The Relationship of Leadership Patterns to Usage Patterns and Suitability of Information Technology for Decision Making of Nursing and Non-nursing Academic Administrators in Higher Education

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctorate of Philosophy at George Mason University

by

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Abstract

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This dissertation describes the relationship of leadership patterns to computer usage patterns and the suitability of information technology for decision making among academic administrators in higher education in the Nursing departments and Arts and Science departments of universities in the United States and its provinces. The author conducted a literature search in nursing and in the related disciplines of psychology, management, education and sociology. The premise of natural matches between leadership patterns and information technology computer usage patterns in existence should demonstrate satisfaction with the suitability of hardware and software available to administrators for decision making responsibilities.

Questionnaires were sent to 637 universities in the United States and provinces where a nursing department was an established program. Important demographic information revealed in the literature review included gender, age, level of education, length of time in administrative position, length of time using computer technology, size of institution based on enrollment, department size, and geographic location. Of all the demographic characteristics, analysis revealed there was no significant relationship between age and level of education. In conclusion, the study revealed that natural matches between leadership style and computer usage patterns did not exist for this group. However, the majority of this group were dissatisfied with the hardware and software available to them. The author proposes that since there was not a natural match, the dissatisfaction was to be expected. If a natural match existed, satisfaction would be demonstrated as would improved efficiency and timeliness of communication. Future research is suggested to promote continued research in this area.

Dedication

The is dedicated to Ann Snow and Eric Williams
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Introduction

In the last two decades, information technology has revolutionized virtually every aspect of manufacturing and service organizations including the process and methods of administrative decision making within these organizations. Efficient and effective decision making is essential for the survival of any organization. In order that growth can be realized in an organization, short and long term strategic planning should encompass decision making. A major part of administrative decision making depends on access, availability and timeliness of information communicated both within and across organizations. Information technology has expanded the quantity and accessibility of information while decreasing the time needed to exchange it. In order to handle the increased amounts of information more quickly and efficiently, administrators now rely on a wide array of hardware systems and software applications. However, surveys and vendor pressure have produced conflicting results in evaluating quality of available hardware systems and software applications. Unreliable evaluations contribute to confusion when administrators try to decide what is best for a certain organization.

This study is based on the assumption that there is neither a single best way to structure an organization, nor is there a single best information system for organizations (Barley, 1990; Druzin & Van de Ven, 1985; Schmidt, 1992; Shrivastava & Nachman, 1989). This study will investigate the premise that there is a pattern of consistency between leadership patterns or style and information technology usage patterns as documented in the literature (Miller & Friesen, 1984; Mintzberg, 1979, 1983; Schmidt, 1992; Shrivastava & Grant, 1983; Shrivastava & Nachman, 1989). If there exists a variety of information needs for decision making and the type of administrative leadership, then it is assumed that this variety in turn necessitates different combinations of hardware systems and software applications for processing and storing information. The development of a 'best of fit' definition between the type of administrative leadership style and information technology will benefit both research and organizations. This match may then facilitate setting up a more efficient and effective information system for organizations.

Statement of Purpose

There are three purposes for this study. The first intent is to describe the relationship between leadership styles or patterns and computer usage patterns for decision making by Nursing and non-Nursing academic administrators within institutions of higher education. The second intent is to describe the relationship between leadership patterns and suitability of information technology used in decision making by Nursing and non-Nursing academic administrators within institutions of higher education. The third intent is to describe the relationship of selected demographics and computer usage patterns for decision making by Nursing and non-Nursing academic administrators within institutions of higher education.

Statement of Problem

Information technology will continue to expand, and costs of updated hardware systems and software applications will continue to increase. Organizations like institutions of higher education should utilize information technology systems that will produce the most effective and efficient means to satisfy the demands of administrators in their decision making areas. For this reason, this study will investigate specifically how leadership patterns and selected demographics relate to computer usage patterns of

Nursing and non-Nursing academic administrators in institutions of higher education. In addition, the researcher will investigate how leadership patterns relate to the suitability of information technology systems used by Nursing and non-Nursing academic administrators in institutions of higher education. Research in this area may provide organizations with models of 'natural matches' of leadership styles with information technology systems that are more efficient and effective in delivering information to administrators for their decision making processes.

Hypotheses

The following hypotheses will be addressed in this study:

1. Arts and Science academic administrators in higher education will demonstrate increased variety and more complex computer usage patterns than Nursing counterparts.

2. There is no significant relationship between computer usage patterns and gender among Nursing and Arts and Science academic administrators in higher education.

3. There will be a difference in variety and complexity of computer usage patterns with age among Nursing and Arts and Science academic administrators in higher education.

4. There will be a difference in variety and complexity of computer usage patterns with level of

education attained among Nursing and Arts and Science academic administrators in higher education.

5. There will be a difference in variety and complexity of computer usage patterns with length of time in administrative position among Nursing and Arts and Science academic administrators in higher education.

6. There will be a difference in variety and complexity of computer usage patterns with length of time administrators use computer information technology among Nursing and Arts and Science academic administrators in higher education.

7. There will be a difference in variety and complexity of computer usage patterns with number of students enrolled among Nursing and Arts and Science academic administrators in higher education.

8. There will be a difference in variety and complexity of computer usage patterns with department size among Nursing and Arts and Science academic administrators in higher education.

9. There will be a difference in variety and complexity of computer usage patterns between rural and metropolitan institutions among Nursing and Arts and Science academic administrators in higher education.

10. There will be an increase in variety and complexity of computer usage patterns with leadership patterns that are more independent among Nursing and Arts and Science academic administrators in higher education.

11. There will be increased satisfaction of suitability of information technology systems with leadership patterns that are more independent among Nursing and Arts and Science academic administrators in higher education.

Definition Of Terms

For the purpose of this study, the following terms are theoretically and operationally defined:

Leadership Patterns (Style):

Theoretical-a taxonomy of strategic leadership type requiring different quality and quantity of information, different types of managerial interactions, different mode of leadership in strategic decision making, involving a different process of interpersonal influence and control, information sharing, and use of organizational rules and procedures based on Mintzberg (1979) and Shrivastava and Nachman (1989).

Operational-taxonomy as defined by Shrivastava and Nachman (1989) and tool developed by Schmidt (1992).

Information Technology:

Theoretical-computer hardware systems and software applications used by an organization in handling information and or facts.

Operational-computer hardware systems and software applications identified as being used by members of organization who are respondents in the study.

Use of Information Technology (Computer Usage Patterns):

Theoretical-implicit organizational design of information system for top administrators revealed in pattern of usage.

Operational-design of information system for top administrators revealed in pattern of usage and hardware system deployment as stated on questionnaire from administrators and Management Information Systems (MIS) department head.

Suitability of Information Technology:

Theoretical-best fit or most appropriate selection of information technology available to produce most efficient and effective decision making (Schmidt, 1992).

Operational-best fit or most appropriate selection of information technology available to produce most efficient and effective decision making as defined by tool developed by Schmidt (1992).

Information Technology for Decision Making:

Theoretical-computer hardware systems and software applications available to aggregate data into meaningful information for decision making.

Operational-computer hardware systems and software applications that are used to aggregate data into meaningful information for decision making as described by administrators who are respondents in this study.

Academic Administrator:

Theoretical-group or individual members within organization most closely associated with making strategic decisions for curriculum of academic programs.

Operational-group or individual members within organization associated with making strategic decisions for curriculum of academic programs as identified by deans or program chairs who are respondents in this study.

Program Major:

Theoretical-Distinct subset of curriculum conferring degree(s); i.e., English, Biology, Nursing.

Operational-Distinct subset of curriculum conferring degree(s) as identified by respondents in this study.

Nursing Academic administrator:

Theoretical-academic administrator in a college or university program Nursing major.

Operational-group or individual organizational members who are academic administrator(s) in a college or university Nursing major as identified by deans or program chairs who are respondents in this study.

Arts and Science Academic Administrator:

Theoretical-academic administrator in a college or university Arts and Science major.

Operational-group or individual organizational members who are academic administrator(s) in a college or university Arts and Science major as identified by deans or program chairs who are respondents in this study.

Higher Education:

Theoretical-four year or more accredited institutions offering baccalaureate or higher degrees.

Operational-four year or more institutions with NLN accredited Nursing programs offering baccalaureate or higher degree as published in the NLN database of accredited colleges and universities.

Gender:

Theoretical-the grammatical distinction of biological sex (Webster, 1959).

Operational-the grammatical distinction of biological sex as indicated by response on demographic tool by respondents.

Age:

Theoretical-the actual measure of time elapsed since a person's birth (O'Toole, 1992).

Operational-actual measure of time since birth in years as reported by respondent on demographic questionnaire.

Highest Education Level Attained:

Theoretical-highest degree earned in college or university.

Operational-highest degree earned in college or university as reported by respondent on demographic questionnaire.

Job Classification:

Theoretical-definition of duties and responsibilities of employee incorporated under one job title.

Operational-job title (dean, associate dean, assistant dean) as reported by respondent on demographic questionnaire.

Length of Time in Present Administrative Position:

Theoretical-actual time elapsed since beginning of present job title.

Operational-actual time elapsed in years since beginning of present job title as reported by respondent on demographic questionnaire.

Length of Time Using Information Technology:

Theoretical-actual time elapsed since beginning the use of computer information technology.

Operational-actual time elapsed since beginning the use of computer information technology as reported by respondent on demographic questionnaire.

Size of Institution:

Theoretical-actual number of full time and part time students enrolled in institution.

Operational-actual number of full time and part time students enrolled in institution as reported by respondent on demographic questionnaire.

Size of Department:

Theoretical-actual number of full time and part time students matriculated in curriculum or department major.

Operational-actual number of full time and part time students matriculated in curriculum or department major as reported by respondent on demographic questionnaire.

Geographic Location:

Theoretical-rural or metropolitan area where institution is located.

Operational-where institution is located, (rural or metropolitan), as defined by respondent on demographic questionnaire.

Theoretical Framework

Previous studies of the relationship between the structure of an organization and information technology have used theories from the fields of management, sociology and psychology. In this study the researcher will examine relevant concepts and theories from these reference disciplines. The researcher will work from the assumption that there is no single best way to organize an organization, and there is no single best information system design. The assumption that there is an effective and efficient match for each organization between information systems technology and leadership patterns is also important. Because each organization is different, its needs are different from the needs of others. Each organization has different organizational rules and different resources. Each organization will interact differently from any other organization. However, similar organizations will tend to use information technology in predictable ways.

Systems theory examines organizing resources available to an organization, both internal and external, and processes resources through the organizational system to produce a particular desired output. Viewed from the macro perspective of organizations, the structure of an organization is guided by the interrelationship of organizational regulations, designs and logic, and resources available to the organization. These combine to allow the organization to function properly and produce the desired output. Regulations or rules within the organization delineate how the resources are used and define the processes (designs and logic) used in the organization to produce the desired output (Barley, 1990; Markus & Robey, 1988; Perrow, 1983; Robey, 1987).

The micro view of organizations looks at the human factor in the design of the organizational structure and its interaction with regulations, design, logic and resources (Barley, 1990; Perrow, 1983; Pfeffer, 1985; Robey, 1987). Each organization combines its human resources; i.e., the individuals who come to the organization with previous skills, knowledge and administrative or leadership styles. These individual characteristics will shape the internal characteristics of the organization and along with it will develop the organization's functions and structure. This structure will in turn define the rules that govern the resources within and available to the organization.

Organizations are different because their human and non-human resources available are different.

The work of Mintzberg (1979) on organizational structure and the work of Shrivastava and Nachman (1989) on leadership patterns provides the conceptual foundation for a typology of leadership patterns. The nature of these typologies suggests not only the ways in which decisions are made within an organization but also the manner and degree of sharing of information among leaders to support decision making (Mintzberg, 1979). Shrivastava and Nachman (1989), using existing studies in the field of information systems, proposed that particular information systems designs would best support particular leadership styles. Information systems should be designed for the specific decision making needs of administrators. Specific information, an administrator's own style of leadership, and the organization's structure that defines administrative roles determines decision making for each.

Mintzberg (1979) defined five organizational structure behaviors that characterize how decisions are made according to the degree of centralization of an organization. The five divisions are: Simple Structure, Machine Bureaucracy, Professional Bureaucracy, Divisionalized Form, and Adhocracy. The degree of centralization is different for each. Simple Structure primarily employs centralized control. Machine Bureaucracy and divisionalized forms fall within the mid range of decentralization, while the adhocracy and Professional Bureaucracy are highly decentralized. These organizational divisions closely parallel the leadership patterns described by Shrivastava and Nachman, 1989 (see Figure 1).

Mintzberg (1979) Organizational Structure	Shrivastava and Nachman (1989) Strategic Leadership Patterns
Adhocracy	Political
Machine Bureaucracy	Bureaucratic
Simple Structure	Entrepreneurial
Professional Bureaucracy	Professional

Figure 1. The comparison of Mintzberg's organizational structure divisions and Shrivastiva and Nachman's leadership patterns.

Mintzberg (1979) defined the divisions as follows. Simple Structures are usually small entrepreneurial organizations with centralized decision making located with the founder/ entrepreneur/ CEO. Products or services are usually unique or in response to fast changing dynamic local environmental demands.

Machine Bureaucracies are usually large organizations associated with mass production technology. Rules and regulations underline the need for control over production and products, process and distribution are standardized and repetitious. Coordination of the organization may reside at different levels and relies on the standardization of work functions. Products and services in these organizations have a high material component rather than an informational component.

In the Professional Bureaucracy, standardization of skills rather than work functions provides the basis for coordination. Therefore, the organizational control tends to be decentralized in order that the skilled employees be provided considerable autonomy over their own work. Products and services tend to have a high informational component, and skilled workers operate independently to accomplish their own goals.

The Divisionalized form is usually characteristic of older, more mature, and very large organizations comprised of multiple semiautonomous organizations. They are integrated by the top administrative framework of the organization and may be centralized within a division and organization and may be centralized within a division and decentralized in relationship to the total organization.

The Adhocracy organization is similar to the professional bureaucracy in that it relies on skilled workers. However, in this organization the skilled workers work together to accomplish the organization's goals rather than the individual's goals. This organization is usually small and works effectively as a cohesive group similar to a project team. For this reason, the organization tends to be very decentralized.

Based on Mintzberg's (1979) structure of organizations, Leifer (1988) proposed a simple matrix of 'natural matches' between the structure of an organization and the information system hardware system configuration it uses to support decision making. Leifer (1988) proposed that the characteristics of Mintzberg's (1979) divisions suggested specific matches with information system hardware system designs in an organization. Although the choice of hardware systems is not always under the control of the manager, the selection and utilization or non-utilization of software application is often at the discretion of the manager. In addition, as technology has increased, software applications available today are often utilized on a variety of hardware systems.

Leifer (1988) proposes that the combination of individual characteristics such as leadership style and organizational characteristics such as the degree of centralization will lead managers or administrators to gravitate toward the use of particular information system products, hardware systems or software applications. Leifer (1988) goes on to propose that this 'natural match' can be demonstrated in computer usage patterns and satisfaction or suitability expressed by users. Information systems that naturally match administrative styles lead to increased use, satisfaction and productivity (Leifer, 1988).

Assumptions

This study is based on the following assumptions:

1. There is neither a single best way to structure an organization nor a single best information system design (Druzen & Van de Ven, 1985). There is, however, a match between leadership patterns and information system design for each organization which will support a more efficient and effective decision making process.

2. Organizations are open systems that must process information but have limited capacity of human and non-human resources to do so.

3. Administrators have identifiable individual leadership styles.

4. Institutions of higher education tend to be open systems where the major work of administrators is in information processing.

Limitations

The following limitations are acknowledged for this research study:

1. The length of the questionnaire utilized may have effected the number of respondents' willingness to participate. Administrators are heavily surveyed, and their time is limited.

2. This study surveyed only institutions of higher education. Samples of organizations from a single sector (manufacturing vs. service) limit variability on technology-structure relationships (Miller, Glich, Wang, & Huber,1991).

3. There was a lack of control over which administrator was completing the questionnaire. There was no guarantee the top administrator was the respondent. This could be corrected using interviews or asking for job title or position. This was not feasible nor appropriate for this descriptive study, but once the theory of 'natural matches' is supported, it would seem appropriate to conduct face to face interviews. This study did not ask for job title or position so as to guarantee anonymity, there being usually only one dean in a program.

4. The next piece of information lacking in this study was institutional location by state or city instead of rural or geographic. This would have provided much richer information in geographic area. In the future, break down of geographic categories more specifically may show different results.

5. To further test reliability of the tools, there should have been a qualitative question for leadership style. This was not included in this study mainly to assure that the respondent did not feel their answer might in any way jeopardize them and, therefore, decrease number of returns. In future studies, it would be important to include reliability testing on all tools.

6. As with many descriptive studies, this was cross sectional. Descriptive studies assume equilibrium. If the institution is on the verge of change, then the data may not accurately reflect the true state of the institution or its informational system and, therefore, the fit would be artificial. It might be revealing to research this group again in consecutive years to see how information technology changes. Many respondents did indeed identify that changes were in the process. Different methods such as interviews or case studies would detect potential for change. With this study, this was not feasible. However, in future

studies a sampling of institutions could be approached to consent to the interview processes.

7. With questionnaires, there is always the risk of response bias. This study did not send out second questionnaires to non-responders. A comparison of the second set of questionnaires would identify if responder bias was present in the first set. In looking at the obtained demographic information, this study appears to represent a homogenous sample. However, this researcher does not ignore the fact that response bias may indeed be influencing the data results.

Significance of Study

Throughout the process of investigating the quality of a given profession, the engaged researcher should consider the nature of the profession, the key variables within the profession and relationships among those variables. Inherent in the decision making process is the need to identify the skills and tools necessary to analyze and solve problems. These elements enable managers and administrators either to adapt to their reality or create it (Senge, 1990a). Managers and administrators may avoid linear thinking and a quick-fix approach by identifying internal processes that may lead to problems and eliminate them (Senge, 1990a; Vogel & Wetherbe, 1991). If organizations are to survive into the 21st century, managers and administrators must learn to create their own place in the future rather than react to changes in the present (Senge, 1990a). To do this, managers and administrators must analyze the strategic foundation upon which their organization is based (Senge, 1990a). Within the organizational structure lie areas of needed change. Some require much energy but lead to little improvement. Others may require little energy but still lead to little improvement for the organization. In identifying high leverage areas, where minimum change would lead to a lasting and significant improvement, organizations expend little energy and improve cost containment, improve their marketability and create their place in the future.

One area of high impact for managers and administrators is access to information necessary for decision making. Improvements in information technology have permitted the monitoring and communication of information, once only available by informal means, both within and across organizations and to a limited number of members of the organization. "To the extent that [information technology] continues to become user friendly and to the extent that organizations view these systems as investments rather than costs, not only will more and more organizations employ these systems, but these systems will be used increasingly by lower levels of employees within these organizations" (Huseman & Miles, 1988). The rapid, reliable and efficient access of information improves an organization's chance to share in the market place. Survival is inherent in a broad and consistent customer base. By identifying the patterns by which others have successfully integrated information technology in the decision making process, one can set up guidelines for others to follow. This makes the decision making process for inclusion of information technology systems less risky and more desirable. For this reason, research in identifying 'natural matches' between leadership patterns and information systems technology should be continued.

Schmidt (1992) based his study on Mintzberg's (1979) organizational structure and Shrivastava and Nachman's (1989) definition of strategic leadership patterns. Figure 2 shows how Schmidt (1992) categorized his leadership patterns and compared them to Mintzberg's (1979) organizational structure and Shrivastava and Nachman's (1989) strategic leadership patterns.

Mintzberg (1979)	Shrivastava and Nachman (1989)	Schmidt (1992)
Organizational Structure	Strategic Leadership Patterns	Leadership Patterns
Adhocracy	Political	Political Bureaucracy
Machine Bureaucracy	Bureaucratic	Central Bureaucracy
Simple Structure	Entrepreneurial	Central Teams
Professional Bureaucracy	Professional	Professional Bureaucracy

Figure 2. Comparison of Mintzberg's organizational structure, Shrivastava and Nachman's leadership patterns and Schmidt's leadership patterns.

Schmidt (1992) developed a tool to measure leadership patterns and that tool, representing the above structure, was used in this study.

In the next chapter, current and classical literature pertaining to this study will be reviewed.

Chapter 2

Literature Review

This study investigated the relationship between information technology and administrative leadership patterns. The literature review focused on the areas of information technology, implementation of information technology, strategic planning and information processing, organizational leadership, the relationship between information technology and organizational structure, organizational characteristics, and information technology in higher education.

An assumption of this study was administrators need information for decision making and strategic planning. Access, availability and timeliness of information are important to the operation and survival of manufacturing and service organizations. As organizations develop, grow and change, information will always be needed. Information technology has changed the way that organizations receive and send information. Today and in the future, survival of organizations will depend upon how they utilize information technology to accomplish strategic planning and decision making (Adler & Shenbar, 1990; Nolan, 1990; and Vogel & Wetherbe, 1991).

Information technology

There were several definitions of information technology in the literature, two of which were Huber, 1990 and Barley, 1990. Information technology is defined by Huber as "devices that transmit, manipulate, analyze or exploit information in which a digital computer processes information integral to the user's communication or decision task" (Huber, 1990 p. 48). These devices contain "properties [to enable] the individual or organization to communicate more easily and less expensively across time and geographic location, communicate more rapidly and with greater precision to targeted groups, record and index more reliably and inexpensively the content and nature of communication events, and to more selectively control access and participation in a communication event or network" (Huber, 1990, p. 50). Huber (1990), proposed advanced information technologies would have an effect on organizational design, intelligence and decision making.

Barley builds on Nadel's Theory of Social Structure (Nadel, 1957) and defines information technology as a causal agent for change within the organization. Humans are perceived as agents of social change and interact within the organization (Barley, 1990). The nature of humans is unpredictable and leads to infinite combinations of interaction between individuals and organizations. Do varying information technologies influence relationships?

Barley (1990) in a longitudinal study of two radiology departments instituting CT scanners found micro social dynamic changes, caused by information technology, had an immediate impact on work roles. These dynamics influenced relational elements within the organization and eventually, the structural elements of the organization (Barley, 1990). Barley (1990) concluded that information technology can cause changes within the organization and among employees.

Implementation of Information Technology

Since information technology provides interaction between the individual and the small or large group, it is difficult to confine research to one level of analysis, be it micro or macro (Barley, 1990; Markus & Robey, 1988). Studying the organizational impacts of information technology on decision making can benefit research by filling in the gap that currently exists. In addition, research in this area can provide organizations information about possible combinations of technology available and the available and the application of technology to particular organizational structure.

Early research on the implementation of information technology began as a study of individual decisions to adopt new ideas. Studies gradually shifted from examining adoption of information technology to analyzing implementation of information technology.

There are no universal patterns of change with the implementation of information technology or the implementation of information systems (Barley, 1990; Markus & Robey, 1988; Robey, 1987; Van de Ven & Rogers, 1988). To a great extent, studies on the implementation of information technology have focused on individual traits such as attitudes and user satisfaciton. Brodt and Strong (1986), surveyed 185 nurses and found educational preparation, the unit on which they worked and length of service in the Nursing profession significantly affected positive attitudes towards computers. All levels of Registered Nurses had more favorable attitudes toward computers than Licensed Practical Nurses. Nurses who had practiced in the profession longer had more favorable attitudes. Nurses on pediatric rehabilitation unit and administrators had more favorable attitudes towards computers than those on all other units. Brodt and Strong found no significant differences in the relationship of attitudes to age, length of employment in the particular institution, shift, or presence of computer terminals on the unit.

Harsanyi and Kelsey (1989) surveyed 486 medical faculty and 62 Nursing faculty in Texas. They found no significant difference between Nursing and medical educators' attitudes on computers, nor did they find a significance in demographics and attitudes.

Howard and Smith (1986), in studying 160 managers in 13 manufacturing and service organizations, found a significant inverse relationship between computer anxiety and attitudes toward computers. Howard and Smith did not find a significant relationship between attitudes towards computers and age, gender, locus of control, cognitive style, or trait anxiety. They did identify an inverse relationship between attitudes towards computers and math anxiety.

Igbaria and Nachman (1990), in surveying 104 end users in six large companies, found results similar to Howard and Smith. Igbaria and Nachman found no significant relationship between user satisfaction and gender, educational level or organizational level but did find an inverse relationship with anxiety and user age. In addition, Igbaria and Nachman found significant positive relationships between user satisfaction and hardware systems and software applications accessibility and availability, computer background of users, user attitudes and system utilization.

Misfeldt and Stahl (1991) conducted a nationwide survey on 63 Canadian Universities. They found a significant difference in attitudes towards computers among academic administrators, non-academic administrators and faculty. Administrators had more positive attitudes toward computers than faculty. Among faculty, engineering and administrative faculty were more positive, while Fine Arts faculty were the least positive. No significant differences among Natural Science, Medical, Math, Computer Science, Education and Humanities faculty were found. The size of the university or age of individual did not seem to affect attitudes.

Parasuraman (1990), in studying 166 managers in a variety of organizations, found anxiety a predictor of attitudes. Parasuraman (1990) found no gender differences when comparing anxiety and attitude. However Parasuraman (1990) found the following gender differences among demographic characteristics and personality traits. Men demonstrated a relationship with computer anxiety and education and intuition-sensing. Even though women indicated no significant relationships between demographic characteristics and personality traits, the feeling-thinking cognitive style and math anxiety were additional determinants of attitudes toward microcomputer usage. Age, external locus of control, and math anxiety were directly related to computer anxiety. In both men and women, computer anxiety was the strongest predictor of attitudes toward microcomputers.

Ray and Minch (1990), studied 114 undergraduate and graduate students in business management classes using computers. They found an inverse relationship of anxiety with job experience as well as experience with computers. There was no significant relationship of anxiety to age or gender.

Yap and Tng (1990), in surveying the attitudes of 459 female computer professionals in Singapore, found a significant percent (73%) were in favor of telecommuting. They found no significant relationship between attitudes and home use of computers but found significant correlation of attitudes with availability of study room set aside for work purposes. Yap and Tng (1990) found no significant relationship between attitude and supervisory responsabilities or amount of programming content in job. Attitude correlated significantly with the respondent's belief about the attitude of supervisors and coworkers toward telecommuting. If the respondent felt their supervisor and coworkers were in favor of telecommuting, then they also exhibited a positive attitude.

Another individual characteristic studied was user satisfaction. User satisfaction and performance with management information systems becomes an important evaluative measure (Conrath & Mignen, 1990; Igbaria & Nachman, 1990; Vijayaraman & Ramakrishna, 1990). Conrath and Mignen (1990) studied 425 Canadian corporations with over 100 employees and over $10 million in revenues. They found that one-fourth had formal procedures to measure user satisfaction. They found a significant relationship between user satisfaction and perceived improvement in production and service and between user satisfation and relationships between departments using and departments providing computer services. Conrath and Mignen (1990) proposed user satisfaction will logically affect rate of usage. Conrath and Mignen (1990) concluded that successful incorporation is dependent upon both efficiently supplied information and perceived satisfaction.

