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Perceptions of Chief Information Officers Who Have Managed Information Technology both Outside and Inside Higher Education

Lisa Christine Spence

PERCEPTIONS OF CHIEF INFORMATION OFFICERS WHO HAVE MANAGED INFORMATION TECHNOLOGY BOTH OUTSIDE AND INSIDE HIGHER EDUCATION

by

LISA CHRISTINE SPENCE

(Under the Direction of Barbara Mallory)

ABSTRACT

This study was conducted to examine perceptions about information technology management of Chief Information Officers (CIOs) in higher education who have previously worked outside that environment. Participants from the University System of Georgia and from universities in the Southern Regional Education Board were interviewed. They had a variety of backgrounds outside higher education, including corporate, military, not-for-profit, and small business.

Participants in the study identified challenges related to diversity of students and faculty; the demand by students for leading-edge technology; academic culture; accountability; funding levels and methods; information security; the lack of a bottom line; the decision-making process; and human resources management. Most of these challenges were perceived to be unique to the higher education environment. They affected the IT management practices of participants by making the environment more complex, and increasing requirements for communication and collaboration. However, participants were satisfied with their choice to move into higher education.

The researcher concluded that CIOs are subjected to many pressures in the complex and diverse higher education environment. These include diverse needs for technology among faculty and students, an atmosphere that lacks accountability for decisions, and restrictions on funding levels and methods. The environment also lacks a strong goal-setting mechanism that would help CIOs to deal with these pressures, so decision making in higher education is a time-consuming and labor-intensive process. The combination of conflicting factors is unique to the higher education environment, but similar across four-year institutions.

To be effective, CIOs establish strong partnerships and communicate with key stakeholders frequently. Despite the pressures, CIOs perceive value in the mission and outcomes of their institutions and are generally satisfied with their work. A CIO considering a move into the higher education environment should consider environmental challenges carefully to determine if the CIO can accept those challenges.

This results of this study have implications for IT practitioners in higher education, CIOs who are considering moving into the higher education environment, and senior administrators who manage or interact with a CIO in higher education.

INDEX WORDS: CIOs, IT Management, Chief Information Officers, IT Challenges, IT in Higher Education

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DEDICATION

This dissertation is dedicated to my late father and mother

AVCM James L. Spence, USN (Ret.)

and

Martha E. Spence

Thank you for my happy life.

Wish you were here.

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U.S. Navy Captain (as of this writing) Mike Spence, my brother – who by his personal and professional accomplishments and his exemplary character makes me the relative underachiever I am, the little sister always trying to keep up.

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The CIOs of the University System of Georgia – friends and role models all.

And finally . . . The dedicated, talented, and caring staff and management team of IT Services at Georgia Southern University – you all were a major factor in my decision to enter the higher education environment from the corporate ranks in the first place, and you are the major reason I've enjoyed it so much.

TABLE OF CONTENTS

Page

LIST OF TABLES

Page

CHAPTER 1

INTRODUCTION

Background

The use of information technology (IT) is pervasive throughout organizations in the 21st century. Generally speaking, IT includes computer hardware, computer software, and telecommunications equipment (Stiroh, 2001). IT use can be defined as the ways in which organizations use information technology to reduce cost, support managers, perform strategic planning activities, and gain competitive advantage (Boynton, Zmud & Jacobs, 1994).

The application of IT to critical areas varies widely among organizations (Boynton et al, 1994). Along with the variation resulting from the different operations of organizations that use IT, there are a number of different types of technologies, specialties and applications within IT itself. These include areas such as network administration, telecommunications, application development, and end user support.

History of Information Technology

It would be difficult to pinpoint when information technology actually began to be recognized as a profession (Schubert, 2004). In most recent times, electronic information storage and communication represent the most common domains associated with information technology. The first use of computers for these purposes in a business or administrative environment came in the 1960's, with the System/360 series of machines

introduced by International Business Machines (IBM). By the next decade, the environment for computing machinery was centered on large mainframes, running in a centralized environment. The era of personal computing began in the 1980s, and with this came a movement away from the centralized environment with IT resources in control (Schubert).

The history of interaction between IT resources and their customers has included both ends of a continuum: IT was very centralized in the early years of use, but very decentralized after the introduction of personal computers. Over the last 20 years, a balance point has been reached (Schubert, 2004). There is some centralization of IT resources and activities, and IT professionals still provide leadership and support for hardware and software, but there is much greater participation by end users in the definition of IT-related needs and initiatives (Schubert). In the 21st century, striking the right balance point is part of maximizing the value of information technology to the organization.

Value of Information Technology

Information technology can create value at multiple levels within an organization. IT can create competitive value for the organization as a whole (Launchbaugh, 2002; Lorentzon, 2003), or drive the restructuring of business processes from which significant performance improvements can result (Hammer & Champy, 1993). On the other hand, IT projects often focus on achieving operational benefits, such as improved customer order response due to improved inventory management or more efficient flows of information within the organization (Stiroh, 2001). Value can be created external to an organization, as well, when a change in technology allows for changes in markets or

distribution methods (Stiroh). New technologies may fundamentally change the environment in which a company operates (Ward, 1986). Since IT has the potential to generate change at all levels within the organization, and in the environment external to it, it is important to understand and manage the resources associated with IT in order to ensure that they are focused in areas that are most important to the organization.

Management of Information Technology

In order to get the most value out of IT-related efforts, an organization should focus on business needs first, rather than on new technology; i.e., the business needs should drive the identification and implementation of technology, not the other way around (Senn, 1995). It is important for IT personnel to establish and maintain good relationships with their customers, and to share knowledge (Boynton et al., 1994). Otherwise, IT projects may not deliver the results expected. IT personnel must take responsibility for the performance of the business in the areas they support (Bassellier & Benbasat, 2004), and must understand how their efforts can best solve business problems (Bassellier & Benbasat; Weiss & Anderson, 2004). To fulfill these responsibilities, it is necessary that IT professionals work as a team with their customers in order to be effective (Weiss & Anderson). Therefore, IT success depends on the establishment of strong relationships with customers, collaboration and teamwork.

With IT success dependent on these requirements for relationship-building, collaboration and teamwork, it is important that IT resources be managed to focus on communication, identification of the IT needs derived from the needs of the business, and understanding the environments of their customers (Weiss & Anderson, 2004). The chief

information officer (CIO) has responsibility for ensuring the appropriate focus and application of IT resources (Dearstyne, 2006).

The Chief Information Officer

The term CIO "normally signifies the most senior official in an organization charged with assessing IT and information needs and overseeing the organization and deployment of information to meet organizational priorities" (Dearstyne, 2006, p. 45). The CIO position was first created as a result of rapid change and the increasing complexity of the IT environment, primarily beginning in the 1980s (Romanczuk & Pemberton, 1997). Most organizations of any size today have a CIO (Dearstyne).

The CIO role itself has changed over the years, and is still fairly undefined (Dearstyne, 2006; Launchbaugh, 2002). Dearstyne (2006) points out that accepted principles, a base of literature on the job specialty, professional associations and journals, and recognized standards for performance do not yet exist for the position. In parallel with the application of IT in general, the CIO's role in the early part of its evolution may have focused at the operational level, using IT to cut costs and gain operational efficiencies (Schubert, 2004; Hoffman, 2003). Today, however, there may be more emphasis on enterprise and strategic efforts where, for example, a CIO might help an organization to apply its IT resources to gain competitive advantage (Schubert; Weiss & Anderson, 2004).

The skill set of successful CIOs reflects their roles at these different levels. It is useful for CIOs to have technical skills so that they can understand the use of tools and techniques that make IT resources effective (Romanczuk & Pemberton, 1997). However, with the emphasis placed on a more strategic role, skills in management, communication,

and collaboration with key business customers and other senior executives are more important (Bassellier & Benbasat, 2004; Dearstyne, 2006; Launchbaugh, 2002; Schubert, 2004). Such skills are critical to the success of the CIO and to the success of the organization as a whole (Romanczuk & Pemberton, 1997).

The Environment of the CIO in Higher Education

The role of CIOs is affected by the environment in which they operate (Gartner Predicts "Zero Budget" CIO, 2002, p. 8). In higher education, the IT landscape reflects that of the larger environment: varied and changing, and increasingly important to all areas of an organization's operations (Jackson, 2004). As have other organizations, institutions of higher education have deployed technology in a number of different ways within the organization, such as in the classroom and in many administrative areas on campus (Balderston, 1995).

In the classroom, technology enhances the ability of students to collect, analyze and interpret data (Lederman & Niess, 1999; McFarlane, 2003). The use of technology in the higher education environment can remove or reduce time constraints associated with complex calculations. It also creates access paths to data and information that are not otherwise physically accessible by a student or faculty member (Lederman & Niess). Ultimately, use of information technology in this way helps students learn to interpret the world around them (McFarlane, 2003).

The Role of the CIO in Higher Education

Discussions of the role of the CIO in the higher education environment identify aspects similar to those identified earlier. Campus CIOs today build relationships with representatives from other campus units (Savarese, 2004). According to Saverese (2004),

alignment of IT with the priorities of the institution is also important. Savarese (2004) notes that, "Successful CIOs have learned to understand the broader issues that are not technology driven" (p. 29).

Another researcher echoes these thoughts: "IT succeeds by advancing other goals like research, teaching, and service" (Jackson, 2004, para. 1). Research, teaching and service are the core business functions of an institution of higher education. Jackson (2004) describes the historical transition of the university CIO's role. The role has transitioned from one of establishing reliable and secure campus infrastructure and setting up utility applications such as electronic mail and instant messaging to one of managing the institution's investment in technology and becoming both an internal and an external advocate for the university, with the institution's strategic goals related to research, teaching and service in mind (Jackson).

Challenges to the CIO in Higher Education

Even though CIO roles are similar across different organizational environments, the environment within higher education creates some specific challenges for the CIO. Neal and McClure (2003) state that institutional goals in higher education are "multiple and conflicting" (p. 31). However, IT professionals must speak the language of the organization's functional areas, and it is imperative that they understand business unit goals and problems, and the relationships among units (Bassellier & Benbasat, 2004).

Top management commitment to technology affects whether employees feel that technology is useful or not (Lewis et al., 2003). On the other hand, these researchers note that in higher education, independence and democracy are highly valued. Thus, the

influence of an authority figure is significantly less than in other types of organizations where more traditional hierarchical organization structures exist (Lewis et al.).

Finally, the success of IT is measured not on its own, but in reference to the success of the enterprise. Weiss and Anderson (2004) write that the metrics for success in IT directly reflect the metrics for success of the organization. However, Weill and Olson (1989) found that decentralization of IT creates a level of difficulty in measuring the benefits yielded by the organization's investment in IT. In higher education environments, IT units in different parts of the organization have historically been distinct and may not have had much reason to work with each other (Woodsworth, 1991). Overcoming such decentralization and lack of integration in order to measure IT investment and results is yet another challenge for the CIO.

Summary

Information technology is used to create strategic value in various ways in organizations today (Launchbaugh, 2002; Lorentzon, 2003). It also assists organizations in making operational improvements (Stiroh, 2001). The CIO is responsible for ensuring that IT delivers the most possible value to the organization by managing its IT resources to meet organizational priorities (Dearstyne, 2006).

In higher education, IT plays a significant role in administration and instruction (Balderston, 1995). In this environment, the CIO is responsible for achieving the most value from an institution's resources by managing both the operational and strategic application of IT (Jackson, 2004). Certain aspects of the higher education environment, such as the value placed on independence, create challenges for the CIO in achieving those objectives (Lewis, Agarwal, & Sambamurthy, 2004).

Statement of the Problem

Information technology is pervasive in organizations today. With regard to instructional use in higher education, the application of technology runs the gamut from providing students new tools to work with as they learn a particular specialty to replacing professors teaching students face-to-face in the classroom. Students use technology to process complex calculations and to analyze and interpret the results of those calculations. Information technology use in administrative areas in higher education takes a number of different forms, including online service delivery and the processing and analysis of information about the institution.

CIOs have an important technical and functional role in any organization. They must understand the mission and business processes of the entity, and must emphasize communication with customers and problem solving to the technical resources that report to them. They must ensure that their personnel understand the mission of the organization, and that their projects and goals are aligned with that mission.

Many aspects of IT use in higher education parallel those found in its corporate application, but the environments in which IT is applied are different in many respects. The higher education environment has a multitude of goals that sometimes conflict with each other, such as the desire of faculty to have freedom in the selection of tools they use to teach and the need of the institution to be as cost-effective as possible in its selection of resources for teaching. Independence and creativity are highly valued in the higher education environment, and the influence of authority figures is significantly less or different than in organizations where more traditional hierarchical leadership structures exist. The IT environment in higher education is often diverse and decentralized,

whereas the IT environment in other types of organizations may be more centralized. Each of these organizational and environmental characteristics of higher education creates barriers or challenges for the application of best practices for managing the institution's IT investment.

With the unique environmental characteristics of higher education, the question arises as to whether technology management practices common outside higher education can be used to manage IT in the higher education environment. The differences in environment may or may not have an effect on the management practices of CIOs.

CIOs who have moved from outside higher education into higher education may have a unique perspective on these questions, since they have managed IT in different kinds of environments. Therefore, the researcher proposed to examine with this study the perceptions of CIOs who have moved from outside into the higher education environment to understand the challenges they encountered in that environment, and their responses to those challenges.

Research Questions

The researcher sought to answer the following research questions.

1. What are the socio-demographic characteristics of individuals who move from outside higher education into the role of CIO in higher education?
2. What aspects of the higher education environment are perceived to create challenges for IT management?
    a. Are there any differences in challenges perceived based on significant socio-demographic differences?
    b. Which of those challenges are perceived to be unique to higher education

as compared to other environments?

3. What effects on IT management practices result from the challenges perceived?
4. What are the attitudes toward working in the higher education environment of CIOs who have moved from outside the environment?

Conceptual Framework

This study extended the research conducted to date by focusing on a population of individuals who have managed information technology in two different environments. The researcher studied the role of the CIO in public higher education institutions, and how that role was affected by environmental differences as the CIO managed technology. To conduct this study, the researcher used the lens of individuals who have performed the CIO role both inside public higher education and outside that environment.

Significance of the Study

As noted in the preceding review, the higher education environment is different in a number of ways from the environment found in other organizations. However, some elements of information technology, for example, the existence of voice and data networks, the need for workstation support, etc., can be quite similar across environments. This raised a question as to how differences in the environments affect the management of information technology in higher education.

Technology changes quickly. The IT environment is especially challenged at this time due to an increasing need for, and lack of, data security. In addition to this need, institutions of higher education are increasingly affected by budget shortfalls and the need to conserve resources. These environmental issues require an IT environment that is closely managed and as standardized as possible, since control results in the ability of IT

to be deployed and maintained in as secure and as cost-effective a manner as possible. However, the open and diverse environment for IT in institutions of higher education defies standardization. It was this researcher's supposition that the conflict between these drivers (the need for effectiveness, efficiency and security on the one hand, and the desire, or demand, for an open, unstructured environment on the other) and the need for successful application of more structured techniques would be reflected in the perceptions and experiences of people who have worked in lead IT roles both within and outside of the higher education environment.

The researcher's findings may be of value to a CIO or other IT manager who is considering moving from outside the higher education environment into a college or university environment. Understanding the experiences of others who have made this transition may help the individual to identify and prepare for the challenges he will encounter, to recognize opportunities he may have in the new environment and, perhaps, to avoid problems during initial exposure to that new environment. An individual may use the experiences identified in this study in considering such a move and, if he/she chooses to make it, to gain confidence from understanding that others have shared this experience.

In the same way, the researcher's findings should be of interest to all leaders in higher education. Communication of practical experience is a valuable way to share best practices and to help others avoid negative results in most professions; IT is no exception. The researcher's findings may provide information to IT practitioners based on the experience of individuals with a particular background, i.e. CIOs who have practiced in different environments. Their experience in different environments may cause such

individuals to approach technology management challenges and opportunities in a way that is different than practitioners who have developed their skills completely within the environment of higher education. The researcher's findings may provide additional insight into the CIO's role and job functions in higher education generally.

The researcher's findings may also be of use to senior administrators in higher education who are evaluating a candidate coming from outside the environment. These findings may identify common beliefs and approaches that are developed in technology managers who operate outside higher education. These can be used by senior administrators in a general sense to understand the world view and possible operating principles of a new CIO who has come from an environment outside higher education. Such an understanding may provide benefits in terms of communication, setting expectations and goals, and evaluating performance.

The researcher's findings may provide a basis for further study of technology management techniques that can be effectively employed in the higher education environment. These findings may also provide a basis for further investigation with regard to whether the changing landscape of IT, especially where information security is concerned, must or should result in an examination of the intersection between such tenets as academic freedom and shared (or individual) governance in higher education institutions, and the IT best practices that are necessary to provide a secure and cost-effective environment. Such findings may result in advancement of IT best practices for the industry: providing a flexible yet secure environment in which IT customers understand the benefits of the practices employed and are not hindered from performing their critical duties, and in which the institutions themselves achieve improvements in

terms of more secure, cost-efficient and effective IT operations in support of their institutional missions.

Participants in this study were CIO's in colleges and universities who had moved from outside the higher education environment into higher education during their careers. These individuals should have benefited from their participation in the study through the opportunity to reflect on the challenges they have met and the successes they have achieved professionally. Their participation also reflected a contribution to the development of knowledge about IT management techniques that may be of value to others in the profession.

The significance of this study to the researcher was grounded largely in her own experience and career history in information technology. The researcher has been in the field of information technology for more than 20 years, 14 of which were in corporate environments. Moving to a higher education environment was a welcome change from the standpoint of personal satisfaction: IT leadership in higher education, and particularly the CIO's position, has so much diversity of activity that each day yields new experiences, and the opportunity to work with and provide support for students and faculty as part of the learning process has been very rewarding.

The researcher was until recently the CIO at Georgia Southern University. In trying to provide the best technology environment possible given the characteristics of the higher education environment, she became interested in understanding whether and how this environment shapes the management techniques employed by others in the role of CIO. The researcher's findings were thus valuable personally in that they will provided to the researcher an opportunity to reflect on her own responses to

environmental challenges and opportunities, and to learn from the experiences and responses of others who have faced similar situations.

The literature researched in this study was also of interest to the researcher with regard to her professional development. Resources that discuss IT management methods have broadened the knowledge base that is important to her career. The process of doing research itself in this area has also built a habit of inquiry and investigation that are important to staying current with regard to IT management methods throughout her career.

Methodology

Mauch and Park (2003) wrote that a major objective of qualitative research is "to gain knowledge (data) from the subject's frame of reference" (p. 18). Since this study was intended to gather information on the perceptions and experiences of CIOs who have moved into higher education from outside that environment, the primary design of the research was a descriptive study using qualitative procedures.

Answers to the research questions were sought from CIOs at four-year public higher education institutions within the University System of Georgia (USG) and the Southern Regional Education Board (SREB). CIOs who have spent part of their careers outside of higher education (i.e. in military, corporate, not-for-profit, or small business environments) were identified, and those CIOs with this particular experience were asked to volunteer for interviews.

Semi-structured interviews were conducted with each participant. Interview questions were developed based on a review of the literature and the researcher's experience as a CIO in the higher education environment, and were piloted with a CIO

outside the primary group of participants. The transcribed interviews were then used as the basis for data analysis. Analysis followed the six phases described by Marshall and Rossman (1999). These were described as: "(a) organizing the data; (b) generating categories, themes and patterns; (c) coding the data; (d) testing the emergent understandings; (e) searching for alternative explanations; and (f) writing the report" (p. 152).

Limitations

One limitation of this study was the researcher's role as a CIO during part of the time the study was conducted, which caused her to be especially sensitive to how she interpreted the perceptions of other CIOs through the lens of her own experience. Another limitation involved the time frames during which the participants had accumulated their experience managing information technology. Almost all had worked in environments external to higher education some time ago, and so managed technology outside higher education when the environment was very different.

Definition of Terms

The following term will be used throughout this paper.

Chief Information Officer (CIO): "the most senior official in an organization charged with assessing IT and information needs and overseeing the organization and deployment of information to meet organizational priorities" (Dearstyne, 2006, p. 45); intended to describe a role, not a title.

Summary

CIOs lead IT strategy and operations in organizations of all sizes and types as they strive to maximize the value of their IT investment. The role of the CIO in leading

IT resources is affected by the environment of the organization. There are many similarities between the deployment and support of IT inside and outside higher education, but there are many environmental differences, as well. In this study, the researcher proposed to capture the perceptions of CIOs of institutions of higher education who have also managed IT resources in environments outside of higher education. These CIOs may have a unique perspective on management techniques that are successful regardless of environment, and on challenges and opportunities for CIOs who move into higher education from a different type of organization.

