1958). The dynamics of planned change. New York: Harcourt, Brace, and Company, Inc.
- McCracken, M. M., Stoner, D. M., Quinn, F. B., & Hokanson, J. A. (1982). Why is it so difficult to teach physicians about computers? In B. Blum (Ed.), Proceedings from the Sixth Annual Symposium on Computer Applications in Medical Care, 6, 78-82.
- Mechanic, D. (1977). The growth of medical technology and bureaucracy: Implications for medical care. MMFQ Health Society, 55, 61-78.
- Melhorn, J. M., Legler, W. K., & Clark, G. M. (1979). Current attitudes of medical personnel toward computers. Computers and Biomedical Research, 12, 327-334.
- Morrow, S. L. (1984). Nursing educators' and nursing service personnel's knowledge of and attitudes toward computer use in nursing practice. Dissertation Abstracts International, 45/09B, 2870. (University Microfilms No. 84-25987)
- Mikan, K. J. (1984). Computer integration: A challenge for nursing education. Nursing Outlook, 32, 6.
- Molnar, A. R. (1979). The next great crisis in American education: Computer literacy. Journal of Educational Technology Systems, 7, 275-287.

- Morin, P. J. (1982). A comparative study of attitudes toward computer assisted instruction and learning styles of nursing students. Dissertation Abstracts International, 43/03A, 653. (University Microfilms No. 82-17547)
- Murphy, M. A. (1985). Computer-based education in nursing: Factors influencing its utilization. Computers in Nursing, 2(6), 218-223.
- Naisbett, J. (1982). Megatrends: Ten new directions transforming our lives. New York: Warner Books.
- Notter, L. E. (1974). Essentials of nursing research. New York: Springer Publishing Company.
- Pillar, B. (1985). The measurement of technology anxiety. In M. J. Ackerman (Ed.), Proceedings of the Ninth Annual Symposium on Computer Applications in Medical Care, 9, 570-574.
- Pocklington, D. (1981). Impact of computers on nursing education: Introduction and overview. In H. G. Hefferman (Ed.), Proceedings of the Fifth Annual Symposium on Computer Applications in Medical Care, 5, 768.
- Reznikoff, M., Holland, C. H., & Stroebel, C. F. (1967). Attitudes toward computers among employees of a psychiatric hospital. Mental Hygiene, 51, 419-425.
- Rogers, E. M. (1962). Diffusion of innovations. New York: The Free Press.
- Rogers, E. M. (1981). Diffusion of innovations: An overview. In E. B. Roberts (Ed.), Biomedical innovations (pp. 75-97). Cambridge, MA: MIT Press.
- Rogers, E. M., & Shoemaker, F. F. (1971). Communication of innovations. New York: The Free Press.
- Ronald, J. S. (1982). Attitudes and learning needs of nursing educators with respect to computers: Implications for curriculum planning. Dissertation Abstracts International, 43/09A, 2879. (University Microfilms No. 83-03098).
- Ronald, J. S. (1983a). Guidelines for computer literacy curriculums in a school of nursing. Journal of New York State Nurses Association, 14(1), 12-18.

- Ronald, J. S. (1983b). Learning needs and attitudes of nursing educators with respect to computers. In R. E. Dayhoff (Ed.), Proceedings of the Seventh Symposium on Computer Applications in Medical Care, 7, 523-527.
- Rosenberg, M., Reznikoff, M., Stroebel, C., & Ericson, R. (1967). Attitude of nursing students toward computers. Nursing Outlook, 22, 44-46.
- Russell, L. B. (1978). Technology in hospitals, medical advances and their diffusion. Washington, DC: Brookings Institution.
- Saba, V. K., & McCormick, K. A. (1986). Essentials of computers for nurses. Philadelphia, PA: J. B. Lippincott.
- Schmitz, H. H. (1979). Hospital information systems. Germantown, MD: Aspen Systems Corporation.
- Schroeder, S., & Showstack, J. (1978). Financial incentives to perform medical procedures and laboratory tests: Illustrative models of office practice. Medical Care, 16, 289-298.
- Schwartz, W. B. (1970). Medicine and the computer: The problems and promise of change. New England Journal of Medicine, 283, 1257.
- Seedor, M. M. (1963). Can nursing be taught with teaching machines? American Journal of Nursing, 63, 117-120.
- Shortliffe, E. H. (1976). Computer-based medical consultations: MYCIN. New York: American Elsevier Publishing.
- Singer, J., Sacks, H. S., Lucente, F., & Chalmers, T. C. (1983). Physician attitudes toward applications of computer data base systems. Journal of American Medical Association, 249, 1610-1614.
- Skiba, D. J. (1983). Computer literacy: The challenge of the 80's. Journal of the New York State Nurses Association, 14(1), 6-11.
- Smith, D. B., & Kaluzny, A. D. (1975). The white labyrinth: Understanding the organization of health care. Berkeley, CA: McCutchan.

