

ABSTRACT

Title of dissertation: A CASE STUDY ANALYSIS OF
TECHNOLOGY DECISION MAKING AT
A HIGHER EDUCATION INSTITUTION

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Higher education institutions are being called upon to “transform” themselves in response to perceived changes in their environments and technology has been seized upon by many authors as a solution to the need for transformation. To control the direction and rate of change, many have also identified a greater need for technology planning, a type of strategic planning specifically applied to technology issues. There has been a lack of empirical studies to examine whether technology planning are successful. The current study examined a technology decision-making process at a higher education institution, comparing subjects’ descriptions of how they believed technology planning should work and how it did work at their campus to theoretical models of decision-making identified by Schmidlein (1974, 1983). The results showed that the theoretical framework used for analysis reasonably encompassed the espoused and actual decision making. Technology decision-making processes that fit with the culture and values of an institution and the characteristics of higher education organizations were considered to be more successful than those that conflicted with these aspects of the institution. Recommendations are

provided for future technology planning processes and to improve the fit of the theoretical model.

A CASE STUDY ANALYSIS OF TECHNOLOGY DECISION MAKING AT A
HIGHER EDUCATION INSTITUTION

by

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Chapter 1

Introduction To The Problem

Setting the Context

Higher education organizations today are facing dramatic changes and must respond to these changes, according to some authors (e.g., Keller, 1997; Norris & Dolence, 1995, 1996; Twigg, Sept./Oct. 1994). One suggested solution to the problems confronting higher education is to “transform” institutions’ instructional and administrative processes, in part through the use of technology (Hafner & Oblinger, 1998; Norris & Dolence, 1995, 1996; Peterson, 1997; Twigg, Sept./Oct. 1994). To control the use of technology at these institutions, many of these same authors are recommending that technology planning, a form of strategic planning applied to technology issues, be instituted. Similar suggestions were made to use strategic planning to control the response of higher education organizations to earlier environmental changes (e.g., Keller, 1983). Empirical research on strategic planning (e.g., Mintzberg, 1994; Schmidlein & Milton, 1988) has indicated that strategic planning may not work as expected, leading to dissatisfaction with the process. The current study was designed to examine the technology planning process at a higher education institution and determine whether similar problems can be predicted using theoretical models of decision making.

Changing Environment of Higher Education

A number of authors have stated that higher education institutions worldwide are facing a quickly changing social, political, and economic milieu (Hartle & Galloway, 1997). Peterson and Dill (1997) outlined seven societal “conditions and challenges” (p. 15) expected to affect higher education in the coming years. The first

condition, constrained resources, they considered overarching for the other six conditions. The other conditions are: an increasing cultural diversity of clientele, a telematic (technological) revolution, mounting demands for educational quality, growing participation in economic productivity and development, more demands for “postsecondary relearning” (i.e., beyond the traditional learner), and globalization.

Other changes expected to affect higher education in the 21st Century include: additional competition worldwide for learners; more governmental deregulation, particularly among European universities; and a proliferation of interdisciplinary science and research programs (Dill & Sporn, 1995). In addition, they include: “enrollment increases, rising tuition costs, reductions in state funding [in U.S.] for higher education, an emphasis on the knowledge-intensive economy, and the demand for flexible degree programs...” (Carchidi & Peterson, 2000, p. 1).

Norris and Dolence (1995, 1996) predicted that as society changes from the Industrial Age to the Information Age, higher education institutions will be affected directly. More learners will demand innovative delivery systems and alternatives to teacher-driven knowledge presentations. With increased access to the Internet, learners will require less in-class, faculty-delivered information and more on-line, learner-driven systems. An “anytime, anywhere” mentality for learning, along with an emphasis on life-long learning, is predicted to challenge higher education organizations.

Effects on Higher Education Organizations

In order to keep up with these changes, higher education organizations are expected to reinvent themselves (Norris and Dolence, 1995, 1996; Twigg, Sept./Oct. 1994). If higher education organizations do not adjust to the new demands, these

authors suggested, they will miss out on available opportunities. Higher education organizations that do not “transform” themselves to fit the needs of the new age and new learner are expected to stagnate and lose revenues. Some authors considered the required changes as a needed “transformation” that will radically alter higher education in a relatively short time frame (Kobulnicky, 1999; Norris & Dolence, 1995, 1996), while others identified the change as taking place in a “slow revolution” (Gilbert, 1996; Green, 1996; Green & Gilbert, 1995).

Whatever the time frame, many authors have stated that higher education organizations will need to reevaluate their values and mission (e.g., Norris & Dolence, 1995, 1996). Peterson and Dill (1997) predicted that societal changes will require “rethinking the basic educational delivery and research processes and functions” (p. 26). This view suggests that higher education organizations should not just alter how they perform their traditional tasks, but question whether these tasks and their missions are in line with the newly emerging environment (Hafner & Oblinger, 1998).

Contrary Opinions

Views questioning those calling for dramatic change by higher education institutions are also in evidence (e.g., Noble, 1998; Slaughter, 2001). Some authors have advised critical examination of the motives behind the calls for change. Increased corporate influences and commercialization of higher education institutions have been cited as two reasons behind the calls for transforming higher education (Croissant, 2001; Slaughter, 2001; Tang-Martinez, 2002). For example, calls for technology to change the way faculty teach may be motivated primarily by

technology and publishing companies pushing for increased markets within the institutions (Noble, 1998). Noble (1998) stated:

...the high-tech transformation of higher education is being initiated and implemented from the top down, either without any student and faculty involvement in the decision-making or despite it... What is driving this headlong rush to implement new technology with so little regard for deliberation of the pedagogical and economic costs and at the risk of student and faculty alienation and opposition? A short answer might be the fear of getting left behind, the incessant pressures of "progress". But there is more to it. For the universities are not simply undergoing a technological transformation. Beneath that change, and camouflaged by it, lies another: the commercialization of higher education. For here as elsewhere technology is but a vehicle and a disarming disguise.

Birnbaum and Shushok (1998) suggested that claims of a "crisis" in higher education today are similar to claims of crisis in higher education over the last century or more. Calls of "crisis" may serve a purpose by those voicing them: "The strong rhetoric and vivid images of crisis are useful tools with which to gain attention, power, and control of organizational control and symbolic processes in a noisy world" (p. 8). Thus, the claims of impending doom may play an important part in making others attend to the issues being put forward and preparing them for action.

The Role of Information Technology

For those who stated that the changing milieu of higher education organizations is requiring changes by those organizations, information technology is cited as one of the critical factors in this change. Although some authors considered information technology to be a force driving transformational changes in higher education institutions (e.g., Hafner & Oblinger, 1998), others considered information technology only to be "enabling" the transformation (e.g., Norris & Dolence, 1995, 1996). In the former case, it is believed that information technology is the cause of

change, while in the latter view information technology is believed to support a change that is occurring separately. Supporting the latter view, Gilbert (1995) stated, “The emergence of new information technologies is neither the cause, the purpose, nor the consequence of this transformation” (p. 14). This sentiment is shared by Brown and Duguid (1996) who said: “It’s probably less helpful, then, to say simply that higher education will change because of changing technologies than to say that the emerging computational infrastructure will be crucially important in shaping an already changing system” (p. 11).

Regardless of whether information technology is leading the changes or merely facilitating them, the consensus is that information technology will be at the heart of many of the changes. For example, information technology will allow for changing delivery systems, such as online classes and more distance education. It will also increase opportunities for computer-assisted training, better communication, advanced computerized administrative systems, and more technology in the classroom (Green & Gilbert, 1995). Gilbert (1996) indicated that higher education is already changing and that the “symptoms” of this change include: a failure of traditional teaching techniques, many students not purchasing or using required textbooks, students using computers regularly, faculty using new forms of teaching aids (e.g., CDs), new teaching methods (e.g., cooperative and collaborative learning), more Internet usage, more distance education, faculty organizations (unions) discussing the impact of technology, and elected officials endorsing information technology for higher education.

Green and Gilbert (1995) offered three reasons for higher education institutions to embrace information technology. First, higher education organizations must maintain a “competitive position” (p. 12). Organizations that do not stay current with new technology advances may be seen by potential customers to be less worthwhile than those that do. A second reason is for “teaching, learning, and curriculum enhancement” (p. 13). Green and Gilbert (1995) described how improvements in teaching and learning have been enabled by technology. They cited a greater emphasis on active learning, better understanding of science through demonstrations, providing collaborative experiences, and showing real-life situations. The third reason for embracing technology is to prepare students for careers and life in the Information Age. They stated that exposing students to technology in college will prepare them well for the labor market once they have graduated and for the future in an information-rich society.

Calls for Planning

Information technology is thus expected to influence teaching, learning, and the management of higher education dramatically. Many individuals are concerned that the course of change has been too haphazard and should be controlled more (e.g., Keller, 1997; Norris & Dolence, 1995, 1996; Peterson & Dill, 1997). To control the changes in both information technology and higher education organizations, many authors are calling for technology planning (e.g., Altschuler & McClure, 2002; Gilliland & Tynan, 1997; Hafner & Oblinger, 1998; Kobulnicky, 1999; Norris & Dolence, 1995, 1996; Peterson & Dill, 1997).

In the past, strategic planning was expected to provide administrators with an opportunity to respond most effectively to environmental changes (e.g., Keller,

1983). Strategic planning was defined by Mintzberg (1994) as: “A formalized procedure to produce an articulated result, in the form of an integrated system of decisions” (p. 12). This definition distinguishes strategic planning from everyday decision making and indicates that the process involves articulating and formalizing a written plan. For many authors, strategic planning is a process that permits an administrator to step outside of the daily decision-making process and consider the broader issues and directions of the organization (e.g., Baldrige & Okimi, 1982).

Research has suggested that, despite claims to the contrary, strategic planning has not lived up to its promise (Mintzberg, 1994; Schmidlein & Milton, 1988, 1990). A primary reason for the problems with strategic planning may be that it is based on assumptions about organizational decision-making processes that are incompatible with the nature of higher education organizations (Schmidlein, 1974). For example, planning, which is based on a comprehensive model of decision making, assumes that goals of the process are clearly stated and prioritized (Schmidlein, 1974), while the goals of higher education organizations are described as ambiguous and contended by competing interest groups and hence, difficult to prioritize (Cohen & March, 1974).

This study examines the apparent contradiction between the calls for technology planning and the nature of higher education organizations. It investigates factors that appear to make decision making for technology more problematic given the characteristics of higher education organizations. It explores whether the same problems that have been experienced with strategic planning in general (Birnbaum,

2000) are experienced with strategic planning applied to technology issues. The following sections introduce the current study.

Nature of the Problem

The purpose of this study is to examine the decision-making processes regarding technology at a higher education institution. It investigates the technology planning process that took place at a branch campus of a large university over a four-year period. The study analyzes technology purchases and usage. It compares the planned processes to the actual processes and uses theoretical models to explain the difference between the two. It also compares theoretical models of decision making to participants' expectations for the actual process. It examines expectations that participants have regarding technology decision making and compares these expectations with the actual process. It explores participants' satisfaction and recommendations for improvement of the decision-making process. The study contains suggestions on how to improve the technology decision-making process to increase participants' satisfaction.

The next chapter examines both past and current calls for formal planning and the literature regarding the efficacy of this type of decision-making process and identifies the variables that are critical for understanding how there may be a mismatch between what people expect to work regarding decision making at a university and what actually works.

The section following this includes the research questions that arise from an examination of the literature on strategic and technology planning. The first set of questions (1-4) is descriptive in nature, while the second set (5-7) is analytic. The first set stems from the need to identify participants' expectations and responses to

the decision-making process, in addition to determining how the process was actually carried out. The second set of questions is derived from the need to analyze the participants' beliefs from a theoretical decision-making framework.

Research Questions

The research questions are as follows:

1. What process do subjects recommend using to respond to changes in technology?
2. How are technology decisions made at the campus?
3. How effective is the current technology decision-making process from the perspectives of the participants?
4. How can the process of responding to technology demands be improved, according to the participants?
5. What decision process assumptions underlie participants' recommendations for making decisions about campus technology?
6. How closely do actual technology decision-making processes correspond to planning and incremental decision-making models?
7. Do comprehensive and incremental decision-making models provide an adequate framework for analyzing technology decision-making processes at the campus?

Importance of Addressing the Problem

The high cost of technology is helping to fuel the increasing costs of higher education in United States today. Technology comprises a large portion of a campus' discretionary budget expenditures (Olsen, 2001). Given concerns about

wasting campus resources and increased pressures to keep down college costs, understanding how the technology planning process is carried out and identifying how it may be improved are important. This is a significant study because it explores the assumption that implementing a comprehensive technology decision-making process is the best way to respond to decisions about increasingly complex technology usage and demands.

Many advocates of such decision making assume it will help contain costs and eliminate waste. However, the literature on planning suggests that formal planning processes may not have the intended effects and may, in fact, accentuate the problems that are targeted by planning. It is important to examine the technology decision-making process and its outcomes to determine how the process works and whether it can be successful in reaching its goals in order to improve the process of dealing with future technologies.

Contributions of Research

This study expands the literature on strategic planning, extending it to decision making for technology at a higher education organization. It is important to determine whether technology decision making has characteristics similar to other types of planning and whether the same caveats apply. The research contributes to the growing body of literature on technology planning since much of the current literature calls for technology planning but is not based on research examining the efficacy of such planning. Since much of this literature is more anecdotal and normative than research-based, it tends to describe how technology planning has been implemented or how technology planning is needed, rather than examining its

effectiveness. This study provides a critical analysis of a process that is typically assumed to be, and promoted as, a panacea for a complex and expensive problem.

Definition of Terms

Information Technology (IT): Computer hardware and software used to support teaching or learning either in instruction directly or through the administration of student programs and services.

Participants: Individuals involved in the technology decision-making process.

Strategic Planning: A formal planning process that involves the identification of internal and external strengths and weaknesses, and external opportunities and threats affecting an organization and proposes a strategy for responding to these conditions.

Technology Planning: Strategic planning as applied to information technology. An intentional effort to respond to future technology demands.

Technology decision making: Decision-making processes relating to technology, including, but not exclusive to, formal technology planning.

Espoused Views of Decision Making: Individual's descriptions of how decision making should occur.

Observed Decision Making: How decision making takes place.

Method

The first portion of the study examines the campus technology plan and compares it with purchases and usage of information technology resources. Comparisons between the actual process and theoretical models are made to determine whether the actual process more closely resembles a comprehensive model or an incremental model of decision making.

The second portion of the study includes interviews with participants and nonparticipants in the campus technology decision-making process. The study compares their perspectives on how the decision-making process should work with how it did work. Their explanations for why actual outcomes differed from the planned outcomes are examined. The participants were asked how they believed the decision-making process could be improved, if at all. Comparisons between the espoused views and the observed decision-making process are made and the differences are examined in light of theoretical models of decision making.

Summary

The current study investigates the relationship between an actual technology decision-making process and theoretical models of decision making to determine whether problems perceived by participants are a result of the difference between their espoused view and the observed process. While technology planning, a form of strategic planning specifically focusing on technology issues, has been recommended as a response by higher education organizations to a changing environment, empirical evidence is lacking to support its efficacy. Indeed, empirical evidence regarding strategic planning in general has suggested that, because of a mismatch between the assumptions underlying the planning process and characteristics of higher education organizations, strategic planning may not work as designed and may lead to dissatisfaction with the process. The current study extends the analysis to determine whether the same problem exists for technology decision making.

Chapter 2

Literature Review

Introduction

Strategic planning and technology planning have been recommended by various authors to solve a number of problems experienced by higher education organizations. Empirical research has suggested that strategic planning has fallen short of these authors' expectations. This problem may be a result of a mismatch between the assumptions underlying the decision-making process involved in the planning process and the characteristics of higher education organizations. It is expected that technology planning will also fail to achieve the goals set for it for the same reason.

The following chapter describes the literature on strategic planning and technology planning. First, a description of strategic planning and reasons why it and technology planning have been promoted are provided. Next, a theoretical framework outlining the assumptions underlying two decision-making models is introduced. This framework is used to show why strategic planning and technology planning may not be the most effective methods for responding to problems experienced by higher education organizations.

At times, this review refers to the literature on strategic planning and other times refers specifically to the literature on technology planning, because the literature on technology planning is separate from, although similar to, that on strategic planning. Strategic planning is considered a more general form of planning; technology planning is strategic planning applied specifically to technology issues.

Thus, while they involve the same processes, they are often described in two separate bodies of the higher education literature.

Strategic planning in higher education

Strategic planning was adopted by higher education organizations from the business literature during the 1970s. It became popularized with the publication of George Keller's (1983) book: Academic Strategy: The management revolution in American higher education. Keller's book provided intuitively appealing examples of successful strategic planning processes and caught the attention of many higher education administrators (Birnbaum, 2000; Dorris & Lozier, 1990; Schmidtlein & Milton, 1990).

Although it is recommended that individual institutions tailor strategic planning to their unique contexts (Cope, 1985; Schmidtlein & Milton, 1990), strategic planning in general involves:

scanning the external environment for possible threats and opportunities, assessing internal strengths and weaknesses, and then, based on a comparative analysis of this external and internal information, identifying major directions which will promote institutional health and viability (Larson, Milton, & Schmidtlein, 1988, p. 3).

Strategic planning was touted as a solution to the problems associated with past planning and decision-making practices (Baldrige & Okimi, 1982; Birnbaum, 2000; Cope, 1987; Keller, 1983). Previous methods included long-range planning, program planning budgeting system (PPBS), and management by objectives (MBO) (Baldrige & Okimi, 1982; Birnbaum, 2000). Problems with these processes were attributed to a lack of fit between the planning methods and the characteristics of higher education organizations (Larson, et al., 1988; Schmidtlein & Milton, 1990). These previous methods required comprehensive processes that involved top-down

controls and “rational” decision processes throughout the organization. The organizations, on the other hand, were considered to be loosely coupled (c.f., Weick, 1979) or fragmented (van Vught, 1988). The majority of the organizations’ employees, i.e., the faculty, are professionals who have stronger affiliations with external organizations than with the internal aspects of the organization. This reduces the power of the organization over its faculty (Birnbaum, 1988; Cohen & March, 1974). Decisions are considered to be less “rationally” determined and more based upon serendipity, “satisficing”, and political bargaining. The actual decision-making process was described as “garbage-can” decision making (Cohen, March, & Olsen, 1972); problems and solutions are paired together as a result of random processes just as items in a garbage can are. Solutions are seldom based upon logical argument and careful selection of the best alternative among a group of rationally chosen alternatives. Instead perceived problems are paired with solutions that co-exist in a particular time-frame and are interpreted as meeting the criteria for solving the problem.

Strategic planning was identified as more appropriate for higher education organizations than previous planning methods. It was considered to be politically sensitive, forward-looking and vision-focused, although not rigidly predetermined. It was to be driven by leaders and top-echelon forces, but with bottom-up visions and creative solutions (Baldrige & Okimi, 1982; Keller, 1983). Strategic planning was predicted to be more successful than past planning processes, because it was a “blend of rational and economic analyses, political maneuvering, and psychological interplay” (Keller, 1983, p. 148). Bryson (1988) suggested that strategic planning

“incorporate[s] both substantive and political rationality” (p. 1). Dorris and Lozier (1990) argued that strategic planning would “bridge the gap” between theory and reality of making decisions in higher education organizations.

Reasons for Planning

The following sections outlines the reasons for strategic and technology planning provided in the literature in higher education.

Controlling environmental change

The primary reason given for planning is to increase control over the environment and the organization. Higher education organizations are being called upon to be “proactive” in controlling anticipated environmental changes to avoid being overwhelmed by them (Peterson & Dill, 1997).

During the 1970s and 1980s, higher education organizations perceived pressure to respond to environmental changes (Baldrige & Okimi, 1982; Birnbaum, 2000; Cope, 1985, 1987, Keller, 1983; Larson, Milton & Schmidlein, 1988). The environmental pressures were viewed as leading to possible “decline and bankruptcy” (Keller, 1983, p. 3). To respond to these changes, Keller (1983) and others (Baldrige & Okimi, 1982; Cope, 1985, 1987) recommended implementing strategic planning processes.

Keller (1983) described six environmental changes he considered to be threatening the well-being of higher education in the early 1980s. The first was a demographic change in the student base, with an anticipated drop in the numbers of traditional-age students and an increase in diverse student populations and part-time students. Keller (1983) bemoaned a “downfall of the liberal arts curriculum” (p. 15), where there was an increase in specialization without an accompanying increase in

integrative knowledge. He anticipated increased competition for students and faculty from non-university programs. There was also a “technological imperative” (Keller, 1983, p. 19) with increased use of information technology being used in research, teaching, and links to industry. Faculty were considered to be aging as a group and becoming more professional and specialized, decreasing the power of the campus. Last, there was a perceived increase in state and federal demands for accountability (Keller, 1983).

Baldrige and Okimi (1982) stated that “the central focus of strategic planning is developing a good fit between the organization’s activities and the demands of the surrounding environment” (p. 16). They also contended that “strategic planning emphasizes flexibility and quick response to changes in the outside environment” (p. 16). Overall, they argued that “the goal of strategic planning is not so much producing plans as it is making critical decisions wisely” (p. 16). These points were echoed by Schmidlein and Milton (1990) who stated that strategic planning was deemed desirable “because it allows for changes of direction as new external information or new situations emerge” (p. 12). Responding to the environment is considered necessary for an organization’s survival (Kotler & Murphy, 1981). The need for “thoughtful adaptations in advance of crises”, rather than mere “reactions to crisis events” has been stressed (Kotler & Murphy, 1981, p. 471). Maasen and van Buchem (1990) explained how, in order to remain competitive and fill its niche, the University of Twente used strategic planning to become more “externally oriented” (p. 66), by choosing programming that would suit the needs of the surrounding communities and its potential students. Dorris and

Lozier (1990) described Penn State University's planning processes and showed that beginning in the 1970s, budgets declined and the institution needed to respond to environmental changes (i.e., changing program demand and drop in state budget).

Schmidlein and Milton (1990) suggested that two reasons why strategic planning will continue to interest many in higher education, even though there has not been empirical evidence to support its efficacy, are: 1) "continuing demographic and economic uncertainties" (p. 14) and 2) strategic planning will continue to be promoted by the practitioner literature.

In comments echoing those touting strategic planning, authors have been recommending technology planning to respond to environmental changes. For example, Kobulnicky (1999) stated that "although some factors of change are external to higher education and not under its control, much is controllable with proper planning". Organizations that do not control their destinies are expected to fall behind competitors or provide openings for others, e.g., outsourcing or for-profit organizations (Gilliland & Tynan, 1997; Hafner & Oblinger, 1998; Norris & Dolence, 1995, 1996; Peterson & Dill, 1997).

Centralizing decision making

A second reason for planning is to centralize decision making at the organization. Dill (1993-94) suggested that when a crisis situation is perceived, one of the first reactions is pressure for more centralization of organizational processes. Cope (1987) emphasized the need for "planning institutionwide and laterally" (p. 31) in a "massive, loosely coupled organization set in a political landscape" (p. 32). He suggested that this coordination was needed to facilitate the organization's response to the environment. Kotler and Murphy (1981) suggested top-down goal-setting

followed by plan-making coming from the bottom of the organization. Dorris and Lozier (1990) indicated that strategic planning was useful when dealing with issues that “crossed organizational boundaries” (p. 11). Green (1990) described how, in the case of Bradford College, administrators took control of an ailing campus and centralized the decision making. This centralization of control was considered to be the saving grace for the campus which was considered to be at the brink of financial ruin.

Kobulnicky (1999) recommended that technology planning should be part of comprehensive plans to transform higher education institutions. Comprehensive planning would allow for increased coordination “between academic and technological planning processes [that] was essential to the success of both processes”. To adjust to the transformation with information technology, Gilbert (1996) suggested that higher education institutions “develop an overall institutional strategy” and develop “institutionwide collaboration”, not “fragmented planning”.

Improving the quality of education

A third reason for planning is to improve the quality of education. Green (1990) described how Bradford College desired to improve the quality of the education and improve its curriculum through evaluations of its courses and instructors in order to attract more students. Ringle and Capshaw (1990) described the strategic planning process implemented at Essex Community College and how it was used to improve both general education and developmental education to meet the needs of its students.

Green and Gilbert (1995) stated that the impact of technology on the system cannot always be anticipated, but advised that organizations plan: “We suggest that

each college and university engage in an institutionwide planning initiative that looks carefully at the ways IT can be used most effectively to improve teaching and learning” (p. 17). Another view regarding planning suggests that a way to retain competitiveness is to improve the quality of the “product” that is offered (Hafner & Oblinger, 1998).

Creating a shared vision

A fourth reason commonly given for planning is to provide information to others about the organization’s activities and to create a shared vision in order to have all participants accept the plan.

Baldrige and Okimi (1982) stated that strategic planning’s purpose is to address “the ‘big’ issues” (p. 17) and to set the direction of the organization while helping focus “on the organization’s destiny and ultimate mission” (p. 18). Kotler and Murphy (1981) emphasized the importance of having “a clear set of institutional goals...to keep the organization from drifting into an uncertain future” (p. 478). Bryson (1988) stated that strategic planning proponents believed it would help set priorities, clarify actions, and set the direction of the organization.

Cope (1987) provided real and hypothetical examples of strategic planning to indicate that it was necessary for strategic planning to have a shared set of “directives” (p. 24) to form plans from individual parts of the university. Without these, he stated, a university president would receive plans from each unit with “largely different assumptions about what was important to the university and what would happen in the external environment” (pp. 23-24). However, Cope (1987) warned that “The greater danger [is] . . . a college or department with a single, possibly inappropriate purpose as the ecosystem changes” (p. 64).

Dunn (1990) explained how, at Tufts University, a dramatic change in direction was instituted using strategic planning. The key to the plan was the creation of a shared vision that was devised by the new president who set the direction of the institution and communicated the change through strategic planning processes. Green (1990) described how a small women's junior college became a co-educational institution through the shared vision which focused on the new mission and directed all of the new programming.

Gilbert, Aiker, Bartelt, Hoffman, Marino, Schleyer, and Stewart (1995) explained that technology planning was needed to integrate information technology within a campus and to get commitment from groups at the institution. Gilbert (1996) recommended that those within a higher education organization “keep asking fundamental questions” and “build a vision” in order to determine whether the organization is meeting the goals it has set for itself. He suggested that planning will allow the organization “to harness the insights of all those who can help understand current patterns of change in teaching, learning, and technology and help shape a ‘vision worth working toward’”. Norris and Dolence (1995, 1996) recommended strategic planning to lead the charge into transforming the organization and to communicate a shared vision of the future. They insisted that the planning process would provide a “new sense of shared values” (1995, p. 91) among campus constituents.

Containing costs

A fifth reason for planning is to allow the institution to contain costs. As mentioned previously, Peterson and Dill (1997) considered constrained resources an overarching issue in the changing milieu of higher education. Keller (1983) also

described how higher education organizations needed to refocus their efforts in times of retrenchment or suffer the consequences. Cope (1987) suggested that organizations needed to “shift resources” (p. 31). This sentiment was echoed by a number of other authors (Dorris & Lozier, 1990; Dunn, 1990; Green, 1990; Maasen & van Buchem, 1990).

Many are concerned that higher education institutions are being asked to perform more tasks and serve more customers, but are not expected to get substantially more resources to do so (e.g., Dill, 1993-94). There is also concern that tuitions have grown more rapidly than inflation and that families’ budgets are strained to pay as it is, so dramatic increases in tuition are unlikely to be accepted (Hafner & Oblinger, 1998). In the U.S., many state governments are concerned about other aspects of their budgets and so large increases in funding are unlikely to come from there either (Hartle & Galloway, 1997).

With constrained resources and an increasingly large proportion of budgets allocated to information technology, institutions desire to use their resources wisely in order to retain a competitive edge in technology in the coming years (Norris & Dolence, 1995, 1996). Many are calling for technology planning to help contain costs associated with information technology development. Many authors indicated that past efforts to allow for unfettered growth of information technology projects have led to waste, duplication of efforts, and incompatibility of technology (Gilbert, et al., 1995; Kobulnicky, 1999; Nelson & Davenport, 1996). Michalak, Facelli, and Drew (1999) explained that planning is needed to coordinate the distributed system of information technology on a campus to “maximize the effective use of resources”.

Baer (1994) suggested that academic leaders should “emphasize” strategic planning (p. 33) to avoid common problems, such as failing to budget for obsolescence.

Uniting long-term and short-term needs

The sixth reason for planning is to unite long-term strategic goals with short-term problem-solving. Dorris and Lozier (1990) discussed the importance of coordinating planning and operations, particular budgeting. Dunn (1990) also described the need to coordinate the plan and budget. Bryson (1988) said that strategic planning should be integrated with other organizational functions. Dorris and Lozier (1990) explained that strategic planning assisted in the reallocation of resources and predicted problems if strategic planning were done in a time of retrenchment. Their concern was a result of the belief that department and college heads would not be willing or able to cut their own programs. Maasen and van Buchem (1990) indicated how the University of Twente, in the Netherlands, used strategic planning to reallocate funds, since state funding was not being increased to support the new programming at the university.

Ringle and Updegrave (1998) suggested that planning has two components: strategic vision and operational goals. They found, in a survey of 150 technology officers at higher education organizations, many suggested that technology planning would help link “technology initiatives and the institutional goals”. Moran (1998) and Wunderle (1998) suggested that planning should examine an organization’s mission and goals and structure information technology around them. Graves, Henshaw, Oberlin, and Parker (1997) suggested that planning should include long-term strategy for transformation and working with information technology to guide purchases.