The researcher's findings may be significant for CIOs who are considering such a career transition, and for senior administrators in higher education who are evaluating a job applicant from outside that environment. These findings may also be instructive for CIOs and aspiring CIOs who are interested in the best practices of, and lessons learned by, other practitioners.

CHAPTER 2

LITERATURE REVIEW

Information Technology

Boynton et al. (1994) wrote that IT use can be defined as the ways in which organizations apply information technology to reduce cost, support managers, perform strategic planning activities, and gain competitive advantage. Generally speaking, information technology (IT) includes computer hardware, computer software, and telecommunications equipment (Stiroh, 2001).

Computer hardware includes mainframe, midrange and personal computers (desktops, laptops, personal digital assistants, tablet computers) and their associated peripherals of all types (printers, scanners, storage devices, etc.) (Senn, 1995). Management issues related to these devices include the identification of an architecture to support an organization, and the definition of standards to assist in cost control (Graves, 1999).

Organizations depend on the software (also referred to as application systems and management information systems) that runs on hardware to handle or support their various operations, linking individuals and units together so that the organization operates more efficiently and effectively as a whole (Senn, 1995). Jackson (2004) noted that, "The traditional DP/MIS [data processing/management information systems] function has been concerned with the capture, manipulation and delivery of internally generated data . . . . Information management [is] primarily concerned with the delivery of information (both internal and external) to managers and executives" (p. 136). According to Jackson

(2004), this particular function has growing importance within many organizations because the information delivered describes the state of the organization.

Telecommunications is another IT specialty area, and ". . . covers a host of electronics, computer systems, Internet-based voice and data applications, and wired and wireless systems, including software, hardware, and integration network developments" (Ghahramani & Tan, 2003, p. 523). Issues and trends related to telecommunications include the management of service levels, including planning and management; the changing technologies and applications that support the wide area network; network technologies for the enterprise; mobile, personal and wireless data technologies; and the future of fiber optics (Ghahramani & Tan).

Johnson (2000) noted that a successful implementation of information technology into a particular organization is achieved when the tool or application becomes part of the environment in that organization. The application of IT to critical areas varies widely among organizations (Boynton et al., 1994). For example, an industrial physics forum in October 2004 spotlighted technologies such as quantum computing, microelectronics, and nanotechnologies associated with supermolecular chemistry and biology (Dawson, 2004). Primary care medical practices use technology for the automated submission of prescriptions, communicating via e-mail with patients and colleagues, patient administration and billing, and to store test results (Andrews, Pearce, Sydney, Ireson & Love, 2004). In the travel industry, agents can request a specific seat assignment on an aircraft and keep track of a customer's hotel preference (Senn, 1995). Although the application of IT may vary widely in different types of organizations, some aspects are similar across many applications and types of organizations.

For example, one aspect of IT that spans a number of the areas noted above has received increased attention in recent years: information security. Three major pieces of legislation have driven it to the forefront of the IT leader's view: The Health Insurance Portability and Accountability Act of 1996 (HIPAA); The Gramm-Leach-Bliley Act of 1999 (GLB); and The Sarbanes-Oxley Act of 2002 (SOX) (D'Agostino, 2004). Control and security of data are key components of ensuring compliance with these acts; failure to control access to an organization's data puts its customers, and the organization itself, at risk (D'Agostino). According to Alter (2006), respondents to a survey conducted in 2005 reported that work on compliance-related projects accounted for 8.3% of the overall IT budget in their organization, and 11.1% of staffing, and D'Agostino reported that some IT departments were holding off on other projects because of the need to allocate resources to compliance. The significant increase in attention to and importance of IT security as a part of the current environment reflects the kind of change that has marked the profession over time.

History of Information Technology

It would be difficult to pinpoint when information technology actually began to be recognized as a profession (Schubert, 2004). Information is the central building block of human communication, so information technology applies at some level to all the ways that scientific and mechanical methods have been used to communicate or store information over time. In the thirteenth century, the printing press was the major innovation in information technology, for example (Schubert).

Schubert wrote that, in most recent times, electronic information storage and communication represent the most common domain associated with information

technology. This era began with the invention of the punched card. Hollerith supported the work of those who used his machines and materials to complete the 1890 census, so if a time could be fixed for the birth of the modern interpretation of information technology, it would be in that period (Schubert, 2004).

Computing devices used in World War II to decode encrypted messages are the next major step forward with regard to information technology (Schubert, 2004). However, there was relatively little progress in the application of computing to business purposes until the release of the System/360 system in the mid-1960's by International Business Machines (IBM) (Schubert). The addition of such systems to the business environment signaled the beginning of the Information Age, with its emphasis on the creation, distribution and application of information (Senn, 1995).

The introduction of large-scale business systems drove the creation of the IT environment - the data centers and applications, and the management responsibilities that went along with them. In the 1970's, most computer implementations involved large mainframes. The environment for management and use of these large computing complexes was centralized. Centralization led generally to issues related to customer focus - users of computer applications often found that it was difficult to get the centralized IT organization to meet their needs (Schubert, 2004).

Schubert (2004) noted that the rise of personal computing in 1980 was at least in part a response to this situation. "Knowledge workers" were positioned on the front lines, in the back office and in senior management of most organizations (Senn, 1995, p. 9). This change to the distributed use of IT throughout the organization led to a loss of control for IT for some time (Schubert).

In the decades following the introduction of personal computing devices and client-server architectures, IT has regained some of its position with regard to centralizing resources and activities. In most cases, a balance point has been reached: end users participate in the definition of IT needs and priorities and are more independent in the management of some IT resources, but leadership and much support of the IT environment rests with IT professionals (Schubert, 2004). Going forward, information technology will be embedded in more and more products and services (Senn, 1995), and Schubert predicted that new technologies such as the personal digital assistant (PDA) will continue to cause IT professionals and the users they support to re-evaluate the balance point of information technology expertise and leadership.

Launchbaugh (2002) wrote that the future of the computer when it first began to emerge as a tool in the business world appeared to be one of great impact for policy, strategy and decision-making. However, over the years the use of information technology remained primarily in the realm of improving operations. Launchbaugh noted that "[t]hat focus is shifting, however, to the 'I,' or the meaning of information and its purpose" (p. 19). As this shift has taken place, there have been concomitant changes to the value of information technology to the organizations it serves.

Value of Information Technology

The application of IT to a variety of activities in organizations today is increasingly acknowledged as both advantageous and necessary (Boynton et al., 1994). IT has a history of application at both strategic and operational levels,
and is becoming more and more critical to everything from introducing new products to improving individual work processes within the organization (Boynton et al.).

Stiroh (2001) discussed the value of IT at an operational level, where benefits include: increased efficiency due to improved flow of information; reduced downtime; increased product availability to customers due to improved inventory management; and the replacement of highly-skilled human resources with relatively low-cost automated systems. The earliest applications of IT in organizations focused on such benefits. Ward (1986) noted that, when businesses first began to use computers in the 1950s, benefits were experienced in terms of operational efficiencies, such as faster calculations, printing and filing, and standardized and expedited administrative activities.

Later, according to Ward (1986), improved computing technologies made possible more complex tasks, for example, forecasting and planning. Once that shift was made, computers began supporting improvements in effectiveness, in addition to efficiency. Businesses realized that computers were holding a very important resource - information - and adopted the storage methods and tools necessary to retrieve it; as they did so, additional benefits were experienced (Ward). Strategic management of information can create competitive value for an organization (Launchbaugh, 2002; Lorentzon, 2003), and during the 1990's, many organizations began to see IT as a way to make major performance gains by reengineering core business processes (Hammer & Champy,1993).

IT has the capability to change the external environment for a business, as well. In some cases, for example, changes to markets result from the application of IT, as when products or services become available online and business moves from a traditional distribution method to the Internet (Stiroh, 2001). Stiroh identified retail book sales as an area where this has occurred. Market changes may also occur when a company is able to

duplicate its services or the distribution of its products online in addition to more traditional methods, as with catalog sales (Stiroh).

Information technology can bring change to a company in many ways and at all levels. However, according to Schubert (2004), the primary goal of IT in the organization is to make everything simpler. If IT is to add value to and streamline an organization without introducing too much change, some management techniques must be understood and practiced.

Management of Information Technology

In order to get the most value out of their IT-related efforts, an organization should focus on business needs first, rather than new technology (Senn, 1995). In order to ensure a business emphasis for IT applications, organizations should focus on developing an overlapping knowledge base between IT and operational managers, since an organization is better able to use IT when IT managers and their customers in the organization share knowledge and processes (Boynton et al, 1994). Otherwise, IT personnel run the risk of focusing their best efforts on projects that do not provide the most value. In turn, the performance of IT support professionals is improved as they gain knowledge about their clients' operations (Nelson & Cooprider, 1996).

In addition to sharing knowledge about the needs of the business, IT personnel must take responsibility for the business performance and success of the areas they support (Bassellier & Benbasat, 2004). They must reach out to understand the factors that influence individual behavior related to information technologies that are critical tools for an organization (Lewis et al., 2003). They must understand the business problems of their customers in order to satisfy their demands (Bassellier & Benbasat;

Weiss & Anderson, 2004), and they must speak the language of their customers (Bassellier & Benbasat). The results of cross-functional teams are more likely to satisfy the needs of the customer for a system they can use and the needs of the business for a system that is cost-effective (P.M.C., 1994).

With these requirements for the success of IT in mind, Weiss & Anderson (2004) pointed out that the IT leader must place emphasis on communication, business problem-solving, and knowledge of the political and cultural environments of his customers. He must also have the coordination and negotiation skills to solve problems in these latter areas. These skills – communication and responsiveness - are important in building and maintaining trust between IT and the areas IT resources support (Weiss & Anderson). In many organizations today, the task of leading the IT resources in an organization falls to the chief information officer (CIO).

The Chief Information Officer

The Role Defined

According to Schubert (2004), "Few professions are more challenging and more challenged than that of the CIO: enabler, peer and partner, business executive with technical know-how, and technical executive with business know-how. Responsible to everyone; and master of so little" (p. vii). Dearstyne (2006) described the CIO's position in terms of its role in the organization, noting that the term CIO "normally signifies the most senior official in an organization charged with assessing IT and information needs and overseeing the organization and deployment of information to meet organizational priorities" (p. 45). Appendix A contains a representative CIO job description provided by Info-Tech, an IT research group (Info-Tech Research Group, 2003).

History of the CIO Role

The history of the CIO parallels in several ways the history of IT in general. Rapid change and tremendous complexity of the IT environment were two of the drivers for the creation of the CIO position (Romanczuk & Pemberton, 1997). Twenty years ago, the chief information officer was a new position (Enns, Huff & Higgins, 2003). Today, however, according to Dearstyne (2006), "Most sizeable companies, governments, universities, and other institutions now have CIOs or someone else with a comparable title (e.g., director of information technology [IT])" (p. 45).

In the early 1980's, the role of the CIO was seen as inexact and changing, due to the newness of the job function and the amount of change experienced within the IT field itself (Rockart, Ball & Bullen, 1982). By the early 1990's, Stephens, Ledbetter, Mitra, and Ford (1992) reported that, "The role of the chief information officer (CIO) continues to be the subject of much discussion and speculation" (p. 449). The transitional state of the CIO's role continues today, and it is still a fairly new and undefined position (Dearstyne, 2006; Launchbaugh, 2002). Dearstyne pointed out that accepted principles, a base of literature on the job specialty, professional associations and journals, and recognized standards for performance do not yet exist.

What does seem clear is that the role has experienced a transition that is similar to that of information technology in general over the years (Launchbaugh, 2002). Weiss and Anderson (2004) wrote that, rather than a focus on solving operational problems, as was true early on, the CIO's role now includes a greater focus on enterprise and strategic issues. Launchbaugh identified the growth of e-business as one of the recent catalysts for change in the CIO's role from a technical to primarily a business or strategic orientation.

Dearstyne (2006) identified this transition as one that is causing CIOs to focus more on the entrepreneurial and creative aspects of applying IT to support the business. As the CIO's role changes, so does his responsibility for managing the IT resources of the organization.

Skill Set, Traits and Behaviors of the CIO

The skills needed to be successful in the role of CIO are reflective of the mix of technology and business-oriented emphases described above, with the same concentration on the business side. Strategic or business-oriented skills are now more important for the CIO than technical skills (Bassellier & Benbasat, 2004; Schubert, 2004). For example, Launchbaugh (2002) wrote that the most important skills for the CIO to have are related to managing relationships, partnering with stakeholders, understanding the best way to find and allocate resources, and creating a vision for the IT organization. Bassellier and Benbasat stated a similar conclusion when they wrote that interpersonal and relationship-building skills are important for IT managers, along with a team orientation. Kotter (1990) added to the list the ability to communicate goals and gain the commitment of others in the organization.

In addition to partnership or relationship-building skills, Dearstyne (2006) noted that it is important that the CIO have the broad business-oriented understanding of many aspects of the organization's environment and goals, priorities, threats and opportunities so that he can adapt technology and information to them. The expectation for the CIO to understand a broad picture of the organization continues to increase (Schubert, 2004).

In order to be successful within the broad picture of the organization, CIOs must excel in the softer or more strategic skills associated with a leadership position. Nelson

(2003) noted that there is a growing emphasis on skills in behavioral and organizational areas for CIOs. Collaboration and negotiation skills are necessary to deal with partners inside and outside the organization, and with organizational superiors (Dearstyne, 2006). Governance and goal-setting are key activities for achieving success. The CIO must be able to establish a vision for his organization and publicize that vision so that partners understand how IT is aligned with the business operations it supports. The CIO's priorities for security, compliance, and mission critical systems development must be clear (Dearstyne). Romanczuk and Pemberton (1997) noted that a successful CIO must be charismatic in order to overcome some of the barriers to acceptance that have traditionally been in place.

Some researchers discussed the specific necessity for the CIO to have technical and functional skills. Dearstyne (2006) affirmed that the CIO must excel at both the technical and the business strategy aspects of his job, and must work closely with functional leaders and experts in the organization to set expectations and get the most value out of the organization's IT investment. Cash and Pearlson (2004) criticized CIOs who spend more time with their IT staff than they do with the customers of their organization. Simply put, "Successful CIOs have learned to understand the broader issues that are not technology driven" (Savarese, 2004, p. 29).

Romanczuk and Pemberton (1997) agreed, and wrote that technical skills are important to the person in the CIO role, although managerial skills are more critical by far. These authors describe the reason for the importance of technical knowledge and skills to the CIO: it is important for him to understand the value and the use of the technical tools that make up the IT infrastructure for an organization in order to be

effective. However, these researchers also make the link between broader business skills and technical skills: not only must the CIO understand the tools his areas deploy and support, but he must also help others to understand the application of those tools and their value to the enterprise (Romanczuk & Pemberton).

Functions of the CIO in Managing Information Technology

That mix of focus on technical and functional elements applies at two levels for CIOs: strategic and operational. For example, Schwartz (2004) reported on a study of CIO job functions by the Meta Group that found many CIOs with business function- and IT-oriented roles. This particular study summarized its findings on the focus of CIOs in terms of operational objectives: business process redesign and making sure the technology architecture can support the operations of the enterprise. Hoffman (2003) identified another operational objective as significant for CIOs: cutting costs. Gartner researchers found that other operations-level activities were still defined as part of a CIO's responsibilities: the authors stated that CIOs must work with company executives to define realistic target dates and improvement goals for IT projects; otherwise, even a successful project can be identified as unsuccessful if expectations are not met (Garner Predicts "Zero Budget" CIO, 2002).

Some see the CIO's role at these two levels as part of an historical progression. The role began as one of establishing reliable and secure infrastructure and setting up utility applications such as electronic mail and instant messaging. Now, the role focuses more on managing the organization's investment in technology and becoming both an internal and an external advocate, with the organization's strategic goals in mind (Jackson, 2004). Schubert (2004) noted that, in times of economic downturn, the CIO

plays an important part in helping the organization get the most out of its resources – a more operational role; however, when an organization and its opportunities are expanding, the CIO can play a key role in helping the organization to gain competitive advantage. In concert with this, Dearstyne (2006) noted that the role of the CIO is to identify ways to use information strategically as a foundation for achieving the priorities of the organization. To the extent they can do this, CIOs make the transition from being seen as service providers and become members of the senior executive team (Dearstyne).

Once that transition is made, the role of the CIO at the strategic level is multifaceted. One CIO responsibility is to establish a policy for managing information along with the guidelines and procedures that make it work in the organization (Romanczuk & Pemberton, 1997). The CIO should focus on awareness of the business, communicating at the right levels with others in the organization, and finding and applying the human resources to get the work done in his area (Romanczuk & Pemberton).

In some organizations the CIO participates in the development of business strategies and the identification of key initiatives along with other senior executives (Schubert, 2004). Some of this transition to a broader executive role has to do with accountability: The Graham-Leach-Bliley and Sarbanes-Oxley legislative acts make CIOs directly accountable for the security and accuracy of financial information produced and maintained by their organization in a way they were not before (Berghel, 2005).

Schubert (2004) noted that the role of the CIO is to make complex IT solutions understandable and useable, and to ensure that they demonstrate value to each person in

the organization and thereby create value for the organization as a whole. Schubert also differentiated between an operational and a strategic role for the CIO, and wrote that the CIO must create an understanding of how IT solutions can be used and how they benefit the organization, rather than explaining how they work. In doing so, ideally the CIO wins support for his areas among IT customers in the organization, and this is another key role he plays (Romanczuk & Pemberton, 1997). In that role, the CIO's relationship with other executives in the organization is critical.

Relationship of the CIO to Other Executives

Schubert (2004) wrote that, "Depending on the company, the culture and the CEO in particular, the CIO either holds a key executive position with all its obligate leadership responsibilities or works as the head manager of the company's IT utility" (p. 6). In fact, Romanczuk and Pemberton (1997) wrote that the CIO's best source of power is the CEO. In many organizations, however, there can be several barriers to the recognition of a CIO as a leader for the organization as a whole.

Romanczuk and Pemberton (1997) discussed several of these barriers. The first issue the CIO must deal with is the fact that the asset for which he is responsible - organizational information - is not tangible, or as quantifiable as financial resources. Furthermore, the achievements of the IT organization often result merely in cost reduction or avoidance, and sometimes these savings are only experienced once. An additional aspect of this is that so much of what the CIO is responsible for does not directly result in revenue but does impact expense to the organization (Romanczuk & Pemberton). The CIO is also challenged to tout the skills and results of his own area to other senior executives who may not spend much time thinking about information

technology. Finally, since the CIO's position is a support position in regard to other areas of the organization, the CIO has less authority and prestige than other senior level positions (Romanczuk & Pemberton).

One of the reasons for uncertainty related to the positioning of the CIO within the senior executive ranks is the newness of the position in general: often, according to Romanczuk and Pemberton (1997), the CIO has a "new-kid-on-the-block" status (CIO: Accountability, Roles and Responsibilities section, para. 5). This may have something to do with the historical separation, through the evolution of the business use of computers, between computer operations and the functional areas of the organization. Less was known by other departments about computer operations, and that sense of the unknown manifested itself as fear and resistance. This is one of the benefits of a CIO with business knowledge and skills: the boundary is removed or substantially lowered (Romanczuk & Pemberton).

Lower boundaries between the CIO and other senior executives are advantageous to the organization, as Romanczuk and Pemberton (1997) noted that the CIO's relationship with top management is critical to its success. Once a CIO has established a relationship with other senior executives, according to a Gartner study conducted in 2002, CIOs must communicate actively with key functional leaders (Gartner Predicts "Zero Budget" CIO). Such communication and partnering are necessary in order to organize IT resources to successfully meet the challenge of a changing environment and changing organizational goals (Gartner Predicts "Zero Budget" CIO). If the CIO does not have the appropriate status in order to communicate with other executives, he does not get the needed support from peers, and communication with business customers with regard to

how to use IT effectively suffers or does not occur at all – a detriment to the organization (Romanczuk & Pemberton). As a result, according to Enns et al. (2003), since CIOs must promote projects that in large part are intended to benefit the functional areas they serve and not their own, they must learn to exert influence on their peers as effectively as possible.

There are some advantages to the CIO's role relative to that of other executives. The CIO's role in supporting different areas of an organization often creates a broad focus and knowledge base. This may result in the CIO participating in a larger role as a senior executive of the organization. In fact, Romanczuk and Pemberton (1997) wrote that the CIO's role is very often not defined or predictable - and thus may come to include a variety of other areas beyond information technology. CIOs should use the unique perspective they have about an organization in order to gain the power to influence others (Gartner Predicts "Zero Budget" CIO, 2002).