Vijayaraman and Ramakrishna (1990), reached similar conclusions when they examined the differences between successful and unsuccessful information centers of ten large companies. They found end users in successful centers had greater perceived satisfaction and higher perceived benefits for services and support in the areas of adaptability, timeliness, availability, dependability, access and adequacy. There is no basis for changing perceptions or improving the system unless the ways users perceive computer based services and their delivery are documented (Conrath & Mignen, 1990).

Igbaria and Nachman (1990) in studying 104 end users in six large companies found that leadership behaviors, such as initiating structure and consideration of information system managers, were positively and significantly related to user satisfaction. The authors concluded that leadership behaviors are viable and important components of implementing a successful information system (Igbaria and Nachman, 1990). In addition, a significant positive relationship existed between user satisfaction and hardware systems or software applications accessibility and availability, computer background of user, user attitudes toward computing and system utilization. No significant relationship was found between user satisfaction and gender, education, nor organizational level.

Individual demographics such as age, gender, educational level and organization level were also a focus in many of the studies cited. In 1990, Barley conducted a longitudinal study of two radiology departments in two Massachusetts hospitals. Instead of focusing on individual characteristics, Barley, using Nadel's (1957) theory of social structure, investigated whether and how new modalities of CT scanners effected the interaction between organizational structure and the relational and non-relational aspects of the radiologists' and technologists' roles. Barley (1990) found that introduction of new technology led to changes in non-relational aspects of roles which in turn transformed the corresponding system of role relations. "Over time, new technologies induced a split in the social organization of two departments, generating a set of distinctions that divided the departments into two social worlds" (Barley, 1990, p.91). Barley (1990) proposed if a new technology alters the process of completing a task and causes changes in interaction with old and new persons, then the communication system and the role interaction must change.

Zmud and Apple (1992) surveyed 80 CEO's of supermarket chains that had instituted scanners. They found that routinization and infusion (incorporation of innovation) increases as members of an organization gain experience with a technological innovation.

Markus and Robey (1988), examined the relationship between information technology and organizational change. Markus and Robey (1988) are in agreement with Barley (1990) that studies on the macro level look at societal and formal organizational structures that explain societal phenomena (large group) without using individual processes (Markus & Robey, 1988). "Micro level studies examine the individual or small group but ignore the interaction of the organization on human purpose and intentions" (Markus & Robey, 1988, p. 593-594). In order to see the big picture, one has to account for not only the interaction of individuals but the interaction of the individual with the organization.

Strategic Planning and Information Processing

Senge (1990), in his book The Fifth Discipline, discussed at great length strategic planning and information processing. Central to his theory is the notion that decision making is a central organizational activity. Therefore, it is important to create organizational structures and processes that facilitate organizational decisions. Senge (1990) goes on to say that informational needs for making strategic decisions should be sensitive to multiple areas of the organization. Internal and external processes and resources are vital to an organization's survival. Information regarding these areas is crucial in making decisions in all areas of the organization's system processing, input, throughput processing and output. Senge proposes that change in any one of the system processes will be based on information availability, accessibility, timeliness and accuracy. Therefore, information necessary to make decisions is of primary importance.

Computer assisted communication technology such as E-mail, image transmission, computer and video conferencing, and decisional support systems, facilitate access to people and information within and outside an organization with an ease that had not been possible prior to computer technology. Efficient and effective organizational communication today will necessarily involve the utilization of both people and computer systems. Adoption of new information technologies by an organization will allow an organization to remain active, vital, efficient and effective and in a much improved position to create a future for itself. The less desirable alternative for the organization is to be forced to respond to technology as crises arise (Senge, 1990).

However, it seems that interactive computer innovations are adopted and incorporated initially at a very slow rate.

Harsanyi and Kelsey (1989) in their study of 486 medical faculty and 62 nursing faculty in Texas identified the slow diffusion of technological innovations in education and clinical environments. Harsanyi and Kelsey (1989) propose little functional advantage is apparent with only a few users because of the interactive nature of computer communication technology. The first organization or department to adopt innovative communication technology usually assume considerable expense. However, once a critical mass of individuals, groups, or organizations adopt an innovation, incorporation proceeds rapidly and geometrically (Harsanyi & Kelsey, 1989).

Currently, more sophisticated and user friendly forms of computer assisted communications and decisional support systems are in use. These major technological capabilities influence the roles of administrators, communications and reaching decisions within an organization. Ultimately, success of information systems will depend on how well the management information system has supported decision making (Vijayaraman & Ramakrishna, 1990) and has assisted administrators in strategic planning.

Strategic decision making within the organization is dependent on group processes and interactions that cross departmental, divisional and organizational boundaries

(Barley, 1990). In a social context, strategic decision making "involves multiple partisan members who must interact over extended periods of time to reach semi-consensual decisions" (Shrivastava & Nachman, 1989, p. 52). Because of the interactive nature and need for immediate response in decision making, availability of advanced information technology increases communication and decision options for decision makers. Hence, the quality and timeliness of communications and information influence the quality of the decision making process. This underscores the need for compatibility between organizational design or structure and the design of technologically supported information systems.

Organizational leadership

Van de Ven (1986) and Van de Ven, Hudson & Schroeder, (1984) hypothesized a paradigm after studying the conditions in the start up of 14 educational software applications companies. In Van de Ven's paradigm, institutional leadership is one of four central areas in organizations where problems arise in implementation of innovations. Since decision making requires the interaction among individuals and groups, an infrastructure that supports the effective synthesis of individual and group oriented leadership within the organization is necessary (Huber, 1990; Shrivastava & Nachman, 1989; Van de Ven, 1986; Van de

Ven, Hudson & Schroeder, 1984). In addition, organizational infrastructure needs to foster innovation and also link innovational individuals and groups into the larger and more encompassing organizational mission and strategy (Van de Ven, 1986; Van de Ven, Hudson & Schroeder, 1984). This can be a challenge since the assumption in much of the past literature is that top management provides strategic leadership in organizations (Shrivastava & Nachman, 1989). Recent theories in organizational infrastructure support the need and use of management teams for strategic planning (Huber, 1990; Senge, 1990; Shrivastava & Nachman, 1989; Van de Ven, 1986; Van de Ven, Hudson & Schroeder, 1984).

Van de Ven, Hudson and Schroeder (1984) studied conditions in the start up of 14 educational software applications companies. They found that conditions under which the organization is planned, and the processes followed in its initial development, impacted the structure and performance in later life of the organization (Van de Ven, Hudson & Schroeder, 1984). The more closely entrepreneurs followed the program planning model, despite individual differences, the greater the probability of achieving later stage development and success (Van de Ven, Hudson & Schroeder, 1984).

Huber (1990) agreed that the initial organizational internal structure was the key to success and survival. Internal politics that interfere with the strategic mission or goal must be dealt with until conformance is achieved (Huber, 1990). Huber (1990) echoed Senge (1990); members of the organization must agree and support the strategic planning if the organization is to survive and grow. Those that do not conform eventually need to be purged from the system (Huber, 1990).

Shrivastava and Nachman (1989), used the data from 27 business cases to develop a classification of leadership patterns based on Mintzberg's typologies (see Figure 3). Shrivastava and Nachman (1989), suggested each leadership type may require different quality and quantity of information for decision making and, therefore, implied different types of managerial interactions existed. Characteristics of strategic decision making puts special demands on the organization's leadership. They must be capable of adapting to drastically changing conditions and operate in a flexible, unstructured environment. Their range of influence and control may spread from subordinates and peers within the organization to external agents as well.

Mintzberg Topology (1979) Organizational Structure	Shrivastava and Nachman(1989) Strategic Leadership Patterns
Adhocracy	Political
Machine Bureaucracy	Bureaucratic
Simple Structure	Entrepreneurial
Professional Bureaucracy	Professional

Figure 3. Comparison of Mintzberg's organizational structure divisions and Shrivastava and Nachman's leadership patterns.

As cited earlier, Igbaria and Nachman (1990) found a significant positive relationship between leadership style and user satisfaction when studying 104 end users in six large companies. Therefore, there is a need to clearly understand managerial activities related to strategic decision making and to match these activities to various information systems.

Information Technology-Organizational Structure Relationship

Research and theories have proposed the existence and importance of technology-structure relationships. Barley (1990), in studying the long term effect of the introduction of CT scanners in two radiology departments, found changes in non-relational aspects of roles. These changes effected the corresponding system of role relationships creating the split of previously perceived united departments.

Miller, Glich, Wang, and Huber (1991), conducted a meta-analytic theory test on technology-structure studies. They found the use of different definitions of technology, variations in organizational size, professionalism and industrial sector do not affect the technology-structure relationship. However, they did find that industrial sector heterogeneity (the premise that larger organizations will have a variety of characteristics) and the size of units of analysis did affect the technology-structure relationship.

There were no current studies that contradicted the above studies. However there was an old study that did not show the link between technology and structure. Blau, Falbe, McKinley and Tracy (1976), in studying 110 New Jersey manufacturing concerns did not support an interaction effect between size, production technology and administrative structure, but did conclude that "automation of administrative support functions through the use of computers exerts numerous influences on the organization of work which parallel those of highly mechanized process technologies" (Blau, Falbe, McKinley & Tracy, 1976, p. 20).

Organizational characteristics have been studied in conjunction with information technology. Miller, Glich, Wang, and Huber (1991), in a meta-analysis found that the size of the organization did not affect the technology-structure relationship. The size of the unit of analysis and industrial sector heterogeneity did have an effect. They also found that the process of routineness is more positively related to centralization in smaller organizations than larger ones. In addition, organizations with a greater percentage of professionals tended to be low in centralization (because of autonomy), and manufacturing organizations may exhibit more technology-structure relationships than service organizations; service organizations tend to deal more with people in process as well as product than manufacturing organizations.

Barley (1990), in a longitudinal study of two radiology departments that instituted CT scanners found that technology directly determines differences in organizational characteristics such as span of control, centralization, and formalization of rules and procedures. This supports the technology-structure relationahip.

Zmud and Apple (1992) also agree with the existance of the technology-structure relationship. In studying technological innovations in adoption and incorporation of supermarket scanners, Zmud and Apple (1992) found that the greater the extent of change the innovation has on the work and governance system, the greater the innovation is incorporated. Zmud and Apple (1992) make a distinction between routinization; the adjustment of organizational governance system to account for innovation, and incorporation; the implementation of activities directed toward embedding an adopted innovation within the organization (Zmud & Apple, 1992, p. 145). Zmud and Apple (1992) explain that incorporation of innovations will follow a sequence of configurations across discrete levels of use with advanced incorporation enabling the deeper, more comprehensive embedding of the innovation within an organization's operational or manager's work system. Simple routinization is necessary, but not sufficient, for organizational infusion (incorporation) of an innovation among its members (Zmud & Apple, 1992). Changes in the organizational processes (routinization) generally require changes in the organizational structure (Huber & McDaniel, 1986; Markus, 1983; Robey, 1987; Zmud & Apple, 1992). This was similar to what Barley (1990) identified in the study of radiology departments.

Implementation of technology influences the roles as well as the structure (Barley, 1990; Zmud & Apple, 1992). Therefore, in terms of organizational structure, the best design is to facilitate making organizational decisions and facilitate incorporation of innovations (Huber & McDaniel, 1986; Markus, 1983; Robey, 1987). Huber and McDaniel's paradigm (1986) proposed the central focus, for creating organizational structures that facilitate decision making, should be methods to organize making decisions and not production processes. Further, the nature of current and future organizational environments will require the use of an organizational design that responds to increased frequency and criticality of the decision making process (Huber & McDaniel, 1986).

Organizational Characteristics

When compared with the number of studies focusing on individual characteristics, the analysis of organizational characteristics was noticeably lacking in research literature. This may be due to the difficulty in operationalizing structural variability of organizations and, therefore, difficulty in adequate measurement.

Earlier studies looked at specific structural characteristics and organizational behavior associated with information requirements. For example, Tushman (1979), studied the impact of environmental variability on communications within and outside a large research and development laboratory. Tushman (1979) found intra-project communication to be contingent on the nature of the unit's task. Extra-unit communication was inversely related to perceived environmental variability. The more variable the external climate appeared, the less those within the task unit communicated with those outside the task unit.

More recently, Pfeffer (1985), concluded that similarities of organizational demographics of employees, such as individual time of entry, age, and educational level, would lead to increased communication frequency and produced greater integration and cohesion of group.

Schmidt (1992), investigated the interdependence between organizational structure and the use of computer technology. Schmidt (1992) studied organizational managers and information systems managers in 114 firms, and found an interdependence between leadership patterns, computer usage patterns and hardware systems deployment. Based the typologies of Mintzberg (1979) and Shrivastiva and Nachman (1989), Schmidt (1992) defined four leadership patterns; Political Bureaucracy, Central Bureaucracy, Central Teams and Professional Bureaucracy, and four information technology usage patterns; Central Feeder, Collaborative, Procedure Based and Scanning. Schmidt (1992) hypothsized a 'natural match' relationship between the two groups based on the 'natural match' classification of Leifer (1988).

Recently theoretical literature has brought to the foreground a need to look at organizations and how they process information. Senge, in his book The Fifth Discipline, (1990a), proposes that individual as well as organizational (group) performance is based on learning. Senge (1990a), states that through generative learning, the organization creates a future, rather than adapting or coping with it. Therefore, the atmosphere of decision making changes from one of reaction to events of reality (crisis management), to one of creating the reality of the future (Senge, 1990a).

Rogers' theory of Diffusion of Innovation (1983) described the way innovations are communicated over time, through certain channels, and among the members of a social system (an organization). Rogers (1983) emphasizes that diffusion is a social process that begins with a perceived need by individual(s) within the organization. Through a process of research and development on possible solutions, decisions are made by a change agent; innovation is diffused throughout the organization or in parts of the organization (Rogers, 1983). Innovations will change the social system and, therefore, the organization. Studies of successful implementation of innovations will reveal successful processes and characteristics of the organization and its members.

Huber (1990) theorized that "organizational effectiveness and efficiency are greatly determined by quality and timeliness of organizational intelligence and decision making. These in turn are directly affected by computer assisted communication and decision aiding technology and indirectly affected through the impact of the technology on organizational design" (Huber, 1990, p. 63).

In Daft and Lengel's model (1986), "organizational structure and internal communication system determine both the amount and richness of information provided to managers" (Daft & Lengel, 1986, p. 554). Daft and Lengel (1986) propose that lack of clarity in information processing is a major problem area for managers and not the lack of data itself.

Many authors theorized the link between organizational structure and information technology (Daft & Lengel, 1986; Huber, 1990; Huber & McDaniel, 1986; Huseman, 1988; Robey, 1987, Van de Ven, 1986; Van de Ven & Rogers, 1988; Zmud & Apple, 1992), but little research has been done in this area.

Higher Education and Information Technology

The survey of the literature revealed a paucity of research on the relationship between the use of information technology and administrators in higher education. The majority of the literature and research has been conducted on the use of computer assisted instruction (CAI) or computer assisted education (CAE). Research on the relationship of administrators in higher education and use of information technology for decision making could not be identified.

Summary

Research supports the supposition that use of computer technology has and will continue to change the way communication and roles occur within an organization. Use of information technology will not eliminate the use of traditional technology. Information technologies were not meant to substitute for traditional technology but to enhancement it. When properties of advanced technology are useful for enhancing individual or organizational effectiveness, organizations should be concerned with the effects advanced information technology has on organizational design, intelligence and decision making

(Huber 1990). To create the future for an organization, decision makers need timely, accurate data that is readily available, accessible and efficiently processed (Senge, 1990).

Two researchers noted that, as the use, capabilities and form of communication and decision aiding technology increases, researchers must reassess what is known about the effects of technology on the organization (Huber, 1990; Johnson, 1987). Research seems to be focused on determining what technology to provide for specific systems and how technology should be delivered. This information will assist organizations in developing information systems that will work for them instead of forcing users to use, or want, what the organization has available (Johnson, 1987; Vijayaraman & Ramakrishna, 1990). In turn, this will help organizations to learn, grow and survive (Senge, 1990).

The state of research on the relationship between leadership patterns and information technology is poor. Studies of these relationships in higher education were non-existent. This study will examine the interdependence of leadership patterns and computer usage patterns for decision making among Nursing and non-Nursing academic administrators in higher education.

Chapter 3

Methodology

Statement of Purpose

The purpose of this study is threefold. First, to describe the relationship of leadership patterns and computer usage patterns for decision making by nursing and non-nursing academic administrators within higher education. Second, to describe the relationship of leadership patterns and suitability of information technology in decision making by nursing and non-nursing academic administrators within higher education. Third, to describe the relationship of selected demographic variables and computer usage patterns for decision making by nursing and non-nursing academic administrators within higher education.

Study Design

Only a few studies across several disciplines have focused on the relationship between organizational characteristics and information technology. This study addresses this gap in the research. This is a field study of top administrators in higher education currently using information technology. The study explored two areas: the relationship between leadership patterns and computer usage, and suitability for decision making and the relationship of computer usage to selected demographic and employment variables of Nursing and non-Nursing academic administrators in higher education.

This study was both descriptive and exploratory. Descriptive research studies attempt to accurately observe, describe and document characteristics of persons, situations or groups and the frequency with which certain phenomena occur (Polit & Hungler, 1991). Exploratory research extends descriptive research and focuses more directly on the identification of relationships between variables (Polit & Hungler, 1991). Exploratory studies provide a richer understanding of phenomena than descriptive research and are of particular importance to new areas being studied. Exploratory studies may provide a broader base from which to conduct further research.

Hypotheses

The following hypotheses were tested:

1. Arts and Science academic administrators in higher education will demonstrate increased variety and more complex computer usage patterns than Nursing counterparts.

2. There is no significant relationship between computer usage patterns and gender among Nursing and Arts and Science academic administrators in higher education.

3. There will be a difference in variety and complexity of computer usage patterns with age among Nursing and Arts and Science academic administrators in higher education.

4. There will be a difference in variety and complexity of computer usage patterns with level of education attained among Nursing and Arts and Science academic administrators in higher education.

5. There will be a difference in variety and complexity of computer usage patterns with length of time in administrative position among Nursing and Arts and Science academic administrators in higher education.

6. There will be a difference in variety and complexity of computer usage patterns with length of time administrators use computer information technology among Nursing and Arts and Science academic administrators in higher education.

7. There will be a difference in variety and complexity of computer usage patterns with number of students enrolled among Nursing and Arts and Science academic administrators in higher education.

8. There will be a difference in variety and complexity of computer usage patterns with department size among Nursing and Arts and Science academic administrators in higher education.

9. There will be a difference in variety and complexity of computer usage patterns between rural and metropolitan institutions among Nursing and Arts and Science academic administrators in higher education.

10. There will be an increase in variety and complexity of computer usage patterns with leadership patterns that are more independent among Nursing and Arts and Science academic administrators in higher education.

11. There will be increased satisfaction of suitability of information technology systems with leadership patterns that are more independent among Nursing and Arts and Science academic administrators in higher education.

Population

The study population was administrators in higher education institutions who have adopted information technology. Information technologies included, but were not limited to, electronic messaging systems, executive information systems, group decision support systems, or executive presentation systems.

Subjects

Subjects were academic administrators in Nursing and Arts and Science in colleges and universities from the 1994 National League for Nursing (NLN) published mailing list for accredited Bachelor of Science in Nursing (BSN) and higher degree programs. Arts and Science and Nursing departments were chosen because they are not usually under the same deans. Also, Nursing results were of particular interest to the researcher. A comparison of Nursing with their cohorts in non-Nursing disciplines in education was considered a comparison of different professional sciences; Nursing comprised of a single discipline characterized by the interweaving of the art and science of Nursing, while the Arts and Science department consisted of different disciplines that are ususally considered either an art or a science.

Subjects in this research were self selected; they returned questionnaires and indicated they wished to participate by completing the questionnaires. In addition to academic administrators, managers in the information system's (MIS) department in each institution were surveyed to determine information technology usage patterns, and suitability of and type of hardware system. The sample included administrators who completed the questionnaire.

Protection of Human Subjects

Permission to conduct this study was obtained from the Human Subjects Review Board of George Mason University. Since this study fell under subpart 46.101, paragraph b (1) of Title 45 CFR 46, Protection of Human Subjects, this study was exempt from Human Subjects Review. The Human Subjects Review Form was filed with George Mason University's Office for Sponsored Programs (See Appendix A).

Participation in the study was strictly voluntary, and participants were assured of their right to withdraw at any time without consequences. The study purpose and procedure was explained in a cover letter along with a guarantee that anonymity would be maintained. The cover letter also included that participation or non-participation was voluntary and would not affect their employment status. Subjects were informed of implied consent and that they would have access to results following conclusion of the study.

Population sample selection

Questionnaires (see Appendix D - I) and introductory letter (see Appendix B) were sent in the fall semester 1995 (October) to academic administrators in Nursing and Arts and Science departments and Information System managers in 637 universities and colleges with Nursing programs listed in the NLN publication. After six months of data collection, data analysis was begun, and no further questionnaires were included in the study.

Statistical power

To provide statistical power of about 85% at ' =.05 for the largest table (leadership patterns with types of hardware systems), a sample size of 125 was needed (Weiss, N.A., & Hassett, M.J., 1993) in which at least one academic administrator and the MIS administrator in an institution both returned a completed questionnaire. This criterion was met with 175 institutions returning at least one academic department and the MIS questionnaires.

Questionnaires

Two packet types were sent to each institution. Packet A contained all questionnaires for the academic department administrators. Packet A was sent to both the dean of Nursing and dean of Arts and Science departments for each institution. Instructions allowed the completion of the questionnaire by deans, assistant deans or associate deans. This step was necessary to increase the accuracy of categorizing various organizational and leadership characteristics. Packet B for the Information System manager at the institution contained all questionnaires except the leadership pattern questionnaire. The Information System manager's packet was necessary to support Leifer's (1988) model of hardware systems-organization structure 'natural matches'.

Instrumentation (See Appendix D-I)

1. Demographic variables - Researcher generated questions based on literature review were utilized to collect information on selected demographic and employment variables (Appendix D).

2. Information technology usage patterns - This was a tool with 17 items developed by Schmidt (1992), containing nine point Likert-type scales, semantically anchored at each end (Appendix E). In addition, choices for "not available" and "assisted" were added. "Not available" was scored as zero. If the respondent wrote in never, a score of 'zero' was assigned. Reliability reported by Schmidt (1992) was α=.5242 to .7764 for six factor extraction and α=.4695 to .8164 for three factor extraction. Reliability for this study using Cronbach's alpha was α=.78. Permission was granted for tool use.

3. Leadership patterns - This was a tool consisting of 17 items developed by Schmidt (1992) based on Shrivastava and Nachman(1989). The tool was a nine point Likert-type

scale, semantically anchored at each end with a minimum of 1, and a maximum of 9 points (Appendix F). Reliability reported by Schmidt (1992) was α=.2514 to .7672 for seven factor analysis and α=.4191 to .7291 for four factor analysis. Reliability in this study using Cronbach's alpha was α= .66. Permission was granted for tool use.

4. Information Systems Suitability - This was an attitudinal instrument developed by Schmidt (1992), with nine point Likert-type scale, semantically anchored at each end (Appendix G & I). Reliability reported by Schmidt (1992) was α =.7976 & .6764. Reliability in this study using Cronbach's alpha was α =.67. The tool was subdivided into its component parts. Reliability of availability and planning factors were α=.86 and α=.62 respectively. Permission was granted for tool use.

5. Hardware Systems Scale - This tool was a categorical scale based on Leifer's categories. Respondents description of hardware systems available was categorized by researcher into categories defined by Leifer (1988). Content validity was achieved by the unanamous agreement of experts in the field with the types of hardware systems (see Appendix H).

6. Content validity of the Likert type tools were reviewed by 3 experts other than the researcher.

7. Construct validity was not done. Future studies should included questions on the demographic tool to indicate the types of information systems the administrators were using and type of administrative structure and leadership style they felt they had in their institution and how satisfied they were with the structure.

Procedure

After approval from George Mason University to initiate the study, the following steps were taken:

1. The 1994 published mailing list of Nursing administrators in colleges or universities of NLN accredited BSN and higher degree programs was obtained. There were 637 institutions identified in the 50 states and all US territories.

2. An introductory letter explaining the research and questionnaires were sent to the entire mailing list of 637 institutions. The researcher sent both types of packets of questionnaires. Packets contained questionnaires appropriate to specified levels of administrators and information system managers, and stamped, self addressed return envelopes. In addition, each packet contained instructions for completing and mailing back questionnaires.

Those who consented to participate returned the completed questionnaires in an enclosed, stamped, self-addressed envelope to the researcher.

3. Packets and return envelopes were coded to identify which university had returned their questionnaire. Questionnaires were coded to identify department and institution. This step was necessary to identify relationships between department and hardware systems use.

Data Collection and Coding

Data collection ended after six months. Each questionnaire returned was coded for department; Nursing, Arts and Sciences, or MIS. All questionnaires from the same institution were given the same three digit code. Names or specific locations of institution or any other identifying data was not coded. Blank questionnaires were discarded and not counted in the study or return rate.

Each organization was classified according to leadership patterns and IT usage pattern. Correlation between the two was calculated.

Each organization was classified according to leadership patterns and hardware systems type. Correlation of coincidence between the two was calculated.

Suitability scores were calculated (from the tool) for each respondent. Correlation of suitability with leadership patterns was calculated.

Frequencies and descriptive statistics were conducted on selected demographic variables.

Cronbach's alpha was used to determine reliability on the Likert-type tools.

Experts were used to determine content validity of the Likert-type tools.

MANOVA of demographic and information technology usage patterns was used to test whether interaction (the fit) had an effect on the information technology usage pattern.

Chi square was used to compare departments and suitability.

Qualitative data of a descriptive nature were categorized by the researcher following certain conventions for contingency tables. Two additional judges, as well as guidance from the dissertation committee were sought to corroborate findings and decrease the chance of bias of a single researcher.

Data analysis was done with SPSS and results are reported in Chapter 4.

Summary

This chapter identified the steps for conducting the study. It described the sample population, identified subjects and recruitment strategies. The chapter identified the data analysis process. Chapter 4, will present the results of the data analysis, and Chapter 5 presents comments on the implications of the findings.

Chapter 4

Results and Findings

This chapter presents the findings of the statistical analysis described in Chapter 3. Discussion of findings and implications will be discussed in Chapter 5. A brief explanatory comment will be made as needed in this chapter. Support or non-support of hypotheses will be identified.

Demographic Characteristics

This study found a high degree of homogeneity. This is important for generalizability of findings.

Three department administrators from 637 universities and colleges were sent questionnaire packets. The three departments were Nursing, Arts and Science, and Information Systems. Table 1 shows the return rate.

Table 1

Return Rate of Questionnaires

Department	Number sent	Returned		
		#	%	% of ret.
Nursing	637	296	0.46	0.416
Arts and Science	637	241	0.38	0.338
Information Systems	637	175	0.28	0.246
Total	1911	712	0.37	1.000

Some questionnaires were returned partially completed. These were counted in the return rate but were then eliminated from the analysis of some calculations. Of the questionnaires returned, one institution was eliminated because the BSN program no longer existed. Three institutions were eliminated because there was no Information Systems department. Two institutions had the same person as department head for Nursing and Arts and Science and, therefore, had only one department response. They were counted in the department in which the completed questionnaire was designated for by the code on the questionnaire. No follow up letters were sent.