Summary of Reasons for Planning

In summary, both strategic and technology planning are expected to enable higher education organizations to control their environment, centralize decision making, improve the quality of education, create a shared vision, contain costs, and unite operational and strategic decision-making processes. Strategic planning, however, has been criticized as failing to deliver on these promises.

The failure of strategic planning may be a result of a mismatch between the assumptions underlying the strategic planning process and the characteristics of higher education institutions. The following sections examine problems associated with strategic planning and how technology planning may have the same problems. A theoretical framework is described that allows analysis of the mismatch.

Problems with Strategic and Technology Planning

As mentioned previously, strategic planning was touted as an improvement over past decision-making processes employed by higher education organizations. Empirical research has suggested, however, that the great hopes for formal strategic planning have not been supported by reality. The following sections describe both theoretical and empirical explanations for the shortfall of strategic planning at higher education organizations. The attributes of recent calls for technology planning are described in the sections illustrating the problems with strategic planning.

Schmidtlein (1974) outlined two different decision-making processes: the comprehensive/prescriptive model (referred to hereafter as the *comprehensive model*) and incremental/remedial model (referred to as the *incremental model*). He suggested that these two models are “ideal” views, using Weber’s definition of that term, of the two poles of a decision-making continuum. Each exemplar has a

different set of assumptions about the organizational environment. Table 2.1 shows the characteristics for the two paradigms. Schmidlein (1974) suggested that successful decision making requires that the assumptions about the decision-making process match with organizational realities. The following sections examine each assumption and how it has been shown theoretically and empirically to work in higher education organizations.

Table 2.1 Characteristics of Decision-Making Paradigms

ENVIRONMENTAL CONDITIONS	COMPREHENSIVE/ PRESCRIPTIVE	INCREMENTAL/ REMEDIAL
<i>J</i>	slow	fast
<i>repetitiveness</i>	high	low
<i>causal relationships</i>	direct, knowable	indirect (complex), unknowable
<i>change technology</i>	available	unavailable
<i>location of economic, social, human, and information resources</i>	centralized	decentralized
<i>functions</i>	logical, algorithmic	politically expedient, heuristic
<i>goals (competing priorities, outputs, quantification, consensus)</i>	prioritized, clearly defined, quantifiable, consensus desirable	not ranked, not prioritized; ambiguous; not quantifiable; consensus is not necessary
<i>deadlines</i>	need to predict future events and plan decisions accordingly; long-term deadlines assume changes that are predictable	do not assume an orderly sequence of decision events; short-term deadlines require increased flexibility of response

The following characteristics of the internal and external environment of higher education organizations are examined in the following sections on the literature on planning: rate of change, repetitiveness, causal relationships, change technology, location of resources, functions, goals, and deadlines. Theoretical and empirical critiques of the compatibility of these characteristics and the two models of decision-making are also provided in each section.

Rate of Change

According to Schmidtlein (1974, 1983), the comprehensive model of decision making is better suited to slow environmental changes than fast ones. Given the time lag between the planning process and implementation, the planning process cannot adjust to fast changes in a timely manner. An incremental process is more capable of rapid responses to changes in the environment (Schmidtlein, 1974, 1983).

Calls for planning. While theoretically a slow rate of change facilitates a planning process, many individuals consider a fast rate of change as a reason for planning. For example, Keller (1983) warned that a rapidly changing environment threatened many higher education institutions and that unless institutions implemented drastic changes in response, they would be forced to close. He suggested that strategic planning was the best solution to this perceived threat. Baldrige and Okimi (1982) indicated that strategic planning “emphasizes flexibility and quick response to changes in the outside environment” (p. 16).

These calls for strategic planning are echoed by many authors writing about information technology. The latter have suggested that the rapidly changing environment of higher education organizations should be responded to with a technology planning process. Gilliland and Tynan (1997) stated information

technology is in a “state of perpetual innovation” with “accelerating change” (p. 51) while “new technologies are adopted daily and easily by end users” (p. 57). Moran (1998) maintained that there is a “rapidly changing environment” (p. 38). Norris and Dolence (1995) have urged higher education organizations to keep up with an accelerating rate of change.

Gilbert (1996) declared that there is a “slow revolution” in higher education as it responds to changes in information technology. Thus, while he agreed that the environment is changing rapidly, higher education, he argued, as a whole is not. He stated that while many have expected a rapid change in higher education organizations in response to information technology, “we’re still waiting for those widespread, dramatic improvements”. Most other authors promote a sense of urgency about the rapid changes in technology and criticize higher education organizations for failing to respond quickly enough. Nelson and Davenport (1996) complained, “organizations often change more slowly than technology”. They remarked that often there is no drive for change and “conditions need to reach a crisis proportion to facilitate rapid change”.

Conflict between fast change and planning. Schmidlein’s (1974) view of the incompatibility of fast change with planning is supported by van Vught (1988), who stated: “The environment is too broad and too dynamic to try to formulate definite descriptions and explanations, from which guaranteed effective interventions could be deduced” (p. 12).

Mintzberg (1994) argued that one of the primary fallacies of strategic planning was what he termed the fallacy of *predeterminism*. This fallacy involves a

contradiction between the notion that planning is based on the need for stability both in the environment and the organization and the notion that planning leads to change. He considered planning to be counterintuitive since "...serious change in strategy tends to be associated with discontinuity, the very thing that planning is least able to handle" (p. 240). Thus, while the environment of higher education organizations is changing, planning, which seeks stability, has a difficult time adapting to that change.

Birnbaum (2000) questioned whether there has truly been an increase in the rate of change in the environment of higher education organizations in the last 25 years compared to previous decades. Claims of such change may have been exaggerated and led to the use of management fads, such as strategic planning which, he stated, ultimately failed. Thus, it is not clear whether the environment is changing at an increasing rate or whether such claims are overblown. For the purpose of the comparison of the two models of decision making, it may not matter exactly whether the environment is changing more rapidly or not. It is important to keep in mind that such claims may be invalid or exaggerated. Without such claims, many might be unwilling to adopt new methods of inducing change within institutions.

In summary, rapid change in the environment is often perceived as threatening and a cause to implement a planning process. However, planning processes, despite claims to the contrary, require lengthy adjustment periods and are better suited to slowly changing environments. Planning decisions typically are made at particular times in an annual cycle instead of when the need for a decision first becomes apparent.

Repetitiveness

Repetitiveness, or its opposite, unpredictability, is also an environmental factor described by Schmidtlein (1974) that affects the decision-making process. According to Schmidtlein's (1983) analysis of the two decision-making models, the comprehensive model responds more favorably to repetitiveness, while an incremental approach works better at handling unpredictability. When the environment is unpredictable, an incremental approach is, by definition, a step-by-step process that can be adjusted to fit the changing environment.

Calls for planning. One of strategic planning's first steps is to scan for changes in the environment that will affect the organization in the future. This information is then used to guide the planning process. Keller (1983) assumed organizations could predict the future. He recommended that they become more forward looking and plan to meet anticipated future events. Bryson (1995) stated that "The environments of public and nonprofit organizations have become increasingly uncertain in recent years..." (p. 1). He recommended that organizations respond to this increasing uncertainty with strategic planning. He also indicated that strategic planning, when designed well, would respond to uncertainty well. He argued that using a more incremental method would result in "chronic underperformance" (p. 9).

Commentators on the changes in information technology and the environment have emphasized the level of unpredictability of these changes. Gilliland and Tynan (1997) described an environment of unpredictability for technology. Norris and Dolence (1996) stated that the changes in "particular technology pathways" are occurring with greater uncertainty for higher education

organizations, as a result of shorter horizons for change in information technology. Ringle and Updegrave (1998), in the report of a survey of 150 technology officers in higher education stated that “most...express skepticism about anyone’s ability to accurately predict which kinds of technology will be needed beyond the next two or three years”. Some authors have asserted that a major problem for higher education organizations is a short obsolescence frame for technology (e.g., Nelson & Davenport, 1996). Preparing for obsolescence requires individuals to predict the useful life of a technology and to identify how to replace this technology with the least amount of waste. Dill (1997) stated that as the environment of higher education becomes more competitive and institutional tasks become more complex, “the net effect of these changes in the environment and responsibilities of colleges and universities is to increase uncertainty...” (p. 93). At the same time, these same authors recommended planning as a response to the increasing uncertainty.

The technology planning literature generally indicates that it is important to have long-term perspectives, although many argue that accurately predicting changes that will occur over a long period is difficult (e.g., McCredie, 2000). Norris and Dolence (1996), for example, recommended that technology planning maintain a five- to ten-year view of the future. Graves et al. (1997) recommended a “long-term strategic framework for prioritizing and funding those issues of technology which are most strategic to the institution’s mission...” (p. 448).

Gilbert (1996) said that transforming higher education organizations should occur through an incremental process, with annual reexaminations of the organization’s values and mission. He suggested that changes in information

technology are gradual but occurring, with a “cumulative impact”. Ringle and Updegrave (1998) suggested surveying campus members every five years to assess institutional priorities and strategic objectives. At the same time, they recommended a technology planning process that includes “fungibility” of the budget, to allow for more incremental changes to be made even when the plan’s time horizon is long. Nelson and Davenport (1996) described a planning process which was sidestepped to respond to short-term needs of the campus regarding technology. It is interesting to note that they continued to support the notion of a long-term plan even though it had been ignored in the case they described.

Conflict between unpredictability and planning. In an environment that is changing rapidly, it is expected that there will be fewer predictable changes. Birnbaum (2000) considers “predicting turbulence...an oxymoronic challenge” (p. 69). Mintzberg (1994), in his discussion of the fallacy of predeterminism, argued that forecasting of future events is problematic and inevitably inaccurate. He stated that planning requires that “the context for strategy making is stable, or at least predictable; the process itself as well as its consequences (strategies) can be predetermined” (p. 224). Critics of the planning process have suggested that it is a mistake to focus on the long term because of the difficulty with predicting future events. Schmidlein and Milton (1990) stated that “long-term goals tend to be too inaccurate” (p. 24).

In summary, the comprehensive model is expected to be less compatible with a changing environment, because it assumes a predictable pattern of interactions between the organization and the environment. If, as many authors have suggested,

the environment of higher education organizations is becoming increasingly unpredictable, then the incremental approach, with its more flexible approach would be a more appropriate response (Schmidtlein, 1974).

Causal Relationships

According to Schmidtlein (1974), another factor relating to the environment of the organization is whether causal relationships among organizational variables, and therefore, outcomes are direct and knowable. The two decision-making paradigms differ in their assumptions about the nature of causal relationships (Schmidtlein, 1974, 1983). The comprehensive model assumes that causal relationships among events at an organization are discoverable. The incremental model assumes that these relationships may only be identified after the fact, through *interpretation* of the process (c.f., Birnbaum, 1988; Cohen & March, 1974; Weick, 1979). A corollary to the organization's complexity is that the more complex an organization is, the less likely causal relationships are direct or knowable.

Calls for planning. The literature on strategic planning is rife with anecdotes of successful strategic planning processes at higher education organizations. The general order of events of these examples is: the environment is scanned, objectives are identified, the plan is designed, and then the plan is implemented. Success occurs when the plan meets its objectives and some measures of success are indicated (e.g., enrollment increases, costs are decreased, etc.) Keller (1983) and Cope (1987), to mention two often-cited sources, provide many of these examples. Implicit and explicit in this work is the notion that strategic planning *led* directly to the specific outcomes that were decided *a priori*. The examples are from institutions

of different sizes and types of administrative structures with no difference in efficacy of the process relating to complexity of the organization.

The same assumption of a direct and knowable causal relationship between the planning process and changes at the organization is apparent in the literature recommending technology planning. Norris and Dolence (1995) stated that in order for a higher education organization “to be effective, all of the organization’s constituents must be aware of the changes in the environment and their impact upon the organization” (p. 86). These authors assumed that as long as the information about the larger environment of the organization is available, individuals will be able to agree upon what to do about changes in the environment and can effect change as desired.

Peterson and Dill (1997) described an “expanding” environment and increasingly diverse delivery systems, customers, constituents demanding services, and more interdisciplinary research and learning. These changes increase the complexity of the external and internal environments of the organization.

Gilliland and Tynan (1997) stated that increasing complexity is a factor responsible for decreasing predictability in higher education. They suggested increased complexity is a result of greater amounts of information from a highly interconnected environment, which can be understood differently by different individuals. They also described how change in the organizations may arise as an “emergent property” or unexpected result of “actions arising from intentions”. They also recommended formal planning, despite these inherent contradictions.

Conflict between complexity and planning. The assumption that complex causal relationships are knowable is considered unrealistic by some authors (Schmidtlein & Milton, 1990). Lindblom (1959) indicated that a planning process is impractical because too much information and too many calculations are required. He also suggested that too many relationships among variables can throw off the calculations easily. Thus, he proposed, the incremental process is the only appropriate way to respond to a complex environment.

Wildavsky (1973), in his critique of planning, outlined the steps involved in understanding the causal relationships among different variables. He highlighted how difficult, if not impossible, understanding the myriad number of relationships would be:

If the consequences of contemplated actions cannot accurately be appraised, specific objectives will be achieved only by accident. The necessity for causal knowledge is made more stringent in long-range planning because the consequences of each action become the basis for the succeeding steps. Each error in prediction is magnified because of its impact on future decisions. (p. 131).

Birnbaum (2000) argued that after a management fad, such as strategic planning, is implemented, individuals believe that success of the organization and implementation of the fad are causally related even when there is no clear evidence for the linkage. This is a result of a cognitive bias: to view one's practices as the reason for successes.

Thus, while planning assumes a direct causal link between the planning process and outcomes, there is some evidence to the contrary. The link may be perceived as existing, as a result of cognitive biases, rather than actually existing.

This bias may explain, in part, why formal planning is considered to be a solution to resolving technology problems in higher education organizations.

Change Technology

The *change technology* variable refers to the process by which deliberate change occurs. The assumptions about this variable are different for the two decision-making models. The comprehensive model assumes that change technology for an organization is available and “critical variables that must be altered are controllable” (p. 6), while the incremental model assumes that the processes that lead to change are ambiguous or the technology to implement them is not available (Schmidtlein, 1974, 1983).

Calls for planning. Authors who promoted strategic planning implied that implementing the strategy that is devised in the planning process leads to deliberate change and specific outcomes. Kotler and Murphy (1981) described the strategic planning process used by Beloit College to respond to its changing environment. They described how identified strategies led to specific goals. Keller (1983) indicated that higher education institutions had to take charge and respond to the environment. He gave many examples of institutions that made what he considered deliberate steps to lead to desired change. Bryson (1988) admitted that strategic planning results in “some combination of what is intended and what emerges along the way” (p. 9). At the same time, he recommended that organizations implement strategic planning processes to effect change.

The literature on technology planning contains the same assumptions as the literature on strategic planning regarding change technology. For example, in Peterson’s (1997) description of a university’s comprehensive technology planning

process, he described how a university can employ a “contextual” planning process. Using this process, an organization is “proactive” (p. 127) in responding to changes in the environment rather than merely being reactive to pressures in the environment to “fill a niche” (p. 135). The underlying assumption to Peterson’s (1997) approach is that the organization can determine its destiny and employ specific measures to reach specified goals.

Kobulnicky (1999), in promoting technology planning, stated, “although some factors of change are external to higher education and not under its control, much is controllable with proper planning”. He also describes the notion of planning to use “technology in a deterministic way to consciously improve learning”. Again, the assumption here is that change processes are available and controllable.

Conflict between lack of control technology and planning. Although the notion that direct control over changes in the organization is considered to be more *evolved* (Mannheim, 1940), some authors consider a sense of control to be more a matter of interpretation of causality than real in higher education institutions (Birnbaum, 1988, 2000; Cohen & March, 1974). According to Wildavsky (1973), planning is “the attempt to control the consequences of our actions. The more consequences we control, the more we have succeeded in planning” (p. 128). The problem with planning, he stated, is that the *desire* to plan does not necessarily mean that “future control has been achieved” (p. 129). He also suggested that there are often “unplanned consequences” (p. 129) of a planning process. Planning, he argued, does not directly control changes.

Mintzberg (1994) indicated that control of the changes in an organization is assumed by the planning process, but is related to the fallacy of predeterminism. The underlying assumption of the planning process is that direct control is possible, while in reality it is not. The reason for this relates to the complexity of the organization, as discussed previously, which makes knowing causal relationships difficult or impossible.

Cohen, March, and Olsen (1972), who considered higher education organizations to be “organized anarchies”, explained that “Although the organization manages to survive and even produce, its own processes are not understood by its members” (p. 1). They stated that the relationship between means and ends is not clear and not necessarily knowable.

In summary, there is a conflict between the assumption of controllable change in the organization that underlie the comprehensive model and a lack of available control for technologies for implementing change. While many assume that control, or implementation, technology is available and used, others believe that there is merely a *perception* of control rather than actual control.

Location of Resources: Economic, Social, Human, and Information

Economic, social, human, and information resources are assumed to be available to implement centralized actions for the comprehensive model and to be decentralized for the incremental model (Schmidtlein, 1974, 1983). Centralization presumably allows for increased levels of control while decentralization allows for increased flexibility and responsiveness by institutional units.

Calls for planning. Most calls for strategic planning recommended increasing the centralization of campus resources and processes. These include

increasing the power or control of the campus leaders and increasing central access to information. Keller (1983) suggested that there was a need for increased central control at higher education organizations to increase responsiveness to the planning process and the environment. Bryson (1988) stated that strategic planning allows the institution to be better coordinated, which would increase responsiveness. In order to respond to issues that cut across campus units and allow key decisions to be made by top-echelon managers, most proponents agreed that strategic planning required greater centralization of resources (Baldrige & Okimi, 1982; Dolence & Lozier, 1990). These calls for increased centralization assume that changes will be made more efficiently and effectively centrally than by decentralized units.

Centralized decision making, particularly by leaders of the organization, was cited by most authors as a key to success for the organization regarding technology planning. Rudy (1995) in a *CAUSE* profile of Penn State University promoted the notion that the comprehensive, campuswide plan for the computer and information systems was successful because it was centralized. Michalak et al. (1999) stated, “when information technology services become fundamental to the daily operation of the university...they require centralized coordination to attain maximum reliability and universal equity of access”. They cited a “lack of coherence in the system” as a cause for crisis in information technology. They also suggested that “good decentralized IT environments are planned; they do not evolve naturally”. They described the importance of centralized decision making and problems that occur when leaders of the institution do not develop an understanding of information

technology concerns. They warned that information technology staff may get too much power if control is not maintained centrally.

Gilbert, et al. (1995) described technology planning at Temple University and indicated that coordinated, universitywide planning was the key to success for the university. Failure to have such *top-down coordination*, they suggested, leads to duplication of efforts and an inability to share knowledge gains for the planning process.

Many authors recommended centralizing the budgeting process and tying it more closely to the technology planning process (e.g., Kobulnicky, 1999). The main reason was a result of the belief that without coordinating the budget with the planning process, the plan would become a “shelf document”, not a working plan. Nelson and Davenport (1996) attributed past planning failures to decentralized technology funding and current successes to centralized resources. Michalak et al. (1999) also recommended centralized information technology budgeting by institutional leaders to maintain ties to the academic mission.

The importance of leaders in the technology planning process was also discussed by many authors. These authors explained that leaders need to vocalize the desires of the campus in the form of a “shared vision” and to ensure that the plan is carried out to the benefit of the majority of constituents. Norris and Dolence (1995) suggested that leaders of the organization need to have information and to take the lead in new initiatives. Leaders, they stated, are responsible for “shaping the debate and helping the campus build a new set of shared values regarding learning in the Information Age” (p. 88). Norris and Dolence (1995, 1996) also said that

everyone at the organization should have more information about the environmental changes and emphasized leaders' role in leading the discussion and actions about these changes. Wagner (1994) argued that leadership is necessary to make "technology utilization as an institutional priority". She argued that the resources necessary for change must support these priorities. Ringle and Updegrave (1998) suggested that providing information to all constituents of the campus will lead to good decisions and failure to get leaders "on board" has led to past failures of technology planning. Michalak et al. (1999) also remarked that centralizing technology decision making will "maximize use of scarce talent" and reduce costs for staffing.

Information is considered a key aspect of the success of technology planning. Without the right amount of information and without sharing knowledge of it, it is predicted that planning will not succeed (e.g., Gilbert, et al., 1995; Kobulnicky, 1999; Norris & Dolence, 1995, 1996). Wagner (1994) stated that "it is critical for technology users and managers to develop perspectives that encompass the issues and concerns of the total organization."

Conflict between centralization and planning. The notion of centralizing economic, social, human, and information resources is based on the belief that doing so will provide higher education organizations the opportunity to improve their ability to respond to the environment in a coordinated manner. This notion is inconsistent with the fundamental nature of the institutions (Birnbaum, 2000; Cohen & March, 1974; Cohen, March, & Olsen, 1972). Schmidlein and Milton (1990) indicated that in order to be successful, the strategic planning process had to fit the

culture of the organization and “its values, traditions, governance structure, decision-making processes and administrative style” (p. 18).

Demands for increased centralization are incompatible with higher education institutions’ organizational structures. Higher education organizations are loosely coupled federations with the majority of the decision-making power at the department level with faculty, who “deliver” a “product” (Cohen & March, 1974). The cultural value of academic freedom and shared authority conflicts with the notion of increased centralization (Birnbaum, 2000). Increasing control and centralizing resources are difficult because it is difficult (and unwise) to “manage” faculty (Chait, 1993; Schmidlein & Milton, 1990). Centralization of resources may “be insensitive to the complex values and circumstances throughout the organization that affect the change process” (Schmidlein, 1974, p. 7). Chaffee and Jacobson (1997) stated that the administrative culture of higher education organizations must be sensitive to the collegial or academic culture, which involves shared authority.

Dill (1993-94) stated that what is actually needed by higher education organizations, rather than increased centralization, is “much greater integration and collaboration among the highly differentiated, ‘loosely coupled’ campus units” (p. 9). “Tightening” organizational relationships through greater horizontal integration and providing more opportunities for innovation and creativity among professionals in the organization would improve the organization’s response to environmental changes (Dill, 1993-94).

In summary, it is assumed in much of the literature on planning that increased centralization of economic, social, human, and information resources would be a

panacea for higher education organizations' problems. However, centralization may adversely affect the nature of the organization, increasing problems, rather than diminishing them.

Functions

Schmidtlein's (1974) *functions* variable refers to the process by which decisions are made. The comprehensive model assumes a logical, algorithmic-type process. In this process a complete set of alternatives is identified and a cost-benefit analysis is performed to determine which alternative is most desirable. The incremental model assumes that the goals are not always clear and are negotiated through a political process.

Calls for planning. Promoters of strategic planning differentiated it from previous planning efforts suggesting that strategic planning takes politics of the organization into consideration. Past efforts, they claimed, had failed in part because of a lack of political analysis. Keller (1983) promoted strategic planning as a "middle" way between long-range planning and incrementalism. He suggested that strategic planning involved both rational and political processes. Bryson (1995) stated that organizational leaders had to understand the organization's social, political, and historical context before proceeding with strategic planning. Leaders, he said, had to "champion" the process which involved explaining how change would occur, building trust, establishing partnerships among individuals, communicating for a "meaningful process" (p. 221), enforcing norms, and managing disputes. Kotler and Murphy (1981) outlined a series of steps in the strategic planning process as a hierarchical procedure. They suggested, however, that because of the importance of faculty in higher education organizations, the planning process

is more “democratized”. In response to this, “administrators do not simply select the most cost-effective strategy, as business managers do, because they must consider a variety of organizational and behavioral constraints” (p. 473).

Baldrige and Okimi (1982) compared long-range planning to strategic planning and indicated:

Rationality, quantitative analysis, and highly technical planning techniques are among the long-range planner’s package of skills...By contrast, people who advocated strategic planning see it as an art form: a subtle blend of facts, hunches, assessments, experiences, and trial and error experiments” (p. 17).

Thus, they suggested that strategic planning was *not* about rationality, but instead should focus on intuitive processes and political processes: “And, real-world administrators report, they rarely make decisions about program continuation based on rational evaluation” (p. 16).

Authors describing technology planning are not as clear about the political nature of decision making in higher education institutions and appear to fall back to the notions of rationality as the process of choice for the planning process. Nelson and Davenport (1996) described a “systematic” approach to the planning process and stated that “Every technology purchase is a strategic decision that must balance price versus performance and obsolescence, and current versus projected markets and priorities”. Hafner and Oblinger (1998) provided flow charts and other advice about how to improve the planning process.

Most technology planning advocates have described the importance of a shared vision, as discussed previously. This suggests that although a logical or rational system of decision making should be used, the leaders should instill a sense

of direction and provide explanations for decisions that are made. Perhaps this is a concession to the political nature of decision making in higher education organizations.

Conflict between “rational” decision making and planning. Critics of planning processes have suggested that a “rational” approach, while appealing to one’s sensibilities, is not compatible with the characteristics of higher education organizations (e.g., Schmidlein & Milton, 1990). Some have suggested that so-called rational decision-making processes, while appealing, do not exist in practice.

Wildavsky (1973) questioned the meaning of the term *rationality*:

Be rational! If rationality means achieving one’s goals in the optimal way, it refers here to technical efficiency, the principle of least effort...one can conceive of several levels of rationality for different aspects of society. There is the rationality of legal norms and of social structures as well as political rationality, which speaks to the maintenance of structures for decision, and economic rationality which is devoted to increasing national wealth (p. 145).

There are a variety of meanings of the term “rationality”. Given this variety, Wildavsky (1973) indicated, the use of the term becomes meaningless “proverbs or platitudes” (p. 146). Planning is an act of faith, he wrote, and the notion of rationality is used to cover up the fact that the future cannot be controlled.

Rational processes are desired and outlined by many authors, but there is little evidence that people within higher education actually use these methods to make decisions. Such “rational” processes tend to focus primarily on economic variables and variables that can be quantified. This view leaves out political, social, cultural, and human resource considerations. Thus it is actually an irrational process (Schmidlein, 1999). Chaffee and Jacobsen (1997) suggested that the dominant

culture of administration of higher education is *rational*, while the culture of faculty is *collegial*, which requires bargaining and consensus-building. The culture of the collegial system involves the “expectation of intellectual integrity” (p. 232) and the value of scientific inquiry. They recommended using a rational approach at the same time as creating a shared vision and trust-building with a “shared cultural value” (p. 232). Birnbaum (2000) also suggested that another type of cognitive bias, a *role bias* of managers, fits the notion that managers of higher education institutions should be rational actors. With this bias, managers are expected, because of their roles as managers, to behave rationally.

Mintzberg (1994) described a second fallacy of strategic planning: the fallacy of *formalization*. This assumption refers to the attempt to mimic individuals’ creative intuition by identifying the component parts of their creativity. By breaking down intuition into its component parts, a “synthesis” (p. 223) is expected to be reached. This notion of reductionism is fallacious, according to Mintzberg, and creativity is more effective than attempts to mimic creative processes through a hierarchical analysis of a rational process.

Schmidtlein and Milton (1988), in their empirical study of strategic planning at 16 higher education institutions, found that planning was seen as a rational solution that would *reduce* the effects of politics at the organization. When this expectation was not met, participants were disillusioned with the process. In their literature review on strategic planning, Schmidtlein and Milton (1990) noted participants’ lack of political understanding; participants focused on economic rationality, rather than the political aspects of decision making.

In summary, proponents of strategic planning have conflicting notions of the character of rationality and political bargaining. While there is some understanding of the importance of political bargaining in the literature, there is reliance upon the value and opportunity for so-called rationality in practice. Since “rational” decision making may not be possible in practice, frustration may develop about decision-making processes that fall short of this “ideal”.

Goals

The *goals* variable is a compilation of several of Schmidtlein’s (1974) factors that relate to decision-making process goals. According to Schmidtlein (1974), assumptions regarding the goals factors vary for the two decision-making approaches in the following ways: First, the *competing priorities* factor relates to whether goals can or should be prioritized. The comprehensive model assumes that they should be prioritized to allow for well-informed decision making. The incremental model, however, assumes that it may not always be possible to rank goals and “priorities are established on the basis of negotiation over expressed self-interests” (p. 6). Second, the *outputs* factor raises the question of whether “goals and measurable outputs are essential” (p. 6). The comprehensive model assumes that measurable goals are necessary to assess outcomes. The incremental model assumes that “means and ends are determined simultaneously through bargaining” (p. 6). This is consistent with the notion of “garbage-can” decision making as described previously. Third, regarding the *quantification* factor, the comprehensive model assumes that goals must be precisely quantified. The incremental model assumes that attention to the quantification of information can lead to incomplete information about the area subject to decision. Last, regarding the *consensus* factor, the comprehensive model

assumes that reaching consensus is one objective of an analysis of goals. The incremental model, on the other hand, assumes that conflict is “inevitable” (p. 6) when comparing goals and “due process” (p. 6) is needed to reconcile conflicts.

Calls for planning. A number of proponents of strategic planning have emphasized the need for goals that are prioritized, clearly defined, quantifiable, and determined by consensus. For example, Kotler and Murphy (1981) argued that “The environment and resource analyses allow the organization to formulate new and appropriate *goals* that it wishes to pursue for the planning horizon” (p. 471, emphasis by authors). They also stated that:

The purpose of developing a clear set of institutional goals is precisely to keep the organization from drifting into an uncertain future. The institution needs to have a clear picture of what kind of organization it wants to look like at the end of the planning period. It needs to know what it wants to accomplish this year, the next year, and several years after... Without goals, whatever the organization does or achieves can be considered acceptable; there is no standard for planning or control (p. 478).

Keller (1983) agreed that the priorities and outputs of higher education organizations should be clearly defined. He criticized the incremental approach to decision making, as characterized by Lindblom’s (1959) notion of “muddling through”, for its lack of clearly defined goals for the organization. Keller (1983) was concerned that organizations would be aimless and not reach their full potentials without clear goals.