Projected Changes to the CIO Role

As has been true to date, most researchers see the role of the CIO continuing to change. "The challenge for CIOs is to define and deliver a sustainable value proposition from the IT organization to the enterprise in an environment with increasing turbulence in technology, business and economy. That value will center more on leadership and service integration and less on creation of technology. That doesn't mean the end of the CIO as a distinct role, but it does mean that major changes lie ahead" (Gartner Predicts "Zero Budget" CIO, 2002, .p. 8). Dearstyne (2006) observed that, because organizations are relying on IT more and more as a strategic asset, CIOs are more prevalent and more powerful. Kahn (2005) noted a possible downside of the recognition of the CIO among

the ranks of senior executives: "elevated status comes with newfound responsibilities and higher stakes" (p. 28).

According to Gartner, the role of the CIO in the organization is affected by the environment in which he operates (Gartner Predicts "Zero Budget" CIO, 2002, .p. 8). In the remainder of this review, the researcher examined the environment for IT within institutions of higher education in general terms, and then considered the effects of these environmental factors on the function and activities of the CIO.

Information Technology in Higher Education

Within higher education, the IT landscape reflects that of the larger environment: varied and changing. IT is used in both academic and administrative areas on today's campus.

Information Technology in Administrative Areas

IT is increasingly important to campus administrative operations. Olsen (2002) wrote that, when a college or university is held accountable in such areas as cost and student head-count, these systems must be able to produce the information necessary to manage and improve. Lagenberg and Spicer (2001) described several changes in the management of the higher education enterprise that have been possible with information technology. For example, services can be provided to students around the clock in multiple settings, rather than being bound by office hours and availability of staff. Administrators have much greater amount of available data for decision-making and can do more with it using analysis tools that are readily available on their workstations (Lagenberg & Spicer).

Some form of integrated administrative system, often including student information, financial management and human resources management aspects, is typically at the heart of an institution's administrative operations. Such systems provide the capability to automate and capture information related to a number of administrative areas on a college campus, e.g., marketing, finance, and student-oriented operations such as financial aid and admissions, etc. (Fowler & Gilfillan, 2003).

Information Technology in Academic Areas

With regard to academic units, according to Jackson (2004), information technology affects all areas of practice in higher education: "IT succeeds by advancing other goals like research, teaching, and service" (Jackson, 2004, para. 1). Messineo and DeOllos (2005) wrote that "educational institutions have continually worked to integrate new technology into the classroom" (p. 51). According to McFarlane (2003), in education, there is a continuum of belief and practice associated with the application of information technology to learning: at one end of that scale, technology is a replacement for the instructor; at the other end, technology becomes a tool used by the student to learn how to interpret data and, ultimately, the world around him. The use of computer technology in the classroom enhances the ability of students to collect and analyze data, it removes or reduces time constraints associated with complex calculations, and it makes available data and information that otherwise would have been impossible to access due to physical location (Lederman & Niess, 1999). Leron and Hazzan (2000) stated that the value of the computer in teaching is to create an interactive environment where students explore concepts themselves and can use that activity to explain complex new ideas.

In other words, new technologies have driven a shift in higher education from a teacher-centered view of pedagogy to a student-centered, more flexible one (Jamieson, 2004). According to Jamieson's analysis:

> The traditional teacher-centered pedagogy based on the format of lecture and tutorial and its requirement for the student to attend on-campus classes is being eroded as online environments provide learners with greater flexibility over when, where, how and with whom they learn. This transformation in the fundamental activity of the university (teaching) represents a massive change for both the institution as the employer and the academics as employees engaged in the business of teaching (p. 22).

Gilbert (2000) stated that, "Higher education is experiencing . . . a revolution at the beginning of the third millennium. It is a revolution driven by mass demand, the imperative for continuing professional education in a global knowledge economy, and the enabling consequences of revolutionary information technologies and telecommunications" (para. 17). Much of the revolution is related to the increasing use and presence of the Internet in the academic and administrative environments on campus.

The use of the Internet is becoming central to the curriculum in many academic departments (Sherman et al, 2000). According to Gilbert (2000), corporate university and Internet-based training opportunities continue to increase, thereby creating significant changes to the higher education environment. Gilbert described an initiative in the United Kingdom to create e-universities that would consolidate resources across institutions to deliver higher education over the Web, a direct response to growing competition. Gilbert noted that, in order to meet competitive forces, higher education

must respond with “visionary thinking, planning and entrepreneurship” (para. 18), and with creativity.

Information technology has also influenced the practices associated with the research mission of universities. Lagenberg and Spicer (2001) identified three aspects of change with regard to research. First, universities in the past have focused more on pure research, whereas today there is a greater emphasis on applied research. Second, institutions have not been directly involved in the commercialization of research products; however, at this time universities are more likely to seek partnerships with outside entities as part of commercial ventures associated with research. Finally, in the past most researchers were required to travel to avail themselves of specialized research environments or equipment. Today, such instruments as supercomputing grids can be accessed and used from the office of the faculty member, located remotely from the research facility being used. Information technology plays a part in all of these aspects of change, in some ways by creating the research opportunities themselves, and in other ways by supporting and promoting the communication and collaboration of researchers (Lagenberg & Spicer).

IT also has an impact on recording and rewarding the service activities of faculty. Electronic portfolio applications provide a means to capture and review service work for review by committees evaluating promotion and tenure applications (Ashford, 2005). Such portfolio applications can store different types of files, so photographs, videos and other visual evidence of service activities can be presented (Ashford).

It is interesting to find that so many of these things were simply being imagined as recently as 15 years ago. In 1991, Woodsworth wrote: "Imagine the impact on

scholarship and research when faculty, students, and administrators in colleges and universities have fully operational electronic work stations. Campuses wired with fiber optics or other high-capacity transmission media will enable students, teachers, writers, researchers, and manager to communicate through a seamless network . . . " (p 15). There is no reason to imagine any of this today – it has already been here for some time.

Impact of the Higher Education Environment on Managing IT

Gilbert (2000) describes the environment of higher education as follows.

> . . . There are certain transcendent issues on which authentic universities have never compromised without compromising their own essential integrity. A university needs sufficient autonomy to discharge its long term educational and scholarly responsibilities effectively; to determine its own curricula; to set its own standards of admission, assessment and progression; and to determine who should and should not receive its awards. It needs to nurture and uphold, on behalf of all its staff and students, the intellectual freedom to be able, without fear or favour, to advance unconventional critiques of established social, political or scientific paradigms. It needs to respect and preserve scholarship and learning for their own intrinsic value, and to provide scholars and researchers with an environment where free inquiry may thrive, independently of outcome or application. Like monks protecting the knowledge and culture of earlier generations from an encroaching barbarism, scholarly communities must always be empowered to identify and protect the best that is known and thought in their world, whether against philistinism, ignorance or the hollow triumph of transient intellectual fashions (para. 47).

Bottery (1994) describes six environmental differences between for-profit and not-for-profit entities that he applies to education: types of incentives, the profit motive, the competitive environment, clarity of mission, bureaucracy and participation, and the number and variety of stakeholders to which they must answer. A number of characteristics of the higher education environment - the variety of stakeholders and the ways institutions relate to them; the history of autonomy of institutions and the faculty who teach in them; the competitive environment; and the growing interest in assessment and accountability – all have an effect on the way IT is managed in that environment.

Stakeholders in the Higher Education Environment

Balderston (1995) listed as stakeholders for institutions of higher education: governments, alumni and non-alumni donors, students, the administration and staff at all levels, the general public, and faculty. These constituencies are obviously varied, and their needs and desires often conflict (Bottery, 1994). Organizations outside higher education are in a similar situation; however, the emphasis on each side is different. For example, businesses are more likely to focus on constituencies important to their financial goals, while a university is more likely to focus on its ethical obligations to stakeholders (Bottery).

Stakeholders in the higher education environment: students.

One of the aspects of the higher education environment that affects IT relates to the diversity and uncertainty of the relationship of students as stakeholders to the institution they attend. Hoffman and Kretovics (2004) described efforts on the part of educators at the university level to define their relationship with students using various metaphors: customer, product, employee. These authors noted that, depending on the

unit involved with a student, it may be appropriate to identify that student in any of these three ways. On the other hand, Shelley (2005) maintained that students are more like patients in a doctor's office. Their tuition is a co-payment, augmented by the funding provided by government and donors. Shelley's metaphor is extended to describe the responsibility of students to participate in their own progress, much as a patient must participate in activities to support his own recovery. Jackson (2003) added to this position the idea that his best efforts as a teacher may not be reflected in the results seen in the classroom: students ultimately decide whether they become involved in learning and thus benefit from it.

In viewing students in any of these lights, it is important for an institution to understand who its students are. Traditional students entering college today are part of a generation known as "Millenials" (Strauss & Howe, 2005), and universities must understand, for example, their preference for working in teams rather than as individuals. Another difference between the higher education environment and other organizations is that, in addition to preparing for the desires and mindsets of a new generation of constituents, the university must also prepare for that group's parents (Strauss & Howe). Millenial parents will be much more involved in their childrens' education at the college and university level, and those parents are much more likely to ask questions related to cost, accountability and the measurable results of their child's education (Strauss & Howe).

Diversity in an institution's relationship with its student stakeholders also exists in the "products" an institution provides to the student in the form of academic programs. Universities have traditionally housed programs for the more elite professions such as

law and medicine, but now provide a wide range of training in disciplines such as management, computing, engineering, journalism, teaching, nursing and many others (Frostd & Taylor, 2001). In addition to that, students engage with a university in a variety of physical environments: in class, they are students; in the residence hall, they are at home.

In their different kinds of relationships with an academic institution, students are affected by and affect the environment for information technology in a variety of ways. In 1991, Woodsworth noted that students, faculty and staff were becoming increasingly computer literate, and predicted one result of this: as these groups became more proficient with technology, they would demand the implementation and use of computer applications with which they were familiar. As these groups began to have a voice in the identification, purchase and implementation of IT applications and solutions, IT personnel would have to become more attuned to campus politics (Woodsworth, 1991).

Ten years later, Breen, Lindsay, Jenkins and Smith (2001), confirmed the accuracy of Woodsworth's prediction. Students have led the adoption of e-mail into the academic culture as a preference for faculty-student contact. Universities must deploy and use information technology innovatively if they want to keep those students from going elsewhere (Breen et al.).

Providing an IT environment where students are comfortable is also important to their success. Messineo and DeOllos (2005) found that students become more anxious when new technologies are introduced into the classroom for their use. If students are not comfortable and familiar with computers, these researchers note, their success in the classroom is potentially affected. They also identified accessibility as a requirement for

students to become familiar and comfortable with the technology they will use in their disciplines (Messineo & DeOllos).

The identity of the new generation of "Millenials" has an effect on the importance and use of campus IT, as well. Parents can stay in touch with their children much more through the application of technologies such as the cell phone and electronic mail. This increases the ability of parents to be directly involved in their child's admissions, financial aid, educational or other university experiences (Strauss & Howe, 2005). Millenials have a strong orientation to working in teams rather than as individuals (Lowery, 2005). For IT professionals in the academic environment, this creates a need to understand how technology can support such activities, and to make it accessible to students in those ways.

The many academic disciplines found in the college and university environment demand an increasing amount and variety of software for use by students, who spend more and more of their study time using those applications, accessing and using information in online databases, and on the Internet (Breen et al, 2001). Many, if not all, of these disciplines come with their own related set of technologies – hardware and software that support the education of students in each area. As the importance of technology increases, it is increasingly important that campuses provide the appropriate access to these resources (Breen et al.).

Students in college now, as predicted by Woodsworth (1991), have an increased presence of IT in their lives inside and outside the classroom. One resulting aspect of IT management in the university environment is that it is necessary to provide for the use of technology by students in pursuits that are not directly related to the core academic

mission of an institution, but are still important in their development as individuals. Niman and Hackney (2002) found that casual, non-academic use of the Internet by students comprised 31% of their total usage. These researchers recognized that limiting university computing facilities to academic uses only would demonstrate an overly-restrictive view of the experience to be gained as part of a college education. Students entering college today ". . . have grown up using the Web, PCs, and fast-paced interactive games. They expect a good IT environment at the school of their choice" (McCredie, 2003, p. 15).

Stakeholders in the higher education environment: faculty.

The increasing demand for and use of IT resources by students creates associated needs and pressures on faculty in the higher education environment. The pace of change in IT, and the creation of new facilities and capabilities such as Internet search engines, some of which profoundly affect aspects of teaching and learning, require faculty in the higher education environment to be flexible and forward-thinking (McCredie, 2003).

Even though there is an increasing need for faculty use of and comfort with technology, especially in the area of online learning, Jamieson (2004) maintained that universities have not done a good job historically of providing professional development opportunities for their faculty, many of whom do not have a formal background in education. Since few academics in the current generation of faculty have themselves experienced online learning as students, there is a much larger shift to be made here than in the past, when faculty members had personal experience with the traditional classroom environment they were later to teach in (Jamieson). "From the perspective of the university as workplace, the proliferation of online teaching threatens the individual

academic's sense of professional identity (e.g. what it means to be a university academic) and the meaning and satisfaction that he or she derives from his or her performance in the workplace (e.g. resulting from the different form of interaction with students)" (Jamieson, p. 26).

Another aspect of the online learning environment that creates complications for faculty and their institutions is the handling of intellectual property. Technology has made possible the development and distribution of course materials by faculty in new ways, through distance learning and online courses. Sanders and Richardson (2002) reviewed the policies of various institutions with regard to the ownership of the intellectual property represented by the materials developed for such courses, and conclude that, "The increasing use of technology in education has significantly changed the face of intellectual property" (p. 118). Lagenberg and Spicer (2001) described the issues surrounding the definition and management of intellectual property as some of the most difficult to deal with from a policy-making perspective.

Leron & Hazzan (2000) discussed the difficult relationships that exist in the higher education environment for information technology related to faculty. These authors identified several beliefs that act as barriers to the quick adoption of IT in higher education, such as the fact that computers in some situations take away the valuable human interaction between instructor and student. In order to deal with these barriers, Leron and Hazzan (2000) stated that, "We believe in holding a long-term vision [for the use of IT in education] but proceeding in small steps and tailoring the solutions to faculty members' taste. Since it is they who should be the bearers of the change, they must do it

their way, though gentle coaching is possible" (p. 245). According to these authors, “It is impossible and unnecessary to impose any ideas on instructors" (p. 244).

Although some faculty members do resist the use of IT, others embrace it. The use of high-performance computing and other advanced IT capabilities to support the research activities of high-quality scientists and scholars presents its own set of challenges (McCredie, 2003). An institution must have an IT governance model and a consistent IT architecture and infrastructure in order to support such research activities effectively (McCredie). Researchers must be able to demonstrate adequate capabilities in order to be competitive for grants and contracts, and the IT infrastructure is an important part of the capabilities they describe (McCredie).

Autonomy in the Higher Education Environment

Independence and democracy are highly valued in the higher education environment (Lewis et al., 2003). In such an environment, the influence of peers is less than in other types of organizations: because faculty members operate autonomously, social influences that affect beliefs about technology use are minimized. This is a complicating factor for IT professionals in the university environment, since part of their job is to understand the factors that influence individual behavior in order to implement and maintain information technology successfully (Lewis et al.).

According to Lewis et al. (2003), an additional complication arises from the fact that the influence of an authority figure such as a dean or department chair is significantly less in higher education than in other types of organizations. Their research findings showed that top management commitment to technology affects whether employees feel that technology is useful or not. When such influence is minimized, as it is in higher

education, positive forces exerted by organizational leaders are not as effective in supporting the efforts of IT professionals as they implement and upgrade new technologies (Lewis et al.).

Further enhancing or complicating the environment of autonomy present in institutions of higher education is the fact that the value systems of academic and administrative personnel are different (Balderston, 1995). Faculty and researchers share an attitude about academic status as a result of their value system; administrators do not share that status (Balderston). As a result, administrative personnel are sometimes the subject of "academic snobbery and academic contempt" on the part of faculty members, and must work to avoid a defensive reaction (Balderston, p. 133).

Specifically addressing technology-related concerns resulting from such values and attitudes, Blustain, Goldstein and Lozier (1999) noted that, "As practitioners of medieval modes of teaching, the faculty (individually or collectively) are sometimes resistant to technical innovations" (p. 70). Green (1999) commented that technology forces a confrontation between traditional "high-touch" and the current "high-tech" approaches to teaching. Some believe that higher education will be enhanced by technology, while some believe that traditional experiences and relationships will be destroyed by technology (Green). Not only does technology challenge faculty in that they must keep up with the skills of students in their classes, but with the advent of online search engines and the ready availability of online resources of all types, faculty are sometimes challenged by students with regard to class content (Green). As a result, "technology remains a highly personal challenge for many in academe," as faculty are

more and more encouraged or required to incorporate technology into their instruction, regardless of the level of individual initiative or interest (Green, p. 12).

Funding and Competition for Resources in the Higher Education Environment

Johnson (2000) noted that, generally speaking, the higher education environment is characterized by increased competition and decreased resources. Pusser and Doane (2001) noted that, when legislatures seek to improve higher education by introducing forces that increase efficiency and productivity, one of the mechanisms used is to give more dollars to students (customers) and fewer to the institutions in order to increase competition. Public institutions compete for funding of all types – research dollars, contributions from alumni and corporate foundations, and from the states that support them. Woodsworth (1991) identified restricted funding as one reason technology advancements on campus do not move forward quickly. Funding has consistently been one of the top issues for IT identified by higher education administrators in Educause surveys over the last several years (Maltz & DeBlois, 2005).

The budgeting and accounting process used in higher education further complicates the environment created by reduced or restricted resources, according to Balderston (1995). The separation of capital and operating budgets and the failure to establish reserves for the replacement of equipment are two outcomes of the financial accounting process that create issues for planning and budgeting of current and future expenditures (Balderston).

Accountability in the Higher Education Environment

In addition to the significant effects of funding restrictions on the higher education environment, Lauwerys (2002) identified requirements for assessment and

accountability as having significant impact in recent years. Universities used to be trusted to perform their missions of research and instruction without outside accountability, but that environment has changed, possibly as a result of an overall breakdown in trust within society (Lauwerys). Frostd and Taylor (2001) discussed this change in relationship to higher education's relationship with its employer stakeholders, for example. While universities have had relationships with employers as stakeholders for a long time, quite often that relationship was on the university's terms. While working with professional bodies in the development of curriculum and assessment methods, they have largely assessed themselves (Frostd & Taylor).

The difficulties of assessing the results of institutions of higher education as opposed to organizations in other environments must be acknowledged: a degree program is "difficult to assess in advance, requires significant time for completion, and takes even longer to evaluate. It is hard to redress damage or to design an appropriate remedy when an institution does not deliver the goods" (Pusser & Doane, 2001, The Nonprofit Form section, para. 1). Grades captured and reported cumulatively over time in the form of a student's GPA do not really reflect accurately how much a student has actually learned (Hersh, 2004). In the higher education environment "there is so much latitude between minimum and maximum performance [of faculty] that the individuals at a university retain significant autonomy" (Balderston, 1995, p. 101).

Information technology can be productively involved with assessment and quality improvement efforts in several different ways. IT can provide an institution with approaches to maintain quality at a lower cost, and can also help it to improve quality at the same cost (Goral, 2003). The accumulation and analysis of data in electronic surveys

such as the National Survey of Student Engagement is a promising area for assessment (Hersh, 2004). Alverno College in Milwaukee, Wisconsin, has implemented an assessment approach that uses electronic portfolios created and maintained by students to keep assignments, feedback, and their faculty and self-evaluations over time. Their work is also made available in these portfolios for assessment by local business and professional contacts. According to Hersh, this approach allows students to assess information over time to evaluate their own abilities in a variety of areas, including problem-solving, analysis skills, and citizenship.

In the implementation of any assessment approach, however, the IT professional must be aware of the environmental response to assessment. The academy itself resists assessment, especially when measures are imposed by outside agencies, according to Hersh (2004). There are various arguments put forward in support of this: some hold that what is learned cannot be measured or may be apparent only years after the learning activities have taken place, while others review the act of assessment itself as a threat to academic freedom (Hersh).

Ultimately, the success of IT is measured in reference to the success of the enterprise (Weiss & Anderson, 2004). Decentralization of IT makes the evaluation of that success more difficult in two ways (Weill & Olson, 1989). First, it creates difficulties in measuring the investment in IT; and second, it complicates the process of measuring the value of that investment (Weill & Olson).

Challenges to the CIO in the Higher Education Environment

The aspects of the higher education environment described in the preceding section create challenges for the CIO. Many of these challenges are recognized in the

2005 top-ten list of issues for IT in higher education conducted by Educause (Maltz & DeBlois, 2005). This list is compiled from responses by CIOs in institutions across the country that are Educause members.