Each department was classified according to one of the four leadership patterns (Schmidt, 1992), and one of four information technology patterns (Schmidt, 1992). Tables 2 and 3 respectively describe the frequency in each classification.

Table 2

Classification of Institutions According to Leadership Patterns (n=640)

Department	Leadership Patterns (Schmidt, 1992)			
	Political Bureaucracy	Central Bureaucracy	Central Teams	Professional Bureaucracy
Nursing	18	103	26	37
Arts & Science	37	139	33	50
MIS	23	107	30	37
Total	78	349	89	124

Table 3

Classification of Institutions According to Information Technologies Usage Patterns (n=420)

Department	Information Technologies Usage Patterns (Schmidt, 1992)			
	Central Feeder	Collaborative	Procedura l Based	Scanning
Nursing	180	6	21	29
Arts and Science	140	5	12	27
Total	320	11	3	56

Schmidt (1992) gave specific definitions for these classifications based on Mintzberg's (1979) and upon Shrivastava and Nachman's (1989) typologies (see Figure 4).

Mintzberg Typology (1979) Organizational Structure	Shrivastava and Nachman(1989) Strategic Leadership Patterns
Adhocracy	Political
Machine Bureaucracy	Bureaucratic
Simple Structure	Entrepreneurial
Professional Bureaucracy	Professional

Figure 4. Comparison of Mintzberg's organizational structure divisions and Shrivastava and Nachman's leadership patterns.

The Entrepreneurial leadership pattern was defined as having a high degree of centralization. Decision authority rested with one person, or a few, making all the important decisions (Schmidt, 1992).

Bureaucratic leadership was typical of an organization with guiding rules and standard operating procedures. "As long as decisions to be made conform to the rules, the organization member closest to the situation makes the decision based on existing guidelines. Thus it...is characterized by a high degree of formalization and moderate centralization" (Schmidt, 1992, p.57).

The Political leadership classification is characterized by groups of organizational managers, each with functional authority over some area of the organization. This group, interacting collaboratively, guide strategy formation (Shrivastava & Nachman, 1989). Formalization and centralization are both very low in this type of leadership(Schmidt, 1992).

The Professional category is seen where organizational power is vested in professional expertise and control of information. Leadership groups make their own rules as situations might arise. Centralization may vary from high to low, while formalization is moderate to low" (Schmidt, 1992).

The researcher anticipated that the majority of administrators would lie in the Professional category for leadership. As Table 2 shows, this was not the case. Most administrators (55%) operated under a central bureaucracy. The second highest leadership category (19%) however, was Professional.

There were four classifications of Information Technology Systems (ITS) usage patterns. They were from simple to complex, Central Feeder, Procedure Based, Collaborative, and Scanning. The defining characteristics of these classifications will be discussed later in this chapter in Table 19 (see page 86). Table 3 showed the division of academic administrators and the ITS usage patterns they used. The most commonly used ITS (76%) was the Central Feeder, the least complex ITS.

Demographic Characteristics

Various demographic variables, such as age and gender, were commented on in the literature as having some affect on computer usage and suitability. Therefore, these variables were also investigated in this study. Relative frequency tables of these variables follow. These variables were chosen to indicate homogeneity of the sample.

Gender

Gender was discussed in the literature review as having both a positive and negative effect in areas relating to computer use. Since there was a controversy in the literature, comparison of gender and computer use was of interest in this study. Table 4 presents the frequency table for gender.

Table 4

Relative Frequency of Gender (n=697)

	Frequency		Department	Frequency	
Gender	Freq.	%		Freq.	%
Male	267	38.31	Nursing	8	1.50
			Arts & Sci.	125	17.93
			MIS	134	19.23
Female	430	61.69	Nursing	285	40.89
			Arts & Sci.	88	12.63
			MIS	57	8.18

Males were disproportionately represented in Nursing (1.50%) and females were disproportionately represented in MIS (8.18). This characteristic is typical of both populations. However, the male representation is less than the researcher's estimate (5-10%) of men in Nursing. This result was not unexpected but it necessitated some calculations (Chi Square and MANOVA) to be weighted. Homogeneity of the group was accepted since these findings are characteristic of the population.

Age

Faculty were on the average, 50 years old (mean=49.59, median=50.00, mode=52.00, SD=8.02) with a minimum age of 24 and a maximum age of 75 (see Table 5). Nursing faculty are the oldest; mean 51.34, Arts and Science next with a mean of

50.93 and MIS are the youngest; mean 45.26. These results indicate a more matured faculty.

Table 5

Relative Frequency on Age (n=685)

Age in Years	Frequency		Department	Frequency	
	#	%		#	%
Less than 30	9	1.31	Nursing	0	0.00
			Arts & Sci.	1	0.15
			MIS	8	1.16
30-39	61	8.91	Nursing	12	1.89
			Arts & Sci.	9	1.31
			MIS	40	5.84
40-49	257	37.52	Nursing	9	14.45
			Arts & Sci.	78	11.39
			MIS	80	11.68
50-59	281	41.02	Nursing	134	19.56
			Arts & Sci.	103	15.04
			MIS	54	7.88
60+	66	9.64	Nursing	37	5.40
			Arts & Sci.	20	2.92
			MIS	9	1.31

It was not surprising that there were very few (1.31%) administrators less than 30 years old. This is typical of those who hold academic administrative positions since graduate degrees and experience in the discipline are usually required by accrediting agencies for both the employing university and the profession. Where mean, median and mode are virtually the same for the entire sample, homogeneity for age of the sample is achieved.

Academic Degree

Most academic administrators have graduate degrees, usually doctorates. 92.4% of the respondents in the study held graduate degrees. Very few administrators held an undergraduate degrees as their highest degree, 7.6% total for associate and bachelor's combined. Most of these were MIS faculty and, since they were not included in the analysis, they were not counted.

Table 6

Relative Frequency of Educational Level (n=494)

Highest Degree	Frequency		Department	Frequency		
	#	%		#	% Total	% Dept.
Master	70	14.17	Nursing	43	8.70	15.03
			Arts & Sci.	27	5.47	12.98
Doctorate	424	85.83	Nursing	243	49.19	84.97
			Arts & Sci.	181	36.14	87.02

The majority of academic administrators, 84.97% Nursing and 87.02% of Arts and Science, held doctoral degrees. This frequency establishes homogeneity of the sample (see Table 6).

Length of Time in Administrative Position

One benefit of a cross-sectional study is that a variety of lengths of time for certain characteristics can be compared. In the field of information technology, the length of time faculty hold a position may influence the use of equipment and technology. The break-in period for new administrators may not permit enough time to learn and use new available technologies. The longer the period of time one works in an environment where technology is or is not used, may influence willingness to use new technology. This sample's span of years in administrative positions ranged from a minimum of less than one year to a maximum of 40 years. However, almost two thirds (60.05%) had been in an administrative position ten years or less (mean=9.98, SD=6.98, median=8.0, mode=10) (see Table 7).

The Information Systems department administrators had the most years of experience (mean=11.57), while Arts and Science and Nursing had less(mean=9.49 and 9.38 respectively). Compared with the previous age factor, academic administrators appear to be older. They had held administrative positions for a shorter time period than the MIS administrators who were the youngest, and had been in administrative positions the longest. For the majority, within each age group, the two academic administrator departments held approximately the same percentage of persons with in a particular time group which again supports homogeneity of the group.

Table 7

Relative Frequency of Length of Time in Administrative Position (n=684)

Years	Frequency		Department	Frequency	
	#	%		#	%
1-5	222	32.27	Nursing	104	15.12
			Arts & Sci.	68	9.88
			MIS	50	7.27
6-10	198	28.78	Nursing	84	12.21
			Arts & Sci.	69	10.03
			MIS	45	6.54
11-15	121	17.59	Nursing	48	6.98
			Arts & Sci.	33	4.80
			MIS	40	5.81
16-20	84	12.21	Nursing	34	4.94
			Arts & Sci.	27	3.92
			MIS	23	3.34
1-25	46	6.69	Nursing	12	1.74
			Arts & Sci.	13	1.89
			MIS	21	3.05
26-30	9	1.31	Nursing	4	0.58
			Arts & Sci.	2	0.29
			MIS	3	0.44
31+	4	0.58	Nursing	2	0.29
			Arts & Sci.	0	0.00
			MIS	2	0.29

Length of Time Using Computers

Academic administrators had used computer technology for a sufficient period of time to allow them to become acquainted with use of the technology; 66.09% over ten years, and almost 95% over five years (see Table 8). Arts and Science administrators had used computers longer than Nursing administrators; mean=16.17 years and 12.34 years respectively. Thus homogeneity on this characteristic is questionable.

Table 8

Relative Frequency of Length of Time Using Computers (n=463)

Years	Frequency		Department	Frequency	
	#	%		#	%
1-5	23	4.97	Nursing	14	2.15
			Arts & Sci.	9	1.38
6-10	134	28.94	Nursing	91	14.00
			Arts & Sci.	43	6.62
11-15	187	40.39	Nursing	116	17.85
			Arts & Sci.	71	10.92
16-20	61	13.17	Nursing	33	5.08
			Arts & Sci.	28	4.31
21+	58	12.53	Nursing	14	2.15
			Arts & Sci.	44	6.77

Size of institution

Size of institution was based on student enrollment as reported by administrators. The majority of schools were small to mid-size (see Table 9). Almost 50% of the schools had enrollments of less than 5000 students and over two thirds or 69.57% less than 10,000.

Table 9

Relative Frequency on Size of Institution (n=493)

Students	Frequency	
	#	%
1-4999	234	47.46
5000-9999	109	22.11
10,000 - 14,999	65	13.18
15,000 - 19,999	29	5.88
20,000+	56	11.36

Department size

Department size was based on student enrollment as reported by the administrators. The majority stated enrollments were between 100-499 students (52.11%) (See Table 10). Arts and Science had an average class enrollment of 500-999, while Nursing reported an average enrollment of 100-499 students. These enrollment figures were not unexpected since Nursing is only one program, where Arts and Science departments may be comprised of more than one program.

Table 10

Relative Frequency of Department Size (n=451)

Students	Frequency		Department	Frequency	
	#	%		#	%
1-99	40	8.87	Nursing	27	5.99
			Arts & Sci.	13	2.88
100-499	235	52.11	Nursing	195	43.24
			Arts & Sci.	40	8.87
500-999	64	14.19	Nursing	47	10.42
			Arts & Sci.	17	3.77
1000-1499	25	5.54	Nursing	7	1.55
			Arts & Sci.	18	3.99
1500+	87	19.29	Nursing	8	1.77
			Arts & Sci.	79	17.52

Geographic location

Since information technology increases communications and efficiency, smaller or rural institutions would be expected to use the technology more. The majority of institutions are reportedly located in a metropolitan area (62.37%) (see Table 11).

Table 11

Relative Frequency of Geographic Location (n=295)

Geography	Frequency	
	#	%
Rural	111	37.63
Metropolitan	184	62.37

Technology access

Almost 100% of the administrators had access to computers within their department (see Table 12). Access within the department creates more efficient use of resources and readily accessible technology is more likely to be used. More exposure to the technology and ease of access is expected to create a positive degree of satisfaction.

Table 12

Relative Frequency of Administrative Access to Information Technologies Within Department (n=504)

Department Access	Department	Frequency	
		#	%
Yes	Nursing	292	57.94
	Arts & Sci.	211	41.87
No	Nursing	0	0.00
	Arts & Sci.	1	0.2

Of those administrators who did have access to computers, not all administrators had computers within their office. When compared to the total number of respondents over twice as many Nursing administrators did not have access to computers in their office (4.66%) compared to the Arts & Science Administrators (2.02%) (see Table 13).

Table 13

Relative Frequency on Administrative Access to Information Technologies Within Office(n=494)

Office Computer	Department	Frequency	
		#	%
Yes	Nursing	264	53.44
	Arts & Sci.	197	39.88
No	Nursing	23	4.66
	Arts & Sci.	10	2.02

Even though this is a small amount of the administrators surveyed, lack of adequate technologies for the administrator of the department can only be seen as detrimental to decision making in this era of information explosion. Since more Nursing administrators did not have access within their office than Arts and Science administrators (over 2:1), homogeneity of the group is questioned. It would be of interest to find out why more than twice as many Nursing administrators than their Arts and Science counterparts in the same institutions did not have office computers.

Satisfaction with computer technology available

When asked a simple question on satisfaction of hardware systems and software applications, the majority of administrators were satisfied with the technology that was available to them (see Table 14).

Table 14

Relative Frequency of Administrative Satisfaction with Access to Information Technologies (n=391)

Department Access Satisfactory	Department	Frequency	
		#	%
Yes	Nursing	185	47.31
	Arts & Sci.	150	38.37
No	Nursing	37	9.46
	Arts & Sci	19	4.86

Almost twice as many Nursing administrators (9.46%) than Arts and Science administrators (4.86%) were dissatisfied. When these results were compared to the results from the access question, this degree of dissatisfaction was not unexpected; since over twice as many Nursing administrators, as compared to their Arts and Science counterparts, did not have office access to computers.

Use of Computer Technology

Administrators also indicated how they used the computer technologies available to them. The majority (86.98%) used a variety of technologies available rather than only one (see Table 15). The singularly most used technology was word processing. Nursing administrators used only word processing rather than a variety of technologies available slightly more (5.96%) than did their Arts and Science counterparts (3.97%). As Table 15 shows, most administrators used the computer for more than one reason.

Table 15

Relative Frequency on Administrative Use of Computer Technologies (n=453)

Use	Frequency		Department	Frequency	
	#	%		#	%
Games	2	0.44	Nursing	1	0.22
			Arts & Sci.	1	0.22
Word proc.	45	9.93	Nursing	27	5.96
			Arts & Sci.	8	3.97
E-mail	2	0.44	Nursing	1	0.22
			Arts & Sci.	1	0.22
Order/ Entry	3	0.66	Nursing	2	0.44
			Arts & Sci.	1	0.22
Other	7	1.55	Nursing	5	1.10
			Arts & Sci.	2	0.44
Combination	394	86.98	Nursing	223	49.23
			Arts & Sci	171	37.75

Approximately the same percentage of administrators in each department used each type of software application. This factor speaks again to the homogeneity of this cohort group.

Most administrators indicated they had home computers (71.67%)(See Table 16). Of those who did, the majority of them did use them for either home or work applications. A small percentage of the Nursing faculty and Arts and Science faculty did not use their home computers, (7.78% and 5.99% respectively). Because the difference between administrative groups for use and non-use is very slight, homogeneity between the two academic administrative groups remains supported.

Table 16

Relative Frequency of Administrator's Use of Information Technologies at Home (n=501)

Use at home	Frequency		Department	Frequency	
	#	%		#	%
Yes	432	86.23	Nursing	251	50.10
			Arts & Sci.	181	36.13
No	69	13.77	Nursing	39	7.78
			Arts & Sci	30	5.99

Of those who did use computers at home, their use was similar to the manner in which they used computers at work (See Table 17). The majority used a combination of software applications at home, 67.95% compared to 86.98 at work. Word processing alone was used at home by 28.44% of the academic administrators; word processing was used at work by only 9.93% of the administrators.

Table 17

Relative Frequency of Administrative Use of Computer Technologies at Home (n=415)

Use at home	Frequency		Department	Frequency	
	#	%		#	%
Games	2	0.48	Nursing	1	0.24
			Arts & Sci.	1	0.24
Word processing	118	28.44	Nursing	79	19.04
			Arts & Sci.	39	9.40
E-mail	0	0.00	Nursing	0	0.00
			Arts & Sci.	0	0.00
Order/ Entry	1	0.24	Nursing	0	0.00
			Arts & Sci.	1	0.24
Budget/Finances	0	0.00	Nursing	0	0.00
			Arts & Sci.	0	0.00
Other	12	2.89	Nursing	2	0.48
			Arts & Sci.	10	2.41
Combination	282	67.95	Nursing	156	37.59
			Arts & Sci	126	30.36

The majority of demographic characteristics among academic administrators were similar enough, and therefore, this sample could be considered homogeneitic and findings could be generalized to the entire academic population of Nursing and Arts and Science.

Hypotheses Results

The underlying premise of this study, based on related research, is different styles of leadership, or leadership patterns, will naturally gravitate to a certain types of information systems technology (Schmidt, 1992). Schmidt (1992) identified a pattern of coincidence between leadership patterns and information technology systems (ITS) usage patterns (Schmidt, 1992). The natural pairs are indicated in the shaded portion of Table 18.

Table 18

The Fit Between Leadership Patterns and ITS Usage Patterns

Leadership Patterns (Schmidt, 1992)	Information Technology Usage Patterns (Schmidt, 1992)			
	Central Feeder	Procedural Based	Collabor-ative	Scanning
Central Teams	X			
Central Bureaucracy		X		
Political Bureaucracy			X	
Professional Bureaucracy				X

Schmidt (1992) proposes if the 'natural matches' are confirmed, administrative satisfaction, and consequently efficiency, improves.

Hypothesis 1:

Arts and Science academic administrators in higher education will demonstrate increased variety and more complex computer usage patterns than Nursing counterparts.

Schmidt (1992) provided the description of the hierarchy of complexity of the four information technology systems (See Table 19). Central Feeder is the least complex system where there is minimal interactive use but frequent use of personal computers and personal databases. This group used aggregate reports and were characterized by the simple individual use of technology systems for information reception, such as internal e-mail and news retrieval.

Procedural Based systems are characterized by more interactive send and receive areas and by the addition of some decision support and executive information systems.

Collaborative systems are more interactive and use most of the available information technology systems if only in a neutral send/receive mode.

Scanning systems, the most complex system, are more likely to use the more complex information technology systems very often. These included the systems like executive information systems and decision support systems. They had less interaction with the simpler e-mail and voice mail systems and tended to receive only.

Table 19

Definition of Types of Information Technology Systems

Hardware system type	Information technology systems			
	Central Feeder	Procedural	Collaborative	Scanning
Within company e-mail	Receive information	Neutral	Send and receive	Neutral
External e-mail	Not used when avail.	Not used when avail.	Neutral	Receive data
Voice mail	Not used when avail.	Not used when avail.	Send and receive	Mostly receive
Computer conferencing	Not used when avail.	Not used when avail.	Used	Neutral
Electronic meeting room	Not used when avail.	Not used when avail.	Used	Neutral
News retrieval	Neutral	Not used when avail.	Neutral	Used often
Outside Networks	Neutral	Not used when avail.	Neutral	Rec.info on environment
Centralized database	Retrieve data	Neutral	Neutral	Neutral
Private database	Used very often	Neutral	Not used	Neutral
Distributed database	Not used when avail.	Neutral	Share information	Neutral
Aggregate reports	Used very often	Neutral	Neutral	Not used when avail.
Dec.support system- Prod.& Sales	Neutral	Used very often	Neutral	Not used when avail.
Dec.support system- Industry model	Neutral	Not used when avail.	Neutral	Used often
Executive inform. Sys.	Neutral	Neutral	Neutral	Used often
On-line regulations reference	Not used when avail.	Used often	Neutral	Not used
Electronic bulletin board	Not used when avail.	Send and receive	Send and receive	Neutral
Broadcast messaging	Send out decisions	Send out rules	Send and receive	Neutral

Based on the above structure, a 2x4 Chi square was calculated first with four categories for information systems technology using a total of 420 subjects; 236 were Nursing and 184 Arts and Science. There were two low count cells, one with 5 and one with 6 subjects (12.5% of cells). The assumption for Goodness of Fit Chi-square Model Test for Minimum Frequencies states that no more than 20% of the cells may contain expected frequencies less than 5. This was not violated.

Table 20

Chi Square Table for Hypothesis 1

Count Exp Val Row Pct Col Pct	Central Feeder	Procedural	Collab-orative	Scanning	Row Totals
Nursing Admin.	180 179.8 56.3% 76.3%	21 18.5 63.6% 8.9%	6 6.2 54.5% 2.5%	29 31.5 51.8% 12.3%	236 56.2%
Arts & Science Admin.	140 140.2 43.8% 76.1%	12 14.5 36.4% 6.5%	5 4.8 45.5% 2.7%	27 24.5 48.2% 14.7%	184 43.8%
Column Totals	320 76.2%	33 7.9%	11 2.6%	56 13.3%	420 100.0%

As Table 20 shows, 76.3% of Nursing administrators and 76.1% of the Arts and Science administrators used Central Feeder systems. The remaining 23.7% of the Nursing administrators and 23.9% of the Arts and Science administrators used non-Central Feeder systems. There were no significant differences between the two groups of administrators, (Pearson's χ^2 (2, n=420)=1.19714, df=3, p=.75). In fact, they were very closely aligned in each of the categories for information systems technology (contingency coefficient=.05, p=.7537, which implies a very weak relationship of only 5%). Therefore, hypothesis 1, that Arts and Science academic administrators in higher education will demonstrate increased variety and more complex computer usage patterns than their Nursing counterparts, was not supported.

Further analysis of the data revealed a hierarchy of usage of the different systems. Central Feeder, the least complex system, was used the most; 76.3% of Nursing Administrators and 76.1% of Arts and Science Administrators. When compared to the other three systems the difference was very apparent; over three quarters of the administrators utilized the Central Feeder system.

Both academic administrative departments were very closely aligned. Scanning, the most complex system, was used the second most highest; 12.3% of Nursing Administrators, 14.7% of Arts and Science Administrators.

Third most used was Procedural; 8.9% of Nursing Administrators, 6.5% of Arts and Science Administrators. The least used system was Collaborative; 2.5% of Nursing Administrators, 2.7% of Arts and Science Administrators.

This ITS preference may be due to leadership patterns as suggested by Schmidt (1992). Educational administrators are often very autonomous; they are often categorized under the Professional Bureaucracy category. This preference will be discussed in more detail with hypothesis 10.

Thus, in this hypothesis, the faculty did not differ in use based on complexity, but did tend to use the more simple Central Feeder system. The researcher found it interesting that the next most utilized system was the most complex Scanning system. The preference here may also be due to leadership patterns as suggested by Schmidt (1992). Although Sshmidt (1992) did not address leadership and organizational structures or included educational administrators, they are often very autonomous, and may be considered to fit the Professional Bureaucracy as well.

Hypothesis 2:

There is no significant relationship between computer usage patterns and gender among Nursing and Arts and Science academic administrators in higher education.

Chi square was used first with four categories for information systems technology, using a total of 418 subjects, 299 females and 119 males. There were two cells without any subjects and three cells with less than 5 (62.5% of cells). The assumption for Goodness of Fit Chi-square Model Test for Minimum Frequencies states that no more than 20% of the cells may contain expected frequencies less than 5. Because of the violation of the Chi Square assumption, the table was collapsed into Central Feeder and non-Central Feeder categories. This modification improved the table somewhat, but one cell still had less than 5 subjects (25% of cells). This cell laid in the table for males on the Nursing side and was related to the disproportionate number of males in Nursing administration. This is a characteristic of the professions; males only comprise a small percentage of Nursing faculty and administrative positions, 2.7% for this study, while females are common in the Arts and Science areas, 41.3% for this study (See table 21).

Table 21

Comparison of Gender in Each Department

Departments	Male	Female
Nursing	8(2.7%)	285(97.3%)
Arts and Science	125(58.7%)	88(41.3%)
Information Systems	134(70.2%)	57(29.8%)
Totals	267(38.3%)	430(61.7%)

As we can see from Table 21, males were greatly under-represented in the Nursing group. This under representation would result in less than 5 cases in more than one group for the Chi Square table. In consideration of the violation to Chi square assumptions, the table was weighted to handle the undersized group of males in Nursing programs. The groups were weighted by 10 for females and 20 for males. The table was set up as a 4x2, but this structure still resulted in violations of Chi Square Assumptions, which required the collapse to a 2x2 table.

Table 22 and 23 respectively, indicate 77.3% of the male and 76.3% of the female administrators used Central Feeder systems. The Phi for males indicates a very small significant difference in the usage of information systems between administrators, (Phi=.06, p=.004) (see Table 22). The table for females also indicates a small significant difference (Phi=.04, p=.03) (see Table 23), although this is somewhat greater than for males.

Table 22

Information System Technology Usage Relationship to Gender-Males

Count Row Pct Col Pct	Nursing	Arts and Science	Row totals
Central Feeder	8 4.3% 66.7%	176 95.7% 77.9%	184 77.3%
Non-Central Feeder	4 7.4% 33.3%	50 92.6% 22.1%	54 22.7%
Column Totals	12 5.0%	2260 95.0%	238 100.0.5

Pearson's $\chi^2(1, n=238)=8.16$, p=.004 Phi=.06, p=.04

Table 23

Information System Technology Usage Relationship to Gender-Females

Count Row Pct Col Pct	Nursing	Arts and Science	Row totals
Central Feeder	176 77.2% 77.2%	52 22.8% 73.2%	228 76.3%
Non-Central Feeder	52 73.2% 22.8%	19 26.8% 26.8%	71 23.7%
Column Totals	228 76.3%	71 23.7%	299 100.0.5

Pearson's $\chi^2(1, n=299)=4.67$, p=.03 Phi=.04, p=.03

It was anticipated that gender would not make any difference. Although the significance of difference is slight, this hypothesis was not supported. The reason for this result may lie in the fact that the sample size of males in Nursing was too small. With the data inconclusive, the validity of these findings is very questionable.

Hypothesis 3:

There will be a difference in variety and complexity of computer usage patterns with age among Nursing and Arts and Science academic administrators in higher education.

Age span was from 24 years to 75 years. Age distribution was collapsed down into three categories, low (24-46 years), medium (47-52 years), and high (53-75 years). Each of these categories contained approximately 33% of the total sample (See Table 24)

Table 24

Relative Frequencies of Age Groups by Department

Age (years)	Total	
	#	%
Low(24-46)	224	32.6%
Medium(47-52)	218	31.7%
High(53-75)	245	35.7%
Total	687	100.0%

Mean=49.59, median=50.00, Mode=52.00, SD=8.02, SE=.306

Since there was more than one independent variable, normality tests such as skewness and kurtosis were applied for Univariate analysis. Bartlett test for bivariate analysis was conducted for sphericity. Normality tests for Multivariate, like BoxM, were used for measuring equality of variance and covariance between groups. Data transformation was necessary because of the violation of non-normal distribution or skewness. Homogeneity test and square roots of data for the information systems technology tool were employed for this reason. The scores were weighted by 0.5 to address the Homogeneity issue. Hotelling's T^2 based on Eigenvalues was utilized to test significance of Multivariate statistics. MANOVA was used to determine significance. Subpopulation descriptives follow.

Summaries of scores by department and age follow. Approximately one third of the sample did not fill out the information technology systems questionnaire.

Table 25

Computer Usage Patterns Multivariate Test of Significance (S=2, M=.5, N=98)

Effect	Hotelling's T^2	df	p
Age	.04	8	.534
Department	.04	4	.119
Interaction	.02	8	.805

BoxM=40.28, $\chi^2(50, n=98)=38.16$, $p=.890$

When computer usage patterns were analyzed, the Multivariate analysis demonstrated a weak significance (p=.119) for department but none for age or interaction between age and department for all systems as was expected. The effect each type of ITS had on the significance was noted. Means were calculated for each ITS and the results will be discussed below.