Baldrige and Okimi (1982), on the other hand, stated that strategic planning was less a matter of setting specific goals, than a “state of mind” (p. 16). They stated that planners should focus on the larger picture of the organization’s situation within

the environment and ways to respond to it, rather than the specific “nuts and bolts” (p. 17). They compared long-range planning to strategic planning and noted that:

The long-range planner is usually concerned about coming up with the *right* plan, given the facts, figures, and crystallized goals. The strategic planner’s interest is in *wise* decisions given a subtle blend of qualitative and quantitative factors (p. 18). [emphasis by authors]

Keller (1983) warned that quantification should not be a substitute for analysis; having data without having a clear purpose could lead to confusion. He stated that: “Quantification is provided mainly to enrich qualitative sagacity not replace it” (p. 141). He also suggested that the goals should not be based on consensus. Since consensus was unlikely to be reached, Keller (1983, 1997) suggested, it should not be a goal of strategic planning.

Much of the writing on strategic planning emphasizes the importance of setting the *right direction* for the organization and not creating an overly constrained process with goals that are too specific. For these authors, the sense of a shared vision, championed by leaders, should be determined through intuition and bargaining (e.g., Bryson, 1995; Keller, 1983). For example, Dill (1997) described how planning can increase the opportunity for communication within the organization to create shared values and visions.

Much of the technology planning literature proposes the notion of clear and quantifiable goals less ambiguously than the strategic planning literature does. One of the most common themes in the technology literature is the view that higher education organizations must develop clear visions or institutional goals regarding technology and the general direction of the institution. This theme is characterized by Norris and Dolence (1995, 1996) who repeatedly called for a “transformation” of

higher education via technology and curriculum changes to meet growing demands for alternative learning experiences. They insisted that institutions that do not want to be left out of the current wave of change need to increase their use of a vision and strategic thinking. They called for thinking “transformatively” and long-term views for the transformational process. They described a “learning vision” that would allow “decision makers to ‘see’ beyond the curvature of the earth” (Norris & Dolence, 1995, p. 87). This vision is to be tied to decision making at the present time to allow the institutions to transform in the following years. Norris and Dolence’s (1995, 1996) notion of the “transformative vision” is echoed in many other writings about technology in higher education.

Kobulnicky (1999) described a technology planning effort at the University of Connecticut and how the committee he led consciously decided to avoid the failures of other institutions to “transform their institutions” through “collective analysis of the university’s current state with respect to the vision [of the institution’s strategic plan] and the factors that supported and inhibited it from attaining that vision”.

Hafner and Oblinger (1998), while advocating technology planning, criticized higher education organizations past and present, saying that they have “historically been unable to become effective learning organizations” (p. 3) which were not meeting the needs of society in the “information age”. They emphasized that technology can enhance the areas in which higher education failed previously. They stated that the first steps in transforming the institutions involve creating a

mission statement and defining clear goals. They suggested prioritizing the goals to fit a custom-service model.

Echoing the sentiment that higher education organizations are not doing well in the rapidly changing environment, Moran (1998) stated that it was because they “keep planning the same old way” (p. 38). He suggested that current planning efforts fail because the vision statements are too vague, without definable goals, and are not clearly linked to the budget which has no prioritized recommendations. Instead, he recommended a holistic view of the “organizational missions and goals” (p. 43) with integration and consistency between the goals and the technology plan. He also recommended a “long-term vision of how technology will support the institution of the future” (p. 46).

Following their survey of 150 information technology officers, Ringle and Updegrave (1998) said the objectives should be prioritized “according to costs and benefits”. They recommended creating “operational goals” annually. They stated organizations must recognize the differences between operational and strategic goals. Wagner (1994) suggested a “framework for technology that emphasizes prioritizing academic technology utilization”. Wagner (1994) warned, however, that it is “easier to measure institutional penetration than to assess utilization efficiency”. She acknowledged the difficulty in quantifying changes, but she continued to call for it.

It is clear that some writing on strategic and technology planning has stressed the “rational” nature of decision making, the need for prioritized goals, clearly defined goals, and quantification of data. Others, however, emphasize the political nature of the process, suggesting that goals are neither prioritizable nor quantifiable,

but, instead, are negotiated. Within the strategic planning literature, there are conflicting views about the necessity or even wisdom of having specific, quantifiable goals. The notion of shared vision, therefore, stands as the substitute for consensually determined goals; a shared vision at least must be supported by the leading promoters of the strategic planning process. The literature on technology planning emphasizes the importance of clear and prioritized goals for the planning process more than the literature on strategic planning. Both focus on the importance of a shared vision to lead the planning process. This emphasis on shared vision may result from the understanding that higher education organizations are federations of subunits with different goals, rather than centralized bureaucracies with single goals that can be outlined easily.

Conflict between goals and planning. Critics of planning dispute the notion that it is possible or useful to identify goals. Cohen and March (1974) described higher education organizations as having ambiguous goals that are difficult to prioritize. The institutions' different subunits may have competing priorities and different goals. Lindblom (1959) stated that planners may be unable to determine and articulate values and rank-order the priorities. He also suggested that outcomes may not be measurable or distinct from chosen policy. He warned that simplifying the process may lead to ignoring relevant values or possible outcomes. Schmidlein and Milton (1990) described how planning processes tend to focus on easily measured goals, distorting the process. They also indicated that well-defined goals are difficult to identify.

Mintzberg (1994) argued that a third fallacy, the fallacy of *detachment*, or the need to separate planning from operations, is fallacious because it suggests that quantification of data is necessary. In order for managers to be able to spend time planning, as a separate task from daily operations, they need data they can assess quickly for the planning process. He suggested that the usefulness of “hard” data is limited. One problem, Mintzberg (1994) pointed out, is that the data are often biased toward the quantifiable and this “is often limited in scope, lacking richness and often failing to encompass important noneconomic and nonquantitative factors” (p. 259). Thus, while managers want to simplify the process through quantification, they are actually more biased when using the available data. Birnbaum (2000) agreed that there is too much focus on quantification of goals.

Schmidtlein (1999) suggested that many of the problems of planning are a result of a faulty bias of individuals who believe that “goal seeking” is a primary task of organizations. An alternative view is that organizations base their actions on the need to balance the “multiple interests [of its constituents] to achieve a distribution of resources that maintains all essential members’ participation” (Schmidtlein, 1999, p. 579). Thus, higher education organizations, by their nature, cannot have clear goals that are rank-ordered. Attempts to reach such goals are unsuccessful because of the complex relationship among the components of the organization. The complexity of the organization leads to “limits to the utility of setting goals and employing a priori analyses as a basis for prescribing changes” (Schmidtlein, 1999, p. 582). By setting goals, one may actually reduce the effectiveness of the organization in meeting its needs, resulting in sub-optimal decisions.

In summary, a shared vision and clear goals determined by logical analysis are considered imperative to a successful planning process by authors promoting both strategic and technology planning. These authors' recommendations vary regarding the specificity and breadth of the goals. While some authors promote comprehensive goals that provide specific directions for a number of functions, others called for a general direction defined by a shared vision. The nature of the higher education organization, with ambiguous and conflicting goals, may make specifying and reaching precise goals difficult.

Deadlines

Schmidtlein (1974) indicated two aspects to the *deadlines* variable. First, he suggested that deadlines can constrain the amount of time available to make formal decisions. Short deadlines create the need to fall back upon previously determined routines, if there is a precedent for a response, or to intuition, if there is no precedent. Schmidtlein stated "The presence of time constraints increases the incentive to plan where past events served, to some degree, as a guide to the future..." (p. 9). Thus, when environmental changes are rapid or unpredictable, it is more difficult to plan with short deadlines, since there is less time to collect data, analyze and obtain agreement on possible future trends. The presence of distant deadlines, therefore, is more adaptable to the comprehensive model than short deadlines. Short deadlines are more compatible with the incremental model of decision making, particularly when the environment is changing rapidly and is less predictable.

The second aspect of the *deadlines* variable refers to the use of specific timetables. Schmidtlein (1974) stated that "the presence of deadlines requires the *a priori* analysis of events and the development of timetables..." (p. 6). Thus, the

comprehensive model has specific deadlines as an integral part of the process. This then assumes that, in order to meet the deadlines, the planning process lays out the sequence of events and changes in order to meet its objectives. The incremental model, on the other hand, assumes that flexibility, rather than planning, is needed to meet deadlines. Successful decision making responds rapidly to changes in the environment: “a flexible bargaining position causes decision-makers to resist committing themselves to courses of action much in advance of deadlines” (Schmidtlein, 1974, p. 6).

Calls for planning. Much of the literature on strategic planning implied a long time should be available to collect data about the environment, identify internal strengths and weaknesses and external opportunities and threats, complete the necessary analyses, set objectives, and identify action plans (Cope, 1987; Keller, 1983; Kotler & Murphy, 1981). Keller (1983) suggested that strategic planning is “action-oriented” (p. 148) and does not necessarily involve the creation of large planning documents with specific details of implementation. However, he also indicated the necessity of collecting a large amount of information on six “elements” of the organization, from its traditions and values to leadership attributes and market trends. Thus, although Keller (1983) professed the ability of the organization to act quickly, it is not clear how the organization could do so when it needs to collect so much information in advance of a change. Short deadlines would require falling back on previously collected information which could lead the organization astray in a changing environment if the information was no longer valid.

At the same time that its proponents were promoting the need for comprehensive preparation during the planning process, they indicated that strategic planning was an improvement over past planning processes, in part, because it allowed for more flexibility and was better able to respond to changes in the environment (e.g., Baldrige & Okimi, 1982; Bryson, 1995). Keller (1983) suggested that the time horizon for strategic planning was short and flexible. Baldrige and Okimi (1982) suggested that the lives of administrators are “crisis-oriented” (p. 16). They stated that while strategic planning provides the overall direction of the organization, good administrators make daily decisions to meet the rapidly changing environment. Administrators’ perspectives, therefore, are “short-range and medium-range” (p. 17).

Bryson (1995) allowed for a strategic planning process that does not necessarily wait for all the steps of the process to be completed before implementation begins. He considered strategic planning to be “iterative, flexible, action-oriented” (p. 38). He stated that “As soon as useful actions are identified, they are taken, as long as they do not jeopardize future actions that might prove valuable” (p. 38). It is not clear how the latter could be foretold; there is an apparent contradiction between having enough information and knowing when to act based upon information gathered at a certain point.

It is apparent that the comprehensive nature of the needed information and analyses requires a great deal of time. None of the proponents of strategic planning described shortcuts or contingency plans that would allow the organization to make quick decisions or alter their plans based on an unpredicted event in the environment.

Their view implied that any environmental change should be predictable because of the exhaustive nature of the environmental scan. These views of strategic planning, therefore, contradicted themselves. While calling for planning, they also called for flexibility that would presumably undermine the planning process.

Technology planning advocates were more likely than strategic planning advocates to suggest skipping steps or continuing with more simultaneous processes to increase flexibility. They suggested that as long as a general “vision” was followed by actions, then it was less crucial that an action had been planned specifically. This difference may be a result of the nature of technology recognized by the technology planning advocates. This view is exemplified by Green and Gilbert (1995) who stated:

Additionally, technology resources are expensive yet have a short half-life, often less than 15 months. Most campuses do not have an amortization plan for acquiring and retiring needed equipment and software that becomes obsolete quickly (p. 14).

They suggested that deadlines are imposed by the nature of technology, which requires decisions to be made about materials and procedures that may be outlived by the payments for their implementation. Thus, the nature of technology may demand shorter deadlines for decision making than organizations are prepared to make.

Gilbert (1996) suggested a way to avoid the “CRISIS, LURCH, CRISIS, LURCH...[emphasis by author]” response mode of institutions that are seeking information technology integration within their academic processes. He recommended continuing analysis of problems that crop up in technology, building a “vision”, and “adjust[ing] to new pace and depth of change”. This view supported

the notion that decisions could be made quickly, and as needed, as long as they are in line with the vision and a “portfolio of change strategies”. This would allow for a rapid response in line with predetermined goals. At the same time, Gilbert (1996) suggested an annual reevaluation of goals and desires. He also indicated the difference in understanding of time for higher education institutions and for technology changes, but did not recommend a solution for this difference.

Proponents of technology planning often indicated the difficulty of waiting for comprehensive strategic planning processes to be completed before reacting to perceived technology needs at their organizations. They acknowledged the difficulty of responding to quickly changing technologies and market demands. For example, Gilliland and Tynan (1997) stated:

In the old model, when change occurred more incrementally and the future was more predictable, a smart manager could confidently study a problem, find an answer, design the organizational structure to solve the problem, “sell” the solution to the people who worked in an organization, and oversee implementation of the solution...But it won't work anymore.

They suggested that because of what they considered to be increasing unpredictability, it was necessary for decision making to become more flexible. Four steps were described to take the organization forward: identify an “intention” or vision of the organization, engage in “dialogue” throughout the organization, effect change through “action”, and provide “evidence” of the organization’s performance through data and reports. These four steps are not to be performed successively, according to Gilliland and Tynan (1997), but often as “parallel processes”. The processes then create the future in an emergent fashion, rather than as one that was planned definitively from the top of the organization down.

Nelson and Davenport (1996) described how Central Michigan University analyzed its technology and technology planning needs and determined to “move forward rapidly with technology planning while taking immediate action, and some risks, on very fundamental issues and problems that simply could not be postponed”. They indicated difficulty was experienced while decisions were being made by administrators at the same time that a planning committee was creating a “comprehensive, future-oriented” strategic plan. The deadlines identified by the immediate needs of CMU’s technology users precluded the full use of analysis by the strategic planning committee.

Ringle and Updegrave (1998) stated that many technology officers they surveyed reported frustration with strategic technology planning because it is a “time-consuming endeavor that distracts from rather than contributes to the real work of building and maintaining an adequate technology infrastructure”. Ringle and Updegrave (1998) distinguished between *strategic goals* which need to be “stable and comprehensive” and *operational goals* which need to be “agile and responsive to rapid changes in technology and in users’ needs”. They recommended using strategic technology planning to set the general goals of the campus which would then be carried out through a more flexible on-going process that would provide the details for shorter-term decision-making processes.

Kobulnicky (1999) described a number of problems regarding making decisions about information technology at higher education organizations while trying simultaneously to analyze data regarding the efficacy of new equipment, outcomes of strategies, and the value of new technology initiatives. For example, he

described the conflict between “the need to meet the large and accelerating costs of technology while we debate the intellectual and organizational return on those investments”. He put forward the notion that a comprehensive academic plan would be the best way to solve the problems experienced when decisions have to be made before a solid analysis can be made. He suggested that creating a clear “vision” for the institution would preclude the problems he described by allowing the institution to have a philosophy to follow in its development and implementation of information technology. A comprehensive planning process, according to Kobulnicky (1999), would provide an analysis for future changes to guide decisions, regardless of deadline constraints. This suggestion, however, seems to recreate the problems he described with having to work on immediate problems while waiting for a plan to be developed.

Many advocates of technology planning identified the need to work within their organizations’ budget cycles, which tended to be based on annual projections while also determining longer-range costs and funding cycles of technology. Thus, many advocates accepted the notion that decisions need to be made on a regular basis because of budget and other planning deadlines while broader planning processes were on-going. For example, McCredie (2000) recommended that a strategic technology planning process should have a five-year “cycle” with strategies identified for the long run. Then “managers should review, evaluate, and possibly modify these strategies on a much more frequent basis as the environment changes” (p. 16). He also suggested that “whether or not your parent institution engages in strategic planning efforts, an ongoing IT strategy formulation and funding cycle is

necessary...” (p. 14). Similarly, Moran (1998) stated that the proper way to plan for technology was to have a “time-line for implementation, usually not more than five years out” (p. 47). He recommended having an “executive team” meet every one to three months to assess progress.

Wagner (1995) attributed success at technology planning at Penn State University in part as a result of having “budgets follow plans” with departments creating plans annually which were then presented to the provost at a budget hearing after which the budgets were set. However, Wagner (1995) quoted the then-head of the university’s Computer & Information Systems department, who explained that an on-going problem was “providing life-cycle funding for information technology”. This suggests that the planning for the short-term, which is done annually, may conflict with the longer-range needs of the institution.

More technology planning proponents than strategic planning proponents expressed the understanding that simultaneous processes of long-range planning and daily or even annual decision making must be allowed to proceed. It was acknowledged that flexible decision making is necessary and that comprehensive data collection and analysis may be preempted by perceived immediate needs. At the same time, however, there is agreement that planning must coexist with more routine schedule demands, which include budget cycles. Much of these acknowledgements may be a result of that fact that technology has its own sequence of implementation and obsolescence which may conflict with the routine deadline needs of higher education institutions. It is not clear, however, in the calls for strategic and technology planning, what the planning process would entail given that

increased flexibility was required simultaneously. The definition of planning requires *a priori* identification of future actions. These authors identified the need for this, although they recognized the difficulties inherent in this because of their calls for flexibility. In the technology planning literature, in particular, it became apparent that planning processes were put on hold to allow administrators to contend with pressing issues that had not yet been addressed. To continue to call this decision-making process planning confused the notion of planning.

Conflict between deadlines and planning. Schmidtlein (1990) found in a study of administrators of higher education institutions that dissatisfaction about planning arose, in part, because of “time-consuming, rigid planning processes that discouraged giving prompt attention to issues except in the context of a planning cycle and/or that required time consuming justifications to depart from out-dated plans” (p. 11). Individuals desired more flexibility and believed planning reduced the ability to be entrepreneurial. In addition, Schmidtlein (1990) described the conflict individuals experienced when trying to balance “daily demands for decisions and periodic crises” (p. 12) with formal planning processes that required time commitments. He also described that “Many persons noted that deadlines, competing priorities and characteristics of some planning processes often impeded learning” (p. 18).

Another problem with setting deadlines relates to the notion that outcomes follow decisions (Cohen & March, 1974). Lindblom (1959) argued that specific deadlines for the outcomes of planning are deceptive since decision making is continuous, not “once and for all”. Means and ends are not determined sequentially,

he stated, but are derived simultaneously. This makes setting deadlines irrelevant since that assumes a linear process rather than how decision making actually occurs. Mintzberg (1994) indicated how strategic planning processes, with their focus on *formalization*, which structures analyses of decision-making processes, forces deadlines on creative processes, making them less likely to happen. Rather than providing space and time for reflection, strategic planning attempts to routinize creative processes. Mintzberg (1994) suggested that managerial thinking: “Indeed, the whole nature of strategy making—dynamic, irregular, discontinuous, calling for groping, interactive processes with an emphasis on learning and synthesis—compels managers to favor intuition” (p. 319).

Schmidtlein (1989-1990) described how budgeting processes were rarely linked closely to planning processes because of the difficulty inherent in their coordination. For example, there is a need to maintain budget flexibility to “react promptly to emerging opportunities and problems” (p. 14), while the plan may become outdated too quickly and be too rigid, thus impeding the development of new initiatives: “Emerging conditions and new information typically resulted in changes in plans right up to the deadlines for budget decisions” (p. 14).

In summary, there is general agreement among those who advocate planning that long-term goals should be set for organizations regarding their general mission and technology. The processes involved in such ventures tend to be time-consuming and difficult to change once they have been set into motion. Many writing on strategic and technology planning stressed the need for flexibility and recommended providing it through processes that occur simultaneously with the planning process.

In the end, it is not clear when the planning process should be considered complete and useful. Plans are often ignored or circumvented when unforeseen circumstances arise or timing of the events do not coincide with the planning process. It seems that proponents of planning want to plan until it is not useful and then want to use incrementalism without calling it such. This confuses the definition of planning. In addition, the assumption that there is a linear order of events of decisions and outcomes created by the use of specific decision-making deadlines constrains creative processes, reduces flexibility, and diminishes the ability of the organization to respond to a rapidly changing environment.

Conclusion

Many authors have advocated use of formal planning processes at higher education institutions, even when evidence suggests this is not the most effective way to respond to a changing environment. Planning is often done because of the perceived need to act, even when what is needed, how it is to be achieved, and how to identify success are unclear (Wildavsky, 1973). As Wildavsky (1973) suggested, “Planning is like motherhood; everyone is for it because it seems so virtuous” (p. 149).

Schmidtlein’s (1974, 1983) analysis of the differences between the planning and incremental models of decision making provides a useful framework to examine the literature of strategic and technology planning. Most descriptions of planning processes contain elements of both paradigms (Schmidtlein, 1974). By analyzing the calls for strategic and technology planning, it becomes clearer that what is called “planning” may in fact resemble “incrementalism” more in some cases. Most authors supporting planning have specified that it involves a formal process with a

comprehensive scope, scheduled activities, and a final written plan. At the same time, these authors' descriptions of planning stray from the planning pole of the decision-making paradigm continuum. One must question how far from the "ideal type" a decision-making process can stray and still be consistent with the notion of formal planning. Wildavsky (1973) considered broad usage of the term "planning" to be unhelpful, suggesting that "If planning is everything, maybe it's nothing" (p. 127).

The characteristics of higher education institutions may lead these organizations to behave more incrementally than much of the planning literature acknowledges. This may explain why more recent descriptions of planning processes resemble incrementalism. Problems with planning processes may be predictable given the difference between the assumptions of the comprehensive model and the characteristics of higher education organizations. The following section will describe the design of the research that will examine this issue.

Chapter 3

Research Design And Methodology

This chapter describes the design of the research for the current study. It describes the focus of the research and the research questions and hypotheses on which the study is based. The theoretical models of decision making which provide the analytic framework for the study are recapped. A description of the information collected for the study and the rationale for the methodology are provided. Specific information regarding the site and subject selection and details of the research methods are described. Lastly, an explanation of the basis for the analysis and limitations of the research are given.

Focus of the Research

The present study was designed to evaluate the view promoted in the technology planning literature that a planning approach is the most effective decision-making process for responding to technology changes in higher education organizations. This view may gloss over the incompatibility between assumptions of the comprehensive model and the character of higher education institutions. This study was designed to examine this notion and provide practitioners with an alternative that may be more compatible with how higher education organizations actually work.

This study examines the technology decision-making processes used at a higher education institution and compares it with how participants believe their organization should adapt to changes in technology and demands for technology. It also compares the decision-making process participants espouse with theoretical models of decision making. Subjects were asked to explain any problems with the

planning process and how the process could be improved. The study then compares reported problems and suggestions to assumptions about institutional realities.

Research Questions and Hypotheses

Based on the analysis of the literature, the research questions and related hypotheses are as follows (see also Appendix A)

Descriptive

Research Question 1: What process do subjects recommend using to respond to changes in technology?

Hypothesis 1: Subjects will recommend a comprehensive decision-making process to respond to changed in technology.

Research Question 2: How are technology decisions made at the campus?

Hypothesis 2: The actual technology decision-making processes at the campus will resemble more closely an incremental process.

Research Question 3: How effective is the current technology decision-making process from the perspectives of the participants?

Hypothesis 3: Problems perceived by participants will be a result of the difference between one's espoused view of how technology decision-making should work and decision-making process realities.

Research Question 4: How can the process of responding to technology demands be improved, according to the participants?

Hypothesis 4: Participants will recommend changes to the technology decision-making process to make it more consistent with the comprehensive model's assumptions.

Analytic

Research Question 5: What decision process assumptions underlie participants' recommendations for making decisions about campus technology?

Hypothesis 5: Participants' recommendations for making technology decisions will be consistent with the comprehensive model of decision making.

Research Question 6: How closely do actual technology decision-making processes correspond to planning and incremental decision-making models?

Hypothesis 6: Actual technology decision-making processes at the campus are expected to resemble most closely the incremental decision-making model.

Research Question 7: Do comprehensive and incremental decision-making models provide an adequate framework for analyzing technology decision-making processes at the campus?

Hypothesis 7: The comprehensive and incremental decision-making models are expected to provide an adequate framework for analyzing technology decision-making processes at the campus.

Theoretical Framework

Schmidtlein's (1974) theoretical analysis of the comprehensive/prescriptive (comprehensive) and incremental/remedial (incremental) decision-making paradigms provides a conceptual framework for this study because it provides a detailed comparison of the characteristics of the two decision-making paradigms. This analysis can be used to: a) identify which model most closely resembles the actual decision-making process, b) identify the views participants hold as to which approach should be used and c) predict the dissatisfaction participants have with the actual process and what they recommend to improve the process.

Schmidtlein (1974) suggested that an actual decision-making process will match neither the comprehensive model nor the incremental model exactly. However, it should be possible, he stated, to determine which model the actual process matches more closely. The two approaches to decision making vary with respect to the characteristics or variables described in Table 2.1. These variables will be used to identify which model the actual process resembles most. Participants' descriptions of the process, and documentation describing the process, will be compared across all of the variables to determine which model most closely resembles institutional realities.

By understanding participants' beliefs and expectations, it was expected that their views about deviations from their espoused view of the process could be predicted. This study hypothesized that participants would desire the technology decision-making process to resemble most closely the comprehensive model. It was predicted that the dissatisfaction participants would have with the technology decision-making process would result primarily from the discrepancy between the comprehensive model and the actual process. Thus, while it was expected that the actual process would resemble the incremental model more closely, participants would desire that the process be more like the comprehensive model. It was expected that when participants were asked about their recommendations for improving the implementation of the planning process, they would indicate improvement in one or more of the areas, indicated by the variables, to make the process more closely aligned with the comprehensive model.

In summary, this study uses Schmidtlein's (1974, 1983) distinction between the comprehensive/prescriptive (comprehensive) and incremental/remedial (incremental) decision-making models. This study matches participants' espoused views to the models. The participants were asked to describe the current campus decision-making process and its shortcomings. Their opinions on how to fix the current process, if any improvement is desired, were solicited and compared with the assumptions of the decision-making models identified by Schmidtlein (1974).

Information Required to Answer Research Questions

The following categories of information were collected and analyzed to address the research questions:

1. The general procedures and processes involved in the technology planning process at the campus.
2. Technology purchases and current usage of purchased equipment.
3. The espoused views about decision making for technology planning held by the participants in the technology planning process at the campus.
4. Participants' reports of problems experienced during the technology planning process.
5. Participants' suggestions on how to improve the technology planning process.

Data for the first two categories was identified through an examination of documents relating to the process and interviews with individuals involved in the process directly. Data for the last three categories was taken from interviews with individuals both directly and indirectly involved in the campus technology planning process. Appendix B contains a guide to the interview process, identifying the variables addressed by each question.

Rationale for Research Methodology

This section describes why a case study was chosen as the method for the current study. A case study is defined as “an intensive, holistic description and analysis of a single instance, phenomenon, or social unit” (Merriam, 1988, p. 21). While some case studies are quantitative in nature, most are qualitative to tap the fuller range of individuals’ perceptions about the process in question (Patton, 1990).

The individual campus examined in this study is typical in its structures and processes and the study of it may lead to broader generalizations about technology planning processes at other institutions of higher education that can be tested in further research. Study of this particular campus allowed for an examination of the theoretical issues identified in the previous section and identification of variables that are considered important in determining how participants perceive the efficacy of the technology decision-making process.

Stake (1994) identified three types of case studies which are carried out for different reasons. The first type is the *intrinsic* case study in which one wants to understand the particular case since it may be peculiar and *not* because it may represent other cases or ideas. The second type is the *instrumental* case study in which one wants to study one case because it may represent “an issue or refinement of theory” (p. 237). The current study is designed as an *instrumental* case study. The third type is the *collective* case study in which one studies multiple cases for reasons similar to those for the instrumental case; understanding these cases allows understanding of even more cases.

Deciding upon a research design for a study entails four dimensions, according to Merriam (1988). These dimensions involve the type of research

questions, the control over the situation, the outcome or “end product” (p. 9) desired, and the target of the investigation. The following section describes these four aspects of case studies and why the case study is best suited for the current study.

Regarding the first dimension, the type of research questions, Merriam (1988) suggested that “‘What’ and ‘how many’ are best answered by survey research. ‘How’ and ‘why’ questions are appropriate for case study, history, and experimental designs” (p. 9). The current study’s research questions are based primarily on subjective views of the technology planning process at a single institution. Since the current study examined participants’ perspectives on the technology planning process, it made the most sense to conduct a case study that would allow focused questioning of participants using open-ended items. Patton (1990) stated that: the “most elementary forms of qualitative inquiry, namely responses from open-ended questionnaire items, the major way in which qualitative researchers seek to understand the perceptions, feelings, and knowledge of people is through in-depth, intensive interviewing” (p. 25).

The second dimension, the control one has over the situation, affects the type of research design one uses as well. In the current study, participants’ perceptions about the technology planning process were assessed along with the documents regarding the process. In this case, therefore, direct manipulation of the factors is not possible and the study involved a retrospective examination of events, rather than a prospective study which manipulates variables. Merriam (1988) asserted that the more control over the situation possible, the more an experiment should be used. A

case study is more appropriate when control over the factors of a situation and manipulation of behaviors are not possible.

The third dimension, the “desired end product” (Merriam, 1988, p. 9), relates to whether “the results will involve description and interpretation of a contemporary phenomenon” (Merriam, 1988, p. 9) or the depiction of cause-effect relationships. In the current study, the goal of the study is a description of participants’ perceptions regarding the process of planning as well as an explanation for their satisfaction or dissatisfaction with the process. This goal is more suited to a case study while a description of a causal relationship among variables is more suited to an experimental study.

The fourth dimension refers to the target of the investigation. Merriam (1988) stated that in the situation of a case study the target is a “bounded system...[which may be] a program, an event, a person, a process, an institution, or a social group” (p. 9). The present study is focused on a specific institution in its own specific context, but the lessons learned from this situation should illuminate general issues relevant to a number of higher education organizations. Although the scope of the study is small relative to the population that one may want to generalize to, the case study can “produce a wealth of detailed information about a much smaller number of people and case...[and] increases understanding of the cases and situations studied” (Patton, 1990, p. 14).