Considering students as stakeholders of an institution creates issues related to establishing and maintaining an effective e-learning environment (Maltz & DeBlois, 2005). For example, the CIO and the institution must "ensure that students are informed consumers of e-learning experiences and have the personal learning, time management, and technology skills necessary to succeed in a technology-mediated environment" (Maltz & DeBlois, p. 25). Green (2004) noted that each generation brings with it a different orientation to information technology: notebooks and cell phones, emerging in 1985, have now become staples of the IT environment. A challenge for the CIO is to understand the qualitative impact of IT on the instructional environment and the student, in order to justify the investment in IT for the campus (Green).

Challenges associated with faculty stakeholders were also noted in the 2005 Educause survey. The needs of faculty must be defined as part of the campus strategic planning process, and faculty must be part of that process (Maltz & DeBlois, 2005). In addition, faculty development, support and training are major issues for the CIO, according to the survey. Faculty must be trained to use emerging technologies such as blogs, streaming media and digital imagery, and to combine these elements for effective classroom instruction (Maltz & DeBlois). Balancing the need for adequate support mechanisms, as advocated by Leron and Hazzan (2000), with appropriate governance models (McCredie, 2003), is an important and necessary area of focus for the CIO in higher education.

The Educause survey identified information security as one of the most pressing issues faced by CIOs in 2005 (Maltz & DeBlois, 2005). Institutions of higher education have a tradition of maintaining open environments, and practices that seek to increase security may be viewed as too intrusive (Maltz & DeBlois). However, Weippl (2005) noted that information security is important to faculty in their roles as authors, researchers and instructors. The CIO and other senior administrators must accept that security policies are absolutely essential, and play a key role in ensuring that all faculty, staff and students comply, since the greatest risk to the environment is the non-compliance of an organization's own personnel (Weippl).

Funding of IT on campus was the top issue identified by higher education CIOs in the Educause survey in the years 2003 - 2005 (Maltz & DeBlois, 2005). This issue raised the challenge for the CIO to work with other senior administrators to ensure they understand the strategic value of IT, and to develop methods for identifying expectations and priorities, and in identifying ways to identify and close gaps in annual funding (Maltz & DeBlois).

Each of the challenges identified in this section has an assessment component associated with it. The needs and skill sets of each new class of students must be identified and evaluated against the methods and infrastructure in use on campus (Green, 2004). The rise of new technologies results in rapid changes in models for faculty development, support and training related to IT facilities and equipment that must be assessed as each change is implemented (Maltz & DeBlois, 2005). CIOs must balance the desire for an open environment where knowledge is shared against the need for that environment to be secure (Maltz & DeBlois). Finally, the CIO must provide for all of

these things in an environment of scarce resources. In order to do this effectively, CIOs must ensure that the value of IT services has been identified, and that investments are evaluated annually (Maltz & DeBlois).

Conclusion

Environmental aspects of higher education create and affect the requirements for IT, and also have specific effects on information technology management. Dearstyne (2006) identified such factors as creating the potential for conflict for the typical CIO: “One of the issues that dynamic CIOs encounter is that their goals, style, and determination to make significant changes are at odds with the organization's traditions and usual glacial mode of doing business" (p. 48). Even with significant difficulties present for those who manage information technology in the higher education environment, Leron & Hazzan (2003) found hope in the fact that the value and power of the application of IT to education is supported by a number of qualitative studies (Leron & Hazzan). Woodsworth predicted in 1991 that integration of IT applications would require organizational changes to the campus. She noted that, “[IT] cannot plan or set priorities without integrating them with others and without being in concert with the overall institutional plans" (p. 16). Schubert (2004) noted that the CIO’s role is both challenged and challenging. The picture of the CIO as the IT leader in the organization, whose role is to drive the collaboration and focus necessary to achieve the integration of IT throughout the institution, while balancing competing priorities for stakeholders that are frequently changing and sometimes scornful of IT as a resource, and accomplishing all of this in an environment of increasing complexity and shrinking resources, supports both of Schubert’s assertions.

CHAPTER 3

METHODOLOGY

Introduction

The purpose of this chapter is to identify the research questions to be addressed, along with a detailed description of the methodology the researcher used to address them. The theoretical foundation of the research methods chosen is identified, and the specific procedures, participants and analysis techniques that were used will be described.

Purpose of Study

Higher education has been significantly changed by the advent and use of information technology (Duderstadt, Atkins & Van Houweling, 2002). In the future of education, demands for productivity, efficiency and accountability will increase. Information technology will play a role in each of those (Visscher, 2001). It has been suggested by one researcher that, in order to meet these demands, institutions may have to look to models in business that have used information technology successfully to navigate a changing environment (Visscher). Therefore, the researcher proposed to document the experiences of CIOs who have moved from outside into the higher education environment with regard to the management techniques they have applied, the challenges they encountered in applying those techniques, and the results achieved in doing so.

Research Questions

The researcher sought to answer the following research questions.

1. What are the socio-demographic characteristics of individuals who move from outside higher education into the role of CIO in higher education?

2. What aspects of the higher education environment are perceived to create challenges for IT management?
    a. Are there any differences in challenges perceived based on significant socio-demographic differences?
    b. Which of those challenges are perceived to be unique to higher education as compared to other environments?
3. What effects on IT management practices result from the challenges perceived?
4. What are the attitudes toward working in the higher education environment of CIOs who have moved from outside the environment?

Research Design

The nature of the research question or questions of interest typically determines the research method to be used; qualitative research, for example, may examine the experiences people have with a particular phenomenon or environment (Strauss & Corbin, 1990). Qualitative research involves, among other things, discovering the beliefs individuals have about their environment (Marshall & Rossman, 1999). The researcher interacts with participants, using their words and behavior as the basis for description and analysis (Marshall & Rossman). These authors further noted that, "Qualitative researchers are intrigued with the complexity of social interactions as expressed in daily life and with the meanings the participants themselves attribute to these interactions. . . . Thus, qualitative research is pragmatic, interpretive, and grounded in the lived experiences of people" (p. 2).

The research questions of interest in this study were intended to elicit the perceptions of a particular group of CIOs in the higher education environment, and their

reactions to and interpretations of their experiences both inside and outside the environment. A career path that includes IT management inside and outside the higher education environment was a primary characteristic of each participant. Qualitative methods were chosen because the researcher sought to gather descriptive information, and because the frame of reference of the participant was important (Marshall & Rossman, 1999). Descriptive studies usually attempt to assess attitudes, opinions, conditions, procedures or demographic information, and usually use questionnaires, observations, or interviews to gather data (Gay, 1981).

The choice of a qualitative study with a phenomenological approach was appropriate due to the background of the researcher conducting the study. Strauss and Corbin (1990) noted that, "In qualitative inquiry, initial curiosities for research often come from real-world observations, emerging from the interplay of the researcher's direct experience, tacit theories, political commitments, interests in practice, and growing scholarly interests" (p. 25). With regard to this study, the interest of the researcher in the questions to be answered arose from a theoretical sensitivity to this particular subject matter arising from her own career history. "Theoretical sensitivity refers to the personal quality of the researcher . . . . the attribute of having insight, ability to give meaning to the data, the capacity to understand, and capability to separate the pertinent from that which isn't" (Marshall & Rossman, 1999, pp. 41 – 42). One of the sources of theoretical sensitivity is professional experience, which can help the researcher understand events and data more quickly and completely (Strauss & Corbin).

Participants

Some CIOs selected for participation were chosen by the researcher based on her involvement in the Administrative Committee on Information Technology (ACIT), an advisory group to the CIO of the USG. This group included CIOs and IT directors from each of the 35 institutions in the USG. Marshall and Rossman (1999) described the need to identify a setting for the study that can be entered by the researcher, and in which the researcher can build an atmosphere of trust. They noted that the success of a qualitative study may depend significantly on trust and a positive relationship between the researcher and the participant. The researcher must understand the study's setting and participants in order to understand how she will be received (Marshall & Rossman). The researcher's participation in the ACIT and her association with many of the CIOs who are members of this group over the last six years created the necessary atmosphere of trust.

The research focused specifically on CIOs who have worked both outside and inside higher education. Participants were identified for qualitative study using criterion sampling. According to Gall, Borg and Gall (1996), "Criterion sampling involves the selection of cases that satisfy an important criterion" (p. 234). The survey used to establish the sample (see Appendix B) identified individuals who met the central criterion for the study: CIOs in the higher education environment who previously worked outside the environment as IT managers in other organizations.

In order to begin her study, the researcher identified CIOs within the ACIT group who met this requirement. To accomplish this, a survey was sent to all CIOs in the University System via electronic mail, using the listserv for the group. Approval to use

this communication method was requested and received from both the interim CIO of the University System and the chair of the ACIT.

The survey asked for specific information about each person's career history, including whether the individual had worked outside of the higher education environment. Responses were received from 16 of 35 CIOs contacted. Based on those responses, the researcher then identified potential research subjects. There were nine respondents from institutions in the University System of Georgia who met the criterion for the study (i.e. working outside higher education).

Next, the researcher reviewed responses to identify CIOs from this group to interview. The sample that resulted from the chosen approach was small. Drisko (1997) noted that " . . . [R]esearch on the phenomenologic experiences of an understudied group can be conducted with samples of different sizes and compositions. Creating a detailed portrayal of a single experience may require only a few key informants . . . " (p. 3 of 12). He also noted that, "Research intended to lead to the development of general theories applicable across persons and settings, however, requires an analysis of alternative viewpoints and conclusions. Such analysis is possible only if the initial sampling is purposefully conducted" (p. 4 of 12). According to Patton (1987), "The power of purposeful sampling lies in selecting *information-rich cases* for study in depth. Information-rich cases are those from which one can learn a great deal about issues of central importance to the purpose of the evaluation . . . ." (pp. 51 - 52). The researcher can choose one of several ways to identify purposefully a sample of information-rich cases (Patton). One of these is maximum variation sampling. The strategy for this type

of sample is to capture and describe common themes across a group of participants who vary greatly in their individual characteristics or experiences (Patton).

With this in mind, the researcher selected potential interview participants who had a variety of experience outside higher education: military, corporate, not-for-profit (outside higher education) and small business. Participants were also chosen based on the size of their institutions: one participant was chosen from a school with less than 5,000 students; two from institutions with a student population of between 10,000 and 20,000; and the fourth from a very large university with a population greater than 20,000. Candidates were contacted individually to request an interview, and all agreed.

In order to assist in promoting the anonymity of participants, a second group of CIOs was selected from schools who are members of the Southern Regional Education Board (SREB). It was decided to stay within the SREB in order to maintain some consistency of environment and surroundings related to the USG schools. Furthermore, only CIOs from four-year institutions were selected from the USG and SREB respondents, in order to maintain some consistency in the role of the CIO and the relative size of his or her operation.

In order to identify CIOs from the SREB, a random sample of institutions was chosen from all four-year SREB schools. In order to do this, a file of random numbers was generated using Microsoft Excel. The random numbers were used to match against a list of four-year SREB institutions, listed in alphabetical order. A list of 18 schools was generated in this fashion, and contact information for the CIO at each school was sought by checking institutional Websites. The researcher found contact information for the CIO's of 15 of the 18 schools, and an electronic mail message was sent to these

individuals. Five individuals responded and, of those five, two CIO's were identified as having experience outside higher education.

In order to maintain consistency with the number of CIO's inside and outside the University System of Georgia, and in order to generate similar variety in size and type of institution, it was then decided to make direct contact with a third group of CIOs from the SREB universities. The researcher reviewed institutional Websites for several universities with Carnegie classification of "research extensive" and identified two CIOs with experience outside higher education.

Like the candidates identified within the USG, the CIOs from the SREB also had diverse career histories. One candidate had experience in the corporate environment; two had experience in more than one environment outside higher education (corporate and military, and corporate and non-profit); and the fourth candidate had experience in corporate, military and non-profit organizations. Each of these four individuals was contacted to see if he was willing to participate in an interview, and all candidates agreed to do so.

In summary, demographic information on a total of 20 CIOs from the USG and the SREB was accumulated. Appendix C shows the information for individual respondents. Of the 20 respondents, 19 were males and one was female. Eighteen respondents were white, while one was Black and one was Asian. All respondents were between the ages of 36 and 65, and had spent anywhere from seven to 43 years in IT overall. The number of years these respondents had spent in the higher education environment ranged from two to 31. All respondents had college degrees, with two having doctoral degrees, 15 having masters degrees, and the remaining three having

bachelors degrees. The sizes of the institutions where they served ranged from less than 5,000 students to more than 20,000 students.

Instrumentation

ACIT and SREB CIOs were given a short survey to identify participants, and to gather demographic information about each one. The survey is shown in Appendix B. One list of questions was used for the semi-structured interviews (Appendix D). During each interview, the participant was also asked to elaborate on the differences between higher education and other environments, as identified on the participant surveys.

Most interview questions were drawn from the literature that describes environmental challenges in higher education that affect IT management. Major areas of emphasis identified in the literature included: students as IT stakeholders; faculty as IT stakeholders; autonomy in the academic environment and its effect on IT; competition for resources; and accountability and assessment in higher education. The researcher asked interview questions intended to identify perceptions of the participants related to these different areas.

Other interview questions sought to confirm participants' perceptions of challenges by asking them whether challenges differed among environments they had experienced, to describe the effects of a challenge (if any) on their IT management practices, and to determine the effect of challenges (if any) on their attitudes about the environment. In this way, each of the interview questions addressed an aspect of one of the primary research questions involved in this study. Appendix E shows the match between interview questions and the research question.

Data Collection

Surveys and Interviews Used in Data Collection

In order to complete the first part of the study (the identification of participants), a survey was used to identify certain demographic characteristics among potential participants. As the second part of the research process, in-depth interviews were conducted by the researcher with participants.

In-depth interviews are appropriate when the researcher seeks to describe the lived experiences of individuals (Marshall & Rossman, 1999). Depth interviewing requires the researcher to ask open-ended questions, to listen to and record the answers, and then to follow up with additional questions based on those answers (Patton, 1987). That process ". . . allows the evaluator to enter another person's world, to understand that person's perspective" (Patton, p. 109).

Interviews were semi-structured. According to Rubin and Rubin (1995), in a semi-structured interview, the topic is introduced by the interviewer, who then proceeds to guide the participant through a set of specific questions. There is a balance between more and less structured portions of the interview. At times, the interviewee will relate more detail in an unstructured fashion about ideas, events and perceptions. During other portions of the interview, the interviewer may ask specific questions in order to elicit more details, examples or background for the participant's comments (Rubin & Rubin).

It was not appropriate to use structured interviews for this research because, as Borg and Gall (1979) pointed out, only a brief series of questions is asked in a structured interview. The questions can usually be answered with a simple yes or no, and there is no follow-up by the researcher to add depth to the answers (Borg & Gall). If the

researcher was to gather detailed perceptions and descriptions from the participants, this type of interview would not have been sufficient. On the other hand, an unstructured interview format was not necessary. According to Borg and Gall, these types of interviews would typically be used when it is expected that the participant will have difficulty expressing the information sought, or when the subject matter is painful. This was not expected to be the case in the interviews to be conducted for this study, as the participants would be discussing matters of practice and professional lessons learned.

The interviews had phenomenological, cultural and evaluative aspects. "Phenomenology is the study of lived experiences and the ways we understand those experiences to develop a worldview . . . . The purpose of this type of interviewing is to describe the meaning of a concept or phenomenon that several individuals share" (Marshall & Rossman, 1999, p. 112). The researcher was also interested in the participants' interpretation of the culture of higher education and its effect on IT management as an element of that culture:

> Cultural interviews probe for the special and shared meanings that members of a group develop, the kinds of activities that group members typically do, and the reasons why they do them. An interviewer learns about the culture by eliciting examples and stories that reveal how people understand their world . . . (Rubin & Rubin, 1995, p. 28).

In a cultural interview, the researcher may ask the participant to describe an occurrence, and then actively listen while the participant defines what is important through his response (Rubin & Rubin).

Since the researcher was interested in understanding how the participants evaluated the effects of the environment of higher education on IT management practices, evaluative questions were used, as well. Evaluation interviews seek to identify the perceptions of participants with regard to the success or failure of a program or project (Rubin & Rubin, 1995).

Given the researcher's own career history relative to the subject of this study, it was essential to conduct the interview process in such a way as to limit bias on the part of the researcher as much as possible. "Bias in qualitative research refers to influences that impair complete or accurate sampling, data collection, data interpretation, and reporting" (Drisko, 1997, p. 7 of 12). Drisko also noted that, "Any influence that limits hearing, interpreting, and reporting data may be a source of bias" (p. 7 of 12).

Drisko (1997) reported that limiting bias in research begins with the awareness on behalf of the researcher of his own potential bias, and the subsequent reporting of that potential, along with a statement about the content areas for the study that may be affected. Development of alternative interpretations and efforts by the researcher to find contradictory data are also methods that can be used to limit bias before the interview process begins (Drisko; Roper & Shapira, 2002).

Fowler (2002) provided some specific guidance in reference to minimizing bias in research during the interview process itself. First, he noted that questions should be phrased in such a way that they do not reflect a judgment on the part of the interviewer; rather, in introducing questions, the researcher's desire for accuracy should be emphasized (Fowler). Second, the researcher must understand that his own behavior establishes a context for the participant, one in which the participant may make

assumptions about the way his responses will be interpreted. The researcher needs to be very careful of these contextual cues during the interview process (Fowler). Roper & Shapira (2002) also recommended that the researcher should maintain "distinct records of emotional responses to persons and events during data collection [to] help manage potential sources of biases influencing the research process" (p. 116). The researcher must also be aware of the fact that the participant may be biased in some way toward the researcher, according to Roper and Shapira. In order to counteract such bias, the researcher must maintain an open manner, listen carefully to the responses of participants, explain the researcher's role, and make clear to participants how the information gathered in the study will be used (Roper & Shapira).

Other methods for minimizing bias can be introduced during the data analysis and presentation phase. According to Mays and Pope (1995), a method that can be used to address the problem of bias in the presentation of the study's results is to document large sections of original responses along with commentary on those responses. The researcher can also develop a quantitative summary of the qualitative responses of the participants, in order to condense the results and present them to the reader in such a way that they can be readily understood or evaluated (Mays & Pope).

For purposes of this study, the researcher maintained an awareness of her own potential bias, and identified the interview questions that might be influenced by it. Those questions were phrased carefully so as not to create assumptions on the part of the participant regarding what the researcher "wants" or "needs" to hear. In particular, each set of questions related to environmental differences was begun with the question of whether the individual felt that environmental differences or effects existed. Only when

the respondent answered in the affirmative were additional questions posed about the nature of those differences or effects.

The researcher also attempted to minimize her response during the interview to the comments made by participants. This was something that had to be paid close attention, since the interviewer had a pre-existing professional relationship with half of the participants. A pilot interview was used to prepare the researcher in this regard.

Process for Data Collection

According to standard practice for the graduate program at Georgia Southern University, the research process began with the creation of a study proposal and the research instruments that would be used in the study. These were submitted to the Institutional Research Board (IRB) for approval. Once approval was received from the IRB, interview questions were piloted in a telephone interview with a CIO from a two-year institution within the University System of Georgia.

At the end of the pilot interview, the researcher discussed the perceptions of the participant regarding the focus of the questions, given the intended nature of the research. No adjustments were made to the interview questions as a result of this discussion, as all seemed satisfactory for the intended purpose.

Interviews were scheduled at the convenience of each candidate, and were conducted by telephone or in the office of the participant. Each participant was given an opportunity to review and sign the informed consent form, the confidentiality of interview responses was confirmed, and the participant was given a chance to ask questions about the process.

Each interview began with a review of the participant's responses to a survey question about differences between the environment inside and outside higher education. Then, a standard set of questions was used to form the basis for the remainder of the interview (see Appendix D). As the participant responded to these questions during the course of the interview, additional questions were formulated by the researcher to probe for additional comments or a deeper perspective on the event or perception described. Each interview lasted between 50 and 90 minutes, and was tape-recorded (with prior approval of the participant).

Recording an interview has several advantages, as noted by Borg and Gall (1979): (1) it helps to reduce the possibility of bias on the part of the researcher, who might unconsciously focus on certain responses or types of responses more heavily in her note-taking; (2) the tape-recorded interviews can be reviewed more than once to gain a deeper or different understanding of responses; and (3) tape-recorded data can be reviewed by someone else other than the researcher for evaluation and classification purposes (Borg & Gall, 1979. Each tape recording was transcribed and the transcripts were used as the basis for the analysis and reporting of participant responses.

Data Analysis

Analysis of the interview responses is intended to identify patterns in the observations made by participants (Marshall & Rossman, 1999). The data analysis process used in this study included most of the steps identified by Taylor and Bogdan (1984): (1) identifying categories of data; (2) coding the data into those categories; (3) sorting the data by those categories; (4) identify data that do not fit into the categories identified; and (5) analyzing the results of these activities.