Table 26

Computer Usage Patterns Univariate Test of Significance-Central Feeder

Effect	F ratio	Significance of F
Age	.34	.710
Department	.04	.841
Interaction	.37	.690

For the Central Feeder system, there was no significant difference for any factor or interaction. It was of interest to note the difference of the three age groups within their own and between disciplines.

Table 27

Computer Usage Patterns Central Feeder Score Means Table

Department	Age group	Mean	SD	Cases
Nursing	Low	25.36 hi	15.08	66
	Medium	23.28 lo	13.43	95
	High	23.85	14.07	105
	Total	24.02	14.07	266
Arts & Sci.	Low	23.59 lo	14.43	51
	Medium	26.92 hi	14.23	83
	High	24.28	12.26	71
	Total	25.18	13.65	205
Total		24.52	13.89	471

Bartlett-Box F=.3099, (5,46559)df, p=.907

In the Central Feeder system for the Nursing administration mean scores for the low age group were the highest while mean scores for the medium age group was the lowest. The highest age group lay in the middle scores. Among Arts and Science administrators, mean scores for the medium age group were the highest and the low age group was the lowest. The pattern for each department differed, but total mean scores were almost equal (see Figure 5).

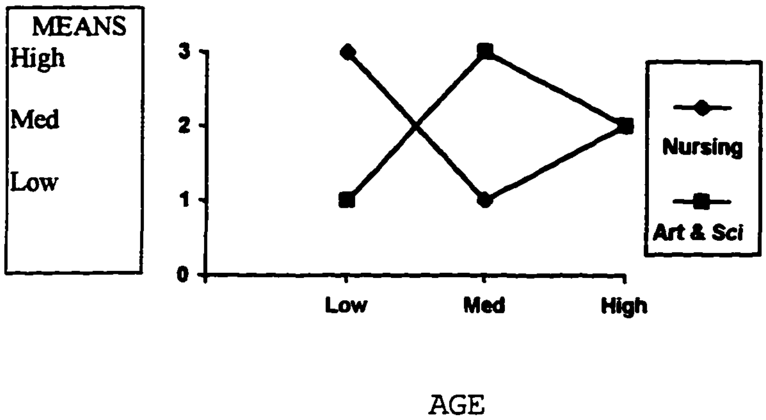


Figure 5

Comparison of Central Feeder Mean Scores for individual departments.

The procedure based ITS pattern was different.

Table 28

Computer Usage Patterns Univariate Test of Significance-Procedural Based

Effect	F	Significance of F
Age	.92	.402
Department	.74	.391
Interaction	.63	.536

The Univariate analysis for Procedural Based systems showed no significant difference related to the interaction or the factors. Departments also differed from the Central Feeder pattern, with the low age group in Nursing and middle age group in Arts and Science being the highest mean

Procedural Based scores, while middle age group in Nursing and high age group in Arts and Science were the lowest.

Table 29

Computer Usage Patterns Procedure Based Score Means Table

Department	Age group	Mean	SD	Cases
Nursing	Low	15.89 hi	13.19	63
	Medium	14.92 lo	11.63	90
	High	15.22	11.60	96
	Total	15.28	11.99	249
Arts & Sci.	Low	17.27	11.74	48
	Medium	17.60 hi	10.94	80
	High	14.44 lo	9.58	68
	Total	16.42	11.74	196
Total		15.78	11.46	445

Bartlett-Box F=.7539, (5,46559)df, *p*=.583

Nursing showed just the opposite pattern from Arts and Science, but for total mean scores, Arts and Science was higher (see Figure 6).

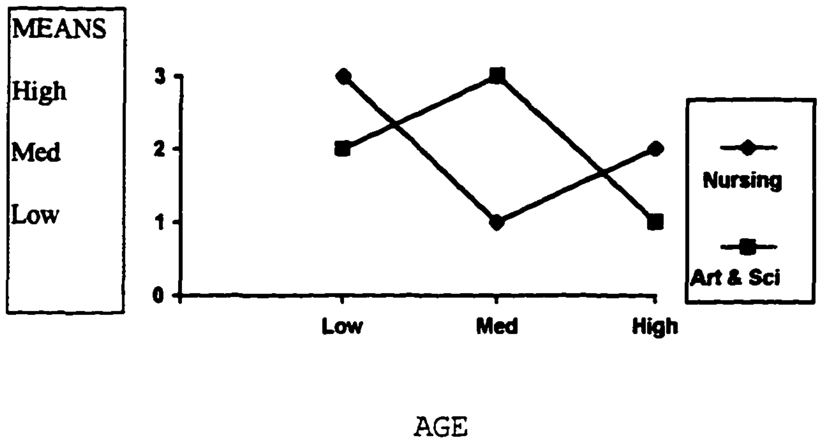


Figure 6

Comparison of Procedural Based Mean Scores with age for different departments.

In the collaborative ITS, the department did appear to have a weak significance difference(p=.121).

Table 30

Computer Usage Patterns Univariate Test of Significance-Collaborative

Effect	F	Significance of F
Age	.32	.727
Department	2.43	.121
Interaction	.40	.673

Departments did not differ on pattern for the highest mean collaborative scores. However, they did differ on the lowest mean score with middle age group in Nursing and low age group in Arts and Science being the lowest.

Table 31

Computer Usage Patterns Collaborative Score Means Table

Department	Age group	Mean	SD	Cases
Nursing	Low	11.41	7.16	66
	Medium	10.38 lo	7.29	90
	High	12.01 hi	6.97	101
	Total	11.28	7.14	257
Arts & Sci.	Low	10.14 hi	7.38	49
	Medium	9.70	6.79	81
	High	9.49 lo	5.98	67
	Total	9.74	6.65	197
Total		10.61	6.97	454

Bartlett-Box F=.2258, (5,46559)df, p=.951

Overall, patterns between departments were different, with an inverse relationship of mean scores to age for Arts and Science, but not for Nursing. Nursing also had a higher mean collaborative score than Arts and Science (see Figure 7).

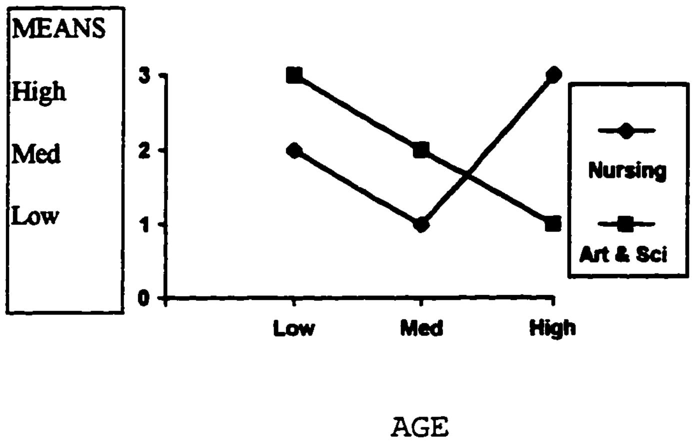


Figure 7

Comparison of Collaborative Mean Scores with age between different departments.

In the scanning ITS, again there were no significant differences.

Table 32

Computer Usage Patterns Univariate Test of Significance-Scanning

Effect	F	Significance of F
Age	.70	.690
Department	.90	.345
Interaction	.46	.634

Departments did differ on high/low patterns in the mean Procedural Based scores, with the highest mean scores for Nursing being medium age range and for Arts and Science the low age range.

Table 33

Computer Usage Patterns Scanning Score Means Table

Department	Age group	Mean	SD	Cases
Nursing	Low	15.11	10.41	64
	Medium	16.68 hi	10.80	90
	High	14.88 lo	9.45	99
	Total	15.40	10.17	253
Arts & Sci.	Low	16.89 hi	7.79	47
	Medium	16.86	9.37	81
	High	15.92 lo	8.01	69
	Total	16.39	8.53	197
Total		15.83	9.49	450

Bartlett-Box F=1.1622, (5,46559)df, *p*=.325

The lowest mean scores for Nursing and Arts and Science were in the highest age range. In overall pattern, the two departments were different. Arts and Science had a direct inverse relationship, but Nursing did not (see Figure 8).

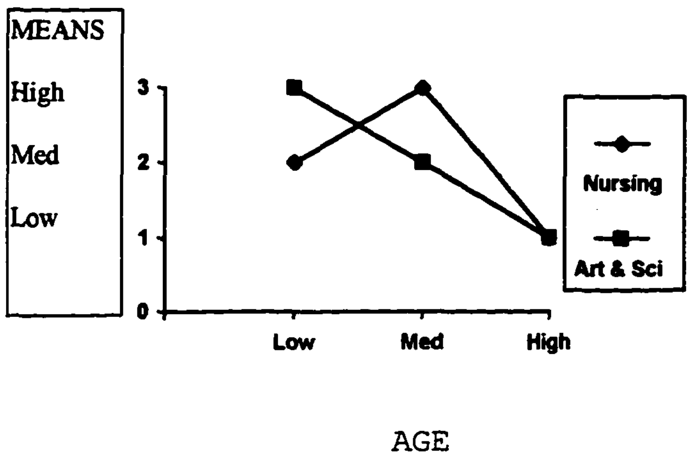


Figure 8

Comparison of Scanning Mean Scores with age between different departments.

In summary, it did not appear that any of the individual technology system means had any significant influence. Table 34 summaries the findings. As we can see, the interaction of age and department (both) showed no significant difference even though two individual factors did. The pattern of mean scores is represented on the right hand side of the table and highest mean scores are identified. The only system Nursing had the highest total mean score in was the collaborative system. In all other systems, Arts and Science had the highest mean score (See Table 34).

Table 34

Summary of Comparison of Information Technology System (ITS) Mean Scores between Nursing and Arts and Science Administrators

ITS	Significance				Mean Scores			Highest Total Mean Score
	Age	Dept	Both	Age-->	High	Med	Low	
				Dept.				
All	no	yes	no					
Central	no	no	no	Nurs.	H	L	M	
Feeder				A&S	L	H	M	X
Procedural	no	no	no	Nurs.	H	L	M	
Based				A&S	M	H	L	X
Collabor-	no	yes	no	Nurs.	M	H	L	X
ative				A&S	H	M	L	
Scanning	no	no	no	Nurs.	M	H	L	
				A&S	H	M	L	X

Means tables showed, no significant difference was identified in any of the mean scores. When Multivariate analysis is taken into account, age did not appear to have an effect on use. Therefore, hypothesis three, that there will be a difference in variety and complexity of computer usage patterns with age among Nursing and Arts and Science academic administrators in higher education, was not supported.

Hypothesis 4:

There will be a difference in variety and complexity of computer usage patterns with level of education attained among Nursing and Arts and Science academic administrators in higher education.

Distribution of highest degrees obtained by higher education administrators ranged from Associate to Doctorate (see Table 35). The distribution was collapsed down into the two categories Masters and Doctorate since these comprised the majority of the sample (92.3 %), and the other two degrees were considered outliers.

Table 35

Relative Frequencies of Degrees

Highest Degree	Frequency	Percent
Associate	2	0.3
Bachelors	50	7.3
Masters	157	23.2
Doctorate	468	69.1
Total	677	100.0

The relative frequency for degrees among the different administrators is displayed in Table 36.

Table 36

Relative Frequencies of Highest Degree among Academic Administrators

Highest Degree Frequency Percent	Nursing	Arts and Science	Row Totals
Masters	43 15.03	27 12.98	70 14.17
Doctorate	243 84.97	181 87.02	424 85.83
Column Totals	286 57.89	208 42.11	494 100.00

Since there was more than one independent variable, normality tests such as skewness and kurtosis were applied for Univariate analysis. Bartlett test for bivariate analysis was conducted for sphericity. Normality tests for Multivariate like BoxM were used for measuring equality of variance and covariance between groups. Data transformation was necessary because of the violation of non-normal distribution or skewness. Homogeneity test and square roots of data for the information systems technology tool were employed for this reason. The scores were weighted by .5 to address the Homogeneity issue. Hotelling's T^2 based on Eigenvalues was utilized to test significance of Multivariate statistics. MANOVA was used to determine significance. Subpopulation descriptives are cited below.

Summaries of scores by department and highest degree obtained by the administrator follow. Approximately one third of the sample did not fill out the information technology systems questionnaire.

Table 37

Computer Usage Patterns Multivariate Test of Significance (S=1, M=1, N=97.5)

Effect	Hotelling's T^2	df	p
Degree	.012	4	.683
Department	.295	4	.295
Interaction	.009	4	.772

BoxM=23.83, χ^2(30, n=97.5)=21.64, p=.867

The Multivariate analysis for computer usage patterns revealed there was neither significant difference based on interaction of degree and department nor difference based on component factors. Means tables were calculated to determine how the different ITS affected the relationship of degree and department.

Table 38

Computer Usage Patterns Univariate Test of Significance-Central Feeder

Effect	F	Significance of F
Degree	1.39	.556
Department	0.52	.240
Interaction	0.35	.556

There was no significant difference based on degree, department or the interaction between degree and department. Departments did not differ on pattern with Central Feeder mean scores. Both factors displayed a direct relationship, with means increasing as degree increased.

Table 39

Computer Usage Patterns Central Feeder Score Means Table

Department	Degree	Mean	SD	Cases
Nursing	Masters	19.69 lo	15.10	39
	Doctorate	24.57 hi	13.72	225
	Total	23.85	14.01	264
Arts & Sci.	Masters	22.64 lo	14.27	25
	Doctorate	25.50 hi	13.31	177
	Total	25.14	13.43	202
Total		24.41	13.76	466

Bartlett-Box F=1.2577, (3,10957)df, p=.287

Arts and Science however, had a higher mean score than Nursing. Figure 9 shows the direct relationship.

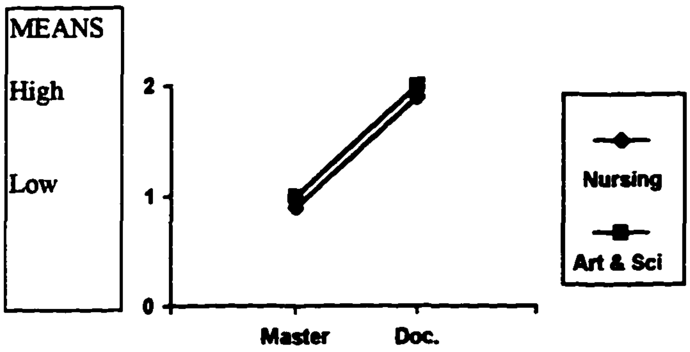


Figure 9

Comparison of Central Feeder Mean Scores with Highest Degree Attained between Nursing and Arts and Science Administrators.

The mean score results for Procedural Based ITS was similar to the Central Feeder ITS.

Table 40

Computer Usage Patterns Univariate Test of Significance-Procedural Based

Effect	F	Significance of F
Degree	0.58	.254
Department	1.31	.446
Interaction	0.44	.507

The Univariate analysis for computer usage patterns revealed no significant difference for either the interaction of degree and department or the component factors. In addition, there was no difference on the pattern of Procedural Based mean scores.

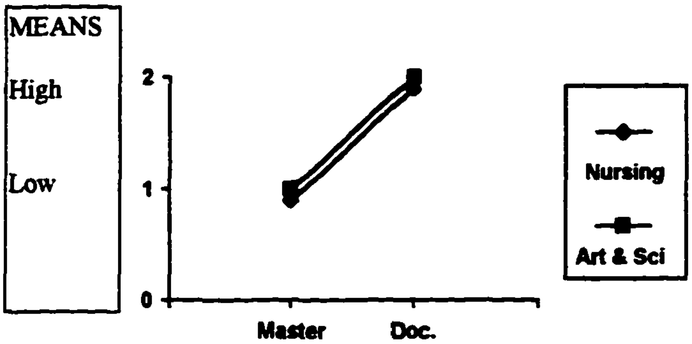
Table 41

Computer Usage Patterns Procedure Based Score Means Table

Department	Degree	Mean	SD	Cases
Nursing	Masters	11.86 lo	11.86	36
	Doctorate	15.61 hi	11.95	213
	Total	15.07	11.98	249
Arts & Sci.	Masters	15.63 lo	12.30	24
	Doctorate	16.57 hi	10.43	169
	Total	16.45	10.65	193
Total		15.67	11.43	442

Bartlett-Box F=.7291, (3,10957)df, *p*=.535

Both departments showed a direct relationship between mean scores and increasing level of education, with Arts and Science having the higher total mean score. Figure 10 depicts the relationship.



HIGHEST DEGREE ATTAINED

Figure 10

Comparison of Procedural Based mean scores with highest degree attained between departments.

The results for the collaborative scores were the same. There was no significant difference based on degree, department, or interaction.

Table 42

Computer Usage Patterns Univariate Test of Significance-Collaborative

Effect	F	Significance of F
Degree	.004	.949
Department	.252	.616
Interaction	.488	.486

A difference in the mean collaborative scores was observed. The mean scores for Nursing were opposite from those for Arts and Science.

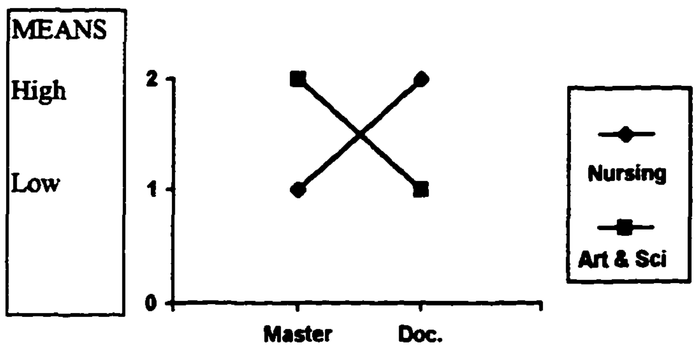
Table 43

Computer Usage Patterns Collaborative Score Means Table

Department	Degree	Mean	SD	Cases
Nursing	Masters	9.97 lo	7.13	38
	Doctorate	11.45 hi	7.10	217
	Total	11.23	7.11	255
Arts & Sci.	Masters	10.29 hi	7.96	24
	Doctorate	9.70 lo	6.44	169
	Total	9.78	6.63	193
Total		10.60	6.94	448

Bartlett-Box F=.2737, (3,10957)df, p=.844

While Nursing had the higher mean scores for the collaborative ITS with doctorally prepared administrators, Arts and Science had the higher mean scores with the master prepared administrators as Figure 11 depicts. Also, Nursing had a higher total mean score than Arts and Science.



HIGHEST DEGREE ATTAINED

Figure 11

Comparison of collaborative mean scores with highest degree attained.

For the scanning ITS, there was no significant difference for degree or department. There was a significant difference for the interaction (p=.099).

Table 44

Computer Usage Patterns Univariate Test of Significance-Scanning

Effect	F	Significance of F
Degree	1.54	.217
Department	0.62	.430
Interaction	2.75	.099

As noted in the collaborative mean scores, Nursing and Arts and Science demonstrated an opposite pattern of scanning mean scores.

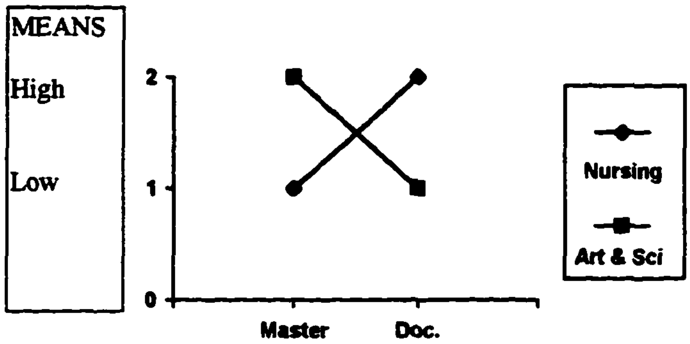
Table 45

Computer Usage Patterns Scanning Score means Table

Department	Degree	Mean	SD	Cases
Nursing	Masters	12.36 lo	11.67	36
	Doctorate	15.67 hi	9.86	216
	Total	15.20	10.18	252
Arts & Sci.	Masters	18.00 hi	9.63	22
	Doctorate	16.22 lo	8.24	172
	Total	16.42	8.40	194
Total		15.73	9.46	446

Bartlett-Box F=3.2230, (3,10957)df, p=.022

Nursing again had the higher mean scores among doctoral prepared administrators, while Arts and Science had the higher mean scores among the masters prepared administrators. Arts and Science had a higher total mean score than Nursing. Figure 12 depicts this relationship.



HIGHEST DEGREE ATTAINED

Figure 12

Comparison of scanning mean scores with highest degree attained.

In summary, it did not appear that any of the individual technology system means other than the Scanning system had any significant influence. Table 46 summaries the findings. As we can see, the interaction of degree and department (both) showed no significant difference even though one individual factor did. The pattern of mean scores is represented on the right hand side of the table and highest mean scores are identified. The only system Nursing had the highest total mean score in was the collaborative system. In all other systems, Arts and Science had the highest mean score (See Table 46).

Table 46

Summary of Comparison of Information Technology System (ITS)Mean Scores between Nursing and Arts and Science Administrators

ITS	Significance				Mean Scores		Highest Total Mean Score
	Deg	Dept	Both	Deg.----->	High	Low	
				Dept			
All	no	no	no				
Central Feeder	no	no	no	Nursing	L	H	
				A&S	L	H	X
Procedural Based	no	no	no	Nursing	L	L	
				A&S	L	H	X
Collabor-ative	no	no	no	Nursing	L	H	X
				A&S	H	L	
Scanning	no	no	yes	Nursing	L	H	
				A&S	H	L	X

Therefore, Hypothesis 4, which expected that there would be a difference in variety and complexity of computer usage patterns with level of education attained among Nursing and Arts and Science academic administrators in higher education, was not supported.

Hypothesis 5:

There will be a difference in variety and complexity in computer usage patterns and length of time in administrative positions among Nursing and Arts and Science academic administrators in higher education.

Distribution of length of time in administrative positions ranged from less than one year to 40 years. The distribution was collapsed down into three categories, low (0-5 years), medium (6-11 years) and high (12-40 years), (see Table 47).

Table 47

Relative Frequency of Length of Time in Administrative Positions

Length of time(years)	Frequency	Percent
Low (0-5)	172	34.1
Medium (6-11)	166	32.9
High (12-40)	166	32.9
Total	504	100.0

The differences of length of time in administration among the different academic administrators were as follows (See Table 48).

Table 48

Relative Frequencies of Length of Time in Administrative Positions

Length of time Frequency Percent	Nursing	Arts and Science	Row Totals
Low (0-5)	104 35.6	68 32.1	172 34.1
Medium (6-11)	92 31.5	74 34.9	166 32.9
High (12-40)	96 32.9	70 33.0	166 32.9
Column Totals	292 57.9	212 42.1	504 100.0

Since there was more than one independent variable, normality tests, such as skewness and kurtosis, were applied for Univariate analysis. Bartlett test for bivariate analysis was conducted for sphericity. Normality tests for Multivariate like BoxM were used for measuring equality of variance and covariance between groups. Data transformation was necessary because of the violation of non-normal distribution or skewness. Homogeneity test and square roots of data for the information systems technology tool were employed for this reason. The scores were weighted by .5 to address the Homogeneity issue. Hotelling's T^2 based on Eigenvalues was utilized to test significance of

Multivariate statistics. MANOVA was used to determine significance. Subpopulation descriptives are as follows:

Summaries of scores by department and length of time in administrative positions by the academic administrators follows. Approximately one third of the sample did not fill out the information technology systems questionnaire.

Table 49

Computer Usage Patterns Multivariate Test of Significance(S=2, M=1/2, N=203)

Effect	Hotelling's T^2	df	p
Time	.04	8	.024
Department	.05	4	.001
Interaction	.0097	8	.862

BoxM=60.89, χ^2(50, n=411)=1.19, p=.171

The Multivariate analysis for computer usage patterns revealed a strong significant difference in means scores based on department and time. When the individual ITS was examined, differences based on length of time in administrative positions were apparent.

The Univariate test of significance showed a significant difference based on time for the Central Feeder ITS.

Table 50

Computer Usage Patterns Univariate Test of Significance-Central Feeder

Effect	F	Significance of F
Time	3.17	.043
Department	.08	.777
Interaction	.16	.848

The mean scores for Central Feeder for the different administrators were basically the same, with longer length of time in administration having higher mean scores. Arts and Science displayed a higher total mean Central Feeder score than Nursing.

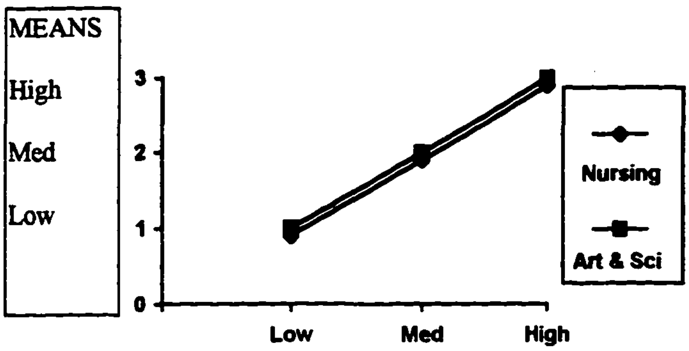
Table 51

Computer Usage Patterns Central Feeder Score Means Table

Department	Length of time	Mean	SD	Cases
Nursing	Low (0-5)	22.14 lo	14.82	94
	Medium (6-11)	24.25	13.83	87
	High (12-40)	26.29 hi	13.40	87
	Total	24.17	14.10	268
Arts & Sci.	Low (0-5)	21.98 lo	12.27	65
	Medium (6-11)	26.13	13.89	72
	High (12-40)	26.96 hi	14.21	69
	Total	25.10	13.62	206
Total		24.57	13.89	474

Bartlett-Box F=.8575, (5,207999)df, p=.509

Figure 13 provides the results in a graphical representation.



LENGTH OF TIME IN ADMINISTRATIVE POSITION

Figure 13

Comparison of Central Feeder mean scores with length of time in administrative position between Nursing and arts and science departments.

For procedure based mean scores there was no significant difference based on the interaction of time and department nor the component factors.

Table 52

Computer Usage Patterns Univariate Test of Significance-Procedure Based

Effect	F	Significance of F
Time	1.01	.364
Department	1.23	.268
Interaction	.14	.870

The pattern of mean scores for procedure based ITS differed among administrators with Nursing's high and low mean scores related to medium and low lengths of time respectively, while Arts and Science's high and low mean scores being high and low lengths of time in administrative position. Arts and Science administrators had higher total mean scores for procedure based ITS than Nursing.

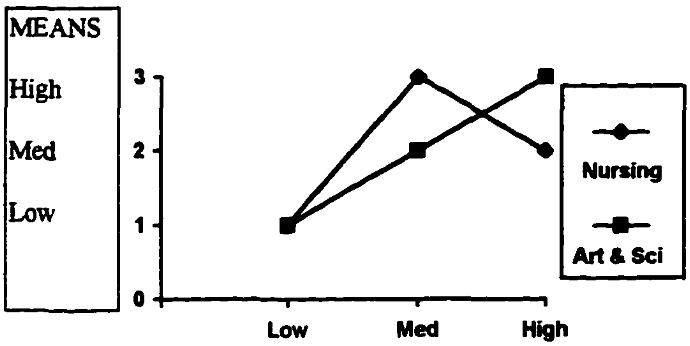
Table 53

Computer Usage Patterns Procedure Based Score Means Table

Department	Length of time	Mean	SD	Cases
Nursing	Low (0-5)	13.55 lo	10.83	89
	Medium (6-11)	16.54 hi	13.50	84
	High (12-40)	15.75	11.60	81
	Total	15.24	12.03	254
Arts & Sci.	Low (0-5)	14.95 lo	10.34	61
	Medium (6-11)	16.72	10.53	69
	High (12-40)	17.22 hi	11.09	67
	Total	16.35	10.65	197
Total		15.72	11.45	451

Bartlett-Box F=1.2028, (5,207999)df, p=.305

Figure 14 graphically represents this relationship.