Selecting Subjects/Site

Site selection

This research site was chosen in part because of its typicality. Patton (1990) suggested that “When the typical site sampling strategy is used, the site is

specifically selected because it is not in any major way atypical, extreme, deviant, or intensely unusual” (p. 173). The campus under study is a campus of a large multi-campus research university in the northeastern United States. The university has had a continuing strategic planning process for over 20 years. As with most higher education institutions today, technology initiatives are considered to be an important part of the university’s goals. Technology has a central role in the processes of the campus planning and budgeting processes, given its centrality to the university’s goals and the percentages of campus resources it requires.

The campus is a feeder campus to the main campus of the university but also offers a number of associate degree programs, baccalaureate programs, one master’s degree program, and several professional certificate programs. Most of its students are commuters and about one-third are classified as "non-traditional".

The campus performs some semi-autonomous activities, such as planning and budgeting, as well as curriculum development. These activities are mostly initiated by central administrators, but carried out by local campus committees and administrators. Technology planning is carried out by the local Information Technology (IT) Committee as part of the campus-wide strategic plan.

The IT committee is a faculty senate committee charged with identifying technology issues on the campus. Members have general knowledge of technology or are expert users and have a desire to enhance technology’s presence on the campus.

In 2000, an *ad hoc* committee was created by the faculty senate at the campus because there were beliefs that pedagogical issues were not being addressed

sufficiently by the IT committee. The *ad hoc* committee was comprised entirely of faculty members.

Subject selection

Merriam (1998) indicated that the acceptable number of individuals to interview for a case study is equivocal and should be based on a point of “saturation or redundancy is reached” (p. 64). In other words, as the information gained decreased and becomes repetitive, the limit to the size of the sample is discovered.

Approximately 40 subjects were identified for interview. The first three categories of individuals include members of the *ad hoc* academic technology, campus information technology, and strategic planning committees. Additional staff members who were not members of the technology or strategic planning committee were identified for an interview. These individuals represent areas of the campus without direct representation on the committees (e.g., admissions, advising). Additional faculty members were also identified representing academic divisions without current representation or with significantly less representation than other divisions. Attempts were made to represent both tenure/tenure-track and non-tenure faculty in all divisions. Although students are members of the campus technology committee, they were not included for interview because of their short terms at the campus and on the committees. All campus administrators are members of the strategic planning committee and thus were interviewed. They included the Campus Executive Officer, Director of Academic Affairs, Director of Business Services, Director of Student Affairs, and the Finance Officer. Three subjects said that they were unwilling or too busy to participate in the study and five were not reachable; the interviews took place during an intersession period between the end of the spring

semester and the beginning of the summer term when many faculty are busy working on their research.

By interviewing individuals from a variety of positions, directly and indirectly involved in the technology planning process, triangulation helped increase the reliability of the findings. “Triangulation has been generally considered a process of using multiple perceptions to clarify meaning, verifying the repeatability of an observation or interpretation” (Stake, 1994, p. 241). Differences in views of the process were examined and comparisons of individuals in different positions (e.g., faculty, administration, or staff) were made to determine whether these differences may be a result of differing interpretations or different levels of knowledge regarding technology and/or the technology planning process.

Method of Contacting Site

Administrators for the university and campus were contacted to ask permission to conduct research at the campus. Individual subjects were contacted through a letter explaining the research, which was sent with a copy of the informed consent form. A follow-up phone call provided an opportunity for the subjects to ask questions about the study. At that time arrangements were made for the interview.

Research Methods

Collecting Data

The first part of data collection included an examination of documentation regarding technology planning and purchases for the campus from July 1998 to May 2001. This time frame was chosen because it represented a significant portion of the campus’ technology planning process. It also included the period in which the campus was in a newly created administrative structure designed to increase the

autonomy of a group of the campuses outside of the main campus. Documents that were included are: planning documents and budget documents. The planning documents included the written requests that were presented to the Strategic Planning committee by the IT committee. The budget documents included printouts of the purchases that had been made at the campus during the years under investigation. By examining planning and budget documents, intended purchases and actual purchases were identified. Subjects' reports on the mechanics of the planning process were added to the information gleaned from the documentation to determine that no significant omissions existed regarding the process initiation and implementation.

The second part of data collection included interviews with subjects about their perceptions of how technology planning should occur and their reactions to the actual planning process. Interview questions were open-ended to allow the subjects to discuss their views of how technology planning should work without being made aware of the study's theoretical framework. Follow-up questions were asked regarding relevant threads of the subjects' statements and to clarify specific points. The questions began with general information about the role of the participant in the process and his or her role at the campus. Later questions probed how the subjects thought the process should occur, how it did occur, problems with the process, and then suggestions about how to fix it (assuming there are perceived problems). Appendix C contains a copy of the interview guide.

Interviewing subjects. The following section describes efforts to ensure sensitivity to human subjects' needs. Issues included confidentiality, informed

consent, and debriefing. Human subjects approval was received from the University of Maryland at College Park Institutional Review Board.

In order to assure anonymity of subjects, data sheets were assigned numbers and no reference to personal information was provided that could be used to identify the individual (e.g., gender and position).

Interview procedures. The current study used a semi-structured interview, since its main goal was to identify individuals' perspectives. It was important in this study to avoid biasing subjects toward the theoretical perspective of the study or to discuss issues that the researcher identified *a priori*. Three different types of interview methods have been identified (Fontana & Frey, 1994; Merriam, 1988). These include *structured*, *unstructured*, and *semi-structured*. The following section will describe the three types and explain why the third type was chosen for the current study.

The *structured* interview includes primarily close-ended or limited-response questions with predetermined questions. All subjects are asked the same questions in the same order. The purpose of this technique is to minimize error. A pre-established coding system and categories of data are created prior to the study. The *unstructured* interview involves open-ended questions with no set responses and no set order for the questions. It allows for not having *a priori* categories and no *a priori* analysis. The *semi-structured* interview, which was used in this study, is "guided by a set of questions and issues to be explored" (Merriam, 1988, p. 86). Using this technique, the interviewer "can probe for clarification and ask questions appropriate to the respondent's knowledge, involvement, and status" (Merriam,

1988, p. 86). The order of questions can be altered to suit the specific interview and follow-up questions can be asked as needed.

Following approval for access to the documentation and subjects by campus or university administration, individual subjects were contacted by phone or in person to set up a convenient time for the interview. With the subjects' permission, the interviews were tape-recorded to provide a backup for the field notes taken by the investigator. The interviews took between 60 and 90 minutes per subject; most took closer to 60 minutes.

Interview questions. Schmidtlein's (1974) analysis of decision-making paradigms, including the list of variables (see Table 2.1), was used to design the interview guide for this study. Appendix B contains a grid that shows which factor each question is designed to probe. The general questions were asked and then follow-up questions were asked when specific issues did not arise spontaneously during the answer to the general question.

Pilot interviews with at least two individuals involved in technology planning processes at a different campus of the same university were conducted in advance to determine that the order, clarity, and appropriateness of the questions were satisfactory.

At the beginning of the interview, subjects were thanked for their participation and were given a brief description of the general nature of the study (i.e., an examination of how decisions are made with respect to technology at their campus). They were then asked for their education level, position at the campus, and experience with planning and technology. This data was used to look for patterns

among the results given the amount of information, experience, and position (e.g., staff, administrative, and faculty) the subjects had. Care was made to ensure that anonymity of the individual was maintained when the results are reported. For example, an individual was not identified as a staff member with x number of years of service who was on the IT committee, etc., because this specific information could be used to identify the person even if the name is left out, given the small size of the campus community.

Four general questions were designed to assess the categories of information identified earlier in this chapter:

A. QUESTION 1—What process do you believe the campus should use to make decisions that respond to changes in information technology and changing demands for information technology?

This question was designed to investigate the espoused model of decision making that the individual holds. It is based on the hypothesis that most individuals would describe a decision-making process that closely resembles the comprehensive model, as described by Schmidlein (1974). Questions about the conditions that were appropriate or necessary for the proposed process (e.g., rate of change, repetitiveness, change technology) were used as follow-ups if these topics are not mentioned by the subject spontaneously. In addition, questions probing the decision-making process were included (e.g., location of resources, functions, goals, and deadlines).

B. QUESTION 2: How have technology decisions been made at the campus?

This question was designed to determine the characteristics of the decision-making process at the campus. Information from the interviews on this question was compared with the data from the documentation analysis described previously. Follow-up questions probed for information regarding the variables identified in Table 2.1. No additional questions were needed to clarify deviations from the planned process or questions of procedure.

C. QUESTION 3: In your opinion, how well has the technology planning process at the campus worked to deal with changing technology needs?

This question was based on the hypothesis that most individuals would be dissatisfied with the technology planning process on campus when their expectations of a comprehensive process conflicted with a more incremental process that was predicted to exist. Subjects' answers were examined to determine the level of satisfaction with the decision-making process and then to compare this response with whether their espoused view of the planning process, from Question 1, resembled their view of how the decision-making process actually worked, from Question 2.

D. QUESTION 4—How can the process of responding to technology demands at the campus be improved?

This question was based on the hypothesis that recommendations for improvement would be based on the deviations between the comprehensive model of decision making and the actual process. Answers were probed to determine whether the factors from Table 2.1 were critical for improving the process from the subjects' perspective.

Data Analysis

The data analysis for this study used the theoretical framework to categorize the data and to analyze themes in the technology planning process and the perspectives of subjects' regarding the process. This procedure is consistent with Merriam's (1988) assertion that data analysis "involves the development of conceptual categories, typologies, or theories that interpret the data for the reader" (p. 133). There were two primary goals for the data analysis for this study. The first relates to the mechanics and documentation of the process while the second relates to the perceptions of subjects' regarding the process. The following sections provide more detail about these two goals.

The first goal of the data analysis for this study was to examine the documents related to the technology planning process and conduct interviews with subjects to determine which theoretical model the actual process most closely resembled. This analysis examined the mechanics of the process, the documents produced by the process, and the follow-up documentation, including budget documents. The mechanics of the process and planning documents will be examined using the variables laid out in Table 2.1. Follow-up documentation, including purchase orders and budget documents, was compared with the planning documents to determine how closely follow-up had been to the planned purchase. The interviews were used to identify the individuals' views about the way decision-making worked. Deviation from and adherence to the plan were noted and examined for any factors relating to the decision-making paradigms.

The second goal of the data analysis was to understand the meaning subjects ascribe to the decision-making process (c.f., Patton, 1990). The second part of the

study provided an analysis of the subjects' subjective evaluation of the technology planning process at the campus.

The data were analyzed for the following information:

1. A description of the processes involved in the technology planning at the campus.
2. A comparison of planned use of resources with actual budget expenditures.
3. A comparison of planned use of resources with actual usage of technology equipment.
4. A comparison of the process of planning with theoretical assumptions regarding decision making. These included a comparison of the factors identified in Table 2.1.
5. A comparison of the process desired/expected by subjects and theoretical assumptions regarding decision making.
6. Discussion of barriers to planning and comparison with predicted perceived barriers.

In the analysis section of the current study, common themes in the responses to the questions in the interview were identified. When it became apparent that having only two categories (comprehensive and incremental) was insufficient for examining all of the subjects' responses, three additional categories were created. These were: *mixed*, *other*, and *unresponsive to question*. It also became apparent that most responses had some combination of comprehensive and incremental themes, so the first two categories were re-identified as *primarily comprehensive* and *primarily incremental*. These issues are addressed in greater detail in the analysis

chapter and the chapter discussing the utility of the decision-making models identified by Schmidtlein (1974, 1983).

Limitations of Study

The following section describes the limitations of the research in the current study. With any case study research there are intrinsic limitations to the methodology. Patton (1990) suggested that the degree of validity depends upon the ability of the researcher; meaning how well a researcher is able to limit his or her biases affects the validity of the findings. Stake (1994) stated that “case researchers, as others, pass along to readers some of their personal meanings of events and relationships—and fail to pass along others” (p. 241).

Some limitations involve what “can be learned from what people say” (Patton, 1990, p. 25). The use of interviews involves an intrinsic limitation, although given that the *perception* of the subjects regarding the technology planning process is one of the main targets of the research, this limitation is lessened. Given that the study was retrospective, asking subjects for their views on the process as it has occurred in the past, could lead to biased recollections of the decision process. Comparing each interview results with documentation and other interview results was able to alleviate some of this bias.

Another limitation involves the question of generalizability of case according to Bogdan and Biklen (1992). Only one campus was examined and this campus may have unique characteristics as part of the university. The IT committee may also not be representative of the types of committees that may be used at other campuses. This campus’ committee has members with a range of technology knowledge from basic to expert, while other campuses may employ individuals or committees

composed only of members with expert knowledge. The members of this committee were also recipients of the technology that is determined, in part, by the committee. Other campuses may have planners who are not constituents of the campus. Although these potential problems are possible, certain aspects of the organization are similar to those of other institutions of higher education, which would suggest that some generalizability is likely. For example, the organizational structure is similar to other higher education organizations; with the relatively flat organizational structure of the faculty ranks and the hierarchical structure of the administrative and staff lines. Many of the same technology and planning issues that are experienced at the campus are being experienced at many other higher education institutions with concerns about funding of long-term maintenance for equipment, increasing demands for technology assistance, and questions about the utility of information technology to assist pedagogical processes. Thus, the primary technology and planning issues confronting the campus are quite similar to those of other institutions, suggesting that some generalizability may be in order.

A further concern relates to the time period examined. It is possible that the results of this study may be less generalizable, since the technology planning process at the campus is less than a decade old. These results may vary from those found at other campuses with longer histories of technology planning or even at the same campus with a few more years of experience.

Lastly, planning documentation may not necessarily be reflective of the actual process. Planning documentation is often written by an individual or small group of individuals who may have different perspectives on the process than others

involved in the process. Time constraints and differences of opinion may affect the completeness and accuracy of the documents; these problems are undoubtedly typical of planning processes in general. Triangulation of the different sources of data was employed to aid in determining where the documents reflected the process accurately and where they deviated from what appeared to be more complete or more accurate descriptions.

In summary, the results of this study must be taken for what they are: retrospective, personal accounts of a decision-making process at a single higher education institution. On the other hand, an examination of these results is expected to provide a more in-depth analysis of the views of the decision-making process than could be obtained by a survey or by an “outsider” and, thus, help to clarify the complex nature of the technology planning process at a higher education institution.

Chapter 4

Results And Analysis

Introduction

This chapter summarizes findings from the examination of documents and interviews with subjects regarding the technology decision-making processes at a higher education institution. First, characteristics of the subjects are identified. Further details about the subjects' characteristics are provided in Appendix D. Second, a general description is provided of the methods used to examine the data collected. Third, a description is provided of information gleaned from the documentation. Last, a detailed examination of the subjects' responses to the interview questions is given, organized by the research question and then by each variable for each research question. In this last section, an explanation of how subjects' responses were coded is given for each variable. This is followed by examples of subjects' responses and then how the results fit with the literature on technology planning described in chapter 2.

Characteristics of Subjects

Thirty-two subjects were interviewed for this study. There were six administrators (three had dual faculty-administrator positions). Twenty-one faculty members (not including those who held dual positions) were interviewed. These faculty represented 16 different departments at the campus. Five staff members were interviewed, including one with a dual faculty-staff position. Nineteen males and thirteen females were subjects. Subjects were not asked what to report their ethnic or

racial background; however, visual categorization indicated that twenty-nine subjects were Caucasians and three were of Asian descent.

Length of Service

Seven of the subjects had been at the campus for five years or less. Nine had been there between six and 14 years. Sixteen had been at the campus for 15 or more years. Some had been in different positions at the campus over time.

Membership on Committees

Half of the subjects had been on the campus Strategic Planning committee within the last five years and half had not. Half of the subjects had been on the Information Technology (IT) committee within the last five years and half had not. These were not always the same individuals who had also been on the Strategic Planning committee.

In the 2001 and 2002 academic years (the campus' academic year ran from January to December), there was an *ad hoc* committee, the Academic Technology committee. This committee was created to investigate primarily the need for an Instructional Design Specialist (IDS), which was a position filled at a number of other Commonwealth College campuses. The IDS was a staff or faculty member who was charged with assisting faculty with any problems they had regarding pedagogy, including integrating technology into their courses. Only faculty members were on this committee. Six of the subjects interviewed for this study had been on this committee.

Experience with Technology and Technology Decision Making

Subjects were asked about their level of experience with technology. They were given a set of fixed responses to choose from: low, medium, and high.

However, a few subjects did not feel comfortable with one of these three responses, so they were permitted to indicate a level between two of the responses (e.g., medium-low). The categories were collapsed back to the three responses to simplify analysis. Since there was not a quantitative measure of the level of expertise, the differences were less distinct than would be useful for analysis. There were six subjects who reported their level of experience with technology as medium-low or low. Eleven indicated their level as medium and 15 indicated it to be medium-high or high.

For experience with technology decision making, subjects were again given the option of indicating a response between the low and medium or medium and high. Nine subjects stated their experience with technology decision making was medium-low or low, 13 stated it was medium, and ten stated it was medium-high or high.

Following examination of the individual responses to each question, the responses were organized by the variables described previously (length of service, membership on IT committee, experience with technology decision making). Since most of the subjects who had been on the IT committee also had been on the Strategic Planning committee, it seemed redundant to characterize them for both committees separately. Also, since reported level of experience with technology and technology decision making were similar, although not identical, examining the results with one of the two variables provided a sufficient level of analysis.

Subject responses were characterized, as described in the later sections of this chapter, and then grouped by the subject variables (length of service, committee

membership, expertise with technology decision making). There were no obvious links between the subject variables and the grouped responses. Individual subjects' responses were undoubtedly affected by their experiences at the organization and with technology, but there was no collective distinction apparent in this study. In the few situations where there were apparent links, the connections are discussed in the sections below.

Description of Technology Decision-Making Process

To provide context for the discussion of the interview results, the technology decision-making process at the campus is described in the following section. Further description of specific subjects' responses about the process is provided in the section discussing the interview results regarding the second research question. The information in the following section was compiled from documentation and interviews of subjects.

The proscribed path for technology decision making at the campus involved beginning with input from different campus constituents to the Computer and Information Sciences (C&IS) department and the Information Technology (IT) committee regarding needs of departments and individuals. These constituents included individual staff and faculty members and groups of individuals in departments or programs. The next step was for the IT committee to evaluate these needs, prioritize them, and submit them to the Strategic Planning committee in the form of a budget request. The Strategic Planning committee then assessed these needs within the framework of the whole campus community and entire budgetary picture. This was guided by the strategic plan which had identified the campus

“vision” and mission. The Strategic Planning committee then forwarded its recommendations to the campus senate, which was primarily composed of faculty, to evaluate the decisions and put forward recommendations. These were then returned to the Strategic Planning committee for reassessment and approval. The final decisions were sent to the office of the Campus Executive Officer (CEO) who made the final budget decisions.

Before the current CEO arrived at the campus, the decision-making processes at the campus were based on a centralized system, with the CEO making almost all of the decisions, with little input from faculty. When the new CEO arrived eight years ago, he changed the system of decision making. It was reported that he believed that shared governance was important, so he helped create a system that ensured faculty input on decisions. The new process involved committees that consisted of faculty, staff, and students under the general auspices of the campus senate, a body made up of representatives of full-time faculty, part-time faculty (limited to ten percent of the total body), students (limited to ten percent of the total body), and staff and administrators (combined limit of ten percent of the total body). Campus senate committees consisted of faculty, staff, and students. Until 2001, faculty and staff were permitted to be chairs of the committees. After this, only faculty members were allowed to chair the committees.

Committees were given budgetary responsibility; the new CEO believed that without this, committees would not be as vital. The flow of decisions was expected to flow from the committees to the campus senate for discussion and approval. The results of the campus senate discussions were sent back to the committees to

complete the discussion and identify budget priorities. The prioritized budget requests were then forwarded to the Strategic Planning committee. The Strategic Planning committee typically had about 15 to 20 members, with five administrators and staff members, nine faculty members, and a campus advisory board member. The Strategic Planning committee annually reviewed the requests of the committees, requesting clarification or additional information regarding the priorities from the chairs of the committees during hearings. The CEO made the final decisions regarding the budget items.

The IT committee was charged with decisions about information technology at the campus. This committee had gone through structural changes in the previous year. Prior to this time, the committee had co-chairs, one of whom was usually the head of the C&IS office. The C&IS office was responsible for maintaining all hardware and purchasing software and supporting materials for the campus. With the change in committee chair requirements, only faculty members were permitted to chair this committee.

Another change that the committee had experienced related to its budget. Within the last two years, the IT committee had made the case that basic items needed to support basic technology operations should not be put up for debate by the Strategic Planning committee each year. The C&IS manager was given a fixed budget to purchase what were considered “toilet paper” items, such as printer cartridges, paper, and other items needed to maintain the current student labs and office computers. New, large-budget items were required to be considered as part of the strategic planning process. The amount of money to support technology

requested by the IT committee has typically been in the tens of thousands of dollars range. Although this amount may not represent a large portion of the multi-million dollar budget of the campus, it is important to note that this may be a large portion of the discretionary spending the campus may have each year.

The documentation examined for this study included the prioritized lists of items created by the IT committee. The lists were revised following meetings with the Campus Senate and then discussed at hearings with the Strategic Planning committee. Other documents include budget records which show items that were purchased.

It became evident through discussions with the individuals in the interviews as well as the documentation that the technology decision-making process had evolved so that only large-budget items were put through the strategic planning process. These tended to be items that were considered to be “new” rather than replacements of existing items or large-scale projects, such as all-new computers for all faculty. These items were supposed to be consistent with the strategic plan’s “vision” for the campus although for technology, it was reported, this “vision” was being reevaluated. With the impending hiring of the IDS, there was a sense that pedagogical issues regarding technology would get greater attention. However, the IDS position originally had been considered a faculty-rank position and at the time of the interviews it was reported that it had been switched to a staff position.

While most of the big-ticket items were identified and purchased through the proscribed process, it appears that there were items that were purchased independently of the strategic planning process and through processes other than

those of the IT committee, such as through the auspices of the CEO or Continuing Education. At the same time, most of the purchased items were the “toilet paper” items, such as printer cartridges. It was also clear, through documentation and interviews, that the items on the designated list that were approved for purchase lacked specificity until the purchase was imminent. The purpose of this lack of detail was to allow for maximum flexibility of choice regarding price and specification, which could vary greatly from the time the decision was originally made to request the item in the fall semester and when the purchase was actually made, often not until the summer when the C&IS department was available for major upgrading of systems. Items that were listed and approved were not always purchased, given changes in campus or college processes.

Subjects’ Responses: Question by Question

In the interviews, subjects reported their demographic information first. Then they were asked a series of questions to elicit their views about how they believed the technology decision-making processes at the campus should work and how it did work. At the beginning of each main section, a general question was asked, along with follow-up questions relating to the specific variables identified in Chapter 3. In some cases subjects responded directly to the general question and few follow-ups were asked, while in other cases subjects asked for clarification or follow-ups rather than directly answering the general question. Subjects’ responses to the general question were sorted into the different types of responses for analysis. Thus, if a subject provided a response relevant to one specific variable, such as *rate of change*, that answer was considered a response to the *rate of change* variable and coded within the framework described in Chapter 3. In some cases, responses

referred to several variables and so these responses were put into each of the related variables sections and coded according to the specific variable.

It is important to note that a subject might have strongly supported the notion of comprehensive planning in an answer to one question while promoting an incremental characteristic in the response to a different question. The characterization of subjects' responses was made variable by variable rather than globally, considering the collection of responses from that subject. This allowed the analysis to tease apart the characteristics of the decision-making process that subjects believed were important for successful decision making or components of the existing decision-making processes at the campus.

The following sections describe the results of the interviews with subjects and are divided into the responses regarding the different variables. The different sections correspond to each of the four descriptive research questions. The first descriptive research question for this study is:

What process do subjects recommend using to respond to changes in technology?

Thus, in the first part of each section the subjects' responses regarding how the processes *should* work are examined. The second descriptive research question is:

How are technology decisions made at the campus?

To answer this question, the second part of each section examines subjects' responses regarding how the processes actually *do* work. The last two descriptive research questions are:

How effective is the current technology decision-making process from the perspectives of subjects?

How can the process of responding to technology demands be improved, according to subjects?

To answer these questions, the last two sections report the responses subjects provided for the last two general questions about how effective the processes were, in their views, and how the processes could be made more effective.

Within each section, a summary of what was found in the literature review regarding each of these variables is discussed along with the characterization of the responses. Samples of subjects' responses are provided in each section. Words and phrases in brackets [] are those of the interviewer or were used to replace personal information or names of individuals. Irrelevant information was removed from responses whenever it did not alter the meaning of the response. The interviews were transcribed verbatim, so conversational responses are provided. Subjects' responses are often not in complete sentences or always complete thoughts. To display natural pauses, semicolons are used in the transcriptions. Ellipses are used to indicate when different portions of the same subject's response were spliced together when they related to the same issue.

In each section the coding system for each variable is described. The specific details for identifying the *primarily comprehensive* and *primarily incremental* responses are provided in each section. The remaining three types of responses: *mixed*, *other*, and *unresponsive to question* are the same for all of the variables. Responses were characterized as *mixed* if they mentioned a combination of *primarily comprehensive* and *primarily incremental* responses. If the subject's response did not fall into one of these three types, but was still related to the question, it was characterized as *other*. If the subject indicated a lack of knowledge or opinion about

the question or did not provide an answer, the response was characterized *unresponsive to question*. See Appendix E for tables containing the breakdown of subjects' responses for each variable by the response categories identified above for the three sets of interview questions.

Responses by Variables

Rate of Change

Subjects' views of what environmental conditions should be like. To examine subjects' views of the environmental conditions that are conducive to the technology decision-making process in the current study, subjects were asked:

Do you think a technology decision-making process is most effective when the environment is changing rapidly or slowly?

Subjects' responses relating to this variable were characterized as *primarily comprehensive* if they suggested that the decision-making process was most effective when the environment is changing slowly since rapid change makes planning difficult. The responses were characterized as *primarily incremental* if they considered the decision-making process to be most effective when the environment is changing rapidly. It is important to note that subjects were asked about the *decision-making process*, not *planning* in all of the interview questions. This was done to avoid biasing them into considering that planning was the only type of decision-making process that was in question.

Most of the subjects (18) believed that a technology decision-making process is most effective when the environment is changing slowly; thus, their responses were considered *primarily comprehensive*. They explained that a slowly changing

environment provides sufficient time with which to collect information, to make the decisions, and to allow committee processes to work properly.

Regarding information collection, two subjects indicated that a more slowly changing environment allowed for better decisions because more information could be gathered. For example, one subject stated:

“When slow; have more time to get information; ex., trying to buy PC at home; by time you make decision, what you want is gone to next level”

Some subjects (7) observed that a rapidly changing environment makes decisions more difficult because priorities may change too quickly and decisions made previously become obsolete before they are implemented. Changes in technology were considered to be easier to identify and respond to when the environment is changing slowly. One subject’s response is typical of this type of response:

“Slowly; can get a handle of what’s going on; can better guess what’s going on; when change, not constant function; changes so completely would not have any idea.”

Some subjects (7) indicated that when the environment is changing slowly, more rational and, hence, better decisions can be made. For example, one subject stated:

“More effective here when things are moving; don’t know; sometimes when made rapid, not rational; when go slower, more rational.”

Two other subjects stated that the decision-making process within the committee structures at the campus worked better when the environment was changing slowly. The following quote represents this view:

“When changing rapidly; committee decision making is cumbersome; better when slowly.”

Five subjects explained that technology decision-making processes were most effective when the environment was changing rapidly; their responses were characterized as *primarily incremental*. They stated that this was because decisions were more likely to be made when there was a sense of urgency or understanding of the need to act quickly. It was suggested that individuals often choose not to make decisions unless there is a sense of necessity. A response representative of this view is:

“Rapidly...forces you to assess constantly; if slow; may fall into status quo; rapid changes gets your attention.”

Five subjects provided answers that were considered *mixed*. Some of these subjects stated that technology decision-making processes were most effective when environmental changes were not too fast and not too slow. They explained that when the environment was changing too rapidly, there would not be enough time to check the decision prior to its being implemented. They also suggested the same view as those whose responses were considered *primarily incremental*, agreeing that rapid environmental changes provided a sense of urgency which would lead individuals to act, rather than avoid making a decision. An example of this type of response is:

“Not rapidly and maybe not slowly either; if changing slowly; more effective; worried about tending toward inertia; if rapid; not enough time for knowing if making new decision”

One subject provided an answer that was considered an *other* response. This response suggested a need for change in the technology decision-making process, but did not indicate whether slow or rapid environmental change was more conducive to

effective technology decision-making processes. This subject stated that the focus of the committees should change as the environment does:

“Process should be changed if environment is changed; focus of committees, etc.”

Three subjects did not provide answers that were responsive to the question or stated that they did not know the answer to this question.

The finding that most subjects believe that technology decision-making processes are best suited to slow environmental change seemingly contradicts the literature on technology planning that recommends planning in times of fast change. In the current study, however, subjects were asked about decision-making processes in general, not planning processes specifically, so they may have had a different concept of decision-making process than planning. In addition, it is possible that the way the question was phrased may have led to the differing response. This may have been because the question asked when technology decision making was most effective, not most urgent. Also, subjects considered two different issues relating to the decision-making process that were affected by the rate of change in the environment: effectiveness of decision making and how to motivate people involved in the decision-making process. Thus, a fast rate of change may reduce the effectiveness of decision making processes, but increase the likelihood that individuals will act in a timely manner.