The exception in the process used was that steps (1) and (2) identified above were essentially combined. Coding the data (the second step) involves breaking data down into parts, examining them for similarities and differences, and asking questions about the phenomena that surfaced in this process (Strauss & Corbin, 1990).

According to Jones (1985), one method for analysis is to decide on categories for the data in advance and then to review the interview results to apply those categories. The risk here is that the researcher's bias may weigh too heavily into the creation of the categories. Therefore, the researcher chose to generate the categories as a result of close examination of the data instead; in other words, categories were defined by the data themselves, as described by Jones. Transcripts were reviewed for key phrases and concepts, and those key phrases were identified as categories or themes.

In general, as noted by Jones (1985), "[t]he analysis of qualitative data is a process of making sense, of finding and making a structure in the data and giving this meaning and significance for ourselves, and for any relevant audiences" (p. 56). In a descriptive study, the researcher interprets the data only minimally. The researcher organizes the data collected according to what she feels is important, but in large part the reader is asked to make generalizations or draw conclusions from the data (Taylor & Bogdan, 1984). By reviewing the transcripts in depth, identifying key comments made by participants that were associated with the research questions of interest, coding those comments with key words, and then sorting and analyzing responses based on those key words, the researcher was able to create the structure described by Jones.

Summary

The purpose of the study was to describe the perceptions and experiences of CIOs who have managed information technology inside and outside the higher education environment. Using CIOs in the University System of Georgia and other SREB institutions as a base population, potential participants with experience inside and outside higher education were identified using surveys. Participants were then interviewed in depth and asked a series of questions intended to elicit their observations about the environments in which they have worked. Responses were analyzed and coded in order to identify patterns or commonality in beliefs, practices and perceptions.

A study may be significant when it can be linked to "concerns of practice" (Marshall & Rossman, 1999). The researcher used the results of the analysis described to search for approaches that are of value to the practice of information technology management in today's higher education environment.

CHAPTER 4

FINDINGS

The purpose of this chapter was to present findings based on the data gathered from the eight interviews conducted with higher education CIOs who have also worked outside that environment. The answers to the study's research questions were reported based on themes that emerged from the analysis of participant responses.

Purpose of the Study

The researcher studied the perceptions of CIOs who moved from outside into the higher education environment with regard to the challenges encountered in managing IT in that environment; how those challenges were perceived to differ from other environments experienced by participants; and the effects of those challenges on IT management practices and attitudes. The research questions that guided the study were:

1. What are the socio-demographic characteristics of individuals who move from outside higher education into the role of CIO in higher education?
2. What aspects of the higher education environment are perceived to create challenges for IT management?
    a. Are there any differences in challenges perceived based on significant socio-demographic differences?
    b. Which of those challenges are perceived to be unique to higher education as compared to other environments?
3. What effects on IT management practices result from the challenges perceived?

4. What are the attitudes toward working in the higher education environment of CIOs who have moved from outside the environment?

Data Collection

In order to gather data, the researcher conducted a qualitative study with eight participants who were CIOs at four-year institutions within the University System of Georgia (USG) and in other schools that were part of the Southern Regional Education Board (SREB). Each participant responded to an introductory survey that identified him as having experience outside higher education and also asked for basic demographic information about the participant and the institution at which he worked. Each participant was then interviewed, using questions primarily based on the researcher's review of literature.

The review of literature resulted in the researcher's identification of a number of areas of focus for interview questions. These included questions about students and faculty as stakeholders for IT and the challenges in those relationships. Interview questions also addressed other areas of emphasis identified in the literature review: the effects of autonomy; scarce resources and funding mechanisms; accountability; assessment; and information security.

Data Analysis and Presentation

To begin the data analysis, and in order to maintain the confidentiality of the participants, the researcher assigned a pseudonym to each participant, using names beginning with the letters A through H. The name of the institution associated with each participant was not revealed; however, the demographic characteristics of the higher education institution were used in the analysis of the data.

Data Analysis for Research Question 1

In order to perform the analysis for Research Question 1, the researcher created a matrix of information (e.g. gender, race, amount of time spent in higher education) for all participants in an Excel spreadsheet. This spreadsheet was used to create a summary of information for each participant, and across participants in the study.

Data Analysis for Research Questions 2 – 4

In order to perform the analysis for research questions 2 through 4, survey and interview responses were analyzed to identify connections with a research question and to identify major themes. Participant responses were copied out of each transcript into an Excel spreadsheet, and organized according to which research question was addressed. Appendix E shows the relationship between each interview question and the research questions for this study.

Each quotation was then analyzed to identify the substance of the participant response. The researcher identified one or two keywords or key phrases that captured the thought or thoughts expressed in the quotation. These were noted in columns in the spreadsheet. Once key words and research question assignments were applied, the researcher sorted the material by the key words or phrases to identify patterns in the responses. These patterns, or themes, were reported as responses to the research questions.

Research Question 2a in particular focused on differences in responses associated with major demographic characteristics of participants. In order to analyze interview responses for this question, key demographic factors identified in response to Research Question 1 for each participant were combined with the quotations identified in the

spreadsheets used for Research Questions 2 – 4. This spreadsheet highlighted instances where participant responses were different based on demographic factors.

Research Question 1: Profile of CIO Participants

This section outlines demographic information for each participant. In order to provide background for the other findings presented in this chapter, information about age, gender, highest level of education attained, number of years experience in IT, number of years experience within higher education, and the general size category of the institution for which the participant works is presented. Table 1 shows a summary of demographic information for the participants.

Participant 1: Adam

Adam was 53 years old and had a masters degree, 21 years of experience in IT overall, and 15 years of experience in higher education. His experience outside higher education was in the corporate environment. His institution had fewer than 5,000 students.

Participant 2: Bob

This participant was 59 years old and had a masters degree. Bob had spent 33 years in IT, the last 17 of which were in the higher education environment. His experience outside of higher education was in the corporate environment. The institution where he worked at the time of the interview had an enrollment of greater than 20,000.

Participant 3: Charles

Charles was 56 years old. He held a masters degree, and had 25 years of experience in IT overall and 12 years of experience in higher education. This participant

had experience outside higher education in both the corporate and military environments, and he was the CIO in an institution with between 10,000 and 20,000 students.

Participant 4: David

David was 44 years old and held a bachelors degree. He had been in IT for 25 years, with 14 of those years in higher education. His experience outside higher education was in the small business sector. His institution enrolled between 10,000 and 20,000 students.

Participant 5: Edward

Edward was 61 years old and had a masters degree. He had 40 years of IT experience overall, and had spent 17 of those years in higher education. He had also worked in both military and corporate environments. He held a masters degree, and was the CIO at an institution with between 5,001 and 10,000 students.

Participant 6: Fred

This participant, who was 45 years old, had a masters degree and was working on his doctorate. He had worked in IT for 15 years and in the higher education environment for only two. Fred's experience outside higher education was in the not-for-profit (non-higher education) and corporate environments. This participant was employed at an institution with fewer than 5,000 students.

Participant 7: George

George was 50 years old and held a masters degree. He was also working on his doctorate. He had more than 20 years of IT experience, seven of those in higher education. He had worked in IT in the military, corporate and not-for-profit (non-higher education) environments. His institution had between 10,001 and 20,000 students.

Participant 8: Henry

Henry was 48 years old and had a bachelors degree. He had a career in IT spanning 23 years, and had worked in higher education for 20 of those. The remaining years of his career were in the corporate environment. Henry was the CIO at an institution with more than 20,000 students.

Table 1

Participant Demographic Information

Participant/ Demographic	Gender	Age	Years in IT	Years in Higher Education	Environmt(s) Outside Higher Education	Degree	Institu-tion Size
Adam	Male	53	21	15	Corporate	Masters	< 5,000
Bob	Male	59	33	17	Corporate	Masters	> 20,000
Charles	Male	59	33	17	Military, Corporate	Masters	Between 10,000 and 20,000
David	Male	44	25	14	Small Business	Bachelors	Between 10,000 and 20,000
Edward	Male	61	40	17	Military, Corporate	Masters	Between 5,000 and 10,000
Fred	Male	45	15	2	Not-For-Profit, Corporate	Masters; working on doctorate	< 5,000
George	Male	50	20	7	Military, Corporate, Not-for-Profit	Masters; working on doctorate	Between 10,000 and 20,000
Henry	Male	48	23	20	Corporate	Bachelors	> 20,000

Summary of Participant Demographics

The participants involved in this study were all white males between the ages of 44 and 61. Most held advanced degrees, and two were working on their doctoral degrees. Across the group, experience outside the higher education environment came from the corporate, military, not-for-profit and small business environments. The shortest amount of time spent in higher education was two years, and the longest twenty years. Four of the participants served in larger, public institutions categorized as research extensive; the other four worked in institutions with non-research extensive Carnegie classifications..

Research Question 2: Challenges to IT Management Perceived by CIOs

The researcher identified aspects of the higher education environment that participants considered to be challenges based on themes that emerged from their responses. These themes are reported as findings in the sections below.

Findings Related to Diversity of Students

The diversity of students was identified by participants as a challenge to IT management in the higher education environment. One of this study's participants, Henry, described the aspect of diversity associated with the multiple roles a student can play. He stated:

> A student can be a grad student, which means they are a student; but they are also an instructor and also an employee or working on a research project so students – yeah, I can have an individual who has a profile that makes them student, staff and faculty.

Most of the participants' comments with regard to diversity of the students,

however, focused on the fact that students are all individuals, with individual levels of technology skills and aptitude, and individual expectations. In particular, two participants cautioned against treating the students as a group. Charles stated, "Students aren't a single body. They are a collection of [over 10,000] individuals at a place like [our institution], each with unique needs, desires, attitudes and proficiencies."

Findings Related to Student Demand for Leading-Edge Technology

Most participants cited the demand for leading-edge technology as a challenge for IT management in higher education. Adam, Bob, Charles, David and Edward all commented that students who are early adopters of technology often do not understand the competing forces associated with managing IT in an organization. Adam remarked:

> But our students tend to want to be on the front edge of just about everything. Many of them are better at most of the things we do for a living than we are and as such are continually wanting to know why we don't do this, this and this because they don't understand the whole concept of scalability. You know: "I do this on my home network. Why can't I do this on the campus network?"

Edward described the impact of these expectations on the higher education environment in general:

> Our students are really connected to everything much more than they even were 10 years ago, they are pushing the higher education to do more proverbial things online. They like it online, be it file sharing or Web pages or file storage or Podcasting, you know all the things the students are into, and I think their requirements are kind of forcing higher education to provide more services, more electronically available services to them.

Bob and Charles both noted that part of the challenge for IT management is to determine which of these leading edge technologies should be selected for use on campus, so that resources are then applied to support, the development of faculty training, etc. When such selections are made, however, both also stated that this leaves some students dissatisfied because of their individual preference for another technology.

Findings Related to Diversity of Faculty Needs

Faculty diversity, in addition to diversity of students, was described by CIOs as a challenge for IT management. Bob, Charles, David and Henry all noted aspects of this. Charles described a typical situation related to faculty diversity:

> The professor in Economics might need access to statistical software, etc., and the professor in Biology might need access to not only data but huge data like a genomics database as well as a really high-bandwidth network and interaction with national laboratories, things like that. And then there's someone over in Computing who wants to do innovative teaching technologies and who wants technology that will allow him or her to do really innovative classroom presentation or simulations, interactive with the students with real-time capture, real-time synchronization of lecture, presentation materials, classroom discussion, as well as any outside-of-the-environment research or linkage to topics that can be wireless, whatever.

Findings Related to Faculty as IT Experts

A second challenge related to faculty, cited by David and Adam, was that many faculty believe themselves to be IT experts. When asked about faculty interactions with IT, Adam responded:

> They think they should be running it. Faculty are one of the toughest because, no offense to people working on their PhD, but when you give a person a PhD they believe that makes them an expert at everything and as such they want to be able to tell everybody how to do their jobs.

David described another frustrating aspect of this when he stated, "So you've got experts out there who are in fact asking you for help and telling you what you should do."

Findings Related to Academic Culture

Autonomy

The research found that CIOs identified aspects of autonomy as challenges. The major focus identified by participants was that, as Adam stated, faculty "just want to do what they want to do," rather than accepting the efforts of IT personnel to maintain a reliable, secure and scaleable environment. Fred echoed this sentiment using almost the same words, and George noted that those faculty who operate autonomously and ignore policies for things like network security "put the other research and other faculty at risk."

Autonomy also creates a different challenge, according to Adam: "[separating] when they *want* to do it from when they *hav*e to do it, and [making] sure that we support the needs to be supported but not allow just anything that is done under the guise of academic freedom." In other words, academic freedom is used as a justification for actions or needs regarding IT. Under these circumstances, the CIO must decide which technology initiatives are critical as opposed to those that are not as critical, and must apply the right level of resources and support to ensure the success of those critical projects.

Edward commented about another aspect of faculty autonomy. He noted that the challenge this creates is that faculty are working toward different goals. These many different goals make it more difficult for the institution to operate as efficiently and effectively as possible.

Attitudes toward non-academic staff

Participants were consistent in their comments related to the relationship between faculty and IT staff. Phrases such as "a necessary evil," (Adam); "with disdain" (Charles); "second-class citizens" (Edward); and "a necessary irritation" (Fred) were used to describe how faculty relate to IT staff members. Participants also stated that faculty relate to administrative personnel as though they are not part of the same organization, not partners, and not part of a team. These aspects create challenges by threatening the effectiveness of the CIO and his organization. According to George, "CIOs are business accelerators and we want to do what's best for the university. If we are not brought in to understand the business then we can't fulfill that function."

Findings Related to Accountability

The researcher found that the lack of accountability is a challenge for IT management in the higher education environment. Four of the participants (Adam, Bob, Charles and Fred) noted this in their comments. Fred stated that he feels accountability is actively avoided in the higher education environment.

The challenge for IT managers is that the lack of accountability complicates the decision-making process when faculty demand to be a part of that process but have no responsibility for outcomes**.** Adam stated, "Something that is unique to faculty is that they never have to take responsibility for anything … or nearly never. As such they get

to sit back and criticize and raise problems without being part of the solution." Under these circumstances, according to Fred, "In the academic world you have so much collaboration going on that the decision never is made."

However, one participant related accountability to positive aspects of the environment. Bob noted that, while there is less accountability in higher education, there is also more personal freedom.

Findings Related to Funding

Participants described the influence of state legislatures as a major challenge related to funding. Bob described practices such as prohibiting the rollover of funds from year to year, the year-end sweeping of funds left in budgets, the practice of using salary savings to fund operating costs, and the control of the State over salary increase levels as examples of this.

Other participants described challenges related to how budgets for IT are allocated within the institution. Both Adam and George described an absence of alignment between institutional needs and IT budgets. George stated, "Here there is no relation to business needs. It's just what money you have available to do whatever you can toward all these entrepreneurs' demands. We are not aligned with the strategic direction of the university." Several of the CIOs also described the level of funding for IT on their campuses as inadequate.

Fred identified as a challenge the lack of representation for IT when budgets are allocated by senior administration on his campus. One of the aspects of this challenge is that staff are demoralized when their carefully-prepared funding proposals are ignored.

Bob described a possible root cause for this: "We are back to that behind the scenes stuff that people depend on us for but don't realize what the cost and implications are for providing that support."

Findings Related to Information Security

Participants in this study agreed that the current environment for information security is a challenge to IT management in higher education, because the need to have an open environment is in conflict with the necessity to impose restrictions that reduce or minimize risk. Charles described the transition that has taken place over the last several years in these terms:

> When you go from the passionate, excited phase of technology adoption and you think of the pragmatic world of "Oh, crap, this has risk," and "Oh, wow, it bit me," then all of a sudden security, like politics, becomes personal.

Adam noted that the environment has changed such that every project now starts with an examination of security.

Responses to this challenge vary, according to participants. George stated that the attitude about information security in higher education sometimes is that it "applies to somebody else and not to me." Several participants, however, described an upside to this challenge, of a sort. According to George:

> That is my catalyst of change. Without it I could not do a lot of the things that I'm doing internally such as managing centralized e-mail, preventing people from setting up their own servers and creating their own IT departments.

In other words, the advantage to the current environment is that emphasis on information security has suddenly given CIOs a basis for pushing through projects that previously might have been rejected.

Findings Related to the Lack of a Quantifiable Benefit

The lack of quantifiable benefit, or a bottom line, was discussed by seven of the eight participants as another challenge inherent in the higher education environment. According to the participants, the lack of a "clear set of goals" affects a variety of things. For example, Adam and Bob stated that it is more difficult to decide whether to fund a project (an IT project or a research project for a faculty member) or not when the results of the project cannot be measured in the context of their effect on the organization's results overall**.** Bob also noted that it is more complicated and time-consuming to sell an idea for a project – rather than just establishing the bottom-line value of an effort, there must be more communication and consensus-building, because the decision is more personal than empirical. Bob stated, "You approach things differently when you try to sell an idea or a strategy or something, where in a corporate environment you just say, 'Well, this is justified by the bottom line, the boss says do it, we're headed in that direction.'"

Henry and Charles both stated that, while there is not a true bottom line for higher education, there are ways to measure results. However, the connection between activities and results is, at best, "indirect" (Henry) or "tenuous" (Charles). Henry went on to state that this lack of a clear goal is helpful to IT in a way, since it may free IT practitioners in higher education to move forward with new technologies more quickly, since there is no requirement to attach the new system to the bottom-line results of the organization.

Another benefit, stated by Adam, is that when he did introduce a very clear, results-oriented approach into his justification for IT projects, his president was very supportive of those projects. Eventually, other members of the president's cabinet at his institution began to adopt elements of the approach. Bob also described a similar experience: he was able to gain support for a voice system upgrade purely on the basis of the reduction in cost to his institution.

Finally, while Henry stated that he feels that higher education lacks a profit motive, he did identify a very clear metric for institutions. He described it as "the institution's overall bottom line . . . our New York Stock Exchange is the *U.S. News and World Report*'s annual ranking. That is higher education's Dow Jones Industrial." Henry noted that the CIO must show how IT affects the teaching and learning activities that support this ranking.

Findings Related to the Decision-Making Process

Seven of eight participants identified a challenge that is related to the lack of a clear set of objectives: the decision-making process. Charles stated, "There's a part of me that yearns for a place where you can just make a decision and go with it." Instead, participants stated that the decision-making process in higher education is time-consuming, cumbersome, and labor intensive. Different participants noted different aspects of this area, however.

Edward stated that the decision-making process is affected by the spirit of autonomy: each faculty member or administrator is focused on his own area of expertise, and that it is difficult for them to look across the organization. Edward characterized the attitude of faculty members as: "I know what I need to do, and as long as you take care

of me, I don't care what you do to the rest of them . . . ." A decision, then, must be characterized in terms of how it will benefit that person in order to be accepted. Fred, on the other hand, noted that people in the higher education environment are "almost phobic" about making a decision. Fred stated that, " . . . [A]cademia has more of this where almost every decision is made by a committee. You've got to go through several different layers of committees. What it does is make decision making extremely difficult and very time consuming."

Findings Related to Human Resources Management

Another challenge described by participants had to do with the management of human resources. CIOs noted that the political environment for state institutions creates constraints on their ability to compensate employees at the level they desire, which creates dissatisfaction.

Limitations in the ability to manage employees in certain ways also create challenges. Participants of the study maintained that disciplinary action is more difficult to apply in higher education. This difference, while it can create frustration in some situations, can also have its benefits, according to one participant, Henry. He stated:

> In my environment I'd have to have a file that would choke a horse [in order to terminate an employee.] . . . That means we manage differently and in some ways we have to manage more benevolently. We can't be really nasty people because we don't want to drive our folks away because it's harder to recruit because we can't pay as much. So I think I have found there is a lot more attention to personnel management issues in higher ed than in the private sector. It gives me a lot better managers. . . .

> We can't just rely on, "I'm not happy with you, you're fired." We have to coach. We have to develop. We have to counsel. I compare managers that I have worked with [inside higher education] with those I have worked with in the private sector . . . and I would not trade my managers for any of those people.

Henry described another positive aspect of the environment related to human resources management. Despite the restrictions on salaries and increases, sometimes employees from outside the environment are attracted to the stability they see in higher education, he stated: "I don't have to worry about coming in some Friday and finding out that [my university] has been purchased by [some other university]."

Summary of Findings for Research Question 2: Challenges to IT Management

Challenges identified by participants comprise the response for Research Question 2. Major challenges identified by participants were:

1. diversity of students and their technology needs;
2. the demand by students for leading-edge technologies;
3. diversity of faculty and their technology needs;
4. many faculty believe themselves to be IT experts;
5. autonomy of faculty allows them to do anything they want with technology;
6. faculty treat IT and other administrative staff as "second-class citizens";
7. the lack of accountability results in a more cumbersome decision-making process;
8. restrictions on levels and methods of funding affect the approaches IT managers take to funding projects, giving salary increases, etc.;

9. there is a lack of representation for IT in the budgeting process, which often results in an inadequate level of funding;

10. the openness of college campuses creates challenges for maintaining a secure IT environment;

11. the lack of a bottom line in the academic environment makes it more difficult to justify expenditures, prioritize projects, and measure results;

12. the decision-making process is cumbersome and time-consuming; and

13. it is more difficult in the higher education environment to discipline employees and, on the other hand, to adequately compensate good performers.