LENGTH OF TIME IN ADMINISTRATIVE POSITION

Figure 14

Comparison of Procedural Based mean scores with length of time in administrative position between departments.

For collaborative ITS, there was a strong significant difference based on length of time in administrative position and department (p=.005 for both) but none for the interaction of both factors.

Table 54

Computer Usage Patterns Univariate Test of Significance-Collaborative

Effect	F	Significance of F
Time	5.13	.005
Department	7.83	.005
Interaction	.23	.796

Patterns of collaborative mean scores were the same for both groups of administrators (see Figure 15).

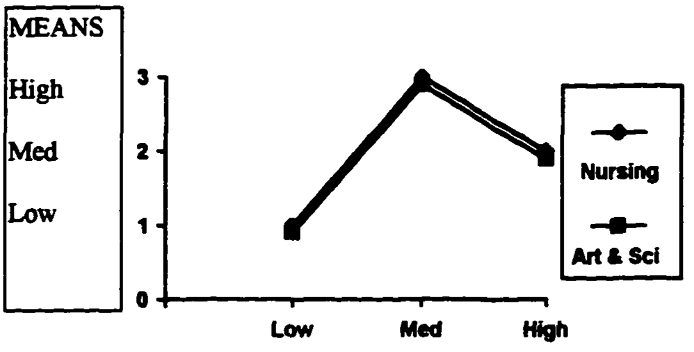
Table 55

Computer Usage Patterns Collaborative Score Means Table

Department	Length of time	Mean	SD	Cases
Nursing	Low (0-5)	9.66 lo	7.40	91
	Medium (6-11)	12.36 hi	7.18	85
	High (12-40)	12.11	6.50	83
	Total	11.33	7.13	259
Arts & Sci.	Low (0-5)	8.27 lo	5.78	62
	Medium (6-11)	10.31 hi	6.11	71
	High (12-40)	10.06	7.10	64
	Total	9.59	6.38	197
Total		10.58	6.87	456

Bartlett-Box F=1.0765, (5,207999)df, p=.371

However, on collaborative ITS Nursing, this time had a higher total mean score (see Table 55).



LENGTH OF TIME IN ADMINISTRATIVE POSITION

Figure 15

Comparison of collaborative mean scores with length of time in administrative position.

The Univariate analysis for Scanning ITS revealed there was no significant difference based on interaction, time or department.

Table 56

Computer Usage Patterns Univariate Test of Significance-Scanning

Effect	F	Significance of F
Time	.70	.497
Department	1.47	.235
Interaction	.06	.935

Patterns of means scores for scanning ITS were the same for both administrative groups.

Table 57

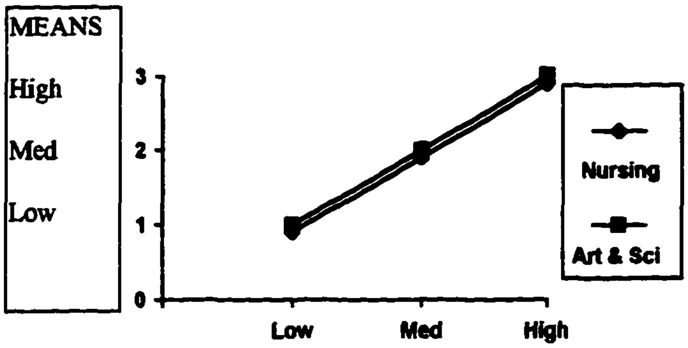
Computer Usage Patterns Scanning Score Means Table

Department	Length of time	Mean	SD	Cases
Nursing	Low (0-5)	14.19 lo	10.37	90
	Medium (6-11)	15.99	10.81	83
	High (12-40)	16.14 hi	9.40	83
	Total	15.41	10.22	256
Arts & Sci.	Low (0-5)	15.17 lo	8.07	60
	Medium (6-11)	16.63	8.35	71
	High (12-40)	17.12 hi	9.09	67
	Total	16.35	8.52	198
Total		15.82	9.52	454

Bartlett-Box F=2.6480, (5,207999)df, *p*=.022

Anova results using Bartlett-Box test however, revealed a significant difference (p=.002).

As length of time increases for academic administrators, scanning scores rise also, with Arts and Science administrators showing a slightly higher total mean score than Nursing.



LENGTH OF TIME IN ADMINISTRATIVE POSITION

Figure 16

Comparison of scanning mean scores with length of time in administrative position.

In summary, it did appear that both time and department did have a significant influence. Table 58 summaries the findings. As we can see, the interaction of degree and department (both) showed no significant difference even though the two individual factors did. The pattern of mean scores is represented on the right hand side of the table and highest mean scores are identified. The only system Nursing had the highest total mean score in was the collaborative system. In all other systems, Arts and Science had the highest mean score (See Table 58).

Table 58

Summary of Comparison of Information Technology System (ITS)Mean Scores between Nursing and Arts and Science Administrators

ITS	Significance				Mean Scores			Highest Total Mean Score
	Time	Dept	Both	Time->	High	Med	Low	
				Dept.				
All	yes	yes	no					
Central Feeder	yes	no	no	Nurs.	L	M	H	
				A&S	L	M	H	X
Procedural Based	no	no	no	Nurs.	L	H	M	
				A&S	L	M	H	X
Collabor-ative	yes	yes	no	Nurs.	L	H	M	X
				A&S	L	H	M	
Scanning	no	no	no	Nurs.	L	M	H	
				A&S	L	M	L	X

From these results the conclusion was that the null hypothesis was not supported and there was a significant difference based on time in administrative department and a significant difference based on department. There was however, no significant difference based on the interaction of time in administrative department and department. Hypothesis 5 was supported.

Hypothesis 6:

There will be a difference in variety and complexity of computer usage patterns with length of time administrators use computer information technology among Nursing and Arts and Science academic administrators in higher education.

Distribution of length of time for use of computers ranged from one year to 37 years. Two lengths of time (40 and 51 years) were left out because they were so far from 37 and were considered outliers. The distribution was collapsed down into three categories, low (1-10 years), medium (11-16 years) and high (17-37 years), (see Table 59).

Table 59

Relative Frequencies of Length of Time for Use of Computers

Length of time(years)	Frequency	Percent
Low (0-5)	142	33.4
Medium (6-11)	183	43.1
High (12-40)	100	23.5
Total	425	100.0

The differences of length of time for use of computers among the different administrators were as follows (see Table 60).

Table 60

Relative Frequencies of Length of Time for Use of Computers

Length of time Frequency Column Percent	Nursing	Arts and Science	Row Totals
Low (0-5)	93 38.8	49 26.5	142 33.41
Medium (6-11)	112 46.7	71 38.4	183 43.06
High (12-40)	35 14.6	65 35.1	100 23.53
Column Totals	240 56.47	185 43.53	425 100.00

Since there was more than one independent variable, normality tests, such as skewness and kurtosis were applied for Univariate analysis. Bartlett test for bivariate analysis was conducted for sphericity. Normality tests for Multivariate like BoxM were used for measuring equality of variance and covariance between groups. Data transformation was necessary because of the violation of non-normal distribution or skewness. Homogeneity test and square roots of data for the information systems technology tool were employed for this reason. The scores were weighted by .5 to address the Homogeneity issue. Hotelling's T^2 based on Eigenvalues was utilized to test significance of Multivariate statistics. MANOVA was used to determine significance. Subpopulation descriptives are as follows.

Summaries of scores by department and length of time for use of computers by academic administrators follows. Approximately one third of the sample did not fill out the information technology systems questionnaire.

Table 61

Computer Usage Patterns Multivariate Test of Significance (S= 2, M= 1/2, N= 189)

Effect	Hotelling's T^2	df	p
Year Start	.06	8	.008
Department	.04	4	.005
Interaction	.008	8	.924

BoxM=67.15, $\chi^2(50, n=256)=65.10$, $p=.074$

The Multivariate analysis for computer usage patterns revealed there was a strong significant difference based on department administrators (p=.005) and number of years they had been using computers (p=.008). When looking at individual ITS there was a significant difference related to number of years using the computer for the Central Feeder score (p=.012).

Table 62

Computer Usage Patterns Univariate Test of Significance-
Central Feeder

Effect	F	Significance of F
Time	4.50	.012
Department	.06	.809
Interaction	.22	.804

Patterns of means scores were the same for both departments. As length of time using computers increases, so did mean scores (see Figure 17).

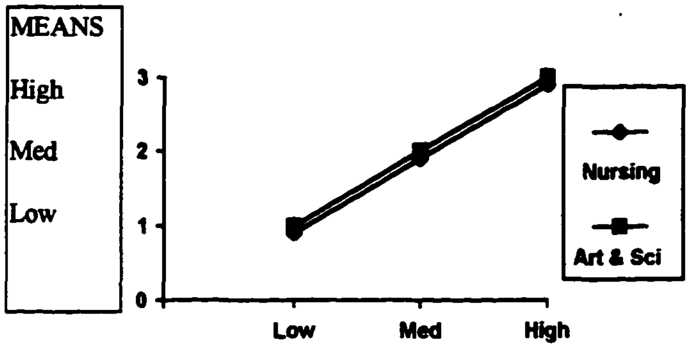
Table 66

Computer Usage Patterns Central Feeder Score Means Table

Department	Length of time	Mean	SD	Cases
Nursing	Low (0-10)	22.53 lo	13.21	96
	Medium(11-16)	24.36	15.07	118
	High (17-37)	27.00 hi	13.36	36
	Total	24.04	14.16	250
Arts & Sci	Low (0-10)	23.13 lo	13.80	52
	Medium(11-16)	23.30	12.12	74
	High (17-37)	29.02 hi	13.95	67
	Total	25.24	13.45	193
Total		24.56	13.85	443

Bartlett-Box F=1.26, (5,139930)df, *p*=.277

Arts and Science however, had higher total mean scores than Nursing.



LENGTH OF TIME USING COMPUTERS

Figure 17

Comparison of Central Feeder mean scores with length of time using computers.

For procedure based ITS, there was a strong significant difference based on time (p=.003) but none for interaction.

Table 64

Computer Usage Patterns Univariate Test of Significance-Procedure Based

Effect	F	Significance of F
Time	4.50	.003
Department	.89	.347
Interaction	.28	.755

As with Central Feeder ITS, procedure based ITS patterns of mean scores were the same for both procedure based ITS with Arts and Science having an increased total mean scores than Nursing.

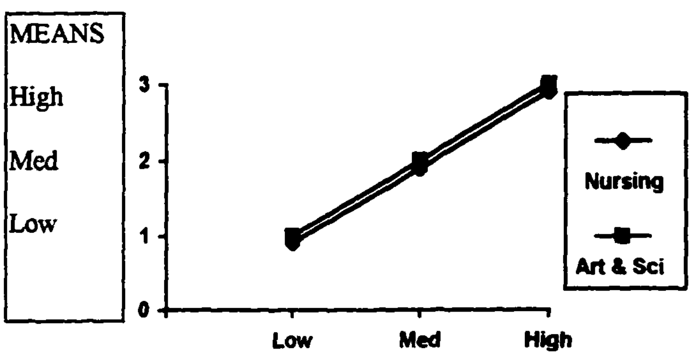
Table 65

Computer Usage Patterns Procedure Based Score Means Table

Department	Length of time	Mean	SD	Cases
Nursing	Low (0-10)	13.97 lo	12.20	90
	Medium(11-16)	15.72	12.27	112
	High (17-37)	17.17 hi	12.64	35
	Total	15.27	12.30	237
Arts & Sci.	Low (0-10)	13.90 lo	10.05	50
	Medium(11-16)	16.45	10.43	69
	High (17-37)	19.35 hi	11.14	65
	Total	16.78	10.75	184
Total		15.93	11.66	421

Bartlett-Box F=1.62, (5,139930)df, p=.151

Figure 18 shows this relationship.



LENGTH OF TIME USING COMPUTERS

Figure 18

Comparison of Procedural Based mean scores with length of time using computers between Nursing and arts and science academic administrators.

Collaborative ITS had similar results for both Univariate test of significance and patterns of mean scores as the previous two ITS, Central Feeder and procedure based.

Table 66

Computer Usage Patterns Univariate Test of Significance-Collaborative

Effect	F	Significance of F
Time	4.50	.003
Department	.89	.347
Interaction	.28	.755

There was a strong significant difference based on length of time using computer. In separating out the mean scores, no difference in pattern between the different departments was observed.

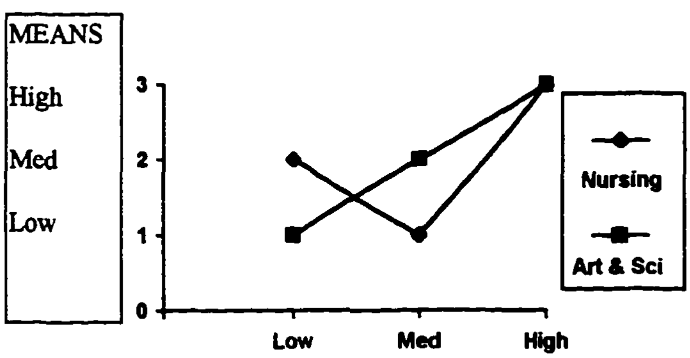
Table 67

Computer Usage Patterns Collaborative Score Means Table

Department	Length of time	Mean	SD	Cases
Nursing	Low (0-10)	10.97	7.06	91
	Medium(11-16)	10.76 lo	7.41	115
	High (17-37)	13.29 hi	6.42	35
	Total	11.20	7.17	241
Arts & Sci.	Low (0-10)	8.51 lo	6.85	51
	Medium(11-16)	9.70	7.07	76
	High (17-37)	11.08 hi	5.93	64
	Total	9.85	6.68	185
Total		10.62	6.98	426

Bartlett-Box F=2.00, (5,139930)df, p=.076

What was evident was as length of time using computers increased, mean scores decreased for both departments. Nursing had higher overall total mean scores than Arts and Science for collaborative ITS.



LENGTH OF TIME USING COMPUTERS

Figure 19

Comparison of collaborative mean scores with length of time using computers between departments.

Scanning ITS showed similar results as the previous ITS, with a very strong significant difference based on the length of time using computers.

Table 68

Computer Usage Patterns Univariate Test of Significance-Scanning

Effect	F	Significance of F
Time	7.99	.000
Department	.07	.789
Interaction	.04	.961

There were no differences in pattern of mean scores for scanning ITS between departments, as was the case with the other ITS.

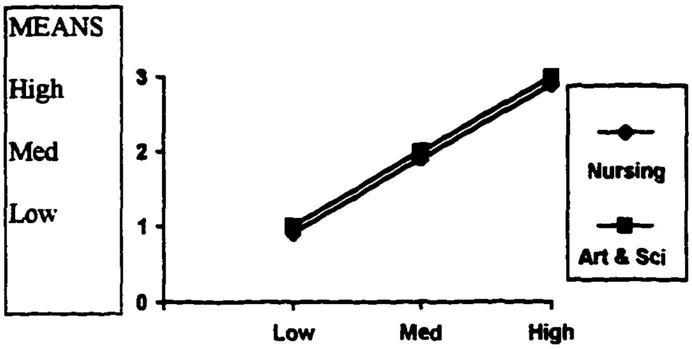
Table 69

Computer Usage Patterns Scanning Score Means Table

Department	Length of time	Mean	SD	Cases
Nursing	Low (0-10)	13.55 lo	9.63	93
	Medium(11-16)	16.31	10.51	112
	High (17-37)	18.57 hi	10.37	35
	Total	15.57	10.27	240
Arts & Sci.	Low (0-10)	14.31 lo	8.84	49
	Medium(11-16)	15.85	7.85	71
	High (17-37)	18.58 hi	8.54	65
	Total	16.41	8.49	185
Total		15.93	9.54	425

Bartlett-Box F=2.95, (5,139930)df, p=.012

Like Central Feeder and procedure based ITS, as length of time using computers increased, so did mean scores for the scanning ITS. Arts and Science once again had higher total mean scores than Nursing.



LENGTH OF TIME USING COMPUTERS

Figure 20

Comparison of scanning mean scores with length of time using computers between departments.

In summary, it was apparent that both length of time using computers and department did have a significant influence. Table 70 summaries the findings. As we can see, the interaction of degree and department (both) showed no significant difference even though the two individual factors did. The pattern of mean scores is represented on the right hand side of the table and highest mean scores are identified. The only system Nursing had the highest total mean score in was the collaborative system. In all other systems, Arts and Science had the highest mean score (See Table 70).

Table 70

Summary of Comparison of Information Technology System (ITS)Mean Scores between Nursing and Arts and Science

ITS	Significance				Mean Scores			Highest Total Mean Score
	Time	Dept	Both	Time->	High	Med	Low	
				Dept.				
All	yes	yes	no					
Central Feeder	yes	no	no	Nurs.	L	M	H	
				A&S	L	M	H	X
Procedural Based	yes	no	no	Nurs.	L	M	H	
				A&S	L	M	H	X
Collabor-ative	yes	no	no	Nurs.	M	L	H	X
				A&S	L	M	H	
Scanning	yes	no	no	Nurs.	L	M	H	
				A&S	L	M	H	X

From these results it is evident that there was a difference in variety and complexity of computer usage patterns with length of time administrators use computer information technology among Nursing and Arts and Science academic administrators in higher education and hypothesis 6 was supported. However, it is recognized that there was no significant difference between department related to time.

Hypothesis 7:

There will be a difference in variety and complexity of computer usage patterns with number of students enrolled among Nursing and Arts and Science academic administrators in higher education.

Enrollment was based on the number of students reported by the respondents. Distribution of enrollment was collapsed down into three categories, low (0-4999), medium (5000-9999) and high (>=10000) (see Table 71).

Table 71

Relative Frequencies of Enrollment Size

Enrollment	Frequency	Percent
Low (0-4999)	329	49.2
Medium (5000-9999)	153	22.9
High (>=10,000)	186	27.9
Total	668	100.0

The differences of enrollment size among the different administrators were as follows (See Table 72)

Table 72

Relative Frequencies of Enrollment Size

Enrollment size Frequency Column Percent	Nursing	Arts and Science	Row Totals
Low (0-4999)	144 50.2	90 43.7	234 47.5
Medium (5000-9999)	57 19.9	52 25.2	109 22.1
High (>=10,000)	85 86.7	64 31.1	149 30.2
Column Totals	287 58.2	206 41.8	493 100.0

Since there was more than one independent variable, normality tests, such as skewness and kurtosis were applied for Univariate analysis. Bartlett test for bivariate analysis was conducted for sphericity. Normality tests for Multivariate like BoxM were used for measuring equality of variance and covariance between groups. Data transformation was necessary because of the violation of non-normal distribution or skewness. Homogeneity test and square roots of data for the information systems technology tool were employed for this reason. The scores were weighted by .5 to address the Homogeneity issue. Hotelling's T^2 based on Eigenvalues was utilized to test significance of Multivariate statistics. MANOVA was used to determine significance. Subpopulation descriptives are as follows:

Summaries of scores by department enrollment size follows. Approximately one third of the sample did not fill out the information technology systems questionnaire.

Table 73

Computer Usage Patterns Multivariate Test of Significance(S= 2, M= 1/2, N= 199)

Effect	Hotelling's T^2	df	p
Size	.11	8	.000
Department	.04	4	.005
Interaction	.02	8	.384

BoxM= 52.15, χ^2(50,n=465)=50.75, p=.444

There was a significant difference based on size and department (p=.000 and .005 respectively). The review of literature led to an expectation of this difference. When results of the individual ITS were reviewed, size of institution displayed a very strong significant difference (p=.000).

Table 74

Computer Usage Patterns Univariate Test of Significance-Central Feeder

Effect	F	Significance of F
Size	19.49	.000
Department	.17	.680
Interaction	.51	.602

The pattern of mean scores for Central Feeder was the same for both groups of administrators. As enrollment increased so did mean scores. However, Arts and Science demonstrated a higher total mean score than Nursing.

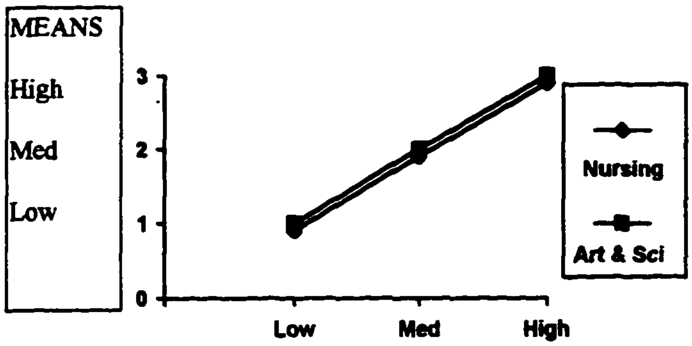
Table 75

Computer Usage Patterns Central Feeder Score Means Table

Department	Enrollment	Mean	SD	Cases
Nursing	Low (0-4999)	19.21 lo	12.67	126
	Medium (5000-9999)	26.63	13.34	54
	High (>=10,000)	30.40 hi	13.71	84
	Total	24.29	14.03	264
Arts & Sci.	Low (0-4999)	20.45 lo	12.69	85
	Medium (5000-9999)	27.52	12.14	52
	High (>=10,000)	30.02 hi	13.95	64
	Total	25.32	13.60	21
Total		24.74	13.84	465

Bartlett-Box F=1.0362, (5,177927)df, p=.395

Figure 21 depicts this relationship.



ENROLLMENT

Figure 21

Comparison of Central Feeder mean scores with enrollment between departments.

Procedure based means scores showed similar results as the Central Feeder ITS, with a very strong significant difference based on size of institution (p=.000).

Table 76

Computer Usage Patterns Univariate Test of Significance-Procedure Based

Effect	F	Significance of F
Size	14.18	.000
Department	1.98	.160
Interaction	.46	.631

The pattern of mean scores were the same for both administrative groups. Again, as enrollment increased, so did mean scores, and Arts and Science continued to exhibit higher total mean score than Nursing.

Table 77

Computer Usage Patterns Procedure Based Score Means Table

Department	Enrollment	Mean	SD	Cases
Nursing	Low (0-4999)	11.37 lo	10.14	115
	Medium (5000-9999)	16.83	12.44	53
	High (>=10,000)	19.53 hi	12.47	81
	Total	15.19	11.97	249
Arts & Sci.	Low (0-4999)	13.11 lo	9.83	80
	Medium (5000-9999)	18.35 hi	10.28	49
	High (>=10,000)	20.05	11.11	63
	Total	16.72	10.79	192
Total		15.86	11.48	441

Bartlett-Box F=.7846, (5,177927)df, p=.561

Figure 22 graphically represents this relationship.

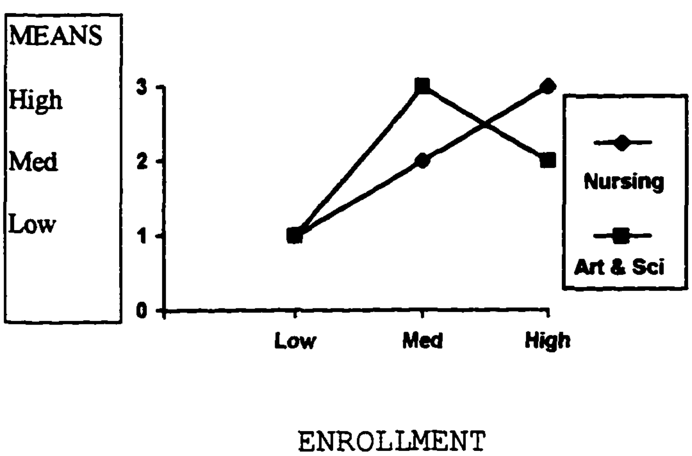


Figure 22

Comparison of Procedural Based mean scores with enrollment between departments.

Collaborative ITS was somewhat different. It showed a very strong significant difference for size (p=.006) and a strong significant difference for department (p=.024).

Table 78

Computer Usage Patterns Univariate Test of Significance-Collaborative

Effect	F	Significance of F
Size	5.19	.006
Department	5.17	.024
Interaction	1.32	.269

However, Collaborative mean score patterns were different than the previous two IT systems.

Table 79

Computer Usage Patterns Collaborative Score Means Table

Department	Enrollment	Mean	SD	Cases
Nursing	Low (0-4999)	9.95 lo	6.58	121
	Medium (5000-9999)	11.02	7.22	53
	High (>=10,000)	13.89 hi	7.01	81
	Total	11.42	7.04	255
Arts & Sci.	Low (0-4999)	8.48 lo	6.63	80
	Medium (5000-9999)	10.86 hi	5.90	49
	High (>=10,000)	10.49	6.94	63
	Total	9.75	6.61	192
Total		10.70	6.90	447

Bartlett-Box F=.4593, (5,177927)df, p=.807

Nursing demonstrated the highest mean scores in the larger enrollment group and lowest mean scores in the lowest enrollment group, while results revealed Arts and Science highest and lowest mean scores in the medium and lowest enrollment groups. Nursing also demonstrated a higher total mean score than Arts and Science (See Figure 23).

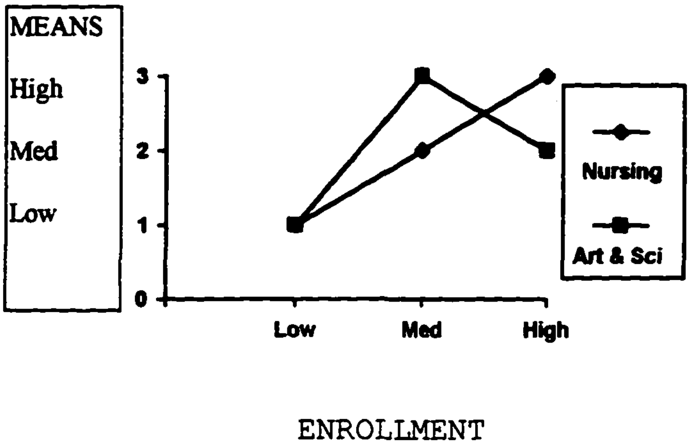


Figure 23

Comparison of collaborative mean scores with enrollment between departments.

Scanning showed a very strong significant difference based on size (p=.000).

Table 80

Computer Usage Patterns Univariate Test of Significance-Scanning

Effect	F	Significance of F
Size	12.75	.000
Department	.94	.332
Interaction	1.32	.269

Scanning ITS mean scores revealed the same pattern for both administrative groups.