- Somers, J. B. (1971). A computerized nursing care system. Hospitals: Journal of the American Hospital Association, 45, 93-100.
- Spector, A. (1984). Survey of microcomputers use in Southern nursing education: 1983. Report to Executive Committee of the Southern Council on Collegiate Education for Nursing, SREB.
- Startsman, T. S., & Robinson, R. E. (1972). The attitudes of medical and paramedical personnel toward computers. Computers and Biomedical Research, 5(3), 218-227.
- Stead, W. W. (Ed.). (1987). Proceedings of the eleventh annual symposium on computer applications in medical care. Los Angeles: IEEE Computer Society Press.
- Stross, J. K., & Harlan, W. R. (1979). The dissemination of new medical information. Journal of American Medical Association, 241, 2822.
- Sweeney, M. A. (1985). The nurse's guide to computers. New York: Macmillan Publishing Company.
- Taba, H. (1962). Curriculum development: Theory and practice. New York: Harcourt Brace.
- Tanon, C., & Rogers, E. (1975). Diffusion research methodology: Focus on health care organizations. In G. Gordon, & L. Fisher (Eds.), The diffusion of medical technology (pp. 51-77). Cambridge, MA: Ballinger.
- Teach, R. L., & Shortliffe, E. H. (1981). An analysis of physician attitudes regarding computer-based clinical consultation systems. Computers and Biomedical Research, 14, 542-558.
- Theis, J. B. (1975, Winter). Hospital personnel and computer-based systems: A study of attitudes and perception. Hospital Administration, 17-25.
- Thiele, J. E., & Baldwin, J. H. (1985). A simulated practice environment: Computerville Regional Hospital. Computers in Nursing, 3, 113-121.
- Thomas, B. S. (1985). A survey study of computers in nursing education. Computers in Nursing, 3, 173-179.

- Thompson, K. (1982, November). The impact of new technology on the health care professional (Publication No. 82-3). Washington, DC: Department of Professional Employees, AFL-CIO.
- Thoren, B. J., Smith, D. P., & Gould, L. C. (1969). Attitude study, training help employees adapt to use of computers. Hospitals, 43, 61-64.
- United States General Accounting Office. (1980). Computerized hospital medical information systems need further evaluation to ensure benefits from huge investments. Gaithersburg, MO: United States General Accounting Office.
- Urban, N., & Bice, T. W. (1981). Measuring regulation and its effects on hospital behavior. Unpublished manuscript, University of Washington, Seattle, WA.
- Waltz, C., & Bausell, R. B. (1981). Nursing research: Design, statistics and computer analysis. Philadelphia: F. A. Davis Company.
- Watson, G. (1966). Social psychology: Issues and insight. Philadelphia: Lippincott.
- Watson, G. (Ed.). (1967). Concepts for social change: Cooperative project for educational development. Washington, DC: NTL Institute for Applied Behavioral Science.
- Wilson, J. Q. (1966). Innovation in organization: Notes toward a theory. In J. D. Thompson (Ed.), Approaches to organizational design. Pittsburgh: University of Pittsburgh Press.
- Young, D. W. (1984). What makes doctors use computers: Discussion paper. Journal of the Royal Society of Medicine, 77, 663-667.
- Zaltman, G., Duncan, R., & Holbeck, J. (1973). Innovations and organization. New York: Wiley and Sons.
- Ziemer, M. M. (1983). Issues of computer literacy in nursing education. Nursing and Health Care, 4, 537-542.
- Zoltan, E., & Chapanis, A. (1982). What do professional persons think about computers? Behavior and Information Technology, 1, 55-68.