These challenges were further explored in the findings for Research Questions 2a, 2b and 3 in this study.

Research Question 2a: Participant Responses Analyzed by Demographics

With this research question, the researcher explored challenges based on the participants' socio-demographic factors, such as type of institution, length of time the participant had spent in higher education IT, and the type of environment outside higher education in which a participant had managed IT. Participant responses were compared across these factors.

Response Differences Based on Type of Institution

Four of the participants were CIOs at institutions with research-extensive (R1) Carnegie classifications; four participants were CIOs at four-year institutions with non-research-extensive classifications. Participants from both R1 and non-R1 classifications made similar comments regarding environmental challenges. The researcher found that

many of the comments made by participants were very similar in their details, also, regardless of whether the CIO was associated with an R1 or a non-R1 institution.

The researcher also found that the only exception to this similarity was related to the theme of academic culture, specifically autonomy in the academic environment. Both Adam and David are CIOs at non-R1 institutions, and both noted a perception that their faculty probably showed less autonomy than faculty at research institutions. In both cases, the participant identified this lower level of autonomy with the fact that the faculty at their institutions do less research, and thus do not have as compelling a need for independent activity. Adam stated:

> I would think that a place like [a research-extensive university] where the faculty are on the front edge of creating the next internet, it would be very easy for faculty to justify doing pretty much whatever they want to do under the guise of research. We don't have that level of research here – almost no sponsored research. So faculty being able to use that as an excuse . . . now their excuse becomes "My buddy at [a research university] is doing it." Not nearly as compelling.

Response Differences Based on Length of Time in Higher Education

With regard to the major challenges identified in previous analysis, once again the researcher found that there was little variation among participants. CIOs used very similar language, regardless of the amount of time they had spent in the environment.

Response Differences Based on Non-Higher Education Environment Experienced

Of the eight participants in this study, three (Adam, Bob and Henry) had corporate experience only outside higher education. David had small business experience

only. One participant (Fred) had corporate and non-profit experience. Two participants (Charles and Edward) had military and corporate experience. Finally, one participant (George) had experience in corporate, non-profit and military environments.

With regard to the responses given by participants with different backgrounds, the researcher found the following.

1. Participants with corporate backgrounds, or corporate and non-profit backgrounds, identified in their comments all of the challenges associated with managing IT in the higher education environment.
2. Participants with military and corporate experience identified all challenges except human resources management.
3. David, who had experience outside higher education in the small business environment, discussed challenges related to all themes except accountability and human resources management.

As across other demographic differences, responses by participants were very similar, regardless of the environment experienced outside higher education.

Research Question 2b: Environmental Differences Perceived by CIOs

The researcher explored whether participants felt that the challenges they identified in the higher education environment were significantly different from those in environments outside higher education in which they had managed information technology. The findings of the study indicated that all participants perceived many of the environmental challenges identified as unique to higher education.

Challenges Reported as Unique to the Higher Education Environment

Accountability

Several participants stated that there is a lack of accountability in higher education, and that they perceived this as different from most other environments. Bob stated, ". . . . [P]eople don't want to run higher education as a business. . . . [A]nd the tenure system I think sort of feeds this in that there is less accountability . . . less personal accountability." Fred noted, "I'm not sure that the folks in academia are really that concerned about accountability. They avoid accountability." However, Fred also noted that the aversion to accountability he perceives in the higher education environment is similar to the environment he experienced in not-for-profit organizations in the past.

Academic culture: autonomy and academic freedom

Participants were asked whether the level of autonomy for faculty in higher education is different from the level of autonomy of employees in other organizations. Most participants said that they perceived a higher level of autonomy for faculty than for employees in other organizations in which they have worked, and several related the level of autonomy directly to research functions performed by faculty. Charles noted that the value of a faculty member's research and ideas gives him an independent value that makes it difficult for a provost or campus president to exert authority over that person. He stated:

> Because those folks have independent value in and of themselves, they are not necessarily subject to the same kind of corporate or central direction from . . . the President and the University leadership, so there is not a strong presence of dictatorial action from the President, or strong policies, etc. Because we do more

> accommodation of them, we won't tell the world's foremost computational scientist, that, well, we're kind of a Dell shop, . . . if that person . . . wants to use an IBM."

Bob stated that such autonomy arises also from the fact that research projects are not attachable to clearly-established measures of success for the organization, such as revenue – with many research projects, it is difficult to measure value, and it is difficult to measure failure, so it is hard to establish clearly whether the research is something the organization should not do. As an example, Bob said, "It's like in some chemistry things some guys crank days and weeks on formulas and iterations of formulas to get one decimal place in the twentieth decimal of a calculation. What is the relevant value of that?"

While most participants discussed autonomy in terms of an environmental difference, two participants (Bob and David) also noted their perception that this is an area of similarity between higher education and, specifically, the research and development units of other types of organizations. Both perceived that, in such units in corporate environments, researchers would have the same or a similar level of autonomy as do faculty in higher education.

Student and faculty diversity

The researcher found that the diversity of student and faculty stakeholders was described as a challenge by participants. Diversity of two types was described as a difference between higher education and other environments: diversity of customers, and diversity of needs or services. These types of diversity were described as factors that

complicate the job of the CIO. Alternatively, however, most who commented on this factor noted that it also adds a richness to the environment that they enjoy.

David remarked that the customers in the higher education environment are "a broader and more complicated group" than a CIO might have to deal with in another type of organization. Edward described the fact that faculty in each academic discipline on a campus see their area as the most important because they have focused on that area for a great part of their lives, in order to achieve excellence in it. The challenge of dealing with the variety of academic disciplines is to find a way to balance their competing views and needs and, ultimately, the needs of the campus as a whole.

Henry also noted that certain of the IT stakeholders on a campus have multiple and diverse roles among themselves. For example, a graduate student interacts with IT and has needs for IT as he studies and attends classes, but he may also be an instructor and an employee in another area. In such a case, then, one customer interacts with IT as faculty, staff and student.

In regard to those multiple roles, Charles commented on the diversity of student IT needs that must be addressed in the higher education environment. According to Charles, "[IT] touches nearly everything they do," from registering for classes to finding research materials in the library to turning in class work through a learning management system, to participating in gaming in the residence hall. IT practitioners in higher education must deal with one customer in all of these different roles and with all of these very different needs. David compared the university to a small city, with IT as a provider of many different kinds of services to the population of that city.

Funding

As with the subject of diversity, funding differences were characterized in two different ways by participants: funding methods and funding levels. Funding differences of one type or the other were discussed at some point by every participant. Some participants found profound differences in certain specific funding mechanisms found in higher education, such as the year-end sweeping of money from budgets, mixing of capital and operating expenses, and the inability to plan for future expenses such as technology refreshment. Henry noted that the difference is between "magic money" inside the institution, and "real dollars" that are paid to someone outside. "In the private sector," Henry stated, "it's all real money." Charles, however, described the same "soft money-hard money combination" that Henry had discussed, but noted that he had seen the same practice outside of higher education. Such funding mechanisms, he stated, are "different in application but not in concept."

Several CIO's focused on the level, or more precisely, the lack of funding as the main difference between higher education institutions and other types of organizations. David noted that universities "[skate] on thinner ice" than most other organizations do when it comes to funding. He stated, "Oftentimes in higher education what we've done . . . is stretched ourselves beyond what our resources, if we were more sane and rational, are capable of providing." Charles outlined the fact that contention for scarce resources often drives funds that could be spent on IT needs in other directions:

> There's always contention between what you need to do the job and what's available. I contend for funds like any other unit head, and the money spent on IT is money that's not available to hire a new faculty member over in the college of

> whatever. What's funded is generally funded by a set of reasonable or unreasonable, or well understood or not understood at all set of metrics or parameters.

Lack of a quantifiable benefit

That lack of quantifiable benefit was also described by seven of the eight participants as another major difference between higher education and other environments. Adam stated that this is the "single biggest [environmental] difference" in the higher education environment, while Bob noted that it is "the" difference between an institution of higher education and other organizations.

Participants described several aspects of this difference between higher education and other types of organizations. The lack of a bottom line or profit motive to help in making decisions about levels of funding is a significant difference, according to participants. Adam stated:

> Outside of higher ed if you have an idea that you need funding for a pet project, anything of that nature , the critical piece of that is: What's its effect on the bottom line going to be? If it's going to be positive, you've got a good chance of getting money. If it's going to be negative, you have no chance of getting money. If it's going to be something in between, your chances lie somewhere in between. In higher ed they don't have as good a measuring stick.

David also noted that the focus most organizations have on a bottom line simplifies most of the relationships within the organization. This bottom-line focus is beneficial to other organizational units such as IT, as well. Without that, IT must face "the entire IT landscape," rather than just those IT components that serve the narrow purpose of the

organization. Another difference, according to George, is that IT personnel in higher education are forced to establish as best they can a common language for communicating across different organizational units. Typically in other organizations, he stated, that common language is provided by the profit motive.

Decision making

Participants described several aspects of the higher education environment that are different from other environments, and which contribute to the cumbersome nature of the decision-making process. Edward noted that faculty and administrators often focus on their own areas of expertise rather than the organization as a whole. This makes it difficult to make a decision based on something that serves the organization as a whole. Instead, according to Edward, a decision must be characterized in terms of how it will benefit individuals in order to be accepted.

Another difference in the higher education environment, as noted by participants, is the necessity to communicate the aspects of every decision across the organization. Fred felt that administrators in higher education often do not seem to have the authority to make decisions themselves, but must follow the path of including others in the decision-making process. He did note a similarity between higher education and the not-for-profit sector in this regard, in that "every decision is made by a committee."

Adam described another aspect of the decision-making process that is different in higher education: the fact that so much time is spent selling an idea or decision to people who have no expertise in the area in question. His example was a decision made by his campus to choose a particular telephony solution. According to Adam, faculty were not included in the original decision-making process and were very upset. Adam stated,

"Why should faculty care as long as you pick up the phone and get a dial tone? . . . So leave that decision to the people whose job it is to provide dial tone." He noted that employees in the corporate environment would never be asked to give their opinions as to whether the organization should change the telephone system.

Human resources management

Each of the challenges described by participants related to human resources management (constraints on compensation levels imposed by the state, and limitations on the methods available to discipline an employee) were perceived by participants as differences between the higher education environment and other environments they had experienced. With regard to compensation levels, Bob remarked:

> Salary is a bit of an issue. That's always a challenge. You got big brother in the state telling you what they think is reasonable. You have certain conditions you have to operate under which may or may not – technology is very different from the other stuff because there are changes every six months. That is hard to make most people understand.

In the same vein, Charles noted that ". . . you understand [limitations on salary increases] when the whole town is in a slump, but when the markets are up and the governor proposes a 3% increase, and that's all you're gonna get . . . I have a difficult time rewarding people, and that bothers me."

Henry commented on the environmental differences related to disciplining employees. He stated, ". . . higher ed . . . has a great many sets of rules about hiring people and firing them." Fred noted that when an employee is not performing, "you can have tremendous difficulty getting that person out of the system."

Edward identified another difference in this area. He described his difficulty with getting support for development programs for IT staff. He believes that this results from the fact that, in the university environment, faculty are expected to have a level of individual commitment to their own development and advancement. This attitude is transferred to staff, according to Edward, who felt that his university needs to adopt a different position, treating development as an investment in the employee.

Environmental Differences Reported Independently by Participants

In addition to exploring whether participants felt that the challenges they had identified were unique to higher education, the researcher also explored whether participants identified other differences between higher education and other environments they had experienced. In this assessment, participants gave short-answer responses describing three to five environmental differences, without reference to the challenges previously discussed. Their responses are provided in Table 2, in the column titled, "Differences Between Higher Education and Other Environments."

The researcher categorized each difference noted by a participant, using a key word or phrase. These key words are shown in the third column in Table 2. Key words were compared to the participants' previous comments regarding challenges that were different in higher education as compared to other environments. The researcher found that the central thought of many of the responses shown in Table 2 matched the challenges described by participants related to Research Question 2. These included academic culture; accountability; diversity; financial or funding mechanisms; human resources management; and information security. Participants also mentioned leadership issues in their responses here, but did not mention these elsewhere in their

discussions of challenges. Participants also gave positive responses regarding environmental differences, such as the freedom to try new technologies and less pressure to perform.

Table 2.

Environmental Differences Reported by Participants

Participant	Differences Between Higher Education and Other Environments	Key Word or Phrase
Bob	Academic freedom	Academic culture
Fred	More freedom to experiment/try new technologies	Academic culture
Henry	Adoption of innovation and new technologies	Academic culture
Fred	Less pressure to perform	Academic culture
Fred	More ideological freedom	Academic culture
Adam	In other organizations, the "Bottom Line" is the scorecard – improves accountability	Accountability
Fred	Less accountability	Accountability
George	Lack of accountability outside IT organization	Accountability
George	Lack of enforcement to policy and standards	Accountability
Bob	Dependence on State bureaucracy	Bureaucracy
Edward	Level of need for interaction and communication	Collaboration
Fred	Collaborative environment	Collaboration
Charles	Cultural diversity of constituents	Diversity
David	Broader, more diverse constituencies	Diversity
David	Broader, more diverse customer activities	Diversity
Henry	Customers served and attributes of customers served	Diversity
Charles	Diverseness of mission	Diversity
Charles	Complexity and diversity of technology environment	Diversity
Bob	Funding mechanisms	Funding
Edward	Technology not funded as well	Funding
Henry	Financial environment/budget – resources availability, allocation, and management	Funding
George	Integration of technology in the overall strategy of the organization	Funding
George	IT is undervalued	Funding
Charles	Distributed/decentralized authority	Leadership

Edward	Level of planning for leadership transition	Leadership
Edward	Higher education is less structured	Leadership
Henry	Leadership structures/decision structures	Leadership
Henry	Staffing resources and management styles	Leadership
Adam	Different employee motivational techniques are needed – in higher ed it is almost impossible to fire non-producers. Success comes from motivating even the worse performers.	Human Resources Management
Edward	Information security	Information security
George	Higher acceptance of risk and liability with compliance and security	Information security

Summary of Findings for Research Question 2b

Participants perceived many of the challenges that affect IT management in higher education as unique to that environment:

1. there is a lack of accountability in the higher education environment compared to other environments

2. there is a higher level of autonomy for faculty than for employees in other organizations in which they have worked, with the exception of the research and development units in other types of organizations

3. IT customers and their needs were perceived to be more diverse than in other types of organizations

4. IT funding mechanisms were considered to be different in the higher education environment

5. The lack of IT funding was perceived to be a major difference between higher education institutions and other types of organizations.

6. The lack of quantifiable benefit was described as a major difference between higher education and other environments. This was found to have three aspects:

    a. it complicates the decision-making process;

b. it causes relationships between IT and other areas to be more complicated; and

c. it results in the lack of a common language with which IT people can communicate with others in the organization.

7. The decision-making process is made more complicated in higher education than in other environments in several ways:

a. faculty and administrators focus on their own areas of expertise rather than the organization as a whole, so that decision-making criteria must be directed at the individual;

b. decision-making is often conducted by committee; and

c. it takes more time to promote a decision to people who have no expertise in the area with which the decision is associated.

8. Constraints on compensation levels imposed by state government were perceived as differences between higher education and other environments

9. The process available for disciplining poor performers was perceived to have significant limitations in higher education as compared to other environments.

10. It was perceived to be more difficult to get support for training staff than in other environments, due to the expectation for personal development among faculty.

Research Question 3: Effects on IT Management of Environmental Challenges

The researcher sought to determine whether and how the challenges in the higher education environment affected IT management practices. Participants reported a number of different ways in which their management practices are affected.

One major effect of environmental challenges in higher education is the need for the CIO to achieve balance across many competing priorities. For example, a balance must be established between providing technology to meet very diverse student expectations, and the cost justification for that technology (according to Bob); and between the principles of academic freedom and "the fact that we can't have chaos on the network" (according to Fred). Achieving this balance is made more complicated by the lack of a bottom-line driver for decision making.

Participant responses, however, suggested that involvement of the various stakeholders, especially faculty, in the IT decision-making process can be used as a mechanism to ensure that resources are balanced across many competing needs, and to ensure as much as possible that the decisions made to achieve that balance are understood. Henry put it most succinctly, "I don't have that sort of fundamental way [an institutional bottom line] in which I can go about convincing the campus that it needs to invest in IT. . . . So you as an IT person have to be successful in getting the institution to understand how IT fits."

A formal or informal governance process was identified by participants as the means for getting the input and understanding necessary to be successful. In most cases, that structure seems to be used by the CIO as a mechanism to ensure that faculty have a place to air their suggestions and concerns. Adam and Henry, for example, both noted that they have established a purely advisory structure, one that allows for input by faculty, without promising a definite response to that input.

It is especially important, according to participants, to ensure that the communication and governance process educates faculty on the goals, priorities and

practices of IT on campus. Adam stated, "You have to have faculty at least somewhat behind you in order to get an opportunity to get anything done. Some people in our jobs tell us that students are the most – the biggest barrier to getting the job done. But it's actually faculty in my opinion." Edward stated this need in a different way, although just as directly, "And the more [faculty] know, the less they whine. And so, the better we can communicate to them the needs and the requirements, the better able they are to deal with this."

The diversity of needs and the lack of a bottom-line driver to use in prioritizing them, however, can also have a positive effect on IT management in the higher education environment, according to Henry: IT in higher education is very much on the leading edge compared to most corporate environments. Apart from technology companies like Microsoft and Google who focus their research and development efforts as a basic part of their business, Henry noted, the use of tools in higher education IT is far beyond what many companies deploy.

Participants described several effects of the lack of accountability and the atmosphere of autonomy they perceived in the higher education environment. Bob noted that faculty want to be involved in decision making, but do not want to be responsible for the consequences of the decisions. He stated that this makes it difficult to get consensus, which then causes units to pursue their own solutions, decentralizing IT on campus and adding complexity to his attempts to provide stable campus solutions for systems like electronic mail, and good support. Adam, Charles, Edward, Fred and George all described similar effects on their ability to provide a stable and reliable IT environment. Fred put his thoughts on the conflict between IT management principles and these aspects

of the academic environment this way: “I have no problem with [academic freedom], but it makes it difficult when [faculty] start applying those concepts to IT.”

Several of the funding-related effects on IT management that were noted by participants were related to the lack of clear goals (“the bottom line”) for the institution. However, Bob also described the effect of state funding restrictions on his IT management practices. In his state, funding for most projects cannot be carried over from year to year, so there are artificial boundaries that are created on how he plans and manages some projects.

On the positive side, David described the availability of some types of funding (such as student technology fee) as very valuable in moving the institution’s IT environment forward. These funds can be more readily available and used with greater flexibility in cases where experimental approaches are being taken, he remarked.

A major effect of the nature of the funding process in higher education, according to participants, is that IT must be “at the table” when decisions are being made. George noted the importance of integrating IT decisions with the strategic goals of the institution, and both Fred and George noted the importance of having a governance structure that brings IT management into the decision-making process when funds are allocated.

Many of the IT management effects described above have their ultimate impact on the decision-making process in higher education. For example, an environment that includes many diverse customers and their needs, in which there is a lack of accountability and a prevailing emphasis on academic freedom and autonomy, complicates and ultimately slows down the decision-making process. As an IT manager, for example, Adam noted that he has accepted the fact that he has allowed his strategic

planning efforts to "slow to a crawl" because it is so important to get input from faculty in order for those efforts to be successful.

Human resources challenges in the higher education environment have effects on IT management, also. One of these is simply the time and effort required to deal with situations where an employee is not performing at a satisfactory level. As noted above, Henry remarked that, "in my environment I'd have to have a file that would choke a horse [in order to terminate someone] unless the guy did something physical." On the other hand, he felt that, as a result, IT managers in higher education must be better than managers outside the environment, because they must take the time and have the skills themselves to coach and develop the staff that they have, rather than seeking to terminate and replace them.

Summary of Findings for Research Question 3

The researcher found that participants provided many examples of the effects on their IT management practices of the challenges present in the higher education environment. In order to be effective in managing IT in the higher education environment, the CIO must:

1. achieve balance across many competing priorities;
2. involve stakeholders in a formal or informal governance process to involve them in decision making and educate them on IT needs and priorities;
3. adjust project plans and approaches based on funding mechanisms controlled by the state;
4. provide stable and reliable IT solutions in a complex and often decentralized

environment in which it is difficult to get consensus on priorities and approaches, and in which the decision-making process is often slow and cumbersome;

5. be involved in the allocation of funding at the highest levels of the organization in order to be effective; and

6. adopt time-consuming approaches to correcting situations with problem personnel and, as a result, hone their management skills to handle these situations.