Table 81

Computer Usage Patterns Scanning Score Means Table

Department	Enrollment	Mean	SD	Cases
Nursing	Low (0-4999)	11.98 lo	8.87	120
	Medium (5000-9999)	17.81	10.35	52
	High (>=10,000)	18.63 hi	10.51	82
	Total	15.32	10.20	254
Arts & Sci.	Low (0-4999)	14.19 lo	8.33	80
	Medium (5000-9999)	17.48	8.54	50
	High (>=10,000)	18.78 hi	8.01	63
	Total	16.54	8.49	193
Total		15.85	9.51	447

Bartlett-Box F=1.5617, (5,177927)df, *p*=.168

Enrollment and mean scores show a positive relationship (see Figure 24). However, Arts and Science demonstrated a higher total mean score than Nursing.

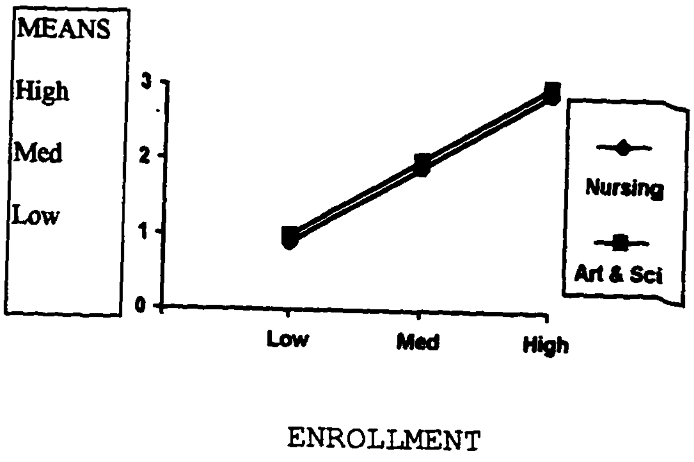


Figure 24

Comparison of scanning mean scores with enrollment between departments.

In summary, it did appear that both length of time using computers and department demonstrated a significant influence. Table 82 summaries the findings. As we can see, the interaction of degree and department (both) showed no significant difference even though the two individual factors did. The pattern of mean scores is represented on the right hand side of the table and highest mean scores are identified. The only system Nursing exhibited the highest total mean score was in the collaborative system. In all other systems, Arts and Science had the highest mean score (See Table 82).

Table 82

Summary of Comparison of Information Technology System (ITS)Mean Scores between Nursing and Arts and Science Administrators

ITS	Significance				Mean Scores			Highest Total Mean Score
	Size	Dept	Both	Size->	High	Med	Low	
				Dept.				
All	yes	yes	no					
Central Feeder	yes	no	no	Nurs.	L	M	H	
				A&S	L	M	H	X
Procedural Based	yes	no	no	Nurs.	L	M	H	
				A&S	L	H	M	X
Collabor-ative	yes	yes	no	Nurs.	L	M	H	X
				A&S	L	H	M	
Scanning	yes	no	no	Nurs.	L	M	H	
				A&S	L	M	H	X

As stated earlier, from these results it is concluded that there was a difference in variety and complexity of computer usage patterns with number of students enrolled among Nursing and Arts and Science academic administrators in higher education, and hypothesis 7 was supported. However, it is noted that because of lack of significant difference of interaction, there is no difference between departments based on number of students enrolled.

Hypothesis 8:

There will be a difference in variety and complexity of computer usage patterns with department size among Nursing and Arts and Science academic administrators in higher education.

Department size was based on number of full time faculty in each department as reported by the respondents. Distribution of department size was collapsed into three categories, low (0-99), medium (100-499) and high (>=500), (see Table 83).

Table 83

Relative Frequencies of Department Size

Department size	Frequency	Percent
Low (0-99)	40	8.9
Medium(100-499)	235	52.1
High (>=500)	176	39.0
Total	451	100.0

The differences of department size between the different academic departments are in Table 84.

Table 84

Relative Frequencies of Department Size

Department size Frequency Percent	Nursing	Arts and Science	Row Totals
Low (0-99)	27 9.5%	13 7.8%	40 8.9%
Medium(100-499)	195 68.7%	40 24.0%	235 52.1%
High (>=500)	62 21.8%	114 68.3%	176 39.0%
Column Totals	284 63.0%	167 37.0%	451 100.0%

Since there were more than one independent variable, normality tests, such as skewness and kurtosis were applied for Univariate analysis. Bartlett test for bivariate analysis was conducted for sphericity. Normality tests for Multivariate like BoxM were used for measuring equality of variance and covariance between groups. Data transformation was necessary because of the violation of non-normal distribution or skewness. Homogeneity test and square roots of data for the information systems technology tool were employed for this reason. The scores were weighted by .5 to address the Homogeneity issue. Hotelling's T^2 based on Eigenvalues was utilized to test significance of Multivariate statistics. MANOVA was used to determine significance. Subpopulation descriptives are as follows:

Summaries of scores by department and department size follow. Approximately one third of the sample did not fill out the information technology systems questionnaire.

Table 85

Computer Usage Patterns Multivariate Test of Significance (S= 2, M= 1/2, N= 182)

Effect	Hotelling's T^2	df	p
Size	.09	8	.000
Department	.02	4	.123
Interaction	.005	8	.984

BoxM= 70.71, χ^2(50, n=428)=65.78, p=.067

There was a strong significant difference (p=.000) based on department size and weak significance (p=.123) for department, therefore, the hypothesis was supported.

In examining the individual ITS, there was a strong significant differences based on size as well.

Table 86

Computer Usage Patterns Univariate Test of Significance- Central Feeder

Effect	F	Significance of F
Size	9.50	.000
Department	1.64	.444
Interaction	.04	.959

Patterns between departments of Central Feeder mean scores were different. Nursing's highest mean scores were in the largest department and lowest means scores in the medium size departments while Arts and Science's highest scores were also in the largest size department but the lowest scores were in the smallest departments. Arts and Science demonstrated a higher total mean score than Nursing.

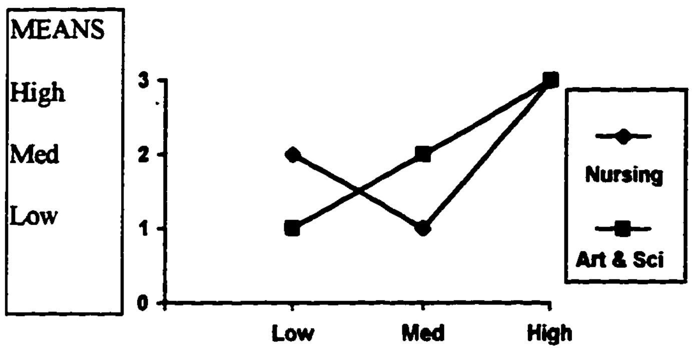
Table 87

Computer Usage Patterns Central Feeder Score Means Table

Department	Department Size	Mean	SD	Cases
Nursing	Low (0-99)	22.54	15.77	24
	Medium(100-499)	22.52 lo	13.60	182
	High (>=500)	29.28 hi	13.99	58
	Total	24.01	14.12	264
Arts & Sci.	Low (0-99)	15.38 lo	14.38	13
	Medium(100-499)	21.03	14.92	38
	High (>=500)	27.81 hi	12.55	113
	Total	25.26	13.80	164
Total		24.49	13.99	428

Bartlett-Box $F=2.94$, $(5,26572)df$, $p=.012$

See Figure 25 for the graphical representation.



DEPARTMENT SIZE

Figure 25

Comparison of Central Feeder mean scores with department size between departments.

Procedure based mean scores similarly showed a significant difference based on size.

Table 88

Computer Usage Patterns Univariate Test of Significance-Procedure Based

Effect	F	Significance of F
Size	9.21	.000
Department	.47	.494
Interaction	.12	.889

There were no differences in pattern of mean scores for both administrative groups. For both departments, as number of full time faculty increased, so did mean scores.

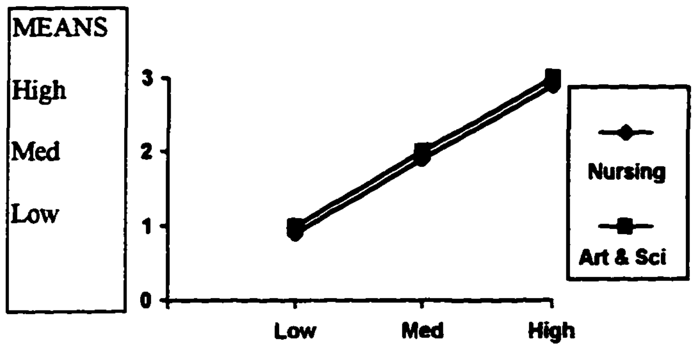
Table 89

Computer Usage Patterns Procedure Based Score Means Table

Department	Department Size	Mean	SD	Cases
Nursing	Low (0-99)	13.79 lo	12.75	24
	Medium(100-499)	13.80	11.45	168
	High (>=500)	19.61 hi	12.50	57
	Total	15.13	12.03	249
Arts & Sci.	Low (0-99)	11.18 lo	7.07	11
	Medium(100-499)	13.14	12.02	35
	High (>=500)	18.37 hi	10.47	111
	Total	16.70	10.91	157
Total		15.74	11.62	406

Bartlett-Box F=1.52, (5,26572)df, p=.179

As with the Central Feeder scores, Arts and Science had a higher total mean score than Nursing.



DEPARTMENT SIZE

Figure 26

Comparison of Procedural Based mean scores with department size.

The collaborative ITS again showed a strong significant difference based on department and department size.

Table 90

Computer Usage Patterns Univariate Test of Significance-Collaborative

Effect	F	Significance of F
Size	5.97	.003
Department	5.81	.016
Interaction	.05	.955

Patterns of mean collaborative scores were different for each department.

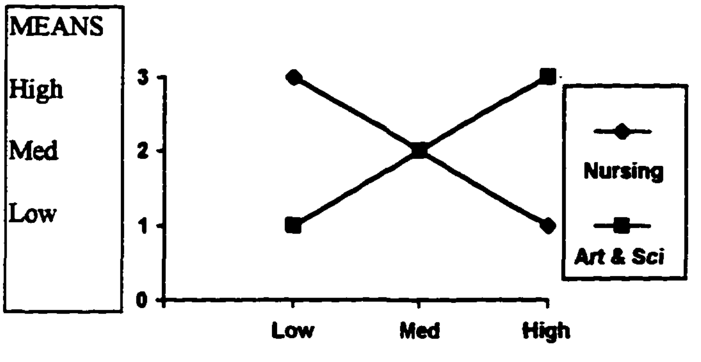
Table 91

Computer Usage Patterns Collaborative Score Means Table

Department	Department Size	Mean	SD	Cases
Nursing	Low (0-99)	10.96 hi	7.80	24
	Medium(100-499)	10.59	6.78	174
	High (>=500)	13.56 lo	7.27	57
	Total	11.29	7.07	255
Arts & Sci.	Low (0-99)	7.00 lo	5.23	13
	Medium(100-499)	7.75	5.56	36
	High (>=500)	11.05 hi	7.12	109
	Total	9.97	6.82	158
Total		10.78	7.00	413

Bartlett-Box F=.64, (5,26572)df, p=.671

Though the Univariate analysis did support a significant difference for collaborative scores for size and department, ANOVA did not (p=.671). Nursing displayed high mean scores in the largest departments and low scores in the mid-size departments. Arts & Science demonstrated high and low mean scores in the largest and smallest departments respectively. Overall, Nursing exhibited a higher total mean score than Arts and Science, and this pattern varies from the previous two ITS.



DEPARTMENT SIZE

Figure 27

Comparison of collaborative mean scores with department size.

The scanning ITS proved to be no different from the other ITS. The scanning ITS showed a strong significant difference based on department size.

Table 92

Computer Usage Patterns Univariate Test of Significance-Scanning

Effect	F	Significance of F
Size	7.93	.000
Department	.003	.951
Interaction	.12	.889

There were no pattern differences in mean scores between the two administrative groups.

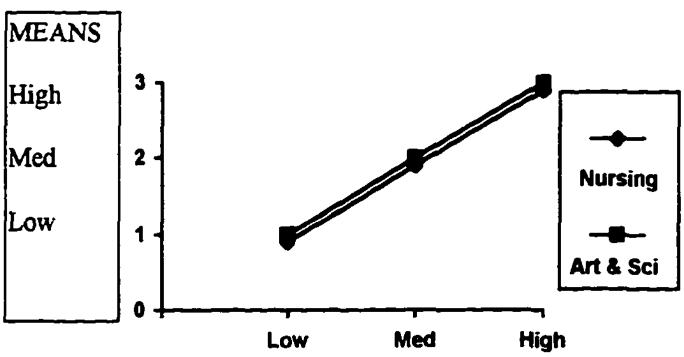
Table 93

Computer Usage Patterns Scanning Score Means Table

Department	Department Size	Mean	SD	Cases
Nursing	Low (0-99)	12.38 lo	10.06	21
	Medium(100-499)	14.80	9.86	174
	High (>=500)	17.75 hi	11.22	57
	Total	15.27	10.27	252
Arts & Sci.	Low (0-99)	10.67 lo	4.77	9
	Medium(100-499)	14.00	9.17	36
	High (>=500)	18.04 hi	8.61	112
	Total	16.69	8.83	157
Total		15.81	9.75	409

Bartlett-Box F=2.84, (5,26572)df, p=.015

As number of full time faculty increased, so did mean scores. Arts and Science again, demonstrated a higher mean score than Nursing.



DEPARTMENT SIZE

Figure 27

Comparison of scanning mean scores with department size between Nursing and arts and science.

In summary, it did appear that both size of department and department did have a significant influence. Table 94 summaries the findings. As we can see, the interaction of degree and department (both) showed no significant difference even though the two individual factors did. The pattern of mean scores is represented on the right hand side of the table and highest mean scores are identified. The only system Nursing displayed the highest total mean score in was the collaborative system. In all other systems, Arts and Science had the highest mean score (See Table 94).

Table 94

Summary of Comparison of Information Technology System (ITS)Mean Scores between Nursing and Arts and Science

ITS	Significance				Mean Scores			Highest Total Mean Score
	Size	Dept	Both	Size->	High	Med	Low	
				Dept.				
All	yes	yes	no					
Central Feeder	yes	no	no	Nurs.	M	L	H	
				A&S	L	M	H	X
Procedural Based	yes	no	no	Nurs.	L	M	H	
				A&S	L	M	H	X
Collabor-ative	yes	yes	no	Nurs.	H	M	L	X
				A&S	L	M	H	
Scanning	yes	no	no	Nurs.	L	M	H	
				A&S	L	M	H	X

As stated earlier, from these results it is clear that there was a difference in variety and complexity of computer usage patterns with department size among Nursing and Arts and Science academic administrators in higher education and, therefore, hypothesis 8 was supported. However, it is noted that between departments, difference was not significant.

Hypothesis 9

There will be a difference in variety and complexity of computer usage patterns between rural and metropolitan institutions among Nursing and Arts and Science academic administrators in higher education.

In this study, 233 institutions identified themselves as rural while 416 identified themselves as metropolitan.

Table 95

Relative Frequencies of geographic locations

Geographic location	Frequency	Percent
Rural	233	35.90
Metropolitan	416	64.10
Total	649	100.00

The differences of geographic location among the different administrators are represented in Table 96.

Table 96

Relative Frequency of Geographic Location

Length of time Frequency Percent	Rural		Metropolitan		Row Totals	
	#	%	#	%	#	%
Nursing	112	48.07	143	34.38	255	39.29
Arts & Sci.	59	25.32	148	35.58	207	31.90
MIS	62	26.61	125	30.04	187	28.81
Column Totals	233	35.90	416	64.10	649	100.00

Since there were more than one independent variable, normality tests, such as skewness and kurtosis were applied for Univariate analysis. Bartlett test for bivariate analysis was conducted for sphericity. Normality tests for Multivariate like BoxM were used for measuring equality of variance and covariance between groups. Data transformation was necessary because of the violation of non-normal distribution or skewness. Homogeneity test and square roots of data for the information systems technology tool were employed for this reason. The scores were weighted by .5 to address the Homogeneity issue. Hotelling's T^2 based on Eigenvalues was utilized to test significance of Multivariate statistics. MANOVA was used to determine significance. Subpopulation descriptives are as follows.

Summaries of scores by department and geographic location follows. Approximately one third of the sample did not fill out the information technology systems questionnaire.

Table 97

Computer Usage Patterns Multivariate Test of Significance

(S= 1, M= 1, N= 203.5)

Effect	Hotelling's T^2	df	p
Geographic	.01	4	.247
Department	.03	4	.009
Interaction	.001	4	.971

BoxM= 34.75, χ^2 (30,n=473)=34.01, p=.280

The above table (Table 97) showed a very strong significant difference for the department (p=.009) but not geographic location or interaction. When individual ITS are considered, there is no significant difference for all factors, geographic location, department and interaction for the Central Feeder system.

Table 98

Computer Usage Patterns Univariate Test of Significance-Central Feeder

Effect	F	Significance of F
Geographic location	.06	.799
Department	.13	.716
Interaction	.06	.800

Patterns for mean scores for Central Feeder ITS were the same for both departments.

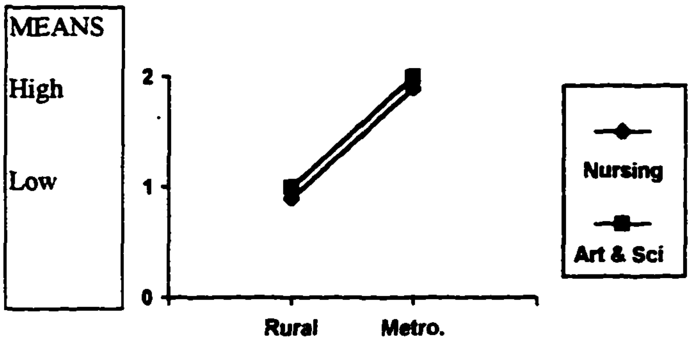
Table 99

Computer Usage Patterns Central Feeder Score Means Table

Department	Geographic location	Mean	SD	Cases
Nursing	Rural	22.60 lo	13.85	98
	Metropolitan	24.92 hi	14.19	173
	Total	24.05	14.09	271
Arts & Sci.	Rural	24.17 lo	14.46	59
	Metropolitan	25.12 hi	12.82	143
	Total	24.93	13.29	202
Total		24.45	13.74	473

Bartlett-Box F=.84, (3,207639)df, *p*=.471

Both departments revealed the same results. In the rural geographic locations the mean scores were low and in the metropolitan locations the mean scores were high (see figure 29), with Arts and Science showing a higher total mean score than Nursing.



GEOGRAPHIC LOCATION

Figure 29

Comparison of Central Feeder mean scores with geographic location between departments.

For the Procedural Based ITS, the results were similar, showing no significant difference.

Table 100

Computer Usage Patterns Univariate Test of Significance-Procedure Based

Effect	F	Significance of F
Time	.06	.799
Department	.91	.340
Interaction	.02	.890

Pattern of mean scores for procedure based ITS were opposite for each department with metropolitan Nursing departments having a much higher score than rural, and rural Arts and Science departments having a slightly higher mean score than metropolitan. Overall, Arts and Science displayed a higher total mean score than Nursing.

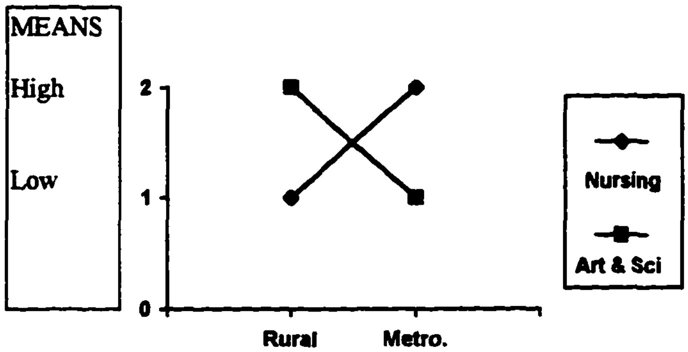
Table 101

Computer Usage Patterns Procedure Based Score Means Table

Department	Geographic location	Mean	SD	Cases
Nursing	Rural	14.01 lo	11.27	293
	Metropolitan	15.83 hi	12.41	163
	Total	15.17	12.02	256
Arts & Sci.	Rural	16.20 hi	11.03	55
	Metropolitan	16.12 lo	10.08	138
	Total	16.14	10.33	193
Total		15.59	11.32	449

Bartlett-Box F=1.98, (3,207639)df, p=.114

Figure 30 graphically represents the relationship.



GEOGRAPHIC LOCATION

Figure 30

Comparison of Procedural Based mean scores with geographic location.

For the collaborative ITS, there was a strong significant difference related to department (p=.021).

Table 102

Computer Usage Patterns Univariate Test of Significance-Collaborative

Effect	F	Significance of F
Geographic location	.004	.950
Department	5.41	.021
Interaction	.02	.893

Pattern of mean scores for this group were also opposite for each department following the same patterns as procedure based ITS.

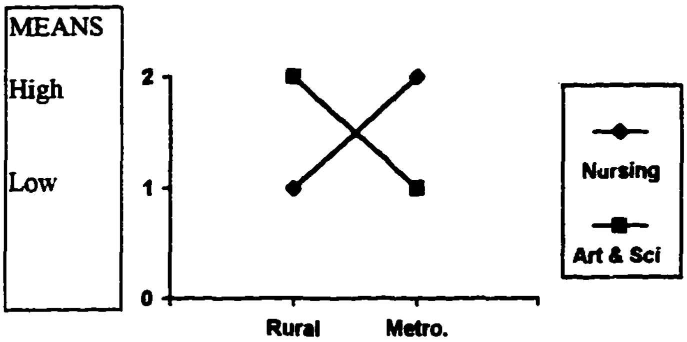
Table 103

Computer Usage Patterns Collaborative Score Means Table

Department	Geographic location	Mean	SD	Cases
Nursing	Rural	10.96 lo	7.18	98
	Metropolitan	11.47 hi	7.09	167
	Total	11.28	7.12	262
Arts & Sci.	Rural	9.71 hi	7.22	59
	Metropolitan	9.64 lo	6.33	135
	Total	9.66	6.59	194
Total		10.59	6.93	456

Bartlett-Box F=1.14, (3,207639)df, *p*=.333

Nursing's highest mean collaborative scores were in the metropolitan institutions, while Arts and Science's were in the rural institutions. In overall scores, Nursing demonstrated higher total mean score than Arts and Science.



GEOGRAPHIC LOCATION

Figure 31

Comparison of collaborative mean scores with geographic location between departments.

For the scanning ITS, there was a weak significant difference for the geographic location (p=.074).

Table 104

Computer Usage Patterns Univariate Test of Significance-Scanning

Effect	F	Significance of F
Geographic location	3.21	.074
Department	.82	.367
Interaction	.02	.890

Pattern of mean scores were the same for each department following the same patterns as the Central Feeder

ITS (see Figure 32), with Arts and Science showing an overall higher total mean score (see Table 105).

Table 105

Computer Usage Patterns Scanning Score Means Table

Department	Geographic location	Mean	SD	Cases
Nursing	Rural	14.05 lo	9.84	92
	Metropolitan	16.04 hi	10.32	167
	Total	15.33	10.18	259
Arts & Sci.	Rural	15.07 lo	8.65	55
	Metropolitan	16.62 hi	8.11	139
	Total	16.18	8.27	194
Total		15.70	9.41	453

Bartlett-Box F=3.25, (3,207639)df, p=.021

GEOGRAPHIC LOCATION

Figure 32

Comparison of scanning mean scores with geographic location between departments.

In summary, it did appear that for Multivariate analysis department demonstrated a significant influence. Significant difference was not demonstrated for geographic area or interaction of the factors for any Univariate factor except scanning. Table 106 summaries the findings. As we can see, the interaction of geographic location and department (both) showed no significant difference. The pattern of mean scores is represented on the right hand side of the table and highest mean scores are identified. The only system Nursing demoanstrated the highest total mean score in was the collaborative system. In all other systems, Arts and Science exhibited the highest mean score (See Table 106).

Table 106

Summary of Comparison of Information Technology System (ITS)Mean Scores between Nursing and Arts and Science

ITS	Significance				Mean Scores		Highest Total Mean Score
	Geo	Dept	Both	Geo.--> Dept.	High	Low	
All	no	yes	no				
Central Feeder	no	no	no	Nurs.	R	M	
				A&S	R	M	X
Procedural Based	no	no	no	Nurs.	R	M	
				A&S	M	R	X
Collabor-ative	no	yes	no	Nurs.	R	M	X
				A&S	M	R	
Scanning	yes	no	no	Nurs.	R	M	
				A&S	R	M	X

From these results there was not a difference in variety and complexity of computer usage patterns between rural and metropolitan institutions among Nursing and Arts and Science academic administrators in higher education but there was between departments. Therefore hypothesis 9 was not supported.

Hypothesis 10

There will be increased variety and more complex computer usage patterns with leadership patterns that are more independent among Nursing and Arts and Science academic administrators in higher education.

As stated before, both departments tend to use the simplest information technology system, Central Feeder. Table 107 repeats the previous data.

Table 107

Classification of Institutions According to Information Technologies Usage Patterns

Department	Information Technologies Usage Patterns (Schmidt, 1992)			
Count Row Percent	Central Feeder	Procedural based	Collabor-ative	Scanning
Nursing	132 78.6	13 7.7	4 2.4	19 11.3
Arts and Science	103 77.4	7 5.3	2 1.5	21 15.8
Total	235 78.1	20 6.6	6 2.0	40 13.3

Pearson's χ^2 (3, n=301)= 21.04, p = .001.

This was not a very strong relationship, (Contingency coefficient= .08, p =.000). Also, as reported before, both departments identified with the same leadership style, Central Bureaucracy. Table 108 shows this data.

Table 108

Classification of Institutions According to Leadership Patterns (n=640)

Department	Leadership Patterns (Schmidt, 1992)			
Count Row Percent	Central Teams	Central Bureaucracy	Political Bureaucracy	Professional Bureaucracy
Nursing	26 14.4	92 50.8	25 13.8	38 21.0
Arts and Science	23 16.3	75 53.2	18 12.8	25 17.7
Total	49 15.2	167 51.9	43 13.4	63 19.6

Pearson's χ^2 (3, n=322)= 7.79, p = .05.

This was not a very strong relationship, (Contingency coefficient= .05, p =.05).

When looking at natural matches proposed by Schmidt (1992), we would have expected the type of information technology system most used would have been Procedure Based, (see Table 109).

Table 109

The Fit Between Leadership Patterns and it Usage Patterns

Leadership Patterns (Schmidt)	Information Technology Usage Patterns (Schmidt)			
	Central Feeder	Procedure Based	Collabor-ative	Scanning
Central Teams	X			
Central Bureaucracy		X		
Political Bureaucracy			X	
Professional Bureaucracy				X

For this population, the theory of 'natural matches' did not hold true. When looking at how the matches did line up, interesting patterns emerge.