- Zoltan-Ford, E. (1984). Professional persons' attitudes toward computers: Comparative analyses and some suggestions. In G. S. Cohen (Ed.), Proceedings of the Eighth Annual Symposium on Computer Applications in Medical Care, 8, 536-539.
- Zumd, R. W. (1982). Diffusion of modern software practices: Influence of centralization and formalization. Management Science, 28, 1421-1431.

APPENDIX A
SURVEY TOOLS

Dear Educator:

As a nurse educator and doctoral student, I am conducting a dissertation research project regarding attitudes toward computer technology between nursing and medical educators in Texas. This interest evolved from a three-year participation with an interdisciplinary demonstration project regarding technological linkages between a regional health care center and three diverse health care delivery sites.

I wish to request your assistance in completing the enclosed questionnaire and profile. Your completion of the questionnaire and profile will require approximately ten (10) minutes. Code numbers are used only for monitoring the return of the questionnaire and profile. Anonymity of responses is assured. A self-addressed, stamped envelope is included for questionnaire and profile return. The target date for the survey return is November 6, 1987.

Thank you. Your participation is greatly appreciated. Should you desire a copy of the results of this research study or further information, please contact me at (806) 793-8470.

Sincerely,

Bennie E. Harsanyi, R.N., M.A.
Assistant Professor
Texas Tech University Health Sciences Center
School of Nursing

Doctoral Candidate
Texas Tech University

BH:sh
Enclosures

Attitudes Toward Computers in General
(Kjerulff & Counte, 1984)

Below are some pairs of words which may describe how you feel about computers. Please rate each pair on a scale of 1-7 (1 being the first word in each pair and 7 being the second word). Circle the appropriate number to indicate your choice.

Computers are, in general,

Good....	1....	2....	3....	4....	5....	6....	7....	Bad
Humane....	1....	2....	3....	4....	5....	6....	7....	Inhumane
Efficient....	1....	2....	3....	4....	5....	6....	7....	Inefficient
Slow....	1....	2....	3....	4....	5....	6....	7....	Fast
Useful....	1....	2....	3....	4....	5....	6....	7....	Not Useful
Overpowering....	1....	2....	3....	4....	5....	6....	7....	Easy to Control
Time Saving....	1....	2....	3....	4....	5....	6....	7....	Time Consuming
Complicated....	1....	2....	3....	4....	5....	6....	7....	Uncomplicated
Helpful....	1....	2....	3....	4....	5....	6....	7....	Not Helpful
Warm....	1....	2....	3....	4....	5....	6....	7....	Cold
Fun....	1....	2....	3....	4....	5....	6....	7....	Not Fun
Boring....	1....	2....	3....	4....	5....	6....	7....	Interesting
Rigid....	1....	2....	3....	4....	5....	6....	7....	Flexible
Creative....	1....	2....	3....	4....	5....	6....	7....	Not Creative
Destructive....	1....	2....	3....	4....	5....	6....	7....	Useful
Economical....	1....	2....	3....	4....	5....	6....	7....	Costly
Competent....	1....	2....	3....	4....	5....	6....	7....	Incompetent
Frightening....	1....	2....	3....	4....	5....	6....	7....	Non-threatening
Helpful....	1....	2....	3....	4....	5....	6....	7....	Harmful
Exciting....	1....	2....	3....	4....	5....	6....	7....	Unexciting

Computer Attitude Profile
(Harsanyi, 1987)

Please indicate the appropriate response to each item as it applies to you. Thank you.

1. Age: _____ 25-30 _____ 41-45 _____ 56-60
 _____ 31-35 _____ 46-50 _____ 61-75
 _____ 36-40 _____ 51-55 _____ 76- +
2. Sex: _____ Female _____ Male
3. Education: (Highest Level)
 _____ Baccalaureate _____ M.D.
 _____ Master of Science _____ M.D./Ph.D.
 _____ Master of Arts _____ DNS
 _____ Master of Education _____ DNSc
 _____ Master of Nursing _____ Other (Specify) _____
 _____ Ph.D. _____ D.O.
 _____ Ed.D. _____ D.O./Ph.D.
4. Profession: ___ Medical Educator ___ Nursing Educator
5. Position/Title: _____
6. Years as an Educator:
 _____ 0-5 _____ 11-15 _____ 21-25
 _____ 6-10 _____ 16-20 _____ 26-30 _____ 30+
7. Years as a Physician:
 _____ 0-5 _____ 11-15 _____ 21-25
 _____ 6-10 _____ 16-20 _____ 26-30 _____ 30+
8. Years as a Nurse:
 _____ 0-5 _____ 11-15 _____ 21-25
 _____ 6-10 _____ 16-20 _____ 26-30 _____ 30+
9. Area of Clinical Specialty/Practice: _____