Research Question 4: CIO Attitudes

The researcher explored the attitudes of CIOs who have moved from outside the environment into higher education. The researcher found that participants were able to identify both positive and negative aspects of the environment. The researcher also found that some of the challenges and IT management effects previously identified by participants were communicated in the form of advice that participants would give to someone considering a move into the environment, or considering hiring a CIO from outside higher education into a position at a college of university.

Aspects of the Higher Education Environment with Positive Effects on Attitude

Several participants described more than one aspect of the higher education environment about which they were positive. Table 3 shows a summary of responses. There were 10 different responses across the eight participants.

Half of the participants described the sense of purpose they feel working in the higher education environment as a positive aspect. Two of those indicated, using almost the same words, that they felt they are making a difference rather than just making money. From a professional satisfaction perspective, aspects such as freedom to experiment (and to fail), the ability to innovate, and the complexity and diversity of

activities were described as important. More personal aspects such as the sense of purpose noted above, and the stability and relatively lower stress level were discussed most by participants. The response related to the benefit of having a football team was made somewhat facetiously, in the judgment of the researcher.

Table 3

Positive Aspects of the Environment Reported by Participants

Summary Response	Reflection of Detailed Participant Comments	Number of Participants With This Response
Campus Environment	Greater sense of energy than other environments	1
Discovery	Ability to work with leading-edge technologies	2
Diversity	Working with different kinds of people, different kinds of activities	2
Football	Other environments do not have	1
Freedom	Freedom to experiment, and to fail	2
Purpose	Sense of reward based on overall purpose of higher education	4
Quality	Overall quality of the American higher education system	1
Stability	Job security	2
Stress level	Environment is less competitive than others	2
Student interaction	Working with students is fun; allows you to stay young	2

Aspects of the Higher Education Environment with Negative Effects on Attitude

Responses about negative aspects of the higher education environment were also various and, as with the responses about positive aspects of the environment, participants frequently gave more than one answer. Table 4 shows a summary of responses. There were nine different responses across the eight participants.

Responses about negative aspects were very consistent with the responses of participants to questions about challenges in the environment. Once again, half of the participants gave an answer that was the same: the decision-making process is a consistent element of frustration for these CIOs. Adam's words reflected the ideas of the group: "The other [element I like least] is the inability to just go ahead and make decisions and go ahead and push through them because they are good decisions. Instead of having to ask everybody and their brother if it is okay for you to do this good decision."

Table 4

Negative Aspects of the Environment Reported by Participants

Summary Response	Reflection of Detailed Participant Comments	Number of Participants With This Response
Lack of accountability		1
Lack of a bottom line	Lack of a clear assessment criterion that is understood by everyone	1
Bureaucracy	Constraints that result from state bureaucracy	2
Decision-making process	Inability to make decisions, and the cumbersome communication process that has to be completed before a decision is made	4
Governance	Lack of rules or guidance in this area	1
Human resources	Inability to discipline and, conversely, to reward employees adequately	2
Lack of resources	Not having the resources necessary to do the job	1
Pace of change	Slow	1
Value of IT	Difficult to get people to understand it	1

Advice for a CIO Considering a Move into Higher Education

In answering this question, participants were given the chance to respond in a way that reflected their own satisfaction or frustration with the environment on a general level, and to provide specific guidance reflective of their own experience with managing IT in higher education. Several participants cautioned the prospective CIO about particular environmental aspects, most of which are reflective of the challenges previously communicated: the lack of a consistent system of measurement (i.e. a bottom line); the lack of accountability; and the sometimes unprofessional behavior of faculty. Two participants went so far as to suggest that the prospective CIO candidate should actively evaluate the higher education environment generally, and the environment at a particular institution, before considering a change. Charles stated that the candidate should "talk to a lot of people first" to understand whether he or she would be able to handle the slow pace of change. Fred suggested that the candidate actually "take a furlough from work and try it out first," because of his perception that the environment is so different.

There were also several suggestions for how the candidate might be most effective and successful having made the transition to higher education. These included understanding the environment and who the customer is at a particular institution, cultivating relationships with faculty early on, and involving all stakeholders in IT decision making. Fred observed the following about customer relationships in the higher education environment:

> In the academic world, quite often you're going to be dealing with the same person for life. And it's a lot like marriage. Now, there's a comparison for you. And in the corporate world you can just buckle down and . . . this clown has got

> to die, be promoted or leave within three years, whoever you're dealing with. That's not true in the academic world. That person's going to be there for the rest of your natural life. So, you know, be prepared for that.

However, even though participants cautioned prospective CIOs about certain environmental aspects, or to adequately prepare themselves for making such a transition, not a single participant suggested that making the transition is undesirable. This parallels in general the responses given by participants to the question of whether they are satisfied working in higher education, a question to which all gave positive answers.

Summary of Findings for Research Question 4

The researcher captured the general attitudes of participant CIOs regarding the higher education environment. All participants reflected generally positive attitudes about the environment, although they also clearly articulated what they found negative about the environment. Charles summed up most succinctly the set of responses. He was asked, "Are you happy that you made the move into higher ed?" Charles answered, "Very much so. Most days."

In reflecting upon the environmental aspects they perceived to be negative, CIOs recognized again many of the challenges they had described previously. Participants further validated both their positive and negative attitudes when asked to provide advice to others considering the same career change they had made: they did not caution against it, but they did recommend that a candidate consider carefully for himself some of the specific negative aspects of the higher education environment before making such a change.

Overall Summary of Findings

This study focused on the perceptions of CIOs who had moved from outside into the higher education environment about the challenges of managing IT in the higher education environment, whether those challenges were different from other environments in which they had worked, and what the effects of those challenges were. Participants identified challenges related to diversity and the requirement for technology innovation offered by student stakeholders; the lack of accountability; aspects of academic culture such as academic freedom and faculty autonomy; funding levels and mechanisms; the environment for information security; the lack of a consistent organizational performance measure (i.e. a bottom line); the slow and cumbersome decision-making process; and specific difficulties related to human resource management.

Participants perceived that aspects of each of these challenges are significantly different from other environments they have experienced. They also perceived that these differences affect their IT management practices in significant ways. However, participants were still positive about their experiences in the higher education environment. Environmental aspects such as a strong sense of purpose perceived to be inherent in the environment, and the ability to work with young people in an environment where there is a lot of freedom to innovate, outweighed the challenges encountered by those who lead IT on a university campus.

CHAPTER 5

DISCUSSIONS, CONCLUSIONS AND IMPLICATIONS OF FINDINGS

The purpose of this study was to document perceptions related to managing IT of CIOs who had moved into higher education environment from other environments. As a key part of this study, the researcher investigated the perceptions of the participating CIOs regarding challenges encountered in the higher education environment, and whether those challenges are different in higher education compared to other environments in which they had managed IT. The researcher also investigated the effects of the environmental challenges perceived on participants' IT management practices and attitudes about the environment.

Eight interviews were conducted with CIOs from institutions in the University System of Georgia and the Southern Regional Education Board. Transcripts of those interviews were reviewed for themes related to challenges associated with IT management in the higher education environment. These findings were reported in Chapter 4.

In this chapter, the researcher will further review the findings of the study. The findings were converged with ideas described in the review of literature. The researcher's conclusions based on these findings were described, along with implications of this study. Finally, recommendations for further research were made based on the study's findings.

Research Findings

CIOs in the higher education environment were found to have many different challenges. Students present challenges for IT management because their needs are very diverse, and often they demand the deployment of leading-edge technologies without reference to what can be supported by the IT staff. Faculty also present challenges because, like students, their technology needs are diverse and the spirit of autonomy in higher education creates an environment where faculty often feel they can do whatever they want to do. It is also a challenge that, very often, faculty treat IT and other administrative staff as "second class citizens."

To add to these challenges, the lack of accountability in the higher education environment results in a more cumbersome decision-making process. A further complication results from the fact that funding levels and methods are restricted, and affect the choices IT manages can take to funding projects, give salary increases to their best-performing staff, etc. There is also a lack of representation for IT in the budgeting process, which exacerbates this situation because it often results in inadequate funding for IT needs and projects.

The open environment of a college campus is a challenge to IT management practices that are focused on maintaining security and stability. That open environment lacks the clear, bottom-line goal experienced in other organizations, a goal which unifies the organization and makes it easier to justify an expenditure, prioritize a project, and measure results. As a result of several of these factors, the decision-making process is cumbersome and time-consuming. Finally, it is challenging that in the higher education

environment it is more difficult to discipline employees and, on the other hand, to adequately compensate good performers than in other environments.

The researcher found that the challenges to IT management identified in the higher education environment were not perceived to be significantly different based on socio-demographic factors of the participants. Slight variations in responses based on the type of institution in which the CIO worked were found.

The researcher also found that participants did perceive many of the challenges that affect IT management in higher education as unique to that environment. For example, participants perceived that there is a lack of accountability in the higher education environment compared to other environments. Participants also perceived that there is a higher level of autonomy for faculty than for employees in other organizations in which they have worked, with the exception of the research and development units in other types of organizations. The diversity of IT customers and their needs was perceived to be greater than in other types of organizations.

Funding and funding mechanisms were perceived by participants to be different in higher education. In particular, participants felt that the lack of IT funding was a major difference between higher education institutions and other types of organizations.

The lack of quantifiable benefit was described as a major difference between higher education and other environments. This was found to have three aspects:

1. it complicates the decision-making process;
2. it causes relationships between IT and other areas to be more complicated; and
3. it results in the lack of a common language with which IT people can communicate with others in the organization.

The decision-making process was found to be a major difference between higher education and other environments. Faculty and administrators focus on their own areas of expertise rather than the organization as a whole, so that decision-making criteria must be directed at the individual. Decision-making is often conducted by committee and, in many cases, those who are making the decision have little or no expertise in the area with which the decision is associated. As a result, the decision-making process take more time.

There were several environmental differences that were associated with human resources management. First, constraints on compensation levels imposed by state government were perceived as differences between higher education and other environments the participants had experienced. Next, the process available for disciplining poor performers was perceived to have significant limitations in higher education as compared to other environments. Finally, it was perceived to be more difficult to get support for staff development than in other environments, due to the expectation for personal development among faculty.

In order to be effective in managing the challenges and environmental differences related to IT in the higher education environment, the CIO must be able to balance resources across many competing priorities. The ability of the CIO to balance resources is enhanced when the CIO involves stakeholders in a formal or informal governance process to involve them in decision making and educate them on IT needs and priorities.

At times, there is a need to adjust project plans and approaches based on funding mechanisms controlled by the state. In order for plans and approaches to be most

effective, the CIO must be involved in the allocation of funding at the highest levels of the organization.

The CIO's job is complicated because the IT staff must provide stable and reliable IT solutions in a complex and often decentralized environment in which it is difficult to get consensus on priorities and approaches, and in which the decision-making process is often slow and cumbersome. The CIOs in the study identified many of the challenges of managing IT in the higher education environment as having a negative impact on their attitudes about the environment, but overall their feelings about working in the environment were positive.

Discussion of Findings

Eight participants in this study, all of whom are CIOs at four-year institutions in the southeastern United States, reported their perceptions regarding challenges experienced by IT managers in the higher education environment. According to the participants, many of these challenges represent distinct differences between the higher education environment and other environments in which they have managed IT. Participants also characterized several of these challenges as negative influences on their attitudes toward working in the environment, although there are many other environmental influences that compensate for these negative elements.

Challenges to IT Management in the Higher Education Environment

Participants in this study identified the diversity of students as a challenge to IT management in higher education. The same person may interact with IT as a student, a faculty member, and as an employee, for example, more or less at the same time. This finding supports the idea that institutions of higher education struggle with the definition

of roles for such stakeholders and, as a result, how to respond and provide services to them in those roles (Hoffman & Kretovics, 2004; Shelley, 2005).

Breen et al. (2001) described another challenge, the demand for institutions to deploy leading-edge technologies, stating that institutions risk real student dissatisfaction if they fail to deploy IT innovatively. Participants in this study noted that students often do not understand and are unhappy when the institution they attend fails to implement a new technology they are using because of a concern for something like network stability. In some cases, a student does not understand that the innovative new component or software application he has installed on his home network does not scale appropriately to run on a campus network.

Lewis et al. (2003) described the importance of independence and democracy in academic culture. This creates challenges for IT management because leaders have less influence over the reaction to changes in the environment (Lewis et al.). The researcher found that participants identified autonomy and academic freedom as challenging aspects of academic culture. Their major focus with reference to this area, however, was not related to change management, but rather that faculty use academic freedom as a justification for doing whatever they want to do.

Participants in the study described challenges associated with the relationship between faculty and IT staff, noting that faculty often tend to demonstrate a lack of respect toward such staff, even when those staff members are providing assistance to them. This finding supports the idea that the value systems found in the culture of academia can result in faculty members exhibiting "academic snobbery and . . . contempt" when dealing with administrative personnel (Balderston, 1995, p. 133). The

risk identified by one participant that is associated with this is that such attitudes may result in the failure of IT personnel to communicate with and to understand the needs of their academic partners. Since IT personnel in higher education succeed by supporting the goals of those who teach, learn and perform research (Jackson et al, 2004), such a failure in understanding can reduce their effectiveness.

It was noted by Maltz and DeBlois (2005) that one of the challenges to be expected by IT professionals trying to implement an assessment approach is the resistance of the academy to assessment in general. Participants in this study described repeatedly the resistance they encounter to the idea of accountability that is the basis for assessment.

Pusser and Doane (2001) described challenges related to control mechanisms exerted by state legislatures on the higher education environment, while Balderston (1995) noted that the budgeting process in higher education can result in a failure to plan and budget for current and future expenditures. Participants in this study also referenced as difficulties the influence of state legislatures related to budget allocations and the methods by which items can be funded. The lack of alignment between IT needs and funding allocated to meet those needs were perceived by participants as obstacles to effective management.

The current environment for information security is a challenge for IT in higher education, where environments have traditionally been open and where the tenets of inquiry and academic freedom are in opposition to the restrictions necessary to reduce risk (Maltz & DeBlois, 2005). The researcher found that participants reported challenges in the area of information security, but also noted that the environment seems to be

changing. Several participants acknowledged that they have been able to push projects forward that would have otherwise been rejected because of the value of those projects for creating a move secure environment.

Participants in this study identified several environmental aspects that were perceived as challenges by CIOs but not described in the literature found by the researcher. These were related to the lack of a profit motive or bottom line; the decision-making process; and human resources management.

The lack of a profit motive was described by one participant as the primary difference between higher education and other environments. In the corporate environment the results of an organization, described by participants in terms of the profit motive or bottom line, are perceived to provide a unifying goal for everyone in the organization. Participants expressed the belief that institutions of higher education lack such a goal, and described the difficulties that arise from not having such a clear goal for the organization: IT projects and proposals are more difficult to identify, promote, prioritize, and evaluate as a result, and it is harder to identify a unifying language that helps IT personnel to discuss initiatives with their stakeholders.

Participants also described environmental challenges in higher education associated with managing employees. There is a paradox in this case: on the one hand, it more difficult to discipline an employee who is a problem; on the other hand, participants also noted that the CIO often cannot compensate his strong performers adequately. Another ironic aspect to this is that, as one participant noted, the higher education environment may create better managers, since those who manage in this environment must be especially resourceful and creative in order to deal with these issues.

These two sets of challenges (the lack of a profit motive and those related to human resources) were indicative of a third area identified by participants as creating significant barriers: the decision-making process in higher education is much more cumbersome, and requires much more time and effort, than participants experienced in other environments. Participants noted that administrators in higher education often seem to fear making a decision, and that the process of making all decisions by committee is a significant barrier to moving forward with IT initiatives.

Effects of Environmental Challenges on the CIO

The findings of this study indicate a variety of challenges for the CIO who manages IT in the higher education environment. These challenges can be grouped generally in two ways: (1) challenges that expand the complexity or number of requirements to which the CIO must respond; and (2) challenges that limit the capacity of the CIO to respond as effectively as possible. Challenges identified by participants in this study that expand requirements and complexity are:

1. diversity of students and their technology needs;
2. the demand by students for leading-edge technologies;
3. diversity of faculty and their technology needs; and
4. the openness of college campuses, which makes it more difficult to maintain a secure IT environment.

Challenges identified by participants that limit the ability of the CIO to manage effectively are:

1. autonomy of faculty allows them to do anything they want with technology;
2. faculty treat IT and other administrative staff as “second-class citizens”;

3. the lack of accountability results in a more cumbersome decision-making process;

4. restrictions on levels and methods of funding affect the approaches IT managers take to funding projects, giving salary increases, etc.;

5. there is a lack of representation for IT in the budgeting process, which often results in an inadequate level of funding;

6. the lack of a bottom line in the academic environment makes it more difficult to justify expenditures, prioritize projects, and measure results;

7. the decision-making process is cumbersome and time-consuming; and

8. it is more difficult in the higher education environment to discipline employees and, on the other hand, to adequately compensate good performers.

Summarizing these two groups of challenges, it may be said that the basic task of the CIO is to maintain a very complex and demanding environment with scarce resources, but without the specific goals and effective decision-making processes that in other environments provide assistance in doing so.

The challenges to IT management in the higher education environment may also be grouped in a different way. Some of these challenges, such as the diversity of students, the spirit of autonomy that allows faculty members in many ways to decide their own course, and the relatively low levels of funding for IT in higher education call for IT and its leaders to be agile and creative in satisfying the needs of their stakeholders. Other elements, however, prevent this: the decision-making process is slow and labor-intensive, and the environment lacks a strong, defining goal that unifies the organization and allows quick assessments of the value or results of a particular proposal.

These different groupings of challenges experienced by the CIO in higher education suggested the obvious: the CIO is caught between many competing forces, and must operate without basic mechanisms such as clear organizational goals that, in other environments, help in the process of setting priorities and making decisions. As Schubert noted in 2004, the CIO is "responsible to everyone; and master of so little" (p. vii). This is the central area of frustration for CIOs in this environment: the combination of forces makes it difficult for them to act at all in some cases, much less with the spirit of innovation and agility that such a complex environment demands. The CIO's goals for change simply conflict with the glacial pace of change found in higher education (Dearstyne, 2006).

Challenges to the CIO Compared Across Environments

The findings of this study also suggested that this combination of factors was perceived by participants to be unique to the higher education environment. Major factors that contribute to this unique situation include the diversity of stakeholder needs and the lack of mechanisms that enforce accountability and order in dealing with that diversity. One of the major factors identified by participants that is absent from the higher education environment but present in others is a "bottom line" measure against which initiatives and results can be evaluated.

Perhaps the overall effect on the CIO in higher education of these factors is that everything he does takes more time than it would in other environments. Participants identified several aspects of this in their comments, e.g. the time-consuming decision-making process; the time it takes to sell an idea; the time it takes to go through the steps necessary to discipline a problem employee; and the time devoted to the governance

process. Technology is about change, and these factors exacerbate the slow pace of change identified by one participant as a negative element of the environment.

Challenges in the environment were identified consistently by participants in this study, regardless of the type of institution they served. With one exception (the perception of faculty in research institutions as claiming more autonomy than those in institutions focusing more intensively on teaching), responses by all participants were very similar. The challenges that participants identified, the environmental differences they perceived, and the responses in terms of management practices and attitudes they described were very much in harmony, sometimes even to the point where they used the same words or phrases.

Responses of the CIO to the Challenges of Managing IT in Higher Education

Although many of the challenges of managing IT in the higher education environment were perceived by participants in this study to be unique, the techniques they described for dealing with these challenges in most cases were not. In order to manage IT successfully in this environment, the CIOs in this study engaged in a variety of approaches, the most important of which were communicating and developing partnerships with stakeholders. The idea of communication and collaboration as critical skills in leading IT in a complex environment was present in many of the participants' responses. These findings supported the contention that any successful CIO must place emphasis on relationship-building, teamwork, and understanding the environments of their customers (Weiss & Anderson, 2004), and that communication skills and the ability to exert charismatic influence are also critical to the success of the CIO (Kotter, 1990; Romanczuk & Pemberton, 1997).

The researcher found that the CIO must balance many competing priorities in order to be effective. In order to balance those priorities and to try to ensure that his organization has the resources it needs, the CIO must work with his stakeholders to understand their needs and to communicate his. As noted in the findings, the higher education environment is one in which faculty and administrators focus on their own areas of expertise rather than the organization as a whole, so that decision-making criteria must be directed at the individual. According to Lewis et al. (2003), such an understanding of the individual behavior of their customers is critical to the success of IT professionals in any environment.