Table 110

Crosstabs of Institutions According to Information Technologies Usage Patterns and Leadership Patterns

Leadership style	Information Technologies Usage Patterns (Schmidt, 1992)				
Count Row Percent Column Percent	Central Feeder	Procedural	Collabor-ative	Scanning x	Row Total Total Percent
Central Teams	39 90.7 17.3	0	2 4.7 33.3	2 4.7 5.1	43 14.8
Central Bureaucracy	115 75.2 50.9	15 9.8 78.9	3 2.0 50.0	20 13.1 51.3	153 52.8
Political Bureaucracy	33 84.6 14.6	2 5.1 10.5	0	4 10.3 10.3	39 13.4
Professional Bureaucracy x	39 70.9 17.3	2 3.6 10.5	1 1.8 16.7	13 23.6 33.3	55 19.0
Column total Total Percent	226 77.9	19 6.6	6 2.1	39 13.4	290 100.0

Pearson's χ^2 (9, n=290)= 169.92, p= .000 Contingency coefficient= .24, p= .000

The second most used ITS and second highest leadership patterns matched Schmidt's (1992) 'natural matches'. There were no Political Bureaucracy leadership patterns using Collaborative ITS as predicted by Schmidt. For the Procedural Based ITS, 78.9% were in the Central Bureaucracy leadership pattern, which coincides with Schmidt's (1992) 'natural matches' once again.

When separating out the different departments, they were found to not vary from the combined departments.

Table 111

Crosstabs of Institutions According to Information Technologies Usage Patterns and Leadership Patterns-Nursing

Leadership style	Information Technologies Usage Patterns (Schmidt, 1992)				
Count Row Percent Column Percent	Central Feeder	Procedural	Collaborative	Scanning x	Row Total Total Percent
Central Teams	22 91.7 17.3	0	2 8.3 50.0	0	24 14.9
Central Bureaucracy	61 75.3 48.0	9 11.1 75.0	1 1.2 25.0	10 12.3 55.6	81 50.3
Political Bureaucracy	18 78.3 14.2	2 8.7 16.7	0	3 13.0 16.7	23 14.3
Professional Bureaucracy x	26 78.8 20.5	1 3.0 8.3	1 3.0 25.0	5 15.2 27.8	33 20.5
Column Total Total Percent	127 78.9	12 7.5	4 2.5	18 11.2	161 100.0

Pearson's χ^2 (9, n=161)=125.30, p= .000, Contingency Coefficient= .27, p= .000

Table 112

Crosstabs of Institutions According to Information Technologies Usage Patterns and Leadership Patterns- Arts and Science

Leadership style	Information Technologies Usage Patterns (Schmidt, 1992)				
Count Row Percent Column Percent	Central Feeder	Procedural	Collabor-ative	Scanning **X**	Row Total Total Percent
Central teams	17 89.5 17.2	0	0	2 10.5 9.5	19 14.7
Central Bureaucracy	54 75.0 54.5	6 8.3 85.7	2 2.8 100.0	10 13.9 47.6	72 55.8
Political Bureaucracy	15 93.8 15.2	0	0	1 6.3 4.8	16 12.4
Professional Bureaucracy **X**	13 59.1 13.1	1 4.5 14.3	0	8 36.4 38.1	22 17.1
Column Total Total percent	99 76.7	7 5.4	2 1.6	21 16.3	129 100.0

Pearson's χ^2 (9, n=129)= 136.40, p= .000, Contingency coefficient= .31, p= .000

The significance of the relationship here is rather strong, (Pearson's χ^2 =136.40, p=.000, contingency coefficient= .31, p=.000). Based on these results, it is concluded that there was a significant relationship between the 'natural matches' as expected based on the work of Schmidt (1992) and Leifer (1988), and hypothesis 10 was supported.

Hypothesis 11

There will be increased satisfaction of the suitability of information technology systems with leadership patterns that are more independent among Nursing and Arts and Science academic administrators in higher education.

The pattern of suitability of hardware systems and software applications were of importance when compared with leadership patterns. When asked on the demographic questionnaire if the hardware systems and software application available was satisfactory, the majority of administrators were satisfied (85.68 %), with Nursing and Arts and Science answering yes 47.31% and 38.37% respectively. Table 113 shows results of the satisfaction tool (suitability) when the subjects were divided by leadership styles.

Table 113

<u>Crosstabs of Institutions According to Satisfaction with Information Technologies and Leadership Patterns</u>

Leadership style	Satisfaction			
Count Row Percent Column Percent	Unsatis-factory **X**	Neutral	Satis-factory	Row Total Total Percent
Central Teams	29 33.3 12.0	29 33.3 14.6	29 33.3 16.5	87 14.1
Central Bureaucracy	141 41.7 58.3	97 28.7 48.7	100 29.6 56.8	338 54.8
Political Bureaucracy	26 35.6 10.7	29 39.7 14.6	18 24.7 10.2	73 11.8
Professional Bureaucracy	46 38.7 19.0	44 37.0 22.1	29 24.4 16.5	119 19.3
Column Total Total percent	242 39.2	199 32.3	176 28.5	617 100.0

Pearson's χ^2 (6, n=617)= 69.41, *p*= .000, Contingency coefficient= .11, *p*= .000

The shaded areas showed that the majority (39.2%) were unsatisfactory with only 28.5% being satisfied with hardware systems and software applications available. 32.3% were neutral on the issue, expressing neither satisfaction or dissatisfaction.

The dissatisfaction was not unexpected. If the theory of 'natural matches' was valid, then mismatched pairs (as was true in this sample), would be dissatisfied. Nearly 40%

felt current hardware systems and software applications were unsatisfactory with the two leadership patterns having the highest percent being the Central Bureaucracy, where most administrators for this study were identified, and Professional Bureaucracy, where the second highest number of administrators were classified. Except for Central Teams, which were equally divided, the only other leadership pattern, Political Bureaucracy, had a majority of administrators that were neutral on the issue. When ITS and satisfaction were examined, the more independent classification of central team was split almost evenly.

When we separate out the different departments, we find a different pattern. In Nursing, the majority of adminstrators (38.2%) were still dissatisfied with ITS available. The largest leadership pattern group for Nursing, Central Bureaucracy, was dissatisfied with the hardware systems and software applications available to them. Two groups, Political Bureaucracy and Professional Bureaucracy, were neutral on the issue, and only Central Teams, the smallest group, were satisfied with the hardware systems and software applications available. If Schmidt's (1992) 'natural matches' were not supported here, as was the case in this study, then dissatisfaction is expected.

Table 114

Crosstabs of Institutions According to Satisfaction with Information Technologies and Leadership Patterns-Nursing

Leadership style	Satisfaction			
Count Row Percent Column Percent	Unsatis-factory X	Neutral	Satis-factory	Row Total Total Percent
Central Teams	10 31.3 10.4	8 25.0 9.5	14 43.8 19.7	32 12.7
Central Bureaucracy	60 43.8 62.5	42 30.7 50.0	35 25.5 49.3	137 54.6
Political Bureaucracy	11 33.3 11.5	14 42.4 16.7	8 24.2 11.3	33 13.1
Professional Bureaucracy	15 30.6 15.6	20 40.8 23.8	14 28.6 19.7	49 19.5
Column Total Total percent	96 38.2	84 33.5	71 28.3	251 100.0

Pearson's χ^2 (6, n=251)= 83.19, p= .000 Contingency coefficient= .18, p= .000

For Arts and Science (see Table 115), the majority(37.7%) again were dissatisfied with the hardware systems and software applications available to them. However, the largest leadership pattern group for the Arts and Science administrators, Central Bureaucracy, were satisfied. This was different from Nursing and the overall group. Schmidt's (1992)'natural matches' were not supported.

The second largest group, Professional Bureaucracy, which had a 'natural match' according to Schmidt's (1992) model, were dissatisfied. Central teams were more satisfied (see Table 115).

Table 115

Crosstabs of Institutions According to Satisfaction with Information Technologies and Leadership Patterns-Arts and Science

Leadership style	Satisfaction			
Count Row Percent Column Percent	Unsatis-factory **X**	Neutral	Satis-factory	Row Total Total Percent
Central Teams	9 31.0 12.5	10 34.5 18.9	10 34.5 15.2	29 15.2
Central Bureaucracy	38 36.9 52.8	22 21.4 41.5	43 41.7 65.2	103 53.9
Political Bureaucracy	8 34.8 11.1	8 34.8 15.1	7 30.4 10.6	23 12.0
Professional Bureaucracy	17 47.2 23.6	13 36.1 24.5	6 16.7 9.1	36 18.8
Column Total Total percent	72 37.7	53 27.7	66 34.6	191 100.0

Pearson's χ^2 (6, n=191)= 95.73, p= .000, Contingency coefficient= .21,p= .000

The other two leadership pattern groups, Central Teams and Political Bureaucracy, also revealed an unexpected result. In the Central Teams group, while they did not have a 'natural match', 34.5% were satisfied and 34.5% were neutral on the issue. The Political Bureaucracy leadership group, which did not have a 'natural match', had 34.8% dissatisfied with hardware systems and software applications available, and 34.8% neutral on the issue. Again, central teams seemed to be more satisfied than not.

In conclusion, in this chapter detailed accounts of the statistical analysis were presented. The results of the hypotheses tested are summarized in Table 116.

In the next chapter, conclusions on the implications of these findings will be presented, as well as comments on limitations of this study and implications for future research.

Table 116

Results of Hypotheses Testing

Hypothesis for Nursing and Arts & Science administrators in higher education:	Support	Not supported
1. Arts and Science academic administrators will have increased variety and more complex computer usage patterns that Nursing counterparts.		x
2. there is no significant relationship between computer usage patterns and gender.		x
3. there will be a difference in variety and complexity of computer usage patterns with age.		x
4. there will be a difference in variety and complexity of computer usage patterns with level of education attained.		x
5. there will be a difference in variety and complexity of computer usage patterns with length of time in administrative positions.	x	
6. there will be a difference in variety and complexity of computer usage patterns with length of time administrators use computer information technology.	x	
7. there will be a difference in variety and complexity of computer usage patterns with number of students enrolled.	x	
8. there will be a difference in variety and complexity of computer usage patterns with department size.	x	
9. there will be a difference in variety and complexity of computer usage patterns between rural and metropolitan institutions.		x
10. there will be increased variety and more complex computer usage patterns with leadership patterns that are more independent.	x	
11. there will be increased satisfaction of the suitability of information technology systems with leadership patterns that are more independent.	x	

Chapter 5

Summary, Findings and Conclusions

Summary

Statement of Purpose

There were three purposes for this study. The first intent was to describe the relationship between leadership styles (or patterns) and computer usage patterns for decision making by Nursing and Arts and Science academic administrators within institutions of higher education. The second intent was to describe the relationship between leadership patterns and suitability of information technology used in decision making by Nursing and Arts and Science academic administrators within institutions of higher education. The third intent was to describe the relationship of selected demographics and computer usage patterns for decision making by Nursing and Arts and Science academic administrators within institutions of higher education.

Statement of Problem

The purpose of research is to add to the body of scientific knowledge of the profession. For this study a gap in the research literature on the relationship between leadership styles and the use of information technology was identified. Leifer (1988) identified 'natural matches' between leadership style and information technology patterns that made decision making more efficient and effective. However, with the exceptiion of Schmidt (1992) there is an abyss in the literature to confirm this hypothesis. Schmidt (1992) surveyed manufacturing and service areas, but did not include institutions of higher education. Using Schmidt's (1992) tool, this study surveyed administrators in the higher education population.

In chapters 1 and 2, this study discussed how information technology has influenced decision making for administrators. The literature review identified 'natural matches' between leadership patterns and information technology usage patterns that compliment and support the information processing structure of top managementn (Leifer, 1988). Schmidt (1992) presented research testing Leifer's (1988) work using organizational structure patterns of Mintzberg (1979) and based on leadership patterns of Shrivastiva and Nachman (1989). Schmidt (1992) surveyed manufacturing and service areas to develop the tools to test Leifer's (1988) work and also identify a definition of his own leadership patterns. These tools were used in this study to examine a population of administrators in higher education to extend the work of Schmidt (1992) to institutions of higher education. Schmidt (1992) explained a satisfactory 'natural match' between the administrator's leadership style and the information technologies they used. As the 'best of fit' was approached, the administrator was more satisfied with the suitability of information technologies available. This study also employed Schmidt's suitability tool.

As information technology continues to expand, the cost of hardware systems and software applications continue to increase. Organizations, like institutions of higher education are expected to utilize information technology systems that will produce the most effective and efficient means to satisfy the demands of administrators in their decision making areas. For this reason, this study specifically investigated how leadership patterns and selected demographics related to computer usage patterns of Nursing and Arts and Science academic administrators in institutions of higher education. In addition, the research investigated how leadership patterns relate to the suitability of information technology systems used by Nursing and Arts and Science academic administrators in institutions of higher education.

For this study, the design and results were presented in the previous four chapters. This chapter summarizes the findings and presents the conclusions.

Findings

Hypotheses

The following hypotheses were addressed in this study:

1. Arts and Science academic administrators in higher education will demonstrate increased variety and more complex computer usage patterns than Nursing counterparts.

2. There will be no significant relationship between computer usage patterns and gender among Nursing and Arts and Science academic administrators in higher education.

3. There will be a difference in variety and complexity of computer usage patterns with age among Nursing and Arts and Science academic administrators in higher education.

4. There will be a difference in variety and complexity of computer usage patterns with level of education attained among Nursing and Arts and Science academic administrators in higher education.

5. There will be a difference in variety and complexity of computer usage patterns with length of time in administrative position among Nursing and Arts and Science academic administrators in higher education.

6. There will be a difference in variety and complexity of computer usage patterns with length of time administrators use computer information technology among Nursing and Arts and Science academic administrators in higher education.

7. There will be a difference in variety and complexity of computer usage patterns with number of students enrolled among Nursing and Arts and Science academic administrators in higher education.

8. There will be a difference in variety and complexity of computer usage patterns with department size among Nursing and Arts and Science academic administrators in higher education.

9. There will be a difference in variety and complexity of computer usage patterns between rural and metropolitan institutions among Nursing and Arts and Science academic administrators in higher education.

10. There will be an increase in variety and complexity of computer usage patterns with leadership patterns that are more independent among Nursing and Arts

and Science academic administrators in higher education.

11. There will be increased satisfaction of suitability of information technology systems with leadership patterns that are more independent among Nursing and Arts and Science academic administrators in higher education.

Discussion

Demographic variables

Hypothesis 1-9

The literature review outlined the research available on the demographic variables of individuals related to computer and information technology and usage patterns. These include department, gender, age, level of education, length of time in administrative position, length of time using computer technology, size of institution, department size and geographic location. This research investigated these nine variables. In addition, the variables were found in the documentation and opinion literature. These demographics also represented some commonly accepted reasons for either providing or not providing computers to individuals within an institution. Table 117 summaries the expected results for these nine demographic hypotheses.

Table 117

Summary Of Expected Results Comparing Nine Demographics With Information Technology Usage Patterns Between Nursing And Arts And Science Academic Administrators In Higher Education

Hypothesis number	Variable	Expected Results	
		No Difference	Difference
1	Department		X
2	Gender	X	
3	Age		X
4	Level of education		X
5	Length of time in administrative position		X
6	Length of time in using computers		X
7	Enrollment		X
8	Department size		X
9	Geographic		X

The first demographic identified was the selection of the two departments: Nursing and Arts and Science. A difference in usage was expected between Arts and Science and Nursing because Arts and Science includes math, computer technology and other sciences. This result did not occur. Administrators were so closely aligned on most of the demographic variables, that homogeneity of the group had been established. An explanation for the lack of support for this hypothesis may lie in the homogeneity of the group.

There were no studies which showed a gender difference in end users. It was anticipated that gender would not make any difference in computer usage patterns. The study concluded that although it was weak, there was a difference based on gender. The reason for this may be the skewed sample distribution, males were greatly under-represented (4.3%) in Nursing. The under-representation of males in Nursing resulted in a violation of Chi Square. This necessitated a manipulation of data, weighting and collapsing of categories to complete the statistical analysis. With the violation to the Chi Square assumption, the validity of these findings is questionable. Further studies are recommended to include an increase in the number of males in the sample.

In relation to age, there were studies that cited age as a factor (Igbaria & Nachman, 1990) and other studies that did not confirm age as a factor (Howard & Smith, 1986; Misfeldt & Stahl, 1991; Ray & Minch, 1990). This study hypothesized that age would be a factor that differentiated usage patterns. This study demonstrated a weak significance for department but none for age or interaction between age and department as expected. The stereotype of individuals as they age is commonly held and identified in the literature. One reason why age did not have a significant effect for this sample may be the relatively short period of time these individuals had been in their administrative positions; the majority less than ten years. In addition there was a relatively long period of time computerized information technology has been around in institutions of higher education, (estimation: over ten years). Thus, these new administrative personnel may have been introduced to the new job and technology at the same time. Departments within each age group, had different computer usage patterns but overall, age was not a factor. The indications of this result is not readily apparent.

The next demographic variable studied was the level of education obtained by the administrators. Distribution of highest educational degrees obtained by administrators ranged from Associate to Doctorate. These were collapsed into two categories, Masters and Doctorate. They comprised the majority of the sample (92.3%). The non-academic administrators (MIS subjects), and the other two degrees (AD, BS) were considered outliers. Again the literature was divided. The level of education of an individual made a difference in computer usage patterns (Brodt & Strong, 1986) but Igbaria & Nachman (1990) indicated that the level of education did not relate to usage patterns. There was no significant difference based on interaction of degree and department nor the component factors found in this study.

In this study, the distribution of length of time in administrative positions ranged from less than one year to 40 years. The Brodt and Strong (1986) study was the only study that looked at the effect of length of service with computer technology and found a positive relationship. This study lends support to Brodt and Strong's study as there was a strong significant difference in mean scores based on the length of time in administrative positions.

Distribution of length of time for use of computers in this study ranged from one year to 37 years. There was a strong significant difference based on department administrators and number of years they had been using computers. This finding supports the findings of Ray and Minch, 1990. Part of this difference may be attributed to access to computers within the department.

Igbaria and Nachman (1990) studied access and satisfaction and found a positive relationship. Reasonably accessible technology within office or department increases likelihood of use. The majority of administrators did have at least departmental access. However, over twice as many Nursing administrators than their Arts & Science counterparts did not have access to computers within their office. Demographics in this sample revealed a high degree of homogeneity, especially in leadership style. Attribution the significant difference could not be made.

There was only one study which looked at the relationship between enrollment and computer technology usage patterns. Misfeldt & Stahl (1991), found no significant difference with technology and institutional size. This study hypothesized that there would be a difference among the groups. As was expected, there was a significant difference based on size of institution, as defined by enrollment, and department. This was different from the findings of Misfeldt & Stahl in their 1991 study. This was not surprising as universities rely on enrollment as part of their revenues. Larger universities would, therefore, have increased resources.

The literature review produced no studies related to department size and computer technology usage. Department size for this study was based on number of full time faculty in each department as reported by the administrators. There was a strong significant difference based on department size and a weak significant difference for department. Size of department did seem to have an effect for the majority of information technology systems; larger departments used the technology more. Similar to enrollment, larger departments would have increased resources related to increased revenues.

In the literature review, there were no studies found that compared geographic location with technology usage. This study showed a very strong significant difference for the department but not geographic location as anticipated. Within Nursing, all the metropolitan institutions had high mean scores. In the Arts and Science departments, metropolitan areas had higher mean scores in Procedural Based and Collaborative systems, while high scores for the Central Feeder and Scanning systems were identified in the rural areas.

Another result of the Univariate analysis is the high means scores for usage patterns. Among all the different demographic characteristics, Nursing consistently had the highest mean scores for Collaborative systems, while Arts and Science consistently had the highest mean scores in the remaining three systems. This result supports the internal homogeneity of each department. While Collaborative systems were the third most complex system of the four systems, it was the system least used.

Hypotheses 1,10 & 11

These hypotheses examined Schmidt's (1992) proposal of 'natural matches" between computer usage patterns and leadership patterns. This was based on the typologies of Mintzberg (1979) and Shrivastava & Nachman (1989). Schmidt (1992) defined the hierarchy of complexity for Information Technology Systems as follows.

Central Feeder systems, the least complex information technology systems, were characterized by utilization of their own databases and simple individual use of information from information technology systems by reception. Central Feeder systems used information technology systems such as internal e-mail, news retrieval, centralized databases, and aggregate reports.

Procedural Based systems were characterized by more interactive send and receive areas and the addition of some decisional support and executive information systems.

Collaborative systems were more interactive and used most of the available hardware systems if only in a neutral send/receive mode.

Scanning systems were the most complex information technology systems. When using Scanning systems, administrators were more likely to use the more complex features such as executive information systems and decision support systems. Administrators using Scanning systems were less likely to be interactive with the simpler e-mail and voice mail systems, where they tended to only receive instead of send.

In this study, 76.3% of Nursing administrators and 76.1% of the Arts and Science administrators used Central Feeder systems. There were no significant differences between the two groups of administrators as was expected in Hypothesis 1. The data indicated that the administrative groups were very closely aligned in each of the categories of information technology systems.

There was however, a hierarchy of usage of the different systems. Central Feeder, the least complex system, was used the most (76.3% of Nursing Administrators, 76.1% of Arts and Science Administrators). Scanning, the most complex system, was the second most utilized (12.3% of Nursing Administrators, 14.7% of Arts and Science Administrators). Third most used was Procedural (8.9% of Nursing Administrators, 6.5% of Arts and Science Administrators). The least used system was collaborative (2.5% of Nursing Administrators, 2.7% of Arts and Science Administrators).

In this study, the faculty did not differ in use of information technology systems based on complexity. The majority (over 75%) did tend to use the more simple Central Feeder system. It was noted that the next most utilized system was the most complex Scanning system. The preference here may be due to leadership patterns as Schmidt (1992) suggested. Educational administrators are often very autonomous and would therefore fit Shrivastava & Nachman's (1989) Central Teams, as well as being considered within the Professional Bureaucracy category. With these two leadership patterns (Central teams and Professional Bureaucracy), the two information technology systems to be used the most would be Central Feeder and Scanning. This was confirmed in this study.

The majority of the administrators responding were categorized in an organizational environment and leadership style of Central Bureaucracy. According to Schmidt (1992), their preferred ITS should have been Procedural Based. In this study however, the preferred ITS was Central Feeder.

Several explanations can be hypothesized for these results. First if the concept of 'natural matches' is a normal occurrence, either this population of educational administrators does not fit into the schemata or one of the tools does not measure the intended variable. Since the individuals tended to use the ITS expected for their group, but reported unexpected leadership style, it is the conclusion of this study that Schmidt's (1992) tool is accurate for ITS usage patterns. This conclusion leaves us questioning the validity of the leadership pattern tool and we may not be able to determine if dissatisfaction is based on poor fit. Satisfaction with ITS was the primary interaction measured, and leadership patterns were held constant. Therefore, the results of this study would seem to support the validity of the ITS tool, but question the validity of the leadership pattern tool.

If the 'natural matches' are the normal relationships, perhaps the influence of the organizational structure is greater on individual leadership styles, forcing usually autonomous and professional groups into comforming to the Central Bureaucracy structure and removing independence. If this is the case, the results would show dissatisfaction with the ITS. In this study the leadership style did not match the system provided. The results of this study identified that only 28.5% of the administrators were satisfied with the ITS available to them. The implications of these results tend to support an unnatural match. It may also lend support to the validity of the leadership pattern tool.

If the concept of 'natural matches' is not a naturally occurring relationship, then the results of this study are difficult to explain. There must be a reason that the majority of administrators were consistently dissatisfied with information technology systems available. Since the sample had a high degree of homogeneity, the validity of the leadership tool may be supported.

Conclusions

Implications

Implications for administrators are multidimensional. Cost containment, productivity, efficiency and effectiveness of the administrative processes of decision making, strategic planning, aggregate reporting, and accreditation requirements are necessary to the survival and growth of the institution. In practice, the concept of 'natural matches' becomes important as administrators who are not satisfied with the technologies provided may not use them, thus making information exchange less efficient and effective. As a result, timely processing of information for decision making is effected, this creates frustration and decreases productivity.

Outputs from information systems are often communicated in such a way that the end user does not utilize them. Before the outputs can be used, end users must break them down into a form that can be utilized. This becomes time consuming and frustrating. The outputs from these systems may meet the needs of the accounting department, but do not meet the needs of the academic administrator. Therefore, academic administrators may utlize the system less.

When organizational institutions look at purchasing expensive technologies, they want to be sure the technology is going to be used. If institutional leaders in charge of purchasing equipment were aware of leadership style and the premise of 'natural matches', they could make a better decision on what systems to set up in each department. This decision would lead to more satisfaction with equipment, greater use, greater efficiency in communications, and improved decision making. Consequently the institution is more flexible and able to respond in an effective, efficient way for strategic decision making and planning. It creates the future for itself rather than reacting to market changes (Senge, 1990). Thus, the institution is well posed for survival in future markets.

With increased cost of hardware systems and software applications, 'natural matches' could guide purchasing more appropriate technology to increase efficiency and effectiveness of decision making and communications. Access to information is power. Access to information helps maintain flexibility and improves appropriate strategic decision making. Senge (1990) discussed that without appropriate decision making and strategic planning, organizations would be doomed to extinction. Providing proper technology to administrators so they may carry out these functions in a manner that is timely and competitive would improve the position and function of institutions of higher education.

In this study, a majority of the administrators indicated they were not satisfied with the ITS that was provided. Administrators that can not carry out their responsibilities in an efficient, effective, timely manner become frustrated and disillusioned and eventually leave. The institution suffers a costly loss of experienced administrators. Institutions need to find a way to make the communication process easier and more efficient for administrators.

As this study suggests, 'natural matches' between information technology and leadership styles may increase satisfaction and, therefore, efficiency of decision making responsibilities. Providing the proper technology to fit individual and situational needs decreases frustration of the end user. Further research in the area of 'natural matches' may provide guidelines for efficient hardware systems and software applications.

In this study the 'natural match' between leadership patterns and information technology systems was not found;

administrators were dissatisfied. Perhaps this has been why academic institutions have been reluctant to use ITS. Appropriate hardware systems and software applications have not been supplied to match the leadership style. The same hardware systems and software applications are used for all end users (academic and non-academic alike), or because it is the least expensive at the time. Because the ITS does not fit the leadership style, it is not used. Consequently, top administration restricts access by decreasing the numbers and variety of technology to save capital. With decreased access, use declines and so does productivity.

In this study over 75% of the administrators identified Central Feeder as their main ITS. This is the least complex and usually the least expensive software application system to install. However, was this system the most productive? Adminsitrators in this study were dissatisfied. When information is not readily available, time sensitive information is not provided to positively influence decision making, reports and strategic planning. Senge (1990) states this may set up a paradigm destined to decrease productivity and efficiency and ultimately may result in the failure of the institution to not only provide for it's employees (faculty and administration), but also for it's clients (students). Senge (1990) also proposes that organizations need to learn from this downward spiral and reverse it to strengthen their position.

In this era of information and technology revolution and explosion, university faculty, and especially administrators, should be equipped to enter the realm of education based on the advanced technologies in information processing and communications. Those institutions not prepared will continue to see decreased enrollment and retention of students.

Communications within the administrative structure relies on efficient and timely processing of information. If 'natural matches' are the naturally occurring relationship between information technology and leadership patterns as proposed by Schmidt (1992) and Leifer (1988), then institutional leaders need to ensure administrators and faculty have the proper tools to carry out their respective responsibilities. Continued research into 'natural matches' for all levels of administration and faculty is needed to provide this information.