Subjects' views of what environmental conditions are like. Subjects in this study were asked their view on how rapidly changes in technology had occurred at their organization over the past four years:

How rapidly did the technology or demands for technology change during

the past four years?

Subjects' responses to this question were characterized as *primarily comprehensive* if they indicated that technology or demands for technology changed slowly or not at all. Their responses were considered *primarily incremental* if they stated that these changes occurred rapidly.

Some subjects (6) declared that the changes had not been rapid over the previous four years. Some of these subjects suggested that there was a sense that the speed of change had actually declined in the last few years. Five of these subjects believed that it was easier to anticipate change and accept that change would occur, whereas previously there was a sense of confusion about the change. One subject stated that there had not been a change in demand, but there had been stabilization which was more predictable:

“Has been at a steady pace; not very rapid; over last 10-12 years more rapid; has stabilized to more steady progress; regarding speed, memory, costs, and Internet information; regarding decision making, has not been a sudden change to reevaluate change; exponential, but known rate.”

Most subjects who provided responses (17) thought that technology or demands for technology changed rapidly during the four years in question. Fourteen suggested that there had generally been a steady increase in demand and a rapid and continually changing environment. One subject also indicated how the rapidly changing technology led to rapid obsolescence:

“Technology is like deep dark pit to throw money away; phenomenal how technology changes; get used to particular software or on computer; next time go to use it; seems antiquated; change format or website.”

Two subjects provided answers that were considered *mixed*. One subject suggested that there was change yearly, but gave a sense that the change in demand

was constructed by subjects rather than a necessary one. This subject indicated in other parts of the interview that while technology changed, it was not necessary to use the new technology because old technology was sufficient. However, this subject indicated that students demanded that the campus have the most up-to-date equipment and software regardless of the true need. The other subject believed that the change was moderately rapid.

No subjects had *other* responses. A number of subjects (7) provided *unresponsive to question* answers to the question regarding how rapidly technology or the demands for technology had been changing. A few did not have a sense of the rate of change while a few had no response relating to this question.

Rate of change conclusion. The literature on technology planning is replete with those stating that because technology and the demands for technology are changing rapidly, a planning process is necessary. The results for this study showed that most subjects believed that technology and demands for it had been changing rapidly. Thus, while most subjects thought that a slow rate of change was most conducive to the technology decision-making process, most believed that the rate of change in the environment was rapid. This apparent contradiction is at the root of the conflict between the assumptions of the planning approach and the actual decision-making processes regarding technology.

Repetitiveness

Subjects' views of how the campus should handle future events. In the current study, subjects were asked two questions to identify their views regarding the ability of a technology decision-making process to handle future events. The first

question, regarding a long-range mission, objectives, or priorities, was asked to determine whether subjects considered future events to be predictable and how the decision-making process should be geared towards those future events. Suggesting that there should be a long-range mission, objectives, or priorities indicates that predicting the future is possible. Also, indicating that a mission should be reevaluated after a long time period rather than a short time period suggests that the future is at least somewhat predictable. The first question for this variable was:

Should the campus have a long-range mission, objectives, or priorities for technology? If so, how often should that mission be reevaluated?

Responses to the first question were characterized as *primarily comprehensive* when they endorsed a long-range plan, mission, objectives, or priorities. Responses to this question were characterized as *primarily incremental* if they suggested that tying the technology decision-making process to the mission, objectives, or priorities was problematic.

The second question asked whether the technology decision-making process should have deadlines and what type of deadlines there should be, if any. Considering fixed deadlines to be important suggests that one believes that predictions of the future process can be accurate. Having flexible deadlines suggests that one is aware of the need for incremental change in the decision-making process. This second question was:

Should there be deadlines for decision making regarding technology? Why or why not? If so, what types of deadlines should there be? How long should the time horizon for the decision-making process be? Why?

Responses to the second question were characterized as *primarily comprehensive* if they suggested that there should be hard and fast deadlines. These

responses were also characterized as *primarily comprehensive* if they indicated that there should be long time-horizons, defined as one year or longer, for the decision-making process. Responses to this question were characterized as *primarily incremental* if they indicated that flexibility regarding deadlines or time horizons was very important.

Many responses (34) to these two questions were characterized as *primarily comprehensive*. These subjects indicated that the campus should have a mission or vision for technology. Throughout the interviews, subjects referred to the three-year rollover of the computer laboratories and faculty computers as an example of a long-term vision for technology. In response specifically to the first question, two subjects mentioned the three-year rollover as a goal for the campus technology plan.

Five subjects suggested that the technology decisions should be embedded within the campus and college strategic planning processes and provide clear deadlines to allow the campus decision-making process to go along as planned. There was a strong desire to tie the strategic plan's overall mission to the goals of the IT committee's planned purchases. These subjects indicated that they thought the technology plan should be clearly integrated from the IT committee's plan to the Strategic Planning committee's process through to the final budget outline. Examples of these responses are:

“Want them to be embedded in campus mission.”

“In an ideal world, budget-making process should be directly tied to campus need through IT committee determines to campus to vision to strategic planning to budget.”

A number of subjects implied that a long-term framework was more desirable than no time-frame or a shorter one. One year was cited by many individuals (8) as an appropriate length of time with which to plan for technology. One subject indicated it should take place every 18 months to fit with Moore's law which states that technology changes significantly every 18 months. Four subjects indicated the mission or vision should be changed every two or three years. Nine subjects indicated that three to five years was an ideal time-frame to strive for, although they also indicated that the reality of technology planning was a barrier. In response to this barrier, a number of subjects stated that the mission or vision should be updated annually. An example of the latter suggestion is:

“What strategic planning does; have to have long-range and short-range goals; things to strive for; attach deadlines to those goals; 3 or 5 years or longer is crucial to technology and other areas and on up the line...probably needs to be reevaluated yearly; as technology changes so rapidly; mission needs to be explored or examined yearly; IT committee may do that on yearly basis; strategic planning probably looks at mission and vision on yearly basis regarding technology.”

Nine subjects stated that it was important to maintain deadlines as part of the campus decision-making process. This would allow for the flow of budget and plan requests from committees to a series of hearings in front of the Strategic Planning committee and then to the formulation of the final budget by the Strategic Planning committee. The Strategic Planning committee would later submit this plan for final approval by the campus administration. The process would continue through purchasing of equipment and installation of the equipment prior to the beginning of the fall term each year. Without the deadlines earlier in the year regarding budget

requests, it was predicted that the latter processes would not work as smoothly.

Responses related to this cycle of deadlines are:

“Would be useful if there were a cycle with a set of deadlines; planning or whatever would have enough time...if someone is contemplating new technology; would be a well-defined process for information gathering.”

“To get information to committees on time; final deadlines drive all committee deadlines; work backwards from that to make sure everything gets to strategic planning on time.”

“Should be deadlines; have to have specific deadline to accomplish implementation; deadlines for hardware purchases, software to be used, who will get new computers; need labs up and running by beginning of fall term, so have to have deadlines; do have mechanism when new software is requested [midyear], but it is more work when done midyear.”

Some responses (7) to the two questions were more along the lines of the *primarily incremental* approach. Three subjects suggested that because of the rapid changes in technology, it was often too difficult to pin down specific details of the decision-making process. Instead, more flexible goals and deadlines were recommended. A sample of this response is:

“Technology is always changing and can make all plans you want; plans would be too vague.”

Two subjects indicated that continuous monitoring of needs and options for technology would be appropriate. They explained how the broader context of a decision was sometimes difficult to assess immediately and had to be looked at over the longer term where adjustments could be made as they were deemed necessary.

They stated:

“Technology seems to be ongoing process; need deadlines for requests for strategic planning to review requests in context of all decisions; should not stop if in middle of year.”

“Technology is changing so rapidly; can set broad, long-range goals; need to

reevaluate goals on an on-going basis...effectiveness of decision may not be clear at time; need continuous evaluation, assessment, need feedback to lead to corrections; should not change decision (broad thrust) in implementation; political in nature; should not sneak in changes to completely change outcome.”

There was also a sense from some of the subjects that the time frame depended upon the type of technology in question. In the case of computer technology, a shorter time-frame would be necessary than for other types of technology, such as overhead projectors. One subject stated:

“Continuous process; have to see how frequently to reevaluate; in computer areas; have to reevaluate more frequently; depends on type of technology (video camera vs. computer); others (overhead projector) are not changing as rapidly.”

Three subjects stated that inflexible deadlines could be problematic, leading to bad decisions when flexibility would provide more options. For example, when technology is changing and a decision about it must be made immediately, to satisfy a predetermined schedule, problems may occur. In some cases it may be more advantageous to wait until the path for the technology or the need of the campus is clearer. The subjects’ responses are:

“Very often you can try to put these decisions off as long as possible; because something new keeps coming out and prices keep changing; generally going down; memory [RAM] fluctuates.”

“Deadlines are always broken; call them ‘windows’...otherwise too easy to let things go...if I want it for my class, that needs to be made immediately, if I want a hard-ware upgrade or new software package, I wait until next year.”

“If deadline; some budget constraints; but may make bad decisions; if not good decision, can just wait.”

Many of the responses (20) were characterized as *mixed* for both questions.

These responses indicated the difficulty in following a plan because of the changes in

technology. At the same time, most of these subjects desired that a plan be followed. In some cases, the desire for deadlines was the result of understanding that without deadlines people do not make decisions when there are many other things to do. An example of such a response is:

“Deadlines are nice; we have tendency to have ongoing things that are eventually dropped; or too short deadlines; neither promotes good decision making.”

In some cases, subjects (10) desired a continuous process of monitoring needs and the available technology, but then indicated that long-range planning process with less specific goals with updates to the plan every year or every few years was more practical. They suggested maintaining a broader set of objectives or goals for the technology planning process while allowing for the specific details to be determined at the time the purchases had to be made. Some subjects noted the desire to have continuous monitoring, but described the difficulty in terms of workload to be able to keep on top of the changes. The *mixed* response in these cases was a compromise between what was desired and what was realistic in terms of how busy individuals could keep up with rapidly changing technology. For example, subjects stated:

“Need to monitor what it has; continual monitoring of what’s available; continual look at what technologies are provided; Microsoft campus; biases students; goals regarding reassessing when technologically where we ought to be; should be jumping to new path?...could make decision about reevaluation every 3-5 years at minimum; every year would be too painful (time, busy work); a lot would not necessarily show new trend in one year’s time; may be good to sit back and watch new technology; ex., Windows XP.”

“Yes; should be part of strategic planning and long-range planning; things change so rapidly; hard to know what will be out there; if do it in broad terms not specific, [would be] possible...on yearly basis; as fast as things change, budget changes yearly as well.”

In some cases it was believed that decisions had to be made at some point in time, even though the technology was continually changing and compromises would have to be made in terms of cost. In other words, it would always be cheaper to wait to purchase technology, but time-frames to coincide with the academic year had to be considered to allow for installation and maintenance of equipment. One subject stated:

“If say there is a deadline and people are not assertive enough; oops! too late (if too rigid it’s a problem); other people will never make decisions if no deadlines (a lot of computer people are like that)...deadlines need to match up with budget deadlines.”

No subjects provided *other* responses. Only two subjects responded that they did not know the answer or did not provide an answer to these questions. These responses were characterized as *unresponsive to the question*.

The results for this variable are consistent with the literature on technology planning, since most individuals reported that a combination of using a technology plan or at least a mission or vision statement and having a mechanism to alter the decision-making processes mid-course is most effective. Subjects wanted a sense of direction for the decision-making processes, but realized that technology changes rapidly and so long-range plans are at risk for being obsolete unless frequent updates are made. Many subjects made the distinction in their responses between the need for flexibility and the need to have deadlines to get individuals to act.

The notion that one year would be a long-term frame for decision-making may seem contradictory, given that long-range planning for colleges and university typically entails five-, ten-, and twenty-year increments. However, given that

technology changes so rapidly, one year may actually be considered long-range. This is in contrast to the view that technology decision making should be practiced on a month-by-month basis or continuously.

Subjects' views of how well the campus has handled predicting future events.

To get a sense of how subjects believed the campus technology decision-making process had predicted future changes over the last four years in comparison to prior to that time, subjects were asked:

How well did the campus technology planning process predict the future changes in technology and technology demands for the campus?

Responses for this question were labeled *primarily comprehensive* if they indicated that the campus technology planning process predicted future changes in technology and technology demands well. They were considered *primarily incremental* if they suggested that the planning process had not predicted future changes well.

To assess subjects' view on the state of environmental change, they were asked:

Do you believe the environment of higher education has become more predictable, less predictable, or about the same? Technology changes? In what ways?

Responses for the second question were labeled *primarily comprehensive* if they stated that the environment of higher education and technology changes was more predictable. Responses were considered *primarily incremental* if they suggested that the environment and technology was more unpredictable. It is important to note that the question was broader initially, asking subjects about

changes beyond technology that affected higher education. Subjects' responses, therefore, included references to changes other than just in technology.

Most of the subjects who provided responses to the first question (14) stated that the campus technology planning process had predicted future changes well. There was a sense that the campus decision-making process had gotten a handle on the types of changes that were occurring with technology and was able to respond appropriately in advance of these changes. One subject, representing this view, stated:

“From my limited experience; doing very good job of seeing what's coming down the pike; when working on building five years ago; did good job of seeing what was coming; difficult part is making it become reality because of budget.”

There was a sense, however, that the specific details of the changes may not have been predicted, although the general direction of the changes was considered to be identified. Using a general strategy, such as having a three-year rotating replacement schedule for the computer laboratories and faculty computers, was considered an effective method of responding to future change. Thus, although the specific details of the change may not have been determined, the fact that change was predicted was considered evidence for successful prediction of the future. There was the understanding of the need for regularly scheduled responses, rather than a specified plan for the change that was determined *a priori*. Some subjects described how previously the general sense of the Strategic Planning committee had been to provide money for technology on the campus and then there was an expectation that the problem had been solved and no more funding would be required. These subjects explained how the “sea change” had occurred when the campus community

bought into the notion that technological change would be constant, rather than a one-shot deal. Thus, the belief that the campus was doing well at predicting the future may have been a result of this change in formulating responses to campus technology demands. There was also a sense that the members of the IT committee, many of whom were IST faculty, were working on the cutting-edge of technology and were able to bring the campus forward with technology. One subject stated:

“Committee [IT] does really good job; lot of the right players are on committee; have good insight on what’s on horizon; good job leading into future...”

A few of the subjects (3), whose responses to the question regarding the predictability of the environment were labeled *primarily comprehensive*, suggested that the environment of higher education or technological changes had become more predictable. The only thing that seemed to become more predictable was that change would occur and that unpredictability was the rule for these changes. A number of individuals, in other parts of the interview, cited Moore’s law of technological change, which indicates the increase in technological power occurs every 18 months. They suggested that the rate of change was predictable, although the direction of that change was not. One subject, representing the views of these few subjects, stated:

“Fairly predictable at [campus]; example: technology is being used more and more; example: active/collaborative work; [for technology] about the same level of unpredictability.”

Most subjects (15) stated that the environment of higher education and technological changes had become more unpredictable; their responses were labeled *primarily incremental*. Some subjects (5) indicated that the campus had not predicted future changes in technology or technology demands; three subjects

indicated that there was such rapid change that it was difficult to determine what those changes might be. For example, one subject stated:

“Changes are tremendous; most campus’ administrators realize importance of technology and try to keep pace; is money; as fast as college is growing; new faculty; hard to keep pace; see great strides to get faculty up and running; hardware and software; always want something faster, better, pricier.”

Some also believed that the campus had been playing “catch-up” with the technology and that the campus was “reactive” rather than “proactive” in its approach to technology decision making. One subject complained:

“...Committee has mostly been reactive; where most of unhappiness came from.”

Some cited the changes in student populations, external business influences, university and state government support, and, of course, technological advances.

Some (8) stated that students and the need for different types of education were different than expected. For example, one subject reported:

“Less predictable; type of students; older, more of mix; would like more diversity; fewer traditional age, highly motivated, more sophisticated in computer use; much less sophisticated or intelligent use of information resources (ex., uncritical searches).”

Other subjects (5) stated that the rapidly changing technology was the source of the unpredictability. One subject stated:

“Because technology is changing so fast and if try to be proactive; at least once a semester, experience unexpected change; seems to be more and more of that.”

Two subjects explained that the unpredictability was a result of changing funding. One subject stated that the unpredictability was a result of changes in how the state legislature provided funding to the university and how the enrollment

funding system of the university for the campuses worked. One subject stated, as an example:

“Less predictable: (1) [university] is not funded at same level [over time] by legislature; (2) open admissions...by definition [technology] is unpredictable (predictability is unpredictable).”

Three subjects indicated that there was less predictability and two of those suggested that the amount of unpredictability was becoming less surprising to the campus since the campus had begun planning for technology. One subject, indicating that change itself, not the content of that change, was becoming more predictable, stated:

“In last 5 years have had change; specialized technology changes; may not have known how it was going to change; now expect more predictable; expecting ‘unexpected’”.

In response to the question regarding predictability of the environment, five subjects gave *mixed* to the first question and eight subjects gave *mixed* responses to the second question. These subjects tended to agree that the campus had some success predicting the future, although they suggested that either the time-frame for prediction was shorter than desirable or that the type of predictions were general. In the latter case, for example, some subjects stated that having a three-year rotation was a good way to anticipate future needs without being too specific about exactly what would be needed. Two subjects stated:

“To extent there were predictions, did well; good job with three-year rotating computers [mostly reactive]; good regarding demands on system but not look-ahead of new things; may not be able to do with technology; need dramatic improvement of short-term plan.”

“About average; no better or worse than everyone else (crystal ball gazing).”

Those who gave a *mixed* response to this question sometimes mentioned that while higher education's environment was more predictable in general, technological changes had been less predictable. A few suggested that the changes were at about the same level of unpredictability as in the past.

No subjects provided *other* responses for either of these two questions for this variable. Eight subjects provided *unresponsive to question* answers for the first question and six subjects gave *unresponsive to question* answers for the second question. Most of these subjects indicated that they were not aware of the specific activities of the campus Information Technology committee or the technology planning process.

Repetitiveness conclusion. The results for the first question about how well the campus technology decision-making processes had predicted future changes and for the second question which asked about the predictability of changes in higher education's environment and technology demonstrate an apparent contradiction in the technology planning literature. The results for these questions suggest that while these changes are typically considered less predictable, there is a general sense that the technology decision-making process has improved in its ability to predict future change or, at least, to predict that change will occur. Although on the surface these two views conflict, upon closer examination there is a sense that the campus response has more clearly addressed the problems that regular change can impose upon the decision-making process. By providing a general framework for responding to change (e.g., the three-year rollover of campus technology) and accepting the fact that change will continue to occur, most on campus feel more

comfortable with the way the campus was dealing with unfolding events. In the past, many suggested, the campus had not been willing or able to acknowledge that resources would have to be committed on an on-going basis for technology. Technology costs had originally been viewed as expenditures along the lines of other campus resources, such as blackboards and copy machines. These other resources only occasionally had to be replaced, while computer technology quickly became obsolete and new demands from different campus constituents emerged at a rapid pace.

These views are in line with the technology planning literature which suggests that there should be broad visions with few details enumerated in campus technology plans. At the same time, however, a number of authors stated that the broad visions should encompass the next five or ten years. This suggestion is unrealistic given the amount of change in technology and the higher education milieu that will occur over such a long period of time.

Causal Relationships

Subjects' views of how the campus technology decision making should work.

To identify whether subjects believed that there was a direct and knowable link among shifting events at the organization or whether there was a more indirect or unknowable link, subjects were asked:

How should the technology decision-making process work to affect decision making at the campus?

Responses to this question were classified as *primarily comprehensive* if they suggested that the connection between the decision-making processes and the outcomes was direct and knowable. Responses that implied that the decision-making

process led directly to change were also characterized as *primarily comprehensive*. Responses were viewed as *primarily incremental* if they indicated the causal relationship was complex, indirect, or unknowable.

The majority of individuals (24) provided responses characterized as *primarily comprehensive*. Many of the subjects indicated a direct connection between the decisions of the individuals at the campus, particularly those in the IT committee and Strategic Planning committee, and the changes made for the campus. The CEO also was mentioned as someone who should be in charge of the process to accomplish the desired changes. Subjects also mentioned links between the technology decision-making processes and the budget process and between the technology decision-making processes and programmatic and equipment changes at the campus. Seventeen subjects stated that the link among these processes should be strengthened, building on the assumption that this causal link was there and that it *could* be strengthened. A response that typifies this view is:

“Should be very tightly integrated given variety of technologies used on campus; most people are using some form of technology; when in resource allocation, must take it into account; IT is central to academic center of campus.”

Only one subject provided a response characterized as *primarily incremental*. This individual suggested that it was unclear whether technology should drive the decision-making process or whether decision making should determine the technology. There was a concern that technology may be purchased to attract students and others rather than to improve pedagogy.

“Reluctant to say whether decision should affect technology; should be other way around; when broader decision making at strategic planning; make decision based on how much money is had; planning must take into account

costs and what will help faculty be better teachers.”

No subjects provided responses characterized as *mixed*.

There was one subject whose response was characterized as *other*. This response could be interpreted in different ways, but it is too vague to pin down its meaning. This subject stated:

“Should ask people what they want, in the end, should fall to those who know.”

Six responses were considered *unresponsive to question*. In these cases, the subjects’ responses do not address the issue of causal relationships in a clear manner, if at all. It is possible that in some cases the subjects interpreted the question differently than was intended and took a different approach to answering the question. In a number of cases (5), subjects’ answers were drawn from later responses because they indicated a lack of understanding of the meaning of the question and a desire to skip the question. These five responses were not all characterized as *unresponsive to question*, but the difficulty the subjects had in understanding the question may be indicative of the ability of the question to be understood and be directed at the desired issue. Perhaps a more direct question could have been asked regarding the causal relationships among events at the campus.

In general, the results for this variable are consistent with the literature on technology planning; a sense of the ability to control events through planning processes was expressed by most subjects. This was desired as well as expected by the subjects. Most subjects believed that the changes at the campus could be a direct result of decisions made by individuals or committees through the proscribed technology decision-making process.

Subjects' views of how the campus technology decision making did work. To find out how subjects believed the technology decision-making processes at the campus actually worked, subjects were asked:

In what way or ways has planning affected how the campus uses technology?

Responses to this question were identified as *primarily comprehensive* when they indicated that there was a direct causal relationship between the technology decision-making process and the changes that occurred at the campus. They were considered *primarily incremental* when they suggested a more complicated causal relationship between the decision-making process and outcomes at the campus.

To determine how specific subjects viewed the causal relationship between the planning process and the outcomes, subjects were asked:

Were the specific items in the plan carried out in later purchases? In technology usage? How so?

Subjects' responses to this question were labeled *primarily comprehensive* when they indicated a linear relationship from the specific details of the technology plan, the technology purchases at the campus, and the usage of that technology. *Primarily incremental* responses were identified when the subjects indicated that the relationship among these three was obscure or not linear.

Most of the subjects (16) who provided a response to the first question suggested that there was a direct causal relationship between the planning processes, how the campus used technology, and how changes occurred at the campus regarding technology. Specific examples of changes in how individuals used technology that resulted from earlier planning processes were provided by some subjects. Eleven subjects described ways in which the technology plan affected the

type of technology that was being used at the campus. For example, one subject responded to the question of how planning affected how the campus uses technology:

“Lots of ways; some good, some bad; has made available computer power in classes (ex., PowerPoint for presentations (for other faculty)); electronic mail, word processing; sometimes hindered things; when it became unavailable (ex., Word Perfect).”

Six other subjects explained that the campus stayed current in its use of technology through implementation of the technology plan. Subjects described how the technology plan was used to identify the software and hardware that individuals would use and how often the computers would be updated. For example, one subject stated that technology planning at the campus was:

“An asset in almost all respects; in terms of recognizing obsolescence, even before it arrives, always people aware of cutting edge at [university]; in touch with people at University Park [main campus]; remain relatively current.”

Another subject described the decision made through the planning process to have the faculty share more expensive laser printers rather than provide less expensive ink-jet printers for everyone:

“Print clustering; could bring high-end printers and have 5-6 people share them; did not hurt but gave better service; networking; have some restrictions based on university requirements; data recovery, more backups; more cost-effective; increased satisfaction; increased security.”

Six subjects described how the technology planning process affected the campus budget process which determined how technology was used at the campus. In the following response, it is clear that the subject attributes changes to the sequence of decision-making processes from the IT committee through the Strategic Planning committee:

“The process works the following way: At [campus], most discussions/debates take place in committee; sent up for campus senate; CEO wants initiative to begin at campus senate level (mostly faculty; 10% staff, 10% part-time faculty; 10% students); new initiatives start from committee of campus senate; if expertise is elsewhere, presentations invited; proposal is presented to senate; discussion is broader; if approved by senate; sent to strategic planning; strategic planning advises CEO in all strategic areas excluding continuing budget areas (ex., chalk, copiers, etc.); strategic planning representation has six faculty (2 elected on rotating basis for three years); CEO has been extremely good in promoting shared governance; Strategic Planning committee set up for fair faculty (elected) and staff representation (chosen by CEO); and student representative and advisory board; senate looks at conceptual aspects of decision making and then sends it to strategic planning where strategic planning comes up with budget; for high priority items (committees to senate to strategic planning); strategic planning sets priorities based on available money.”

Regarding the more specific details of the outcomes, ten subjects who provided *primarily comprehensive* answers for the first question indicated a link between the decisions that had been made regarding technology and the purchases and usage of that technology. Explanations of how the budget process worked, which involved identifying priority levels for the different items in the requested budget for the IT committee were given. Few subjects knew the specific details of the technology purchases, but these ten subjects believed that the purchases made by the campus were in line with what had been decided in the technology planning process.

Two responses to the first question were characterized as *primarily incremental*; they indicated that the order of events from decision making to outcome was not always clear. At times there was a sense that there was incremental change in the way that technology was developed at the campus; rather than having a distinctly defined set of steps, there was a sense of gradual evolution. For example, one subject stated:

“Not at all; own feeling/general sense is if we had fool-proof program to develop web page in five easy steps; those without web pages now still wouldn't; have not been constrained; faculty need to be educated in technology (ex. person in poverty); given understanding of possibilities; if had in development to show possibilities; grant information, freeware, more nontechs would come along more.”

The other subject described how necessary changes were sometimes a result of less planning and more happenstance. For example, there were instances of where updates to equipment or software were made and then different groups of individuals who needed to work together were no longer compatible. Changes were made after this was discovered and then it was decided that such groups had to be linked together within the decision-making process in the future. Thus, the technology planning process did not anticipate such needs and had to be adjusted accordingly for future projects.

Regarding the second question, the *primarily incremental* responses (2) called into question the direct path between the campus decision-making process and what was changed at the campus in terms of purchases and usage. Other processes were cited, such as from the Dean's office and other campus administrative offices. Generally, the highest priority items, which were additional items to the basic C&IS budget, called the “toilet paper” budget items because they were considered as basic and necessary to the campus functioning as toilet paper and chalk, were approved and funded by the Strategic Planning committee. Lower priority items were funded as the budget allowed and, in some cases, bargains were made or partial funding was provided, when alternatives were provided by the IT committee or sought by the Strategic Planning committee. These items were not specified within the technology plan; instead, discretion was given to the IT committee and C&IS department

regarding the specific items to be purchased.. Only the larger items that had to be requested individually within the technology planning process were catalogued for the Strategic Planning committee's approval. One subject described how there was not a specific set of purchasing plans set up by the IT committee for the technology plan:

“Didn't actually; don't have checklist; things are moving along well now; three to four years ago wanted three year rotation; didn't happen; under [Dean] made things happen.”

Four subjects provided answers to the first question and nine subjects provided answers to the second question that were characterized as *mixed*. These subjects suggested that the decisions for technology were embedded within the campus decision-making process and were results of the process, but were not dramatic changes for the campus or were not planned results, but emerging from the reality of the budget. One subject, whose response was typical of this type of response stated:

“Don't know how many of items were; but high priority items were.”

Subjects indicated that some of the items that were identified in the plan were purchased, but not all were. This may have been because of changes in needs or changes in what was available that was different at the time of purchase than at the time the plan had been written. One subject explained:

“Usually; if approved; every now and then something approved and technology changes; may wait to see if some item/ model may be better; may be stretched out indefinitely.”

Two responses to the first question were labeled as *other*. One subject described a situation where new technology was requested through different sources,

in this case through the administration and through an internal grant process. Eventually the equipment was purchased, but it was never clear to that individual where the funding or decision actually came from. The second *other* response suggested that the types of decisions made in the technology planning process were driven by the unique perspective of the Information Sciences and Technology program and were not necessarily clear how others benefited from the decisions.

Answers that were labeled *unresponsive to question* were provided by eight subjects for the first question and 11 subjects for the second question. Most of the subjects who were not directly involved in the decision-making processes were not familiar with the specific details. Some who were on the IT committee were aware of the choices made for prioritized list that was forwarded to the Strategic Planning committee but not aware of the decisions made at that next level. In some cases, they were aware that the items were purchased, but were not always familiar with what was done with the equipment or other materials after they were purchased.

Causal relationships conclusion. The responses in this study were consistent with the literature on technology planning. Subjects believed there should be and was a direct causal link between decision-making processes and the outcomes of the processes. Cognitive biases may cause individuals to draw causal inferences even in situations where there is little evidence for them. Subjects' lack of specific details of the causal links, leading to purchases or usage of the technology suggests that these links were not always present or apparent.