The researcher also found that it is critical that the CIO be involved in the process of allocating funding for the campus at the highest levels. This supports the contention of Maltz and DeBlois (2005) that the CIO must work with other senior administrators to develop methods for identifying expectations and priorities related to funding for IT. Negotiation skills are seen as critical to the role of any CIO (Weiss & Anderson, 2004), so this is not a requirement that is unique to the environment. Unfortunately, one of the challenges identified by CIO participants was that, in the higher education environment, IT leadership is often not involved in high-level decision making and, as a result, funding and support for IT initiatives are often inadequate. However, the researcher found that CIOs did register success when making business-oriented arguments in support of a particular project, in both funding- and security-related discussions.

Effects of IT Management Challenges on Attitudes

The findings of this study suggested that the unique challenges to managing IT presented by the higher education environment do not prevent CIOs from having positive

attitudes about the environment and their work in it. There are a number of environmental aspects that outweigh the challenges presented by the environment for IT management, according to these CIOs. Participants were most satisfied with the sense of purpose, the amount of personal freedom, the lower stress level, and the greater job stability provided by the environment. They were least satisfied with several factors described as challenges in the environment, most notably the decision-making process; the level of bureaucracy; and areas of difficulty in human resources management such as the inability to discipline employees who are not performing, and the inability to provide satisfactory compensation to strong performers. Despite the presence of these negative factors, the researcher found that each participant was satisfied with his decision to move into higher education. However, when offering advice to other CIOs considering the same move, participants cautioned that each individual should consider some of the specific negative factors present in the environment in order to evaluate whether he can accept them or not and be satisfied in the environment.

Conclusions

The researcher reached the following conclusions from this study.

1. The challenges identified by participants are a "perfect storm" of factors that combine to complicate the job of IT management in higher education. These factors include: diverse needs of faculty and students, and the demand by students for leading-edge technologies; faculty autonomy and lack of accountability; restrictions associated with funding levels and methods; and the lack of a unifying goal for the organization.
2. The higher education IT environment is complex and diverse. Faculty focus

on different disciplines, each of which has its own needs for IT. Students also have very diverse needs for technology and a variety of expectations about what should be deployed.

3. On the other hand, resources are inadequate to meet all of the diverse needs of faculty and students, and there is no strong goal-setting mechanism that helps to guide decisions about how to use these limited resources.

4. As a result, the decision-making process in higher education is time-consuming and labor intensive.

5. The combination of factors that drives this cumbersome decision-making process is unique to the higher education environment, but is similar across four-year institutions, regardless of their size or mission.

6. CIO's who enter higher education from outside bring with them knowledge and practices learned in very different environments. In some cases, those practices learned outside can be brought to bear to manage technology in new ways in the higher education environment. However, in most cases, the higher education environment shapes the practices of these CIO's, who adapt to its unique aspects in order to succeed.

7. The CIO's best practice in order to be effective in the complex higher education environment is to establish strong relationships and communication processes with key campus stakeholders. These are critical to the understanding of needs, priorities, goals, activities, challenges and successes by both IT professionals and those they support.

8. Time and effort required to work through the decision-making process

are significantly greater in higher education than in the corporate, military and not-for-profit environments, and are a source of frustration for the CIO in higher education.

9. The challenges of working in the higher education environment are outweighed by the value CIOs perceive in higher education's contribution to society.

10. An individual who is considering a career move into the higher education environment in the role of CIO must consider specific challenges carefully to assess whether he or she can be satisfied in this unique environment.

Implications of the Study

The perceptions and experiences communicated in this study provide insight into the challenges associated with the role and practices of the CIO in higher education. CIOs in organizations outside higher education may find value in this study as they consider applying for a position at a university or college campus. Understanding the aspects of the higher education environment and the challenges that may be encountered may assist these individuals in defining questions to ask during the interview process, and in evaluating the environment at a particular campus relative to areas such as governance, decision-making, the budget process, and relationships between IT and key stakeholders.

In a similar fashion, senior administrators in higher education may find value in this study, not only if they have the opportunity to consider hiring a CIO from outside the environment, but also more generally in understanding the attitudes, frustrations, approaches, challenges and opportunities for success of their own CIO. Support for the campus CIO from senior administration may include things such as ensuring that the

CIO is included in decision-making about funding, assisting in the development of key relationships on campus, and helping to define an effective governance process. If other senior administrators partner with the CIO on these types of activities, this nay help him to be as effective as possible.

At the beginning of this study, the researcher felt that the results of the study might provide information to IT practitioners regarding best practices. While certainly the participants provided information on those practices they had found effective, their responses were largely in concert with the prevailing literature. The importance of building relationships, communication and collaborating with stakeholders were recognized in the literature as keys to success for IT practitioners, and the participants echoed these thoughts.

Finally, the study has had implications for the researcher in terms of her own work. During the course of this study, the researcher changed jobs, moving from the CIO position at Georgia Southern University to a role as Executive Assistant to the CIO at the Georgia Institute of Technology. During the course of this study, then, she had experienced the higher education environment at two significantly different institutions. To date, the researcher has been able to reflect upon many of the findings of this study as she learned about and began to negotiate the IT environment at Georgia Tech, and has used several of them to explain a position, illustrate a point, or describe an environmental difference she encountered.

Recommendations

The researcher offers the following recommendations for further study.

1. The study should be replicated in other areas outside the southern United

States. Higher education environments with a union presence, for example, might yield an additional set of challenges for IT management.

2. The study should be replicated with CIOs in private institutions, since those institutions may have differences in funding methods and sources, and different methods of assessment and goal-setting as compared to public institutions.

3. The key findings in the study related to challenges and IT management effects should be used as the basis of a quantitative study conducted with a much larger population. Such a study might focus particularly on the management techniques CIOs are using to deal with specific challenges.

4. The study should be repeated over time. IT changes rapidly and new challenges will continue to emerge. Also, as the higher education environment changes, both specific to IT in areas such as information security, and more generally, the effects of the environment on IT management practices should be assessed.

5. A study of perceptions and attitudes of CIOs who have not worked outside higher education as compared with those who have should be conducted.

6. A study of CIOs who have moved from inside higher education into environments outside higher education should be conducted to evaluate experiences and perceptions they have regarding IT management in different environments.

Dissemination

Several of the participants have asked to review the results of the study once they are completed. The study will be shared with them, as well as with other IT practitioners, through the literature.

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APPENDICES

JOB DESCRIPTION – CHIEF INFORMATION OFFICER

Title

Chief Information Officer

Description

The Chief Information Officer's role is to provide vision and leadership for developing and implementing information technology initiatives. The Chief Information Officer directs the planning and implementation of enterprise IT systems in support of business operations in order to improve cost effectiveness, service quality, and business development. This individual is responsible for all aspects of the organization's information technology and systems.

Responsibilities

- Participate in strategic and operational governance processes of the business organization as a member of the senior management team.
- Lead IT strategic and operational planning to achieve business goals by fostering innovation, prioritizing IT initiatives, and coordinating the evaluation, deployment, and management of current and future IT systems across the organization.
- Develop and maintain an appropriate IT organizational structure that supports the needs of the business.
- Establish IT departmental goals, objectives, and operating procedures.
- Act as an advocate for the organization's IT vision via regular written and in-person communications with the organization's executives, department heads, and end users.
- Identify opportunities for the appropriate and cost-effective investment of financial resources in IT systems and resources, including staffing, sourcing, purchasing, and in-house development.
- Assess and communicate risks associated with IT investments.
- Develop, track, and control the information technology annual operating and capital budgets.
- Develop business case justifications and cost/benefit analyses for IT spending and initiatives.

- Coordinate and facilitate consultation with stakeholders to define business and systems requirements for new technology implementations.
- Ensure continuous delivery of IT services through oversight of service level agreements with end users and monitoring of IT systems performance.
- Ensure IT system operation adheres to applicable laws and regulations.
- Establish lines of control for current and proposed information systems.
- Define and communicate corporate plans, policies, and standards for the organization for acquiring, implementing, and operating IT systems.
- Direct development and execution of an enterprise-wide disaster recovery and business continuity plan.
- Approve, prioritize, and control projects and the project portfolio as they relate to the selection, acquisition, development, and installation of major information systems.
- Review hardware and software acquisition and maintenance contracts and pursue master agreements to capitalize on economies of scale.
- Assess and make recommendations on the improvement or re-engineering of the IT organization.
- Keep current with trends and issues in the IT industry, including current technologies and prices. Advise, counsel, and educate executives and management on their competitive or financial impact.
- Promote and oversee strategic relationships between internal IT resources and external entities, including government, vendors, and partner organizations.
- Supervise recruitment, development, retention, and organization of all IT staff in accordance with corporate budgetary objectives and personnel policies.

Position Requirements

- University degree in the field of computer science or business administration. Master's degree in one these fields preferred.
- […] years experience managing and/or directing an IT operation.
- […] years experience working in the […] industry.
- Experience in strategic planning and execution.
- Considerable knowledge of business theory, business processes, management, budgeting, and business office operations.

- Substantial exposure to data processing, hardware platforms, enterprise software applications, and outsourced systems, including […].
- Good understanding of computer systems characteristics, features, and integration capabilities.
- Experience with systems design and development from business requirements analysis through to day-to-day management.
- Proven experience in IT planning, organization, and development.
- Excellent understanding of project management principles.
- Superior understanding of the organization's goals and objectives.
- Demonstrated ability to apply IT in solving business problems.
- In-depth knowledge of applicable laws and regulations as they relate to IT.
- Strong understanding of human resource management principles, practices, and procedures.
- Proven leadership ability.
- Ability to set and manage priorities judiciously.
- Excellent written and oral communication skills.
- Excellent interpersonal skills.
- Strong negotiating skills.
- Ability to present ideas in business-friendly and user-friendly language.
- Exceptionally self-motivated and directed.
- Keen attention to detail.
- Superior analytical, evaluative, and problem-solving abilities.
- Exceptional service orientation.
- Ability to motivate in a team-oriented, collaborative environment.

Work Conditions

- On-call availability and periodic overtime.
- Sitting for extended periods of time.
- Dexterity of hands and fingers to operate a computer keyboard, mouse, and other computing equipment.

CIO MANAGEMENT TECHNIQUES

The purpose of this survey is to identify Chief Information Officers (CIOs) working in the higher education environment who have managed information technology (IT) in an environment or environments outside higher education. Please take a few minutes to respond to this survey. All responses will be kept confidential. Thank you in advance for your time.

Name of respondent:

Name of institution:

1. Information about the institution/IT organization where you are presently employed

   a. Type of institution
      ☐ 2-year
      ☐ 4-year

   b. Total enrollment (graduate and undergraduate)
      ☐ 5,000 or fewer
      ☐ 5,001 – 10,000
      ☐ 10,001 – 20,000
      ☐ more than 20,000

   c. Size of present IT organization
      i. Number of direct reports
      ii. In the IT organization for which you are directly responsible, number of full-time, permanent employees:

2. Personal demographic information

   a. Educational background (check all that apply)
      ☐ High school diploma
      ☐ Associates degree in
      ☐ Bachelors degree in
      ☐ Masters degree in
      ☐ Doctoral degree in

   b. Gender: ☐ Male ☐ Female

   c. Age: years

   d. Race: ☐ Asian ☐ Black or African American ☐ Hispanic or Latino
      ☐ White ☐ Other:

3. Career/position information

   a. Job title:

   b. Total number of years you have worked in IT overall:

   c. Total number of years you have worked in IT in higher education:

   d. Number of years since you last entered the higher education environment:

   e. Have you managed IT outside the higher education environment?
   ☐ Yes ☐ No

4. If the answer to 3(e) is yes, please answer the following questions.

   a. Identify the type(s) of organization(s) other than higher education where you performed the role of CIO or other IT manager. Please check all that apply.
   ☐ military
   ☐ corporate
   ☐ a non-higher education not-for-profit organization
   ☐ other:

   b. Reason(s) you took a position in higher education

   c. Do you believe there are environmental differences between institutions of higher education and other types of organizations?
   ☐ Yes ☐ No

   If you answered 'Yes' to question 4(c), please answer the following questions.

   d. Please describe up to five (5) environmental aspects that you consider to be different between higher education and other types of organizations.
   1.
   2.
   3.
   4.
   5.

   e. In your opinion, do any of these environmental differences affect the way IT is managed in higher education?
   ☐ Yes ☐ No

RESPONDENT DEMOGRAPHIC INFORMATION

Resp #	Inst Type	Total Enrollmt	Bach Deg	Mstrs Deg	Dct Deg	Gen	Age	Race	# Yrs In IT	# yrs HE	# Yrs Since HE Entry	Mngd IT Out of HE	Mili-tary	Corp	Not-for-Prof
1	2-yr	20000+		X		M	65	W	43	31	3	Y			Y
2	4-yr	5001-10000			x	M	62	W	35	21	21	Y		Y	
3	4-yr	5,001-10,000	x	X		M	61	W	40	17	14	Y	Y	Y	
4	4-yr	20000+		X		M	59	W	33	17		Y		Y	
5	4-yr	10001-20000	x	X	x	M	58	W	36	9		Y	Y		
6	4-yr	10000-20000		X		M	56	W	25	12	NA	Y	Y	Y	
7	4-yr	5000-		X		M	53	W	21	15	15	Y		Y	
8	2-yr	5000-	x			F	52	W	22	22	22	N			
9	4-yr	5001-10000		X		M	51	W	27	27		N			
10	4-yr R1	10,001-20,000		X		M	50	W	20+	7	7	Y	Y	Y	
11	4-yr	5000-	x	X		M	49	W	16	16		N			
12	4-yr R1	20,000-	x			M	48	W	23	20	16	Y		Y	
13	4-yr	10001-20000	x	X		M	45	W	21	19	19	N			
14	4-yr	5,000-	x	X		M	45	W	15	2	2	Y		Y	
15	4-yr	10001-20000	X			M	44	W	25	14	0	Y			Y
16	4-yr	5001-10000		X		M	43	A	17	17	17	Y		Y	
17	2-yr	5000-		X		M	42	W	25	11	6	N			
18	4-yr	5001-10000	x	X		M	41	B	7	3	2	Y			
19	2-yr	5000-		X		M	36	W	13	11	NA	N			Y
20	4-yr	5001-10000	x	X		M	36	W	16	16	16	N			

INTERVIEW QUESTIONS

1. Do you feel that students are IT stakeholders?

   If yes:
   a. Describe the way or ways that students interact with IT as stakeholders
   b. What are IT's responsibilities to students as stakeholders?
   c. Are there any challenges associated with dealing with students as IT stakeholders? If yes, what are they? What is your biggest challenge among those you've identified, and why?
   d. Do you feel there are any aspects of IT's interaction with students that are unique to higher education, or are different in a higher education environment than they would be in environments outside higher education?
   e. If yes to 1(d), do those differences affect IT management? If so, how?
   f. Can you provide an example of a situation where you feel the practices of your IT organization were or are affected by the fact that students are IT stakeholders?
   g. Are any of the aspects, interactions or examples you've described different from you encountered with stakeholders outside higher education?

2. Do you feel that faculty are IT stakeholders?

   If yes:
   a. Describe the way or ways that faculty interact with IT as stakeholders
   b. What are IT's responsibilities to faculty as stakeholders?
   c. Are there any challenges associated with dealing with faculty as IT stakeholders? If yes, what are they? What is your biggest challenge among those you've identified, and why?
   d. Do you feel there are any aspects of IT's interaction with faculty that are unique to higher education, or are different in a higher education environment than they would be in environments outside higher education?
   e. If yes to 1(b), do those differences affect IT management? If so, how?
   f. Can you provide an example of a situation you have experienced where you feel the practices of your IT organization were or are affected by the fact that faculty are IT stakeholders?
   g. Are any of the aspects, interactions or examples you've described different from you encountered with stakeholders outside higher education?

3. Do you feel that faculty have a level of autonomy in the higher education environment that is not present for employees in non-higher education organizations?

If yes:

a. Describe the aspects of that autonomy from your perspective
b. Do you feel that these manifestations of autonomy affect practices in managing IT? If so, how?
c. How do faculty relate to those who occupy positions above theirs in the institutional hierarchy, such as department chairs, deans or the provost? How do faculty relate to non-academic staff?
d. Does the character of those relationships affect IT management? If so, how?
e. Does the relationship of faculty to students have any aspects that affect the management of IT in higher education?

4. Do the methods of funding used by your institution differ from what you experienced outside higher education?
    a. If so, how?
    b. How do those funding differences affect your IT organization?
    c. How do those funding differences affect you in your role as CIO?

5. How does your institution assess its success, generally speaking?
    a. What part does IT play in the evaluation of institutional success?
    b. As CIO, how do you assess the success of your unit?
    c. Are there aspects of your campus environment that make assessment of your success more difficult? If so, what are they?
    d. Do those aspects differ from what you experienced in the environment outside higher education?

6. When you first moved into the higher education environment, did you apply any IT management techniques that you learned through your management experience outside higher education? If so, what were they? What were the results of your efforts?

7. Do you think the environment at your institution has changed in the last five years with regard to the techniques and practices of IT management? If so, how has it changed? Provide examples.

8. Do you feel that the external environment related to information security has had an effect on the practices of IT management in general? At your institution? How? If there have been changes, how have those been received by your stakeholders/customers?

9. Why did you decide to move into higher education? Are you happy that you made that change – was it "worth it"? If so, why? What do you enjoy the most about the higher education environment? What do you like the least, or find most challenging about the higher education environment?

10. What advice would you give to an IT manager or CIO who was considering moving from outside higher education into higher education? What should he expect, and how would he ensure his own success? Will he have challenges in making that transition? If so, what will be his greatest challenge?

11. What advice would you give to a senior administrator who was considering hiring a CIO from outside higher education?

APPENDIX E

ASSIGNMENT OF SURVEY AND INTERVIEW QUESTIONS TO RESEARCH QUESTIONS

Rsrch Qstn #	Research Question	Survey or Interview Question Number*	Survey or Interview Question
1	What are the socio-demographic characteristics of individuals who move from outside higher education into the role of CIO at a college or university?	Survey question (various)	Participants were asked for their age, race, gender, number of years of career experience in IT, number of years of experience in higher education, size of the institution where they were employed, and their educational background.
2	What aspects of the higher education environment are perceived to create challenges for IT management?	1c	Are there any challenges associated with dealing with students as IT stakeholders? If yes, what are they?
		2c	Are there any challenges associated with dealing with faculty as IT stakeholders? If yes, what are they?
		3a	Describe aspects of faculty autonomy from your perspective.
		3c	How do faculty relate to non-academic staff?
		4b	How do funding differences affect your IT organization?
		8	Do you feel that the external environment related to information security has had an effect on the practices of IT management in general? At your institution?
2a	Are there any differences in challenges perceived based on significant socio-economic differences?		This research question was answered based on the analysis of responses to other questions.

2b	Which of those challenges are perceived to be unique to higher education as compared to other environments?		Do you feel there are any aspects of IT's interaction with students that are unique to higher education, or are different in a higher education environment than they would be in environments outside higher education?
		2d	Do you feel there are any aspects of IT's interaction with faculty that are unique to higher education, or are different in a higher education environment than they would be in environments outside higher education?
		3	Do you feel that faculty have a level of autonomy in the higher education environment that is not present for employees in non-higher education organizations?
		4	Do the methods of funding at your institution differ from those you experienced outside higher education?
		11	What advice would you give to a senior administrator in higher education who is considering hiring a CIO from outside the environment?
3	What effects on IT management result from the challenges perceived?	1e	Do environmental differences related to students affect IT management? If so, how?
		1f	Can you provide an example of a situation where you feel the practices of your IT organization were or are affected by the fact that students are IT stakeholders?
		2e	Do environmental differences related to faculty affect IT management? If so, how?

		2f	Can you provide an example of a situation where you feel the practices of your IT organization were or are affected by the fact that faculty are IT stakeholders?
		3b	Do you feel that these manifestations of autonomy affect practices in managing IT? If so, how?
		3c/d	How do faculty relate to non-academic staff? Does the character of those relationships affect IT management? If so, how?
		4b	How do those funding differences affect your IT organization?
		8	Do you feel that the external environment related to information security has had an effect on the practices of IT management in general? At your institution?
4	How do these challenges and differences affect the attitude of the CIO toward working in the higher education environment?	9b	Are you happy that you made that change – was it "worth it"?
		9c	What do you enjoy the most about the higher education environment?
		9d	What do you like the least, or find most challenging about the higher education environment?
		10a	What advice would you give to an IT manager or CIO who was considering moving from outside higher education into higher education?
		11	What advice would you give to a senior administrator who was considering hiring a CIO from outside higher education?

* Unless otherwise noted, question numbers refer to interview questions