Future research

The results of this study did not conclusively or consistently show 'natural matches'; administrators that did not have 'natural matches', however, were dissatisfied with technologies provided. More research is needed. Future research in this area should focus on types of hardware systems and software applications available, user satisfaction, and suitability of technology to assist the administrator in decision making, reporting and strategic planning. Studies comparing satisfied and dissatisfied administrators within both successful schools (maintained increasing enrollment and retention) and schools that are struggling, would provide added insight to this area. Studying a variety of departments would increase generalizability of the results.

In this study, many administrators indicated that a change in technology was in the process. Cost containment strategies and plans for technological updating would be valuable information in this area. Pre and post studies of institutions that are introducing new information technology systems should be conducted. Repeat study of this cohort group would give greater information based on pending changes of ITS administrators identified.

Detailed longitudinal studies would provide a view of the institution in a more dynamic state. Cross sectional studies assume equilibrium; this is not usually the case. Changes in systems would identify the mismatch of systems and leadership patterns. In addition, longitudinal studies may identify other variables that were previously invisible.

Replication studies can be used to determine if findings are stable and exhaustive. They may validate previous research and provide needed information in this area. Replication studies of this particular population may (or may not) validate hypotheses presented in this study as well as possibly identify artificial positive results. Replication of this study with similar populations, as well as with lower level administrators and professors, could provide greater insight to the area of study. Use of subjects throughout the organization rather than just top administration would provide richer information on leadership typology throughout the organization. Since there is a question of the validity of the tools, replication studies using the tools can contribute additional information.

Qualitative research would add a different aspect of information to this area. Groups of satisfied and dissatisfied administrators could be interviewed and types of leadership style and information technologies available could be investigated for each group. Analysis of specific failures and sucesses may identify themes that would lead to further information and studies.

Investigation is needed concerning access to computer technology. Equitable distribution of resources within an institution inspires growth and satisfaction of employees. Unequal distribution decreases morale and sets up unnecessary competition. Departments with less technology, as presented earlier, may experience the loss of expertise in administration and faculty, and subsequent decreased enrollment and retention. This leads to decrease in revenues for not only the department but the institution as well. This may lead ultimately to the dissolvement of the department or the institution.

In summary, further studies would add to this area of limited research and begin to fill the gap in understanding the relationship between information technology and leadership patterns.

Appendix A

George Mason University

Fairfax, Virginia 22030-4444
(703) 993-1000
TDD: (703) 993-1002

December 8, 1993

MEMORANDUM

TO: Martha Morrow
Nursing

FROM: Margaret Hanson MH
Sponsored Program Administration

SUBJECT: "The Relationship of Leadership Patterns and Organizational Structure to Usage Patterns and Suitability of Information Technology for Decision Making of Nursing and Non-Nursing Academic Administrators in Higher Education"

#869

Under University procedures, the above cited research project is exempt from review by the Human Subjects Review Board since it falls under DHHS Exempt Category 2.

You may proceed with your project. Please note that any further modification in your protocol requires review by this office.

The University is bound by the ethical principles and guidelines for the protection of human subjects in research contained in The Belmont Report. Even though your project is exempt from HSRB review, the University expects you to conduct your research according to the professional standards in your discipline and the ethical guidelines mandated by federal regulations.

Thank you for cooperating with the University by submitting your research project for review.

cc: Dr. Mary Anne Noble

Appendix B

P.O.Box 2956
Winchester, Va. 22604
October 27, 1994

Dear Administrator,

I am a doctoral candidate in the College of Nursing and Health Sciences at George Mason University and am conducting a study to determine relationships between computer usage patterns and organizational structure patterns. This information will help in designing compatible matches between organizational structure and computer hardware systems and software applications available to administrators. Would you please assist me by completing the enclosed questionnaire. Your opinions and experiences are very important and are needed to give an accurate picture of the academic setting. If you are unable to answer this questionnaire would you please give it to one of your Associate or Assistant Deans to fill out.

Your participation will require about twenty to thirty minutes to answer the questions. When you finish filling out all pages, put the survey in the enclosed stamped preaddressed mailer and drop in any mail box.

It is your choice to take part in the study. You may stop at any time and for any reason. You agree to take part in the study when you fill out the enclosed forms and return them. There is no cost or risk to you or your employer.

The information I receive from this study will remain confidential. This means that there is no way to know who you are because your answers will be changed into numbers and entered into a computer. Reports on this study will not use information that identifies a person or where they work.

The preaddressed mailer for returning the survey is coded so I can determine which institution the packet was sent from. There will be more than one person answering from each institution, and more than one institution in the study. The coding will allow me to keep institution questionnaires together.

You may call me at 703-667-1705 for questions about this study. Dr. Mary Anne Noble is my advisor and you may call her at 703-993-1900. You may also call the George Mason University Office for Research at 703-993-2295 if you have questions about the rights of subjects. This study was approved by George Mason

University according to the rules for protecting people who take part in research studies.

If you wish to have the results of this study please enclose your name and address on a separate piece of paper in the return envelope. Do not put your name on the survey.

Thank you for taking time to help me in this project.

Sincerely,

Martha J. Morrow RN, MSN

P.O.Box 2956
Winchester, Va. 22604
October 27, 1994

Dear Information System Manager,

I am a doctoral candidate in the College of Nursing and Health Professions at George Mason University and am conducting a study to determine relationships between computer usage patterns and organizational structure patterns. This information will help in designing compatible matches between organizational structure and computer hardware systems and software applications available to administrators. Would you please assist me by completing the enclosed questionnaire. Your opinions and experiences are very important and are needed to give an accurate picture of the academic setting.

Your participation will require about twenty to thirty minutes to answer the questions. When you finish filling out all pages, put the survey in the enclosed stamped preaddressed mailer and drop in any mail box.

It is your choice to take part in the study. You may stop at any time and for any reason. You agree to take part in the study when you fill out the enclosed forms and return them. There is no cost or risk to you or your employer.

The information I receive from this study will remain confidential. This means that there is no way to know who you are because your answers will be changed into numbers and entered into a computer. Reports on this study will not use information that identifies a person or where they work.

The preaddressed mailer for returning the survey is coded so I can determine which institution the packet was sent from. There will be more than one person answering from each institution, and more than one institution in the study. The codes will allow me to keep institution questionnaires together.

You may call me at 703-667-1705 for questions about this study. Dr. Mary Anne Noble is my advisor and you may call her at 703-993-1900. You may also call the George Mason University Office for Research at 703-993-2295 if you have questions about the rights of subjects. This study was approved by George Mason University according to the rules for protecting people who take part in research studies.

If you wish to have the results of this study please enclose your name and address on a separate piece of paper in the return envelope. Do not put your name on the survey.

Thank you for taking time to help me in this project.

Sincerely,

Martha J. Morrow RN, MSN

Appendix C

Appendix D

Demographic Instrument
Nursing Administrator

Demographic data:

1. Age:____years

2. Gender: Male___ Female___

3. Number of years held a position in education (if applicable)___

4. Number of years held a position in administration___

5. Years in current administrative position___
   a. Type of Nursing program(s) offered at your institution (check all that apply)
      ___diploma
      ___LPN, LVN
      ___ADN
      ___BSN
      ___Masters
      ___Doctoral
   b. Types of non-Nursing programs offered at your institution (check all that apply)
      ___certificate
      ___Associate
      ___Baccalaureate
      ___Master
      ___Doctoral
      ___other (please specify)
   c. Size of your institution (current total annual enrollment of entire institution):

   d. Size of your unit/department (current total annual enrollment of your department):

   e. Geographic location of your institution:
      ___small rural community (less than 10,000 residents)
      ___moderate rural community (10,001 to 50,000 residents)
      ___large rural community (over 50,000 residents)
      ___small metropolitan community (less than 10,000 residents)
      ___moderate metropolitan community (10,001 to 50,000 residents)
      ___large metropolitan community (over 50,000 residents)
      ___other (please describe)
6. List all degrees/certificates you currently hold, field of study for each, year of graduation for each:

7. Are you presently enrolled in a formal education program?
   a. Yes___If yes please state type of program and degree/certificate you will obtain:

   b. No___

Please go on to next page:

8. Do you currently teach any classes?
a. Yes___If yes please state number of credit hours per semester:
Fall____Spring____Summer____
b. No____
9. Length of employment contract _____months.

Computer use data:
10. Have you ever used a computer? Yes___ No___
If no go to next question. If Yes please continue with this question:
a. What year were you first introduced to operating a computer?____

b. What were the circumstances:(e.g. school related, work related, home use, games)

c. What was the type of program used:(e.g. games, word processing, e-mail, order entry, information/data search, budget/financial) Please describe:

d. Was this required? Yes___ No___
e. On an average basis, how often do you use a computer now?
___5 days a week or more
___less than 5 days a week
___less than 5 days a month
___less than 5 days a year
___never
11. Was the use of computers required in any of your courses in school?
a. Yes___If yes please identify which courses and how long ago:

b. No___
12. Do you have access to a computer in your department?
Yes___ No__ If no go on to next question.

If yes: is it in your office? Yes___ No___
For what reason(s) do you use it if any?(e.g. games, word processing, e-mail, information/data search, budget, other) Please describe:

Is it satisfactory for your current job? If no, explain why (use the back for more):

13. Do you have a computer at home? Yes___ No___
a. If yes do you use it?
Yes___ No___
If yes: for what reason(s)? (e.g. games, word processing, information/data search, budget, e-mail, other)Please describe:

Thank You. If you answered no to questions 10 and 12 you do not need to answer the remaining questions. Put the survey in the stamped preaddressed mailer and drop in any mail box.
If you answered yes to questions 10 and 12 please turn to the next page.

Demographic Instrument
Administrator

Demographic data:

1. Age:____years

2. Gender: Male___ Female___

3. Number of years held a position in education (if applicable)___

4. Number of years held a position in administration___

5. Years in current administrative position___

    a. Types of programs offered at your institution (check all that apply)
        ___certificate
        ___Associate
        ___Baccalaureate
        ___Master
        ___Doctoral
        ___other (please specify)
    b. Size of your institution (current total annual enrollment of entire institution):

    c. Size of your unit/department (current total annual enrollment of your department):

    d. Geographic location of your institution:
        ___small rural community (less than 10,000 residents)
        ___moderate rural community (10,001 to 50,000 residents)
        ___large rural community (over 50,000 residents)
        ___small metropolitan community (less than 10,000 residents)
        ___moderate metropolitan community (10,001 to 50,000 residents)
        ___large metropolitan community (over 50,000 residents)
        ___other (please describe)
6. List all degrees/certificates you currently hold, field of study for each, year of graduation for each:

7. Are you presently enrolled in a formal education program?
    a. Yes___If yes please state type of program and degree/certificate you will obtain:

    b. No___
8. Do you currently teach any classes?
    a. Yes___If yes please state number of credit hours per semester:

Fall____Spring____Summer____

9. Length of employment contract _____months.

Please go on to next page:

Computer use data:

10. Have you ever used a computer? Yes___ No___If no go to next question.

If Yes please continue with this question:

a. What year were you first introduced to operating a computer?____

b. What were the circumstances:(e.g. school related, work related, home use, games)

c. What was the type of program used:(e.g. games, word processing, e-mail, order entry, information/data search, budget/financial) Please describe:

d. Was this required? Yes___ No___

e. On an average basis how often do you use a computer now?

___5 days a week or more
___less than 5 days a week
___less than 5 days a month
___less than 5 days a year
___never

11. Was the use of computers required in any of your courses in school?

a. Yes___If yes please identify which courses and how long ago:

b. No___

12. Do you have access to a computer in your department?

Yes___ No__ If no go on to next question.

If yes: is it in your office? Yes___ No___

For what reason(s) do you use it if any?(e.g. games, word processing, e-mail, information/data search, budget, other) Please describe:

Is it satisfactory for your current job? If no, explain why (use the back for more):

13. Do you have a computer at home? Yes___ No___

a. If yes do you use it?

Yes___ No___

If yes: for what reason(s)? (e.g. games, word processing, information/data search, budget, e-mail, other)Please describe:

Thank You. If you answered no to questions 10 and 12 you do not need to answer the remaining questions. Put the survey in the stamped preaddressed mailer and drop in any mail box.

If you answered yes to questions 10 and 12 please turn to the next page.

Demographic Instrument
MIS Director

Demographic data:

1. Age:____years

2. Gender: Male___ Female___

3. Number of years held a position in education (if applicable)___

4. Number of years held a position in administration___

5. Years in current administrative position___

    a. Size of your institution (current total annual enrollment of entire institution):

    b. Size of your unit/department (current total number employed)
    Full time____
    Part time____

    c. Geographic location of your institution:
    ___small rural community (less than 10,000 residents)
    ___moderate rural community (10,001 to 50,000 residents)
    ___large rural community (over 50,000 residents)
    ___small metropolitan community (less than 10,000 residents)
    ___moderate metropolitan community (10,001 to 50,000 residents)
    ___large metropolitan community (over 50,000 residents)
    ___other (please describe)

6. List all degrees/certificates you currently hold, field of study for each, year of graduation for each:

7. Are you presently enrolled in a formal education program?
    a. Yes___If yes please state type of program and degree/certificate you will obtain:

    b. No___

8. Do you currently teach any classes?
    a. Yes___If yes please state number of credit hours per semester:
    Fall____Spring____Summer____

9. Length of employment contract _____months.

Please go on to next page:

Computer use data:

10. Have you ever used a computer? Yes___ No___

    If no go to next question. If Yes please continue with this question:

    a. What year were you first introduced to operating a computer?____

    b. What were the circumstances:(e.g. school related, work related, home use, games)

    c. What was the type of program used:(e.g. games, word processing, e-mail, order entry, information/data search, budget/financial) Please describe:

    d. Was this required? Yes___ No___

    e. On an average basis how often do you use a computer now?

    ___5 days a week or more
    ___less than 5 days a week
    ___less than 5 days a month
    ___less than 5 days a year
    ___never

11. Was the use of computers required in any of your courses in school?

    a. Yes___If yes please identify which courses and how long ago:

    b. No___

12. Do you have access to a computer in your department?

    Yes___ No__ If no go on to next question.

    If yes: is it in your office? Yes___ No___

    For what reason(s) do you use it if any?(e.g. games, word processing, e-mail, information/data search, budget, other) Please describe:

    Is it satisfactory for your current job? If no, explain why (use the back for more):

13. Do you have a computer at home? Yes___ No___

    a. If yes, do you use it?

    Yes___ No___

    If yes: for what reason(s)? (e.g. games, word processing, information/data search, budget, e-mail, other)Please describe:

Thank You. If you answered no to questions 10 and 12 you do not need to answer the remaining questions. Put the survey in the stamped preaddressed mailer and drop in any mail box.

If you answered yes to questions 10 and 12 please turn to the next page.

Appendix E

Information Technology Usage Patterns Instrument
Administrators

Below is a list of descriptions of computer-based tools. Use the scale lines below the descriptions of each tool to indicate how you use each one. If a tool is not available in your organization, please check the box "not available" and leave the corresponding scale boxes blank. If you have an assistant who uses the tool on your behalf (such as replying to E-mail or producing aggregate reports for your perusal), then check the box next to the word "assisted" and answer the corresponding scale items according to how your assistant uses the tool.

example: Never |_|_|_|_|_|_|_|_|_|_| always

1. Within - university Electronic Mail (E-mail)

|__|not available |__|assisted

never used |_|_|_|_|_|_|_|_|_|_| used many times everyday

mostly send |_|_|_|_|_|_|_|_|_|_| mostly receive

2. External (non-university) Electronic mail

|__|not available |__|assisted

never used |_|_|_|_|_|_|_|_|_|_| used many times everyday

mostly send |_|_|_|_|_|_|_|_|_|_| mostly receive

3. Voice mail

|__|not available |__|assisted

never used |_|_|_|_|_|_|_|_|_|_| used many times everyday

mostly send |_|_|_|_|_|_|_|_|_|_| mostly receive

4. Computer conferencing: like telephone conferencing but using computer keyboards and monitors to carry on conversations.

|__|not available |__|assisted

never used |_|_|_|_|_|_|_|_|_|_| used many times everyday

5. Electronic meeting room (decision room): specially designed facility for face-to-face, computer-supported meetings.

|__|not available |__|assisted

never used |_|_|_|_|_|_|_|_|_|_| used many times everyday

Please go on to next page:

6. News retrieval service (such as Dow-Jones)
|__|not available |__|assisted

never used |_|_|_|_|_|_|_|_|_| |used many times everyday

7. Outside networks (Compuserve, Prodigy, USENET, ARPANET, etc.)
|__|not available |__|assisted

never used |_|_|_|_|_|_|_|_|_| |used many times everyday

mostly send |_|_|_|_|_|_|_|_|_| |mostly receive

8. Centralized database system: all university data stored at one location, but can be reached from any location by remote hook-up.
|__|not available |__|assisted

never used |_|_|_|_|_|_|_|_|_| |used many times everyday

mostly enter data|_|_|_|_|_|_|_|_|_| | mostly retrieve data

9. Private (personal) database: usually on a personal computer, data not automatically shared with others.
|__|not available |__|assisted

never used |_|_|_|_|_|_|_|_|_| | used many times everyday

10. Cross-link to databases located elsewhere in the university and locally: relevant data stored in multiple locations, tied together for institution wide access.
|__|not available |__|assisted

never used |_|_|_|_|_|_|_|_|_| | used many times everyday

mostly enter data|_|_|_|_|_|_|_|_|_| | mostly retrieve data

11. Aggregate reports from lower level administrators/personnel: on screen or on paper.
|__|not available |__|assisted

never used |_|_|_|_|_|_|_|_|_| | used many times everyday

12. Decision support system with production and /or other model: focus of system is on planning based on internal capabilities.
|__|not available |__|assisted

never used |_|_|_|_|_|_|_|_|_| | used many times everyday

Please go on to next page:

13. Decision support system with competitor model: aim is to analyze competitive "moves".
|__|not available |__|assisted

never used |_|_|_|_|_|_|_|_|_|_| used many times everyday

14. Executive information systems: provides information tailored to your decision making needs.
|__|not available |__|assisted

never used |_|_|_|_|_|_|_|_|_|_| used many times everyday

15. On-line reference to institution regulations
|__|not available |__|assisted

never used |_|_|_|_|_|_|_|_|_|_| used many times everyday

16. Electronic "bulletin boards" for internal institution information: provides central facility to keep people informed.
|__|not available |__|assisted

never used |_|_|_|_|_|_|_|_|_|_| used many times everyday

mostly send |_|_|_|_|_|_|_|_|_|_| mostly receive

17. External electronic "bulletin boards" for information from outside employing institution.
|__|not available |__|assisted

never used |_|_|_|_|_|_|_|_|_|_| used many times everyday

mostly send |_|_|_|_|_|_|_|_|_|_| mostly receive

18. "Broadcast" messaging: sending same message to a large number of people automatically.
|__|not available |__|assisted

never used |_|_|_|_|_|_|_|_|_|_| used many times everyday

mostly send |_|_|_|_|_|_|_|_|_|_| mostly receive

19. Word processing: for generating personal reports, letters, etc. Not automatically shared with others.
|__|not available |__|assisted

never used |_|_|_|_|_|_|_|_|_|_| used many times everyday

mostly send |_|_|_|_|_|_|_|_|_|_| mostly receive

Please go on to next page.

If there is other support available in your institution that is not listed here, please enter a description and indicate
your use in one of the following blank items.

20.Describe support available:

|__|assisted

never used |_|_|_|_|_|_|_|_|_|_| used many times everyday

21.Describe support available:

|__|assisted

never used |_|_|_|_|_|_|_|_|_|_| used many times everyday

22.Describe support available:

|__|assisted

never used |_|_|_|_|_|_|_|_|_|_| used many times everyday

23.Describe support available:

|__|assisted

never used |_|_|_|_|_|_|_|_|_|_| used many times everyday

Tool developed by Roy Schmidt. Used with permission.

Please go on to next page:

Appendix F

Leadership pattern instrument

Please read each of the following statements carefully. Using the scale line below each statement, indicate how much you agree or disagree that the statement accurately describes the leader(s) or leadership in your department by marking the appropriate cell.

example: disagree |_|_|_|_|_|_|_|_|_|_| agree

24. There are several groups of influential administrators, but one group of administrators tends to make most of the important decisions.

disagree |_|_|_|_|_|_|_|_|_|_| agree

25. The leader of our department stands out from the others due to his/her personal qualities (Charisma, knowledgeability, aggressiveness, confidence, energy, etc.)

disagree |_|_|_|_|_|_|_|_|_|_| agree

26. There are certain jobs in this organization that carry more authority for strategy no matter who is in the job.

disagree |_|_|_|_|_|_|_|_|_|_| agree

27. Our leader can just ask people to do things, and they willingly perform.

disagree |_|_|_|_|_|_|_|_|_|_| agree

28. One can gain considerable influence in this organization by knowing the rules and getting the chain of command behind what he/she is doing.

disagree |_|_|_|_|_|_|_|_|_|_| agree

29. The key to power in this organization is to become an expert in your area and keep your knowledge up to date.

disagree |_|_|_|_|_|_|_|_|_|_| agree

30. There is a one-on-one relationship between our leader and all the key managers for rewards and reprimands.

disagree |_|_|_|_|_|_|_|_|_|_| agree

31. The top administrators are colleagues, and no one person really has direct control over the reward system for the group.

disagree |_|_|_|_|_|_|_|_|_|_| agree

Please go on to next page:

32. Our leader decides the roles administrators have and allocates the resources necessary for the administrators to accomplish their goals.

disagree |_|_|_|_|_|_|_|_|_|_| agree

33. Depending on the task at hand, administrators take on roles according to their predefined job responsibilities.

disagree |_|_|_|_|_|_|_|_|_|_| agree

34. Strategic decision are really made at lower levels (division, department, etc) where the interests of the function most affected will get due attention.

disagree |_|_|_|_|_|_|_|_|_|_| agree

35. There are quite a few people around the department that have the ear of top management due to their expertise.

disagree |_|_|_|_|_|_|_|_|_|_| agree

36. Top management's job is to keep the department on an even keel, rather than constantly worrying about what new program the competitors are cooking up.

disagree |_|_|_|_|_|_|_|_|_|_| agree

37. Top management is always vigilantly watching competitors, regulators, government officials, and so on for indications of any action that could affect the organization.

disagree |_|_|_|_|_|_|_|_|_|_| agree

38. The rules and regulations of this organization spell out the limits of strategic action.

disagree |_|_|_|_|_|_|_|_|_|_| agree

39. Rules and regulations are important in guiding strategy, but they are interpreted to suit the current situation when necessary.

disagree |_|_|_|_|_|_|_|_|_|_| agree

40. The leaders create new rules for dealing with new issues, rather than relying on existing guidelines.

disagree |_|_|_|_|_|_|_|_|_|_| agree

Tool developed by Roy Schmidt. Used with permission.

Please go on to next page:

Appendix G

Information system suitability instrument

Administrators

Please indicate your response to the following questions on the scale provided.

example: |_|_|_|_|_|_|_|_|_|_|

41. Are the features of computer-based support you need available?

mostly not |_|_|_|_|_|_|_|_|_|_| all available

42. Does the available computer-based support suit your needs?

unsuitable |_|_|_|_|_|_|_|_|_|_| just what I need

43. Do you plan to change the "mix" of available computer-based support?

not at all |_|_|_|_|_|_|_|_|_|_| radical changes

44. Has anyone recently recommended use of new or different computer-based support tools for your work?

none at all |_|_|_|_|_|_|_|_|_|_| many new tools

45. What features do you wish you had available in your computer-based information system.(use the back for additional room)

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Thank you for your time in completing this survey. Please place the survey in the stamped preaddressed mailer provided and drop in any mail box.

Appendix H

Information system instrument
Information system managers

Please indicate which one of the following hardware configurations best describes the information system used by your institutions top academic administrators by placing a check mark in the blank next to your choice. The top academic administrators are administrators (deans, assistant deans, associate deans, program heads, department heads) who regularly confer on strategic decisions for academic programs.

If academic management relies on more than one system, please indicate the configuration that provides most of
the support for top academic administrators as "1", with check marks next to the other systems used.

If academic administrators do not personally use the hardware indicated, relying instead on assistants to produce
output for their perusal, place an "A" in the blank beside that particular item.

___Stand-alone PC. The administrators input their own data by keyboard or disk. Sharing of data is done by swapping disks.

___Mainframe/central system. Data is retrieved from one central database by means of remote terminals (not PCs) or printouts.

___Decentralized system. A number of independent database systems are used, one system at each geographic complex or in each department. Generally, the same information is stored at every location. No direct link between the separate systems.

___Distributed system. Database systems at each location are tied together so that each piece of information only needs to be stored at one geographic complex but can be retrieved from any location.

___PC on LAN, WAN, or as terminal for a central system. Direct sharing of information by electronic transfer of files, database server, E-mail, etc.

___Collaborative work support system or group support system ("groupware"). Decision makers are tied together electronically either in their offices or in a specially equipped room, affording a computer-assisted meeting or collaboration.

___Executive Information System (EIS). For this option, please indicate the specific hardware combination used to support the EIS. Use the back of this page if needed.

___Other hybrid system. Please describe briefly. Use the back of this page if needed.

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Appendix I

Information system suitability instrument

Information system managers

Please indicate your response to the following questions on the scale provided. If you are uncertain about any item, please give us your opinion anyway.

example: |_|_|_|_|_|_|_|_|_|_|

41. Do the top academic administrators seem to have all the features of computer-based support they need readily
available?

mostly not |_|_|_|_|_|_|_|_|_|_| all available

42. Does the available computer-based support suit their needs?

unsuitable |_|_|_|_|_|_|_|_|_|_| just what I need

43. Do you plan to change the "mix" of available computer-based support?

not at all |_|_|_|_|_|_|_|_|_|_| radical changes

44. Have you recently recommended use of new or different computer-based support tools for top academic administrator's work?

none at all |_|_|_|_|_|_|_|_|_|_| many new tools

45. What new support features for computer-based information systems are due to be added in the near future. Please list with short description. (use the back for additional room)

Tool developed by Roy Schmidt. Used with permission.

Thank you for your time in completing this survey. Please place the survey in the stamped preaddressed mailer provided and drop in any mail box.

List of References

List of References

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Curriculum Vitae

Martha Biviano Morrow has been a member of the Nursing profession for 25 years. She has a variety of experiences as a direct care provider in hospitals in the United States. She has participated in a variety of health related activities in the community including Free Medical clinic, merit badge counseler for BSA, and CPR instructor. She has experience in in-service education, EMS instructor, and Nursing faculty fulltime at Shenandoah University since 1980, Winchester, Virginia, and adjunct faculty at George Mason University, Fairfax, Virginia. She has served on the Page County Primary Care Consortium board since 1992, and was chair of the Educational committee that designed and set up the educational component for a nurse based clinic in Stanley, Virginia.

Professional honors include grants from Shenandoah University to construct software program and a drug and alcohol unit. In addition, she received over $18,000 in fellowships and grants from George Mason University for research studies. She is a member of Sigma Theta Tau, past president of District 12 VNA, and currently is the coordinator for the Bachelor's in Nursing program at Shenandoah University. She has been a guest lecturer at workshops, seminars, and professional meetings, as well as community groups on a wide variety of topics.

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