Change Technology

Subjects' views of how goals should be reached. To identify subjects' orientation toward the *change technology* variable, a question was asked regarding

how organizational goals should be reached. This question was posed only if subjects indicated in an earlier question that goals should be set during the technology decision-making process. The question to explore the *change technology* variable was:

How should goals (if any) be reached?

Subjects' responses were classified as *primarily comprehensive* if they suggested that identifying and then reaching goals was required and feasible. Their responses were classified as *primarily incremental* if they indicated that goals were difficult to set because of the complexity of the organizational variables.

The majority of respondents (22) provided answers considered *primarily comprehensive*. Most of these responses (12) mentioned using the strategic plan's objectives and goals to determine those for technology decision making. It was important to most of these individuals to integrate technology decision-making processes into the broader campus decision-making processes. Two subjects stated:

"If set prioritized goals, subgoals, objectives, systematic; prioritization is important."

"Have goals regarding how many technology classrooms; goals of campus and regarding technology needs have to be integrated to see how they works towards this goal; need to follow plan; want to see real document."

Subjects who had been members of the campus' IT committee (14) within the last five years were more likely to indicate the need for specific goals and for a clear connection between the goals and the outcome than those who had not been on the IT committee in the last five years (8). More of the latter group provided *mixed* (2) or *unresponsive to question* (4) responses. Only one of the non-IT committee members and the remaining two IT committee members provided *primarily*

incremental responses. IT committee members may have a clearer sense of the connection between the technology planning process at the campus and the outcome or, at least, have a stronger desire to see such a connection.

Seven subjects stated that the goals for technology planning should be to get the faculty, staff, and students at the campus what they want and need to work. There was a sense that just attracting students to the campus by having the most up-to-date technology was not appropriate. Instead, it was important for the goals to be practical and for the technology planning process to identify what people needed to get their work done and effect the necessary changes. Two subjects suggested that the campus should set goals for technology with a vision for the future and aim for those goals in the long-term. For example, one subject stated:

“Long-term, where we want to be eventually; where we see campus in 5-10 years; can’t change things overnight; need some kind of vision of where campus should be.”

Six subjects suggested that the goals of technology planning should be reached by attaining the appropriate level of funding. There was a sense among some subjects that sources internal and external to the university, not just the campus, were additional sources of funding. Industries with interests in the curricula offered at the campus and the state government were cited as current and prospective sources of funding to reach the goals for the technology planning process. One subject, agreeing with this view, stated:

“We don’t do as much as we could; grants are out there for external funds to support technology...survival; need to find creative sources of funding.”

In a few cases (4), the efficacy of goal-setting or quantification of goals was questioned. These *primarily incremental* responses questioned whether the

complexity of the issues involved made formal quantification and setting of objectives and goals possible or realistic. Three of these subjects explained:

“Tough question...on working on different committees, decisions being made; how to test effectiveness of decisions made is difficult to do at time of decision making; if can set ground rules at time (if look ahead); it can be done, if one knows how the decision is going to benefit the campus; if not in some specific way, in some general way; must be a measure of effective resolution; has not been the case in the decisions I have been involved in at the campus; has not been the culture of decision making at campus, yet, we are moving in that direction; are committees where people are thinking of setting goals; some decisions have been made with much to test; whether and how to evaluate them; measure success of decisions has been achieved or not; in most cases, make decisions seen on face value, looks like it is going to benefit the campus.”

“Think goals are for PR purposes; in real world, goal is idea; if students don’t do well with it; then scrap; if had legitimate criteria for goal, fine, but most students will come out fine; goal should be to acquaint students with basics; good goal would not be to have 2000 student web projects.”

“If meeting educational goals and budget goals; doing pretty well; I’m very leery of formal goals with numbers and calculations and things of that sort; too difficult to quantify.”

Two responses were characterized as *mixed*. These responses suggested having a middle-ground for goals, with looser, less specific types of goals or goals that differed in terms of specificity depending upon the type of technology involved. One also questioned the value of goals and at the same time mentioned that a non-quantitative factor (i.e., happiness) was probably the best way to identify the success of the decision-making process. These subjects stated:

“Depend upon what technology decision talking about, ex. using particular software, how frequently was it used and how well did it work; change in productivity; good idea to have goals; to see how effective it was; not too rigid; not applied to all decisions.”

“Dislike dealing with goals because they are always changing; maybe have some general goals (ex., related to mission); ex. enrollment.”

No responses were characterized as *other*. Four responses (4) were characterized as *unresponsive to question*.

Most subjects believed that change of the organization was under the control of individuals or committees who set goals and then met these goals through actions. This finding is consistent with the literature on technology planning. The technology planning literature unambiguously endorses the notion that goals must be clearly identified. It has also criticized higher education organizations for failing to have unambiguous and distinct goals. Thus, as suggested by Schmidlein (1999), there is a common assumption that goal-seeking is desirable and appropriate.

Subjects' views of how goals have been reached. The current study examined subjects' views about the *change technology* variable in terms of whether the campus technology planning process resulted from a set of deliberate actions (proactive) or whether it was merely a response to changing demands for technology (reactive).

The following question was put to the subjects:

Has the decision-making process been reactive or proactive in responding to changes in the environment or technology? How so?

Subjects' responses were classified as *primarily comprehensive* if they suggested that change technology was available or that events were controlled by the technology planning process. If they indicated that the process had been proactive in response to changes in the environment or technology, their responses were considered *primarily comprehensive*. In other words, if the subjects believed that identifying and then reaching goals was a direct process, their response was considered *primarily comprehensive*. Their responses were classified as *primarily incremental* if they stated that the process had been reactive to changes in the

environment or technology. If they indicated that change technology was unavailable or that events were not controllable, their responses were labeled *primarily incremental* as well. Responses that suggested that the relationship between goal-setting and reaching goals was complex or impossible were identified as *primarily incremental*.

As with the question regarding how goals should be reached, some subjects (7) believed that the campus had control over the changes in the environment or technology. They indicated that, primarily through the use of the three-year rollover plan, the campus had taken a proactive stance on responding to the changes in technology. Two subjects, in statements representative of this view, said:

“Primarily proactive; people on ITC as it has evolved are more knowledgeable than typical faculty recommending technology.”

“Proactive; decision to recycle every three years; need to keep up.”

In addition, some cited the fact that since the C&IS department had been given more of a permanent budget, which did not have to be bargained for each year as an indication that there was a more proactive response to the campus technology needs. Interestingly, all but one of these subjects (6) had *not* been on the IT committee in the past five years. Individuals who had been on the IT committee perhaps had a better understanding of how the committee responded to changes in the environment and changing demands. There was a sense that it was desirable to have more proactive planning for changes but with constraints on C&IS staff and committee members' time, there was less time available for planning for the future and creating a vision for the future of technology. Two subjects indicated that the

campus was becoming more proactive as it adjusted to the changing demands for technology. An example of this view is:

“Initially reactive; more proactive in last few years; just put in proposal for projectors in each room; permanent teaching stations and one to upgrade conference center; looking to offer wireless network connections.”

Some subjects (10) believed that the campus was responding mostly reactively to the environment or technological changes, thus providing *primarily incremental* responses. More subjects who were on the IT committee (7) provided a *primarily incremental* responses than those who were not on the IT committee (3). This finding is in line with what was stated above regarding the IT committee members’ views of the technology planning process. Examples of the *primarily incremental* responses are:

“Reactive...most decisions made that way; School of IST; sent money and had to be spent immediately; a lot of decisions made that way; same with campus technology fee is earned; see what can be spent.”

“Largely reactive...squeaky wheel gets the grease; largely maintain status quo; try to do long-range planning, but given budget constraints can’t be proactive when want to.”

Subjects cited a number of reasons for the reactivity. These included: bureaucratic decision-making processes that required short deadlines for decision making, a limited budget which required that few long-range purchases could be afforded, and the amount of work required by other aspects of faculty lives which reduced the amount of time they had to devote to long-range planning. Six of the subjects indicated a desire to have the campus be more proactive, but cited some of these reasons for not being more proactive. Examples of these views are:

“Primarily reactive; would be better if proactive; anticipate problems before they arise; can’t be done entirely; but some things; in terms of money;

definitely reactive; better buy it now; ex., short fuse; not enough time to decide; ex., with laptop.”

“In practice, reactive; desire to be proactive; always catching up; is a small campus and people on campus (majority) are becoming aware of technology at slower pace; catching up; because of fewer engineering, computer science?, maybe; because people in science and engineering and computer science are too busy (workload?); maybe; slow pace of progress on branch campuses has been historic; more inertia on branch campuses; most of the time; inertia and lack of drive and current knowledge; mostly reactive.”

Many subjects (15) provided responses labeled *mixed*. These typically explained that the campus technology decision-making processes were a mixture of both proactive and reactive elements. The three-year rollover plan was cited often as a proactive measure, while having to make decisions quickly and with little use of the sense of mission or vision was cited as evidence of the reactivity. Responses of this type did not differ significantly for those who had been on IT committee and those who had not (7 and 8, respectively). The following statements exemplify these views:

“More proactive; combination here; more proactive...a couple ways; ability to anticipate and request in advance needs one might have; more proactive in that some people involved in some decision making are proactive in personality and ability to move ahead; in ITC got to have leadership and committee make-up that has willingness to be proactive especially regarding technology and ability to anticipate and have expertise and knowledge in field.”

“We are proactive; every once in a while, reactive; like need for projectors; five years ago more of faculty wanted it; now everyone wants it; trying to be proactive To avoid problems; just like blackboards; why should we not have a blackboard in every room.”

“A bit of both; pedagogically reactive; C&IS mostly proactive (given limited budgets).”

“Mix of both...things didn’t get done that shouldn’t; reaction to that; personnel issues.”

No subjects provided *other* or *unresponsive to question* responses.

Change technology conclusion. Subjects' frustration with the reactive nature of the technology decision-making processes is consistent with the technology planning literature. The technology planning literature is rife with criticism of higher education organizations for failing to identify specific goals and objectives. It also contains sample methods for identifying goals and reaching those goals. While control over future technology processes is desired and expected, there is a conflict with the unpredictability of the future events as well as the general lack of control over the changes in the organization. At this campus, as part of a college-wide initiative, there was an on-going plan of rollover for the technology. This plan gave many individuals a sense of control over the technology changes at the campus, although some desired more than this level of control. In addition, there was the sense that the time necessary to plan for these future events is filled with on-going activities. A number of subjects suggested that the IDS was needed to help fill in this future-planning gap.

Location of Resources

Subjects' views of how resources should be used or distributed. Questions relating to each of the resource types were asked:

Should there be a leader of the campus technology decision-making process? Who should lead the process? What should the leader's role be?

What role should shared authority (governance?), between faculty and administrators, play in the decision making about technology?

Should the budgeting process be related to the technology decision-making process? How?

What type of information is needed to make good decisions about technology at the campus? Who should collect this information? How often? Who

should have this information? How should it be used to make decisions?

The responses of the subjects were characterized as *primarily comprehensive* when they mentioned the following: a centralized leader, more centralized control (less shared authority), a budget tied closely to a plan, and a centralized gathering of a large amount of information used to lead the decision-making processes. *Primarily incremental* responses were characterized as such if they mentioned the following: diffused leadership or, at least, a leader who was more facilitator than decision maker, shared authority, loose coupling between the budget and plan, and information gathering that may “satisfice” rather than comprehensively catalogue campus details.

Half of the responses for the question regarding leadership (16) were considered *primarily comprehensive*. These responses most often suggested that having a centralized figure to lead the campus technology decision-making process was desirable. However, who they named as this individual was varied. The newly created position (but not yet filled at the time of the interviews) of the IDS was often identified as the locus for this task. Others identified for this centralization included: the C&IS manager, a new Director of Information Technology (DIT), the campus administrators (CEO and/or Director of Academic Affairs); and the IT committee.

Some subjects suggested that the leader should be an IT leader (5), such as the Director of Information Technology (DIS), or the C&IS staff should work together to lead the technology planning process. The DIT is a new position that had been discussed by the Commonwealth College for the campuses. This leader would be required to focus not just upon the technical details of the campus technology but

also the long-term plans for the campus' technology. Samples of subjects' responses include:

“Nice if had director of IT, responsible for technology on campus who would have difficult job who would be trying for standardization and ease of maintenance of equipment; would be nice if there were one contact point to work with to get technology approved or focus for bringing it in and installed.”

“DIT; have to make hard decisions about what to purchase and to make sure ranking (priorities) is accurate.”

Subjects identified the tasks for a leader of technology planning. These tasks include having a broader view than individual faculty members. One subject recommended having an individual without a stake in the outcome:

“Guess there should be a leader; not a dictator; computer department (C&IS) may not be the best; might be better with someone without stake involved; often is someone with stake; may be better with disinterested party; to try to bring ideas together; get input; make decisions based on fact, not emotions.”

One subject described an IDS who would:

“...Mediate between different groups, ex., big users (number crunchers, ex. physics); others who want lower tech stuff; ex., overhead projector systems to connect to calculators; requests get ignored; let faculty know what's reasonable regarding requests; need to address faculty needs, not fads.”

This view is similar to several (4) recommendations that the leader be someone with technological expertise who could do long-term planning. Two of these subjects' statements are:

“Has to be someone who can do long-term planning; five years down the road...needs to be a technology coordinator; in university setting someone who has respect of faculty (absolutely needs advanced degree) and ability to look at needs of university setting...need, to some extent, to be big picture person; need solid technical background; need to really understand possibilities; but don't necessarily think this person needs to be tied up in the day-to-day strategy.”

“Not sure who it should be; torn between tech support person or faculty or

staff or separate leaders...IT committee will send out questionnaire; what do you have? what do you need? what can we do? leader can identify what is on campus, how can it be used? sometimes see others using something I could use.”

Thus, the main roles of the leader of the technology planning process would be to ensure fair distribution of campus resources while considering future trends in technology and how they would affect the campus. There was not consensus, however, on whether the leader would be a member of the faculty, staff, or administration. Faculty were more likely to consider having a faculty member in the IDS position be the leader, whereas staff and administrators were mixed in their expectations.

A number of responses for the question on leadership (10) were labeled *primarily incremental*. These generally suggested that having a single leader for the technology decision-making process was not as good an idea as having a group of people involved, either through an existing committee (e.g., IT committee) or department (e.g., C&IS). There was concern that one individual would not be able to represent the campus needs appropriately and that more individuals would be able to provide a broader range of knowledge and perspectives. Typical subject responses of this type included:

“Should be a “coordinator” or “chair”; not “leader”; rooms for different types of leadership; university is faculty-driven; chair of IT committee should be faculty member.”

“Not necessarily a leader; but group of people knowledgeable in area to make appropriate decisions; not an area where common sense does not apply; need to have knowledge to be effective on committee.”

“Doesn’t work in any college to have dictator; should be job of committee; C&IS has been good about identifying problems and needs (ex., for IST);

tend to work as group.”

Seven subjects, in responses characterized as *mixed*, suggested that while a number of individuals should help by identifying the alternatives or supplying information, there should be a leader or “facilitator” to organize the decision-making process. In some of these cases, it was stated that a committee should provide alternatives but a single individual, such as the CEO, should make the final decision.

For example, one subject explained:

“Facilitator”; ‘leader’?; yes; at some point a decision has to be made, not a popular one; but a leader in a shared governance, collaborative sense; where multiple sources of inquiry are sought out .”

One subject, in a similar vein, suggested that having strong leaders led to stronger committee actions:

“Leader (of IT committee) shared governance; matter of group (IT committee) working with administration; administrators will make assignments and have a handle on the budget, but needs to be strong leadership is key to effective operation of our senate and the committees in our senate; that we have to have strong leadership; I think we have a lot of that here, but it’s a collaborative effort (faculty, committee, senate) trying to put in same direction; open forum; administrators open to what faculty and staff want; for good of students how can we design a plan to be most effective as institution of higher learning for students [who?] co-chairs of IT committee; to be in position to make recommendations; not sure of charge of campus futures group; need synergy; need strong leadership from IT committee; not just experts of technology group, but also from faculty and staff regarding what’s important regarding the whole campus; not sure how IT committee works; people on committee can give overview of whole campus; hopefully have representation of whole campus.”

It was also believed that, because faculty needs were only part of the whole campus picture, it was important that the administrators have final say on decisions.

Administrators were expected to have an understanding of the broader issues of the

campus and therefore be able to represent more areas than just the faculty arena.

One subject, in a representative statement, explained:

“Why we have strategic planning; set up so each committee has input; recommends for area; has to be there; otherwise will be driven by single agenda.”

Only one subject provided a *primarily comprehensive* response to the question regarding shared authority. This subject stated:

“Administrators pay bill, so faculty can ask for what they want and need, administrators must be ones to say it’s feasible or not; upgrading every year is not necessarily best use of resources; faculty members’ option to ask; ‘you don’t ask, you don’t get’.”

Many subjects (22) supported the notion of “shared authority” for decision making; their responses were labeled *primarily incremental*. They explained that shared authority was important because faculty made up a large percentage of the campus employees and because of their important role in the mission of the campus in terms of both teaching and research. Thus, they explained that the faculty should have as much, if not more, say than other campus constituents in the technology decision-making process. Some subjects (6) believed that faculty had to provide input to administrators who might otherwise not understand the faculty needs and perspective regarding technology. For example, two subjects stated:

“Administrators know money and constraints and recruitment; but not aware of faculty needs in terms of specifics.”

“Administration should not decide willy-nilly; should have input from faculty from different disciplines...faculty live in “utopian ways” and do not understand money; needs give and take; faculty said what we would have and administration say what is possible; should not be top-down; faculty may get what they can’t use or don’t want.”

A number of individuals (5) stated that the role of faculty, staff, and administrators in technology decision making should be more equally distributed. Some of these believed that staff concerns had been downplayed in the last year or so within the technology planning process. For example, one subject indicated:

“Extremely important; technology is being used by faculty and staff on campus; shared decision making is extremely important that faculty and staff communicate; should be uniform system is needed to be able to work together; hardware, software, etc.”

In response to the question regarding shared authority, nine (9) subjects stated that there should be a combination of shared governance with administration. However, in these *mixed* responses, final decisions should be made at the administrative level, to promote fairness and a “big picture” view of the decisions. Some believed that faculty had too much say and they were blind to the needs of others on the campus. For example, one subject suggested:

“Squeaky wheel gets the oil; faculty are outspoken and may not take whole campus into consideration; if doing research; should be considered; administration may need technology, but come in second tier.”

One subject’s solution was to have the strengths of both faculty and administrators blended in the decision-making process:

“...Need both sides; faculty researching ideas (dreamers) and administrators (deal with restricted funds); IDS may be able to straddle fence.”

In response to the question regarding the budget process, most subjects (24) suggested that the budget and decision-making processes should be tied closely together; their answers were labeled *primarily comprehensive* answers. For most of these subjects, the notion that these two processes could be separate was not feasible. They believed not tying decision making to the budget would make the decision-

making process untenable and unrealistic. By integrating the budget and plan, it could be ensured that the limited resources of the campus would be spent wisely. Most individuals suggested that technology, given its high price tag, could exceed its appropriate share of the budget if care was not taken. Subjects stated that integrating the budget with the campus technology plan was fairer and allowed the highest priority items to be identified and purchased. Three subjects provided these quotes, which are representative of the rest:

“How can you not? ...in one sense, to some extent, the “pie” should be determined by campus and how to figure out how to decide it should be set by IT people; can be resentment of IT and IT people (C&IS) because it takes so much of whole budget; never seem satisfied.”

“Think so; should be [that we] know how much is available to spend, then make decisions; can see what is practical; spend money on what is needed; money that is not spent is not gotten again; no incentive to save.”

“Budget needs to be kept in mind by decision making for IT to determine what can be worked with; what is possible; must prioritize and recognize how far on priority list budget will allow (ex. if have \$100 K and first items cost \$40K and \$30K...).”

Many subjects (14) desired the technology planning process to drive the use of the budget, rather than have individual items be decided upon until the money was used up. Instead, these subjects desired a long-range planning process that would guide the use of the budget. Examples of these responses are:

“Yes and no; yes, certain technology needs campus must address. No; technology always will take more money; campus as whole must be taken into consideration; within larger vision.”

“All committees feed into strategic planning; IT committee comes up with budget; other committees ask for \$20, 30, 50 thousand while IT committee comes up with six bazillion dollars; have to update student labs, faculty needs, teaching classrooms, and nothing stays current long; difficult on one hand to say “no” to ITC’s budget but difficult not to cut their budget; something else will not get its budget.”

“In an ideal world; budget-making process should be directly tied to campus need through ITC determines to campus to vision to strategic planning to budget.”

Only a few subjects (3) stated that the budget process should be loosely or not at all tied to the technology decision-making process. These subjects, whose responses were labeled *primarily incremental*, stated that tying the budget to the decision-making process would constrain the process inappropriately. Some indicated that there had been too much concern about costs and not enough with being more creative with technology.

For example, one subject stated:

“Frequently focus too much on cost; other issues that are important: (1) utility, plausibility (want or can use) of equipment and software; (2) ease of use; cannot presume newer faculty will be more sophisticated technology group.”

Another subject was concerned, explaining that the budget and planning process should be related but:

“I don’t think it [plan] should be driven by it [budget].”

Four responses to the question regarding the budget were labeled *mixed*. These responses suggested that there should be a combination of planned budget items for the technology and flexibility to respond to unanticipated needs. These subjects were concerned with uncontrolled spending and inflexible control over the budget process. For example, one subject described the following situation as an example of why flexibility is necessary:

“If know some large ticket item that everyone is interested in and budget for it; rather than just say “Your budget for this year is...” Should start out with pie-in-the-sky; but perhaps should be able to think realistically about budget to get most for money; figure out priorities; come from both ends; in order to

get something done would be nice to figure out what could be done; if only look at what money is available would nickel and dime self; but if not being realistic about knowing limitations, would be hurting self.”

Most individuals (25) indicated that getting as much information from campus constituents about their needs and wants and then researching the available and soon-to-be available equipment was important. Many stated that the lack of a full-time person doing such investigation had put the campus at a disadvantage. Many mentioned that although there had been a survey or two of the campus needs recently, there was the need to have a regular process that would determine the needs and how best to meet those needs. Fifteen subject stated that it was important to gather information about individual’s and group’s needs. One subject’s response, illustrated the other’s views:

“Should go out and investigate what is available regarding needs; go back to faculty; with associated costs, other people’s needs; determine how high priority need should be rated; check with administration regarding large goals of campus.”

Ten subjects stated that the information-gathering process would entail identifying what types of technology solutions were available for the campus’ use. A number of subjects throughout the interviews indicated that the IDS would provide such information regarding pedagogical issues while the DIT or C&IS manager would provide this information for other technological needs. For example, one subject stated that what was needed in terms of information was:

“Knowledge of current products; what is needed for different uses for faculty, staff; analyze this; what is most logical next step [who?] IT committee or leader of IT committee; [how often?] at least annually since an annual budget cycle; people in technology field get monthly magazines; go to conferences; would not limit to once a year [who?] IT committee then strategic planning [how?] coupled with all seen needed on campus, prioritized, feasible with budget.”

The information about the needs of the campus community along with the technological solutions would be gathered and then inserted into the broader planning process, according to at least one subject who stated:

“Someone needs to sift through it ; at strategic planning level; when reviewing budget requests; or requests for additional equipment ; what is the future market at [campus]; how do these requests or needs are relate to where we are heading in the future and where we need to be five years from now.”

Six subjects thought the information should be gathered annually and one thought it should be gathered biannually. This would allow the campus to have a plan regarding how it would meet these needs in the future. Ten subjects thought having such a plan based on this information was important. An example of this view is:

“Need technological know-how to see what needs are and how to deal with those needs; also with IDS, who would be an especially important piece; to say what faculty might need in the future (ex., projection needs); IDS would see broader future needs (total picture regarding pedagogy and technology).”

A few subjects (4) suggested a *primarily incremental* approach to collecting information about the technology decision-making process. Trial and error and continuous investigation of possibilities for technology were identified as techniques for gathering information. Acknowledgement of the difficulty inherent in tracking a changing domain such as technology was explicit in interviews with a number of individuals. For example, one subject explained that information for decision making was:

“Dictated by deals at campus and university deals; work with Microsoft; that decision is almost made for us; other areas; need trial and error; purchase different vendors’ software (ex., Word recognition software); try what may be best “players”; do pilot studies; need to see what will be compatible with security software; sometimes find incompatible software.”

These subjects indicated that more frequent information gathering was important, given the speed at which technology changed. One subject stated that without someone who had a job dedicated to this task, it would be difficult to maintain such information.

Only three (3) subjects suggested a *mixed* approach to information-gathering for technology at the campus. These responses suggested a combination of information-gathering techniques from the planned process to spontaneous collection by individuals. There was a sense in these responses that information-gathering should be continuous and built into a planned process. For example, one subject stated that the type of information that should be gathered included:

“What technology is going to be used for, the environment (lab, research, what level of quality of output is needed), who is going to use it (durability & reliability; students vs. faculty only); who? [would gather it] anybody; C&IS or IDS would have repository of information, but anyway it comes is [is fine]; how often? primarily once a year for budget; however would ask once a year but would accept it all year; someone should have chance to reprioritize as requests come in.”

No subjects gave answers that were characterized as *other* for any of the four questions regarding the *location of resources* variable. Only one subject provided a response that was characterized as *unresponsive to question*

In summary, for the *location of resources* variable, the results were consistent with the literature on strategic and technology planning only some of the time. This literature promotes centralizing decision-making processes, having strong leadership, tying the budget to the planning process, and gathering large amounts of information prior to making decisions. Subjects in this study were more likely to respond that there was a need for more decentralization or, at least, a sharing of control over the

technology decision-making process. It is possible that because many of the subjects were faculty, there was a greater sense of a need for sharing the responsibility of the technology decision-making process than if more of the subjects had been staff or administrators. Because this particular campus had been using a shared faculty/administrator system for making technology and other campus decisions, it is also possible this was considered to be more desirable and effective than if there had been a different campus culture.

Most subjects indicated that the budget should be tied closely to the technology decision-making process; this was consistent with the literature on technology planning. Realizing the permanent nature of the demands for technology had been indicated by a number of subjects as an important hurdle that the campus had overcome in the last few years. Prior to that, the technology advocates on campus (C&IS department and IT committee) had had to argue for the basic essentials in the budget process each year. Within the last two years or so, there was an acceptance by the campus, through the Strategic Planning committee, that a basic (“toilet-tissue”) budget should be considered permanent funding while additional funds had to be requested by the IT committee and reviewed by the Strategic Planning committee. A number of subjects were concerned that not having the budget closely tied to the technology decision-making process would lead to waste and an overwhelming of the budget by technology; they believed that tying them together would help reign in the costs of technology at the campus.

Almost all subjects in this study considered that collecting information regarding technology needs and available technologies was an important process.

This finding is consistent with the literature on technology planning. Most subjects believed that a comprehensive annual survey of needs was important. Some individuals realized, however, that this task was difficult or nearly impossible for the individuals in the existing positions at the campus (e.g., C&IS manager) who were busy enough in their current jobs. Having to maintain a regular database of what constituent needs were and what resources were available was viewed as extremely difficult.

Subjects' views of how resources are distributed or used. To determine how subjects' believed that campus resources for decision making were distributed or used, the following questions were asked:

Has there been a leader for the technology planning process? If so, who was it? How was this decided? What was this person(s) role in the process?

What role did shared authority between faculty and administrators play in the decision making about technology?

Has the budget been coordinated with the technology plan? If so, how?

What type of information has been collected prior to the technology planning process? How was this information collected? Who collected it? Who was able to use this information? How often was information gathered?

Subjects' responses to these questions were characterized as they were for the previous set of questions. The first two questions in this section, relating to whether there was a specific leader of the technology planning process and what the role of shared authority was at the campus, are discussed together since they addressed different aspects of a similar issue. The expectation of not having a single, controlling leader was tied to the belief of many of the subjects that faculty should share in all decision making. The definition of "leader" varied across subjects and

this affected how they answered the question relating to having a leader. For example, if “leader” meant that one individual had all the decision-making power, then few subjects believed there was a single leader. If “leader”, on the other hand, meant “facilitator”, then more believed there was a leader for the technology planning process. Much of this view was determined by subjects’ expectation for faculty sharing in the decision-making processes.

Nine subjects provided *primarily comprehensive* responses to the question regarding leadership. These subjects stated that there was centralization of the leadership role, although they differed in their views about who the “leader” was for the campus process. Two subjects reported that the leader was the C&IS manager, while three others believed he shared the leadership position, with either the campus registrar or the head of the IT committee. One person reported that the C&IS “people” were the leaders and one stated it was the IT committee chair alone. One subject who stated that the C&IS manager was the leader explained:

“In terms of long-term goal-setter? ...probably [C&IS manager], he’s the creator of the budget; define leader; in terms of long-term visionary? No.”

The leadership of the IT committee had, as described previously, been in flux in the last few years at the campus. The C&IS manager and registrar had shared the chair position for years until the chair position was designated as a faculty-only position. The faculty chair had been held by two or three different faculty members since the change in the designation.

In response to the question regarding shared authority, only one subject provided a *primarily comprehensive* response. This particular answer was a specific complaint about the lack of shared authority regarding how decision making

occurred at the campus. The concern of this subject was that faculty were not always privy to the final decisions that were made about technology at the campus. This subject stated:

“Believe too many times decisions have been made by individuals with very little public knowledge about it; end result is an announcement that something is here without having heard anything about it.”

Thirteen subjects provided *primarily incremental* responses to the question regarding the locus of leadership. These subjects stated that the leadership of the decision-making process was primarily through a committee effort with faculty playing a large role in the process. Eight of these subjects described the leadership role as shared by the faculty, IT committee, and the C&IS department. Three subjects described the situation thus:

“Has been collective process; campus as a whole feels we have to keep up with technology; people in IST and computer science departments have helped us to understand how to keep up; campus has supported goal.”