10. Have you ever used computer technology for personal use (word processing, spreadsheets, budgets)? ___ Yes ___ No
11. Have you ever used computer technology for health care delivery or education? ___ Yes ___ No

12. Within the last year, in how many contact hours of instruction in computer technology have you participated (continuing education, inservice, faculty development, workshops, lectures)?

☐ None	☐ 13-18	☐ 31-36
☐ 1-6	☐ 19-24	☐ 36-41
☐ 7-12	☐ 25-30	☐ 42+

13. Within the last year, in how many contact hours of actual "hands on experience" in computer technology have you participated (continuing education, inservice, faculty development, workshops, lectures)?

☐ None	☐ 13-18	☐ 31-36
☐ 1-6	☐ 19-24	☐ 36-41
☐ 7-12	☐ 25-30	☐ 42+

14. Use of computers in clinical practice. Check all that apply to you.

☐ Record Keeping	☐ Treatment Planning
☐ Patient Billing	☐ Patient Monitoring
☐ Patient Assessment	☐ Patient Education
☐ Diagnosing	☐ Discharge Planning
☐ Medical/Nursing Documentation	☐ Administration
☐ Financial	☐ Robot Systems
☐ Communication Systems	☐ Expert Systems
☐ Network Systems	☐ Information Systems
☐ Other (specify) _____	☐ Admissions

15. How often do you use computer technology in clinical practice?
☐ Hours/Daily ☐ Hours/Weekly ☐ Hours/Monthly

16. Use of computers in education. Check all that apply to you.

☐ Authoring Software
☐ Record Keeping
☐ Interactive Video Systems
☐ Computer Managed Instruction
☐ Computer Literacy Instruction
☐ Computer Assisted Instruction
☐ Drill and Practice
☐ Tutorial
☐ Simulations
☐ Games
☐ Dialogue
☐ Integration of Computer Concepts into Curriculum
☐ Word Processing
☐ Research
☐ Library Network Systems
☐ Other (Specify) _____

17. How often do you use computer technology in education?
☐ Hours/Daily ☐ Hours/Weekly ☐ Hours/Monthly

APPENDIX B
MEDICAL AND NURSING SCHOOLS

Medical Schools

Baylor College of Medicine
 Texas A & M University
 Texas College of Osteopathic Medicine
 Texas Tech University Health Sciences Center School of
 Medicine
 University of Texas at Dallas-Southwestern School of
 Medicine
 University of Texas School of Medicine at Galveston
 University of Texas Health Science Center at Houston
 School of Medicine
 University of Texas Health Science Center at San Antonio
 School of Medicine

Schools of Nursing

Abilene Intercollegiate School of Nursing, A consortium of
 Abilene Christian University, Hardin-Simmons Univer-
 sity, and McMurray College
 Angelo State University
 Baylor University School of Nursing
 Corpus Christi State University
 Dallas Baptist College of Nursing
 Houston Baptist University Department of Nursing
 Incarnate Word College Division of Nursing
 Lamar University Department of Nursing
 Pan American University
 Prairie View A & M University College of Nursing
 Southwestern Adventist College
 Stephen F. Austin State University Division of Nursing
 Texas Christian University, Harris College of Nursing
 Texas Woman's University College of Nursing
 Texas Tech University Health Sciences Center School of
 Nursing
 University of Mary Hardin-Baylor School of Nursing
 University of St. Thomas School of Nursing
 University of Texas at Arlington School of Nursing
 University of Texas at Austin School of Nursing
 University of Texas at El Paso College of Nursing and
 Allied Health
 University of Texas Health Sciences Center at Houston
 School of Nursing
 University of Texas Health Sciences Center at San Antonio
 School of Nursing
 University of Texas School of Nursing at Galveston
 University of Texas at Tyler Department of Nursing
 West Texas State University School of Nursing