“Committee chair is not ‘leader’; campus does not like idea of ‘leaders’.”

“There have been several leaders; mostly people who are definitely involved in process full-time and those who use it in teaching ex., Engineering faculty regarding CAD programs...have different committees under faculty senate; ITC is responsible for pulling together items; any input goes through committee; leaders step up or are ex officio.”

Fifteen subjects provided *primarily incremental* responses to the question regarding whether there was shared authority for technology decision making at the campus. A number of these subjects mentioned that the CEO typically included many individuals, primarily through committee work, in campus decision making. The way in which the budget process at the campus operated was used to illustrate how inclusive the campus decision-making process usually was. The budget process

required committees to submit their budget requests for each year to the campus senate, a faculty-run group, and then to the Strategic Planning committee, which had faculty, staff, and administrative members. Some subjects described the recent restructuring of the IT committee, which was executed to increase faculty control over the technology decision-making process as a result of faculty concerns that they had too little say in the changes occurring regarding technology at the campus. While there were still concerns about how the committee was working given that it was difficult to retain a chair for the committee, there was a sense that faculty concerns were taken seriously and the faculty had a large amount of shared governance.

Ten subjects described the importance of the IT committee to illustrate the role of shared authority. For example, one subject stated:

“They [faculty] are parts of committee; see role every step of the way; as money for students; on IT, ad hoc committee.”

Three other subjects stated that administrators played the part of “facilitators” to support faculty initiatives and academic decisions of faculty. One of these subjects said:

“Administrators have bought into idea of keeping up with technology; very good support.”

In their *mixed* responses to these two questions (6 and 10, respectively), subjects described how the technology decision-making processes were a result of leadership from one or two individual along with input from faculty. There were some subjects who described the C&IS manager as the “leader” who was most knowledgeable about technology on the campus, but who worked closely with the IT

committee. There was a sense from some that the C&IS manager led as a result of his expertise and position, but that the IT committee was there to help set the direction of the technology efforts at the campus. There was the notion of having a “leader of a committee effort” with either the C&IS manager or the IT committee chair leading but with the will of the IT committee behind the changes.

Regarding shared authority, a number of subjects described how there were times in which the decision-making process had not worked as they had desired, with one or more individuals taking control of the process. There were some cases that subjects described where some decisions did not go through the proscribed channels or final decisions did not correspond to the recommendations of the IT committee. One subject stated that there were “deals cut after committee decisions are made”, bypassing the proscribed process. One subject indicated that there had been, in the previous incarnation of the IT committee, just an appearance of shared governance. There was a sense that faculty on the committee had less say in the decisions of the committee; this was a major impetus behind the change in the IT committee’s leadership designation. There was also concern that the shared authority was too heavily weighted towards the faculty, with staff concerns viewed as less important.

In response to the question regarding the budget process, 12 subjects provided *primarily comprehensive* responses. Three subjects stated that the budget was coordinated with the technology plan but were not familiar with the details of the process. The other nine subjects explained how the IT committee submitted its budget request to the Strategic Planning committee. This request was the

cornerstone of the campus technology plan and was often the only written documentation for each year's plan. One subject explained the process this way:

“Process has been IT committee proposes budget; has standard budget then proposes above and beyond to strategic planning; [strategic planning] rules on it; if there is enough money to support beyond prioritized list where we think it should be; gets funded.”

Fewer subjects (4) provided *primarily incremental* responses to question regarding the budget. As mentioned previously, the general sense at the campus was that the budget process should be and was intimately tied to the technology planning process. A few subjects, however, indicated that there were many times when other sources of money became available, either through the campus, university, or from external sources that were spent without specific reference to the campus technology plan. For example, new funds from the university's new Information Sciences & Technology college were given to the campus to support the new IST program but did not go through the same budgeting process as the other technology budget requests. One subject described this situation:

“...Sometimes decision has been made ‘off-line’ certain pots of money made available; then blended into campus budget...some IST money earmarked for IST needs for programs; some CEOs putting money into bigger campus budget; been told that's why there is more of an initiative within [college]”

One subject stated that the budget process set the parameters for the decision-making process, but did not necessarily drive the decisions. Another subject explained that it was difficult to tie the budget and the planning processes because of the timing of the two processes:

“Problem is there are three sources of funds: campus; computer fee, & IST advanced [student] standing fee (last two are restricted funds); in order to decide how many computers; timing is off for different budgets; may need several-year to plan for different funds.”

Seven subjects provided *primarily comprehensive* responses to the question regarding information collected during the technology planning process. These subjects reported that information gathering was going on in a wide variety of places throughout the campus. There was a belief that the IT committee members and the C&IS staff constantly were on the look-out for new technologies that could be incorporated into existing campus technologies. It was also reported that the IT committee and C&IS collected survey data from all, or most, campus constituents to determine existing levels of technology and future needs. One subject explained:

“Working on new way now to do this; (C&IS person) has been collecting data; has new program to do this; doing inventory on what we have and what we need; encouraged everyone to fill out short survey on what they have, what they need; never was tool to collect data in past; now have this program; should, if taken seriously, help a lot.”

It was expected that this survey would become part of an annual cycle of information gathering at the campus. Along with this survey, information was also being collected through the Registrar’s office regarding technology needs in the classrooms:

“Bringing in numbers of classes, number of technology classes (ex., how many faculty request technology classrooms or occasionally, how many students in new majors; may need labs for themselves); needs would be supported regarding numbers for technology classrooms.”

Nine subjects provided *primarily incremental* answers regarding information gathering at the campus. These subjects stated that there had been scattered attempts to collect information from individuals about their technology needs. The survey that was mentioned previously apparently had gotten a limited response from campus constituents. Some suggested that such surveys had been done previously at odd

intervals, rather than systematically. For example, one subject stated: “sometimes will distribute questionnaires to faculty via email; few and far between”.

Few subjects provided *mixed* responses to questions regarding the budget and information gathering (4 and 2, respectively). These subjects suggested that there had been attempts to centralize and control the budget and information-gathering processes but at times the planned processes did not work entirely as expected, with unanticipated budget changes and changes in subjects of the technology planning process which diverted the information-gathering process.

Two subjects provided *other* responses to the question regarding the budget. One questioned whether there was a true plan for technology at the campus and the other questioned how the budget process worked in terms of equity for different campus programs. These responses were:

“Not sure we have IT plan.”

“Unless it doesn’t cost money; can spend all money on technology, but not on Learning Center; does not make sense.”

A fair number of the responses for these four questions were labeled *unresponsive to question* (4, 6, 10, and 14 for the four questions, respectively). In many of these cases, the subject had indicated earlier on in the interview process, that he or she was unfamiliar with the specifics of the technology decision-making process and so these questions were not asked by the interviewer. In some cases, subjects responded to earlier questions about how things *should* be and then went on to explain how they thought things *did* work regarding technology decision making, particularly regarding the leadership and shared authority questions, but then did not have knowledge of how the budget process and information gathering occurred.

Location of resources conclusion. Many subjects familiar with the technology planning process at the campus described different ways in which the campus had improved the use of campus decision-making resources. Subjects described the evolving changes in the IT committee leadership and the committee structure which would enhance faculty participation in the process. They also described how there were plans for regular information gathering, which could be led by the new IDS who could maintain a good sense of what faculty needed and desired for technology. The IDS, who was being hired at the time that data collection for this study was being done, was considered by many as the solution to many of the problems faculty experienced regarding technology. The person in this position was expected to increase the faculty voice in the process and have time for creating a broader vision for technology that the faculty did not have time to do.

The results for the *location of resources* variable regarding how subjects reported technology planning are somewhat consistent with the desires of the subjects found in the first part of the interviews. Many subjects indicated that there was at least some attempt to have decentralized leadership, shared authority, and a budget coordinated with the planning process. However, subjects reported that there had been less successful attempts at information gathering. There were many statements made by subjects pointing to plans to alter the composition and tasks of the IT committee and add the IDS position which would enable the campus towards the goals of increased coordination with the plan and information gathering. In addition, there was a sense that the IDS, whose position was originally designated as

a faculty position, would strengthen the role of faculty in the technology planning process.

The literature on technology planning is replete with suggestions on centralizing the decision-making process, tightening the links between the budgeting process and the decision-making process, and having a more comprehensive information-gathering process. Subjects in this study concurred with tightening the links between budgeting and planning and having a more comprehensive information-gathering process. However, most of the faculty who were interviewed believed that shared authority, rather than centralizing the decision-making process, was more important.

It appears that the technology decision-making process at the campus has evolved in such a way that it fits the campus' culture, as recommended by Schmidlein and Milton (1990), and the characteristics of higher education organizations (cf., Birnbaum, 2000; Cohen & March, 1974; Cohen, March & Olsen, 1972). The campus, which has a strong faculty and a history of shared decision-making processes, values a stronger faculty role and shared governance. The technology decision-making process at the campus had undergone a change to enhance these characteristics within the year prior to this study. In addition, the primary vehicle for decision making at the campus involved budget decisions, with hearings and discussions centering on prioritized items. It followed that the budget was considered to be an integral part of the technology decision-making process as well. However, it became clear throughout the interviews that the budget decisions that were made during the hearing process were actually considered broad guidelines

for large ticket items (e.g., new computer laboratory equipment or computer servers). Thus, while the budget process relating to technology planning satisfied both the desire for integration and the need for flexible purchasing, as was described in the section on the *causal relationships* variable. Regarding information gathering, the contrast between the subjects' beliefs that gathering more information would be more useful and their reports that information gathering at the campus had been less successful than desired suggests that the time-sensitive nature of technology and demands for technology and the difficulty in centralizing certain processes outweighed the ability of the campus to collect and use information consistently and purposefully. Subjects indicated that the problem with information gathering may change with the hiring of the new IDS.

In conclusion, it appears that the desire for centralization of decision making, tight integration among campus decision-making processes, and comprehensive information gathering is balanced with the realities and values of the campus. Seeking equilibrium within the organization is a continuous process, with committees reworking and renegotiating the decision-making processes.

Functions

Subjects' views of how processes should work. To examine subjects' beliefs about the *functions*, which referred to the manner in which decisions are made, variable, they were asked the following questions:

What should be the role, if any, for bargaining in the decision-making process regarding technology?

Should multiple alternatives or options be identified in the decision-making process? What types of alternative choices should be considered? How should the choice be made among the alternatives?

Responses to these two questions were characterized as *primarily comprehensive* if they indicated that a formal logic or algorithmic process should be used to make decisions regarding technology. *Primarily comprehensive* responses suggested identifying a number of alternatives or options for the decision-making process. Responses that suggested that bargaining should be considered in the decision-making process were labeled *primarily incremental*. If political expedience or a heuristic method of decision-making was mentioned, the response was considered *primarily incremental*. These responses suggested that a political process was needed to identify alternatives rather than using a “rational” decision process.

A few subjects (3) gave *primarily comprehensive* answers in response to the question regarding political bargaining. Bargaining was considered to make the decision-making process unfair and these subjects reported that bargaining did not belong in the technology decision-making process. One subject was explicit in indicating in a “perfect” world political bargaining would not exist, suggesting that this was not necessarily what is realistic in such a situation. This subject explained:

“In perfect world; [political bargaining] shouldn’t have any part in it; here to serve students.”

One subject, opposed to bargaining, stated:

“Not the way to do things; better off in Strategic Planning committee; with key players who hear and see all aspects of campus; bargaining pits one interest group with another; [would not be] not rational decision making.”

Many more subjects (19) reported that bargaining was necessary, particularly because of limited resources, in order to provide an opportunity to reach many different goals. Not all individuals who provided *primarily incremental* responses for this question suggested that bargaining was always fair or that different

individuals or coalitions had equal power. Three subjects indicated that bargaining was allowable if each individual had an equal chance to be heard and get resources and was voluntarily involved in the bargaining. These subjects said:

“As long as it’s entered into on equal footing and no one is coerced; if voluntary is ok; sides of bargain are kept; no idea.”

“Bargaining should be approved; not ‘behind the doors’.”

“Political bargaining always takes place; organizations of power; trade-offs, but system works best when least “politicized”; should be needs-driven rather than by desires by people in power; often have trade-offs between needs over time; good communication.”

Ten subjects reported that bargaining was necessary to ensure that one’s needs were met. Bargaining was seen as a normal part of the decision-making process, with compromises and bargains made along the way by everyone involved to maximize the impact of the available resources. Examples of this view are:

“Has to be some; what we would like and what we can really get, especially when money at [university] budget is cut back; have to negotiate what we really need versus what would like to have; a minimum of what we need vs. what we would really like to have.”

“Bargaining comes down to looking at what requests to fill; bargaining among committee members making decisions over time.”

“Should be some opportunity for bargaining; problem is money; strategic planning has various proposals from different committees; with limited resources; will be bargaining; each committee chair can make case in strategic planning why funding should be given; in senate meeting provide information; strategic planning starts deliberating in February.”

A number of subjects (7) provided *mixed* responses to the question regarding political bargaining. Their responses indicated a combination of using political bargaining after using a more “rational” system to identify alternatives. One subject’s answer provides an example of this view:

“Difficult; don’t want largest programs to get everything just because they are the largest programs; because smaller programs wouldn’t get anything; can have phase-in program; you can’t have this now, bargaining would be ok; strategic planning does this now with prioritization; needs to be across board.”

Several subjects indicated that they accepted bargaining but with some conditions. For example, one subject described how bargaining was fine as long as over the long-run, different constituents’ needs were met:

“Discussion of bargaining; discussion is an integral part of all decision-making processes; [trade-offs]; trade-offs are an integral part of all decisions processes; if finite budget; have to make compromises; different parts of campus have different interests; perhaps one segment of the campus wants one thing one year and a second the next; have to be give and take; wish had enough resources to take care of all needs; need bargaining, multi-year planning to take care of all needs in long run.”

Another subject described how bargaining was acceptable as long as political aspects of it were transparent and agreed upon:

“Anytime there could be win-win situation, OK; bargaining is OK; if not political; lots of politics at [university] and particularly campuses...rather be upfront about what needs are and how to get them accomplished; political in my mind is negative; people have their own agendas they try to push for; I could do it prefer to work together.”

Most subjects (24) provided *primarily comprehensive* answers for the question regarding identifying alternatives. Most subjects suggested that identifying a number of alternatives was beneficial and practical. They also stated that a logical process was needed to make decisions among alternatives that are identified. Five subjects outlined how alternatives should be put forward which should then be prioritized by the IT committee or Strategic Planning committee. For example, they stated:

“Should go out and investigate what is available regarding needs; go back to faculty; with associated costs, other people’s needs; determine how high

priority need should be rated; check with administration regarding large goals of campus.”

“...About rational decision-making processes; first identify problem, identify alternatives, evaluate alternatives, pick one, do a follow-up; get all your choices before making your decision; don’t satisfice because first one that came along would do it; be a comparison shopper.”

A number of subjects (5) described how providing alternatives was necessary for the budget process or to work within the campus decision-making process. For example, it was considered that by providing alternatives within the technology plan, the IT committee could ensure that some of its items were approved because the Strategic Planning committee would be able to take some of the items that were proposed rather than have to reject the whole plan. Examples of these subjects’ views are:

“Better have some options out there (Plan A-C); [choice among alternatives]; budgetary; optimal plan then on down the road.”

This view is similar to the view of five other subjects who stated that providing alternatives would allow the decision-making process to work more efficiently when there are limited resources. With similar reasoning, these subjects believed that providing alternatives allowed for reaching the same goals set out by the IT committee, while satisfying the budgetary processes of the Strategic Planning committee for the campus. One subject’s response elucidates this view:

“For simple fact that can’t always get what you want; faculty need to prioritize needs as well [how choice?] based on prioritized needs.”

Five subjects stated that it was important to consider identifying alternatives as a political tool, rather than necessarily a formal logical approach to decision making. These responses were labeled *primarily incremental*. These subjects

indicated that provided more “wiggle” room at a certain level of the process allowed for broader choices later in the process. These subjects understood how the process worked, including how the Strategic Planning committee preferred to have step-wise options rather than “either-or” choices. An example of this view is:

“Strategic planning loves to have options; if only one way; puts us “in box”; need to give wiggle room; if can’t have 20 computers this year; can have 10 this year, 10 next; typically get alternatives.”

Some subjects (5) gave answers to the question regarding alternatives that were labeled *mixed*. These responses suggested that identifying alternatives was important, but at the same time, bargaining and political processes were necessary for determining choices. An example of these responses is:

“Needs to be some type of formula; some type of weighting [mathematical model?] not necessarily, but some way to make sure everyone’s needs can be addressed.”

Only one subject responded with an *other* response for the question regarding political bargaining and no one provided an *other* answer for the question regarding alternatives. The *other* response for the first question is:

“Can play a role; what is in best interest of students to have academic success?”

Two subjects provided *unresponsive to question* responses to the first question and none provided such responses to the second question.

The results for the *functions* variable are somewhat consistent with the literature on technology planning. The review of literature in this area found that most advocates of technology planning favor enhancing the use of “rational” decision-making processes while reducing the role of politics. What was found in this study was that most subjects favored “rational” decision-making processes,

evidenced by the recommendation that multiple alternatives be examined for cost-benefit analysis for items that were identified in the strategic planning process. It was considered important to have a vision or mission, as stated previously, and bargaining was seen as permissible as long as it was within the framework of the mission or vision for the campus that had been identified in the strategic planning process or the IT committee procedures. A number of subjects indicated that they wanted the political bargaining process to be “fair”, suggesting that agreed-upon parameters for the process should be retained. However, most subjects also recognized the reality of a limited budget and how it was necessary to bargain in order to get one’s needs met. Thus, while they considered it important to have fairness, which they believed was ensured by having a “rational” approach, many of the subjects also indicated an understanding that bargaining was an important and necessary component of the decision-making processes at the campus.

The attempt to categorize the subjects’ responses may, at times, mask the similarities in subjects’ responses to the questions. In the case of the *functions* variable, most subjects indicated that it was important to provide prioritized alternatives as required by the strategic planning process. These responses were categorized as *primarily comprehensive*. However, a number of subjects stated explicitly that another reason for doing so was for political reasons: this allowed for the bargaining process relating to strategic planning to take place. These latter responses were categorized as *primarily incremental* or *mixed* depending upon the description within the response. It should be noted that all attempts were made to categorize the responses most accurately, but at the same time, it is recognized that

the range of responses indicates that subjects may view the usefulness of identifying alternatives in more than one way. Thus, as discussed previously, the technology planning process had evolved at the campus in a way that satisfied subjects' desire for "rationality" while fitting the campus culture and characteristics of the organization.

Subjects' views on how the process did work. To assess subjects' views of how the functions of the technology planning process did work, they were asked:

Has the campus had a "vision", mission, objectives, or priorities for where technology is going in the future? How was this determined? Has it been revisited since it was determined?

How was political bargaining, if at all, involved in the decision-making process?

Primarily comprehensive responses to the first question were defined as those that stated that the campus had a "vision", mission, objectives, or priorities regarding technology. This type of response suggested that the decision-making process followed a systematic, algorithmic process. *Primarily incremental* responses included those that stated that there was little "vision", etc. or that one was not followed during the decision-making process. This view was in line with the notion that the decision-making processes did not correspond to the model. For the second question, if the subject indicated that political bargaining was not part of the process, then that subject's response was labeled *primarily comprehensive*. If the subject described political bargaining as an important aspect of the decision-making process, that subject's response was considered *primarily incremental*.

Many subjects (12) who provided responses for the first question indicated that the campus had a "vision" or mission which guided the technology decision

making. A number of these subjects also explained how the technology decision-making process involved the goals determined by the strategic planning process at the campus and the broader university. The IT committee had recently undergone a process by which its own mission was re-evaluated and revised to clarify the objectives of the committee and its role within the broader campus mission. Sample responses of these views include:

“[IT] committee has mission, vision...committees are encouraged to have mission statement.”

“Vision is to keep us in forefront of technology; way to do that; mechanism is three-year rotation of computers supplied to faculty and staff; other equipment is updated regularly.”

A number of subjects (6), whose responses to the question regarding the mission etc. were characterized as *primarily incremental*, indicated that the process by which the campus technology decisions were made was less directly tied to a “vision”, etc. and more driven by immediate needs of the campus. Often, it was reported, the technology decision-making process was driven by the budget rather than by a central mission. Also, there was a sense from some subjects that individual decisions were made by administrators based on an individual’s needs rather than how those needs fit into the broader scope for the campus. For example, they stated:

“Often *ad hoc* procedure; IT does not always get a lot of input; and talks with C&IS department.”

“No; why we need IDS; to look in “vision” terms; to integrate technology and pedagogy; has been done more piecemeal so far.”

Subjects (6), whose responses were characterized as *mixed*, described how the campus may have had a mission, but did not follow it in the actual decision making regarding technology in response to the first question. There was a sense

that the planned process and the actual process were not the same; the documentation that had been worked on by the IT committee and the Strategic Planning committee may not always have been followed in practice. One subject explained:

“Maybe not “campus”; in IT committee; in fall tried to identify needs; broke down campus areas and then made them comprehensive; not revisited (haven’t met since coming up with them).”

Only a few subjects (4) suggested a “rational” process was employed for technology decision making. These subjects described the official process by which the decisions were made, including the committee structure and order of events in the decision-making process. They indicated that political bargaining was not the primary vehicle for decision-making at the campus. Their responses were labeled *primarily comprehensive*. Examples of their statements are:

“IT committee is active committee; at end of every year put forward through prioritized list to strategic planning and faculty senate so is process; all had opportunity to provide input to committee.”

“The process works the following way...most discussions/debates take place in committee; sent up for campus senate; CEO wants initiative to begin at campus senate level (mostly faculty; 10% staff, 10% part-time faculty; 10% students); new initiatives start from committee of campus senate; if expertise is elsewhere, presentations invited; proposal is presented to senate; discussion is broader; if approved by senate; sent to strategic planning; strategic planning advises CEO in all strategic areas excluding continuing budget areas (ex., chalk, copiers, etc...CEO has been extremely good in promoting shared governance; Strategic Planning committee set up for fair faculty (elected) and staff representation (chosen by CEO); and student representative and advisory board; senate looks at conceptual aspects of decision making and then sends it to strategic planning where strategic planning comes up with budget; for high priority items (committees to senate to strategic planning); strategic planning sets priorities based on available money.”

Most of the subjects (18) who provided an answer for second question described how political bargaining was involved in the technology decision-making

process; hence their responses were labeled *primarily incremental*. They often described bargains that were made outside of the proscribed process as well as deviations from the proscribed process.

Seven subjects described bargaining across groups and within the IT committee to come to a decision regarding technology. Subjects reported:

“...Necessary to make concessions among groups; I think that has happened; not rival camps fighting over funds; some campuses have battles over things like this; we are always a pretty congenial group; not spoiled by having had too much; we’re usually grateful for what we get.”

“In terms of which computers to buy; may not have thought of demands for maintenance; bargaining regarding prioritization, certainly; DAA has a lot of say as supervisor of faculty; may need to decide that one department gets more than another; different departments may need to bargain over who gets what [when].”

Much of the bargaining, not surprisingly, revolved around the use of the limited budgetary resources of the campus. This bargaining regarded maximizing the available resources. For example, one subject stated:

“A lot of bargaining; when lay out strategic planning and budget plan; go forward with several hundred thousand with recurring funds (department allotment) but do not always get it (exclusive of student technology fee); we negotiate; may decide to hold off on webmaster for this year; negotiation in strategic planning; in ITC less negotiation; list everything; give itemized list (with priorities) and say which can or cannot be cut.”

No response to the second question was considered *mixed*.

One subject provided an *other* response to the question regarding political bargaining. This subject did not explain whether bargaining was involved in the decision to get equipment, but indicated that it was an unknown process to him or her that led to this situation. No *other* responses were provided for the first question.

Eight subjects provided *unresponsive to question* responses to the question on vision or mission and nine subjects provided *unresponsive to question* responses to the question regarding political bargaining. Most subjects professed a lack of knowledge of the details of the technology decision-making process and so this question was either not asked of the subject or the subject said that he or she did not have the information.

Functions conclusion. The results for the *functions* variable are interesting in that while many subjects suggested that the campus has a sense of “vision” or mission that it used to determine its technology decision-making process, they also stated that the actual process did not always follow the proscribed path set by this “vision” and the mechanisms set up to be used for the decision making. The responses to the first question suggested that, for the most part, the campus had a set of guidelines for determining whether technology purchases fell within the needs of the campus community. At the same time, the subjects indicated that the proscribed path was not always followed, with individuals sometimes going directly to the campus administrators. Most subjects believed that political bargaining was an intrinsic part of the technology decision-making process. Rather than using a “rational” process, political bargaining was the method by which many decisions were made. In some cases the bargaining involved making compromises so that more than one constituent’s needs could be met by trading off over the course of a few years the needs of the different groups or individuals. Thus, a bargain may have been made to agree that in one year one need would be satisfied and in the following

year a different need would be met. Other times the political bargaining involved negotiating during the budget process to set priorities.

The literature on technology planning has suggested that having a “vision” is most important. This may result from recognition of the political nature of the decision-making process; the process by which a vision is generated and promoted is intrinsically political. Thus, there is a mechanism by which politics is accepted in the process while maintaining the appearance of rationality. In this study, the subjects described how they had incorporated the political process into the technology decision-making process at the campus. From developing the vision through the process from the IT committee to the campus faculty senate to the Strategic Planning committee, there is much evidence that the political nature of the process. In the present study, therefore, there is more evidence that the political nature of the organization is acknowledged and accepted into the daily activities than in the more “rational” processes promoted in the literature. When there was a breakdown in the process or someone had circumvented the proscribed procedure, there was a sense of unfairness and discontent that arose. Thus, subjects were likely to accept the political process as part of the technology decision-making process, but were unhappy when they believed the agreed-upon parameters were sidestepped. They desired rational boundaries for the irrational, political processes.

Goals

Subjects’ views on how the decision-making process should work. To examine subjects’ beliefs about goals, they were asked:

Should consensus be an aim for the technology decision-making process?

How should the success of technology decision-making be determined?

Should goals be set? What types of goals should there be?

Should the alternatives be prioritized? How should the priorities be determined?

Subjects' responses were characterized as *primarily comprehensive* if they indicated that there should be goals for the decision-making process that are prioritized, clearly defined, quantifiable, and established by high levels of consensus. Consensus, as described in the literature review, is important because it signals that by providing enough information and identifying the prioritized goals, the "appropriate" solutions should become obvious. This view differs from the views that consensus is reached through incremental bargaining; this latter view is analyzed in the *functions* variable section. The purpose of this classification is to examine the manner in which goals are identified and examined. Responses were labeled *primarily incremental* if they suggested that goals or ranked or prioritized choices are not feasible or desirable. Also, they were considered *primarily incremental* if they stated that the outcomes of decision making are ambiguous, not quantifiable, and not based on a clear consensus.

Many responses (13) for the question regarding consensus were considered *primarily comprehensive*. There was a sense that it was important to make sure that individuals believed the decision-making process should be a result of agreement among all individuals and not just a select few. Four subjects argued that extensive consensus was important to attain to avoid having some people believing they were cheated in some way or at least for participants to "buy into" the process. Some examples of their responses are:

"Leads to least people being "ticked off"; have major feeling what is being

done is the right thing.”

“Consensus is one of my favorite words; would be wonderful to have it; need majority to feel they are putting best foot forward; sometimes some on ITC disagree.”

In a similar vein, four subjects explained that consensus was important so that they would be happy with the final decisions. Two of them stated:

“Allows people to “buy into” it more; may say this is what benefits the campus most; campus wins.”

“We do everything by consensus here; probably that creates the least amount of whining with consensus; people feel they are getting their fair share of resources of technology.”

Few subjects provided answers labeled *primarily incremental*. For the question regarding consensus, only four suggested that consensus was not a desirable goal for the decision-making process. Most of these subjects suggested that consensus led to the “lowest common denominator” or other less desirable outcomes. A couple also indicated that getting consensus was not possible. Examples of these responses are:

“No everybody has different needs; cannot always get consensus; if look at rolling over year to year different priorities; over multiple years look at everyone’s needs; might have majority vote; may have powerful factions; may have five students with one need and 40 with other need; may not be able to gain consensus.”

“...Consensus-building comes to lowest common denominator; does not lead to bold and innovative actives; to make progress, consensus-building—what keeps everyone happy—may need to take risks and make unpopular decisions; don’t believe in committee of like-minded people this is; committees should not be put together by those on committee; want diverse interests; best committee represents broadest and most diverse range of individuals with different viewpoints; see all angles in discussion before making decision...”

Fourteen subjects provided *mixed* responses for the question regarding consensus. Eleven indicated that, although consensus would be an “ideal” goal for the technology decision-making process, it was so unrealistic as to be beyond consideration. For example, some stated:

“Consensus is ideal; difficult to make IT decisions; have such different levels of knowledge; for all that faculty talk about needing to become educated about technology, they are like the general public in that way; faculty do not have wish to become educated in technology; when faculty say they want to need assistance, they often want someone to do it for them or someone to show them step-by-step.”

“It’s impossible; want unanimity.”

At least one subject indicated that while consensus would be a good goal, it could also be problematic:

“Would be nice; but not required...so everyone is happy/satisfied/understands decision; ultimately decision has to be made; consensus may not be good if have to bend too much.”

For the second question, regarding whether goals should be identified and what type of goals these should be, a clear majority of subjects (22) believed that having clearly identified goals was important. These responses were characterized as *primarily comprehensive*. The types of goals that were identified as important included having technology being useful to as many individuals as possible (8) and providing technology and technology skills to enable students to be best prepared upon graduation (3). More general goals, such as making sure people at the campus are satisfied (7) and tying the technology plan to the mission of the campus (7), were also mentioned. Responses illustrating some of these points are:

“Anything that’s made for campus in general should be goals regarding maintenance, levels of technology (rolling replacement plan), down-time, response-time for maintaining technology; turn around time for responding to

requests for technology.”

“Do a needs and satisfaction assessment electronically; faculty, staff, students, dovetailed with needs assessment...short-term and long-range regarding whether current needs are met and anticipated needs.”

“Goals that fit with strategic planning goals; five years down road; IT is one of most important.”

“Long-term goals; life cycles of machines.”

Twenty-six subjects responded with answers classified as *primarily comprehensive* to the question regarding the prioritization of alternatives. For example, some stated:

“Determine how high priority need should be rated; check with administration regarding large goals of campus.”

“Each committee has to have prioritized list; regarding IT; certain things have to have; after that have priorities; most years don’t get past number one on list (after basic stuff) having seen process work, think it’s good.”

“Decision making is a choice out of set of alternatives; do you choose to divide to set ranking? in decision-making process that is what happens; choose to select best and second best; sometimes with the understanding that first choice will be tried, if does not work or some opportunity comes forward; there are a number of factors that make it difficult to get the choice you want; go to second and third one [choice?] there are cases where this is desirable; where second and third choice would help; where first may not be implementable; go with one when it works; where it may not be possible, go to alternatives.”

Nine of these subjects indicated that the prioritization process should be integrated into the campus strategic planning process. Illustrations of this view are:

“Subcommittee structure; faculty, staff, students, administrators; separate groups should bring forward needs for group.”

“Absolutely; has to be...there’s limited resources; in strategic planning; have to understand everyone’ wants more than money; have to prioritize what needs are; someone must approve it; strategic planning does it; if enough money, get what need.”

Regarding goals, only one subject provided a *primarily incremental* response for the question regarding determining the success of technology planning and two provided this type of response for the question regarding prioritizing alternatives. These responses indicated the difficulty in identifying goals that were meaningful, quantifiable, or prioritizable. For the former question, the subject stated:

“...If start defining goals far in advance (ex., update student lab every year or update faculty computers), gets iffy; because don’t know if money is there or what technology changes will arise; what if decide to go wireless; if made decision a year ago; would be really worried now; not secure; could be real problem; greater expenses to students; need to be flexible; environment has changed rapidly; slowed a bit; to go back to decision-making process...”

Two subjects indicated that it was important to maintain flexibility and make decisions as needed rather than in advance. For example, one subject said: “should see how each would provide a solution; then order those.”

A number of subjects provided responses that were labeled *mixed* for the question regarding determining success (9). In response to this question, some subjects suggested that although goals were a good idea, in reality they were difficult to formulate or had to be flexible or vague enough to permit changes as needed.

“Tough question...how to test effectiveness of decisions made is difficult to do at time of decision making; if can set ground rules at time (if look ahead); it can be done, if one knows how the decision is going to benefit the campus; if not in some specific way, in some general way; must be a measure of effective resolution; has not been the case in the...at the campus; has not been the culture of decision making at campus, yet, we are moving in that direction; are committees where people are thinking of setting goals; some decisions have been made with much to test; whether and how to evaluate them; measure success of decisions has been achieved or not; in most cases, make decisions seen on face value, looks like it is going to benefit the campus.”

“If meeting educational goals and budget goals; doing pretty well; I’m very leery of formal goals with numbers and calculations and things of that sort; too difficult to quantify.”

Regarding the question relating to prioritizing the goals, a few subjects (3) stated that prioritization was an admirable goal, although again, not necessarily realistic given the state of technology decision making. Two of these subjects suggested that rather than identifying priorities, it might be more useful or possible to indicate the benefits and costs of different alternatives. For example, one of these subjects stated:

“Yes; instructors should know what’s ideal, acceptable and unacceptable; in between; should be able to flex budget.”

No subjects responded with an *other* response for any of the questions regarding the *goals* variable. Two subjects provided *no answer* responses (one for the question regarding consensus and one for the question regarding prioritizing alternatives).

The results from the *goals* variable are consistent with the literature on technology planning. Most individuals proposed situations where there should be clearly defined goals that could be used to guide the decision-making process. These goals were to be identified and prioritized by consensus across the campus community. Most subjects indicated a desire to have an inclusive, straightforward process. At the same time, however, many subjects (26) indicated that although a more normative decision-making process regarding technology was desirable, it was too unrealistic to consider a true option. Their responses suggested that the decision-making process had to be based on the way that decisions were actually made rather than on a desired model of how they would have preferred it to work.

Subjects' views on how the decision-making process did work. To assess subjects' perception of how the campus technology decision-making process occurred, relating to the *goals* variable, subjects were asked several questions about how goals were determined. Subjects were asked:

How have the purposes for the technology plan been determined? What types of goals were identified?

Were alternative scenarios identified and prioritized? How was the choice between alternatives made?

As for the questions about how the decision-making process *should* work, the responses about how the process *did* work, were characterized as *primarily comprehensive* when they suggested that there were clear goals that were prioritized, quantifiable, and based on consensus. *Primarily incremental* responses were responses that indicated that these conditions did not characterize the campus' technology decision-making process.

Ten subjects provided *primarily comprehensive* responses to the question regarding determining the purposes of the technology plan. Their responses (6) often cited the process of the technology decision-making process as part of the larger strategic planning process which set the goals of the campus. For example, they stated:

"IT committee puts together proposals for technology it believes campus needs, then goes to strategic planning (with priorities); strategic planning does not rearrange priorities and strategic planning addresses it with feedback from administration offices."

"IT committee always sends plan to strategic planning; strategic planning has ultimate "go, no go" say; strategic planning is ideal whole-campus view."

Three subjects described how the IT committee was responsible for determining the goals for technology and one subject explained that it was the C&IS department that had identified the goals.

The subjects also mentioned that goals were a primary concern for the campus, which would allow the process to have direction and the decisions to be in line with the direction set by the broader campus needs. Most of the subjects who provided this answer (8) were those who had been on the IT committee within the last five years. Those not on the IT committee in the last five years were more likely to respond that they did not know as much about the technology planning process (7) as those who had been on the IT committee reported (2).

Eight (8) subjects provided *primarily comprehensive* responses for the question regarding alternative scenarios. Most of these subjects indicated that prioritization had been necessary because of the limited budget and the need to identify the priorities of the C&IS department and IT committee to the Strategic Planning committee. A prioritized list was required by the strategic planning process and was also considered beneficial because it allowed the partial funding of the IT committee's request list that was presented to the Strategic Planning committee. Although consensus did not come up specifically in most subjects' answers, the notion was implicit in many answers. Subjects indicated that there had to be a sense of agreement among the different committees that the prioritized list was supported by most individuals and departments in order for the Strategic Planning committee to accept it. By the time the prioritized list had been presented to the strategic planning process, it had been through a number of formal and informal processes to approve

it. Again, subjects who had been on the IT committee were more likely to provide *primarily comprehensive* responses (7) than those who had not been on the IT committee (1). Many of the subjects who had not been on the IT committee (12) reported not having enough information to answer the question regarding identification of alternatives. Six subjects (6) who had been on the IT committee provided *unresponsive to question* responses to this question.

Ten subjects (10) provided responses labeled *primarily incremental* for the question regarding the purposes and goals of the technology planning process. Most of these responses indicated that the setting of goals, if there was such a specific process, tended to be haphazard or ambiguous. For example, some subjects answered:

“Don’t know; my experience is haphazard process.”

“No idea; can’t tell whether there is true technology plan; things had been submitted for budget; IT committee sat and kibitzed; experience ranged from none to a lot; would have been nice [to have plan]; some had lots of knowledge in one area and inability to see beyond (not big picture); IT people [C&IS] would begin talking and, eyes would roll, would lose half of committee; people would agree to whatever was said...”

“Is not much of technology plan; what comes out of ITC is vague (ex., 3-year plan for overhaul of computers).”

Five subjects (5), in response to the second question, indicated that there was not a systematic approach to identifying and prioritizing alternatives. Their responses were classified as *primarily incremental*. There was a sense that the list sent to the Strategic Planning committee was mostly identified by a few individuals who had not examined a comprehensive set of alternatives prior to selecting the list. One subject’s response, which illustrated this view, was:

“Yeah, considered, but with technology not that many discussed in committee; at committee level.”

Three subjects provided answers characterized *mixed* for the question regarding the purposes and goals and one provided a *mixed* answer for the question regarding alternative scenarios. Although they suggested that there were some types of goals that had been identified, these subjects’ responses suggested that the process was more haphazard or unplanned than expected. One indicated that goals had been set by the IT committee, but it was not clear how or what those goals were. Another subject indicated that the process of goal-setting worked in at least two different ways: through the IT committee and by “bubbling up” through individuals who would then seek assistance, through the administrative offices, for example. This subject stated:

“By and large most decision making has happened from...two processes at work here (1) IT committee which annually comes up with list of what it wants to get from campus; and if going work I think they should be doing; growth process throughout the year (2) a lot simple bubbles up from individuals who have need for something or discovered something; often independent of IT committee; the way system works here; whenever this happens; often floated by IT committee or strategic planning.”

One subject responded to the second question suggesting that the process of identifying alternatives or priorities was not completely systematic, although there was some attempt to identify alternatives.

One subject provided an *other* responses for the question on the purposes and goals for the technology plan but no one provided an *other* response for the question regarding scenarios. The *other* response for the first question indicated a lack of knowledge of the process of identifying the purpose of the technology plan, but suggested that if there were one, it would have come through the C&IS staff.

Quite a few subjects (9) for the first question and 16 for the second question) provided *unresponsive to question* responses. These subjects indicated that they were not familiar enough with the technology decision-making process to provide a meaningful answer. Most of these subjects (19) had not been on the IT committee in the last five years compared with eight who had been on the IT committee. In the case of the subjects on the IT committee who were unfamiliar with whether alternatives were identified and prioritized, there was a sense from a number of subjects that the details of the technology plan were determined by a small group of individuals after the general direction was provided by the whole IT committee. It is also possible that some of these subjects may not have been on the committee within the last two or three years so they may have been less familiar with the specific details of the current plan.

Goals conclusion. The results for the *goals* variable indicated that while subjects desired clear-cut, rationally determined goals, they understood there were aspects of the decision-making environment (e.g., time, work-load, fast-changing technologies) that made it difficult to reach this objective. The individuals who were most involved in the IT committee believed that the decision-making process was most comprehensive, probably because they were most likely to be aware of the specific goals and the priority- setting by the IT and Strategic Planning committees. The level of detail about the goals most often depended upon the individual's familiarity with the technology decision-making process.

These results are less consistent with the literature on technology planning, where calls for planning varied in terms of the level of details included in the

planning process. The technology planning literature is rife with calls for clarifying long-term goals and “visions” for transforming organizations. The subjects in this experiment were more likely to focus on the more narrow operational goals as mentioned by a few authors in the technology planning literature (e.g., Ringle & Updegrave, 1998). The subjects tended to consider the technology decision-making process primarily as an on-going process rather than as a long-term goal-setting process. In this context, few subjects in the current study questioned the value of goal-setting and their responses indicated a lack of familiarity with the specifics of the goal-setting process. There was a general sense that prioritization occurred, since it was required by the strategic planning process. However, there was disagreement about the comprehensiveness of the process that identified and prioritized the alternatives.

Deadlines

Subjects' views of how deadlines should be used. To examine subjects' views of these issues, two questions were created:

How difficult is it to change the decision-making process?

Should there be deadlines for decision making regarding technology?
Why or why not? If so, what types of deadlines should there be? How long should the time horizon for the planning process be? Why?

Unfortunately, a mistake was made in the phrasing of the first question so that it was more relevant to the how subjects believed the decision-making process *was working*, not how it *should be* done. This mistake was discovered early in the data collection process and was discontinued after only a few subjects had been interviewed. The second question, while referring to the *repetitiveness* variable, also

relates to the *deadlines* variable since it specifically asks about deadlines. The data from the *repetitiveness* variable were not recoded for the *deadlines* variable, since both variables, at least in part, relate to the length of time needed for decision-making and the ability to predict future events.

In the literature on the *deadlines* variable, two main issues arise: having sufficient time to make decisions and having either *a priori* or flexible deadlines. Many subjects (15), whose responses were labeled *primarily comprehensive*, suggested that longer-term deadlines were important. Many other subjects (10), whose responses were labeled *mixed*, stated that it was important to be flexible with these deadlines in order to respond appropriately to changing technologies. Some of these subjects also suggested that a reason for having deadlines was to make sure that individuals involved in the decision-making process did not avoid acting because of having other responsibilities that were more pressing. Only a few subjects (5) suggested *primarily incremental* responses to the decision-making process, with doubts about having any deadlines.

Subjects' views of how deadlines do work. To gauge how subjects considered deadlines to be used in the technology planning process, they were asked:

How difficult was it to change the decision-making process?

What time frame was considered when examining technology decisions?
One year? Five years?

How much time was devoted to the technology planning process at the campus? Was this amount of time sufficient?

These three questions were all related to the *deadlines* variable because they examined the flexibility apparent in the technology decision-making processes, how

far ahead the decision-making process was focused, and how much time was available for the decision-making process. *Primarily comprehensive* responses to the question regarding the difficulty of changing the decision-making process indicated that there was a pre-determined process which led to specific outcomes, with little flexibility available for change beyond what was specified in the plan. Responses to the question regarding the time frame involved were characterized as *primarily comprehensive* when they suggested that long-term time frames, over a year, were more consistent with the decision-making approach. Responses to the question regarding the amount of time provided for the decision-making process were considered *primarily comprehensive* when they indicated that enough time had been allocated to the technology decision-making process. Responses were characterized as *primarily incremental* when they indicated that the following were apparent in the decision-making processes: flexibility, short time-frames (defined as under one year), and insufficient periods of time available for ideal decision processes. For the third question, responses which indicated that the decision-making process was ongoing were also labeled *primarily incremental*.

Only a few subjects (5) had *primarily comprehensive* responses to the first question, which indicated a set order of events and fixed deadlines in the decision-making process. These subjects stated that there was difficulty in changing the ways that were set for the decision-making process. There was a sense of frustration for some subjects who reported that the decision-making process was hampered by procedures that had been “always been done like this” or by the politics of the

campus, whereby only certain individuals could effect change. One subject stated that the process had been improved since the CEO had come to the campus:

“Decision making on campus has evolved over last eight to ten years; faculty are happy about direction; since new CEO came on board; if person has drive to make changes at highest level that happens; at level of faculty have tried, but not successful; mechanism to arrive at decisions; change at highest level has been more effective; than from the grass-roots; in present structure; process has been changed for grass roots ideas to become more important.”

A number of subjects (8) stated that the decision-making process regarding technology was flexible, providing *primarily incremental* responses to the first question. There was a sense that changes could be made in the specific details of the decision processes even after the general parameters were set in a longer-term process. Some suggested that changing administrators, either who were not in their positions for long and did not want to lock in the processes or who had inclusive management styles, increased the flexibility of the process. Others indicated that the IT committee had a flexible process which provided opportunities to change the planning process. Examples of their responses are:

“Was smooth; because old process was in closed door session meetings with CEO and line staff; with technology suddenly part of whole campus; new CEO wanted committees with budgets; committees report to campus senate and strategic planning; was accepted and worked well and everyone’s ok with it; negative; some people did not want to be that engaged; lots of conversations; some faculty did not want to be chairs; a lot of time involved; regarding budget and how to stretch budget.”

“Not difficult at all; no steam roller effect to prevent us from being flexible.”

“Not difficult at all when new CEO came on board...new CEO believes very strongly in shared governance and committee processing; was not difficult at all; just required a change in governance [when want to make change, not problem?] not a problem; not a big problem.”

Subjects (6) whose responses to the first question were characterized as *mixed* indicated that there was little flexibility in changing the decision-making process but it depended upon the type of decision or whether one was a member of the IT committee. There was, in some responses, the notion that some of the changes were continuous or there was flux in the decision-making process itself. For example, one subject's response illustrated the complexity of this issue:

“Major change was acceptance; big change, can't say when or how; final sort of acceptance that was ongoing cost; early on there was always hope that ok we spent money now on computers and we don't have to spend money this year, right? that kept us in that whole constant never quite on top of things; somewhere along the way to varying degrees, but varying people the acceptance that this is an ongoing cost; can't spend big year and then save that money next year; there will always have to be money for IT; was perhaps the biggest change, was that acceptance; always playing catch-up; what is given to IT every year varies, but always some base amount that is always there.”

Another subject described how some decisions were more easily changed than others:

“It depends on the kind of decision and where it was made; was it college decision?; need to convince; local is easier and where in process (for example, has order been made?); with IDS, outside funding changed position a bit; have to be flexible; technology changes; needs change; in short period, what you think in technology now may not be useful; in five years may not have concept of what is coming down the pike.”

Seven subjects described long-range plans in response to the question regarding the time frame. Most of these subjects cited the three-year rollover plan for the faculty computers and computer laboratories as evidence for the time-frame for the planning process. One subject suggested that an even longer time-frame of five years had been examined while one stated that a two-year frame was the range for a specific plan and three years was for a more general plan, such as the three-year

rollover for the computers. Apparently, the time-frame for the plans depended upon the specific type of technology and the amount of specificity that was required. One subject explained this:

“Not more than 2 (specific) to 3 (general) years; Moore’s law (18 months’ rule for the changing of technology); will probably have new technology to alter how we use technology; start generally [in decision-making process].”

Some subjects in response to the question regarding the time frame (7) stated that the decision-making process occurred within a year’s span or continuously. Their responses were labeled *primarily incremental*. These subjects reported that the goals for the process were set each year rather than on a longer-term basis. The main focus of the technology planning process involved the yearly budget requests from the IT committee to the Strategic Planning committee:

“Next fiscal year; basically spending starts as of July 1; start for fall semester; not much time; can’t do ahead of time; can’t deliver before July 1.”

Beyond that time, there was not documentation regarding a specific technology plan, but instead, discussion of longer-term issues and the desire to maintain the three-year rollover plan.

A few (5) of the responses for the question regarding time frame were labeled as *mixed*. These suggested that there was a combination of long-term frames and short-term frames and that these depended upon which decision was being considered. Most subjects referred to the three-year rollover plan for the computers as evidence for a longer time-frame. At the same time, that there were other aspects of technology that were not based on a longer term plan. One subject provided “evidence” of a long-term frame:

“We have part of process; large step forward with three-year roll-over with

computers; we had a “dead” lab; one “dead” on rotating basis; had obsolete software; those affected made impact by convincing others that this had to change; went to three-year roll-over; have process in place for “trickling down” machines; to get what people need; within C&IS department this happened.”

Some subjects (5) stated that a long period of time was devoted to the decision-making process and that the amount was sufficient, in response to the question regarding the amount of time devoted to the technology planning process. Their answers were labeled *primarily comprehensive*. These subjects reported that the IT committee had met often in the previous fall to work through changes in the composition and mission of the committee and for the technology plan. Most of these subjects believed that the amount of time was sufficient to accomplish the committee’s goals. For example, two subjects reported:

“If number of meetings of ITC is gauge; quite a bit; often in private conversation; last year; ITC meet in summer and into fall; typically committee met four times in semester; this committee met more; had been leadership vacuum; had overhaul; time intensive [sufficient?] should talk to chairman of committee; I think so; think things happened because of meeting that improved situation.”

“A reasonable amount of time; looked at all aspects of technology question; what industry, academic sides were doing; based on budget could go on three-year cycle.”

For the third question, no one suggested that there was not enough time to make decisions about technology or that the decisions were made too rapidly, but five (5) reported that the decision-making process was continuous. Their responses were classified as *primarily incremental*. Examples of these responses are:

“More or less continuous; IT committee meets year round; enough time.”

“By IT committee; time was sufficient; monthly for whole (academic) year; strategic planning also.”

Three responses for this question were labeled *mixed*. One subject reported that there was sufficient time, but not much had been accomplished by the IT committee. Two indicated that the decision-making process had transpired over long periods of time and was part of an on-going process.

Three subjects provided *other* responses to the first question, relating to the difficulty in changing the decision-making process, while none provided *other* responses to the second two questions, relating to the time-frame for the process and the amount of time devoted to the process. These three subjects had different views of the technology decision-making process but their responses did not appear as one of the three previous types. One subject indicated unhappiness with the process, believing that many individuals did not have a clear voice in the process. Another described how changing the composition of the committee had been problematic, but the reason did not resemble the other three types. One subject indicated difficulty understanding how the process worked:

“Sometimes decisions have been made and didn’t even know it; I don’t always have good mental map of where decision was made to know where to go [to get it changed].”

Many subjects (11, 13, 20, for the three questions, respectively) provided comments which were considered *unresponsive to the question*. Most of these subjects indicated a lack of knowledge about the specifics of the technology decision-making process. Some of these subjects were not asked the later questions because they had already stated they were not familiar with the specific process. Subjects who were currently on the IT committee were more likely to answer than

those who were not currently on the committee. This was particularly true for the third question, which asked about the amount of time spent on the planning process.

Deadlines conclusion. The results for the *deadlines* variable suggest a variety of views that subjects held about time-frames and flexibility of the technology decision-making process. While the technology planning literature generally recommends flexibility along with broadly sketched longer-range plans or visions for technology, the interviews in this study showed that subjects varied more in their views of how closely the technology planning process should and does adhere to the proscribed path. As in the technology planning literature, which aspect of the decision-making process the subjects considered while responding to the question affected the response more than an overall impression of the process. For example, in this study, some subjects focused on the three-year rollover and some focused on the individual choices of the IT committee. Thus, these questions may have been too broad to be as effective in getting a general sense of the entire process. It was clear from the interviews, though, that the technology decision-making process is less transparent to individuals who are not directly involved in the process and this may make some individuals frustrated with it or have a sense that the process is difficult to change. Individuals on the IT committee, for example, were more likely to refer to the process as organized and participatory than those not on the committee.

General Questions D & E

After subjects provided responses to the questions about how they thought the technology decision-making processes at the campus *should* and *do* work, they were asked two general questions about how effective they thought the processes

were and how the processes could be improved. The following sections report the findings from these two questions.

Question D

To assess how well subjects thought the technology planning process was working at the campus, subjects were asked:

In your opinion, how well has the technology decision-making process at the campus worked to deal with changing technology needs?

Responses to this question, which asked subjects how well the technology decision-making process had been working over the past four years, were identified as *primarily comprehensive* if they mentioned one or more of the factors associated with the comprehensive model, as indicated in the previous sections. For example, if subjects stated that the process involved in technology decision making was not coordinated enough or needed a stronger leader, the responses were characterized as *primarily comprehensive*. On the other hand, responses were considered *primarily incremental* if they described the process as having the characteristics of the *incremental* model, as discussed previously. For example, if they indicated that the process was working well because it was flexible and was able to respond to change rapidly, the responses were identified as *primarily incremental*.

Many of the responses (15) to this question were identified as *primarily comprehensive* because they described how subjects approved of aspects of the technology decision-making process which fit with the comprehensive model or reported ways to improve the process by making it more consistent with the comprehensive model. These responses cited a need to increase coordination, often through the strengthening or creation of a position for a leader, such as the IDS, who

could create or identify a “vision” for the campus to follow in its use of technology. Another common *comprehensive* notion was that the campus was not doing well because it was not forward-looking enough and did not have a plan that was long-term enough. There was a concern that the budget was spent without a comprehensive plan, which would set the direction of the purchases. Some subjects believed that the campus was keeping up well with the new technological developments through information gathering that was being done by C&IS staff and faculty in related fields. Examples of these responses are:

“Room for improvement; an honest effort has been made; but not enough coordination; too much quick fix approach to problems; without individual with broad knowledge; decisions by salesmen and Microsoft.”

“No eye on the future past the next two years; don’t think the process has predicted anything; I think our campus has kept up; part of it is because of campus technology fee and the money spent on technology; in a way that is a weird way to do things; in a way, set aside money for technology ends up getting spent; kind of whether you need it or not; need it for upgrade and money is available; don’t agree with whole fee thing, kind of crazy, but may work out.”

“Doing very good job of seeing what’s coming down the pike; when working on building five years ago; did good job of seeing what was coming; difficult part is making it become reality because of budget.”

“Generally driven by budget; can’t afford to do X, but can do Y; some basic decisions; regarding three-year rotation; very little discussion regarding pedagogically helpful materials; IT committee has tried to get information from faculty; but may know what is needed or what exists; decision making has been overly democratic.”

“Not so great so far; we may not be done making changes; fairly reactive; students are more advanced; not keeping up with students’ demands.”

“Basically in good ways; made decision to get more technology classrooms; faculty who didn’t do it, now are; affects how they teach; more students are involved in technology.”

None of the responses to this question reflected the desirability of an incremental process. When incremental processes were mentioned, they were generally considered negatively, such as a sense that responding reactively or in a piecemeal fashion was not an appropriate way to make decisions about technology. The lack of an identifiable leader or a centralized source of information had also come out in the interviews as a negative aspect of the planning process.

One subject provided a *mixed* response. This subject stated that the campus planning process had been working well. There was less sense of there being proactive changes, but the campus was seen as “progressive” being near the “cutting edge” of technology and reacting appropriately to changes at the campus. This subject stated:

“On our campus has worked quite well; even if not proactive, very progressive.”

Quite a few of the responses (13) were considered *other* because they did not resemble the other three types of responses. Many of these responses indicated that the process was going well, but they did not provide detailed explanations. Some of the responses indicated that the campus was responding sufficiently to the demands for technology, although general improvements could be made. A few subjects stated that they believed that more technology support was needed for some on campus. Examples of these responses include:

“In general, reasonably well; probably most general faculty say they do not feel supported in learning technology; not in terms of hardware, having it available; most people may not know it, but they have a decent level of hardware and software available to them; always current on applications and most people have machines that are capable of doing what they need them to do; there are some forgotten people; what I expect us to get; where poor IDS person comes in, will have to do is fill in the ability people to use the

technology and having the technology available to them; aren't support people here dedicated to doing that; also to take advantage of the ability to learn; people either see it as totally beyond them or if they have ever used a word processor and they take a few more minutes they will learn anything."

"Tremendously; at [this and other campuses]; demands them; changes are tremendous; most campus' administrators realize importance of technology and try to keep pace; is money; as fast as college is growing; new faculty; hard to keep pace; see great strides to get faculty up and running; hardware and software; always want something faster, better, pricier."

"Don't know from personal experience; but from hearing others' complaints; needs improvement."

"Generally quite well; have impression campus is well equipped with technology; how much budget and how much planning not sure."

"Fine; a bit overblown [believed that most people had computers more powerful than they truly needed]."

Three subjects whose answers were labeled *unresponsive to question* did not respond to the question or had no opinion about the question.

Question E

To examine subjects' views of how to improve the technology decision-making process, subjects were asked:

How can the process of responding to technology demands at the campus be improved?

Just as for the previous question, subjects' responses to this question were characterized based on whether they mentioned variables consistent with the planning or incremental approaches as described by Schmidlein (1974, 1983). For example, a response was considered *primarily comprehensive* if it suggested that the technology decision-making process should be more coordinated, have a stronger leader, be more "rational", or be based on a recognized "vision". On the other hand,

if the response suggested that the process should be more flexible or more decentralized, it would be considered *primarily incremental*.

Most of the subjects (22) provided a response to this question that indicated a desire for a *primarily comprehensive* process. Many of the subjects, in the course of the interview, suggested that there should be an individual who would be in charge of the technology decision-making process. The specific individual desired varied from subject to subject. There were three individuals most often mentioned in regard to this position: a new Instructional Design Specialist (IDS), the chair of the IT committee, and the head of the C&IS department. The IDS position had just been created at the campus, although the position had not yet been filled when this research was in progress. The position was originally designed to be filled by an individual of faculty rank, although this was in question at the time of the research. The main role of the individual charged with the technology decision-making process was to provide a sense of leadership and a “vision” for where the campus would head in terms of technology in the future.

“When have IDS person hired; maybe when DAA/CEO change; lots of flux in DAA; needs to be concerted efforts regarding what faculty use and not use; and awareness what some do not need high-end money equipment that will not be used.”

“Has to be someone with bit of vision and authority to enact that vision; need credentials for faculty support; has to have communication ability for faculty to understand support; we have done good job of putting hardware into room; but not for facilitating learning; lack of consideration of pedagogical concerns and concern with doing things cheaply; showcasing would be good sometimes.”

“Having central figure whose mission is not to maintain central system and software on system and who faculty are confident in and have authority; who could convince faculty of what was needed and why and value (only present what’s valuable); and have critical debate among faculty about what was

good; had best technology debate this year regarding IDS; people opposed to IDS were not convinced of use; needs to be communicated.”

“With more money; IDS; with a bit more leadership from administration and faculty.”

“Have broader ‘vision’ for integrating pedagogy and technology from IDS or someone else; which will positively impact faculty, students, etc.; IDS would be faculty position; need to be pedagogically sharp; can always learn software.”

Other subjects whose responses were characterized as *primarily comprehensive* indicated a desire for increased information collection and knowledge dissemination. They believed that the process of surveying the campus constituents had not been consistent enough and needed to be on a regular basis, such as once a year. In terms of knowledge dissemination, there was a desire for being kept informed of the processes by which decisions were made as well as a desire for them as “consumers” of technology to have greater knowledge of what was available and how it could be used. Some individuals suggested that the information collection and knowledge dissemination should be tasks carried out by the “leader” of the technology decision-making process.

“Never have received a survey about what I needed; always ‘this is what we’re getting’; don’t know where it came from.”

“Let us know what process is and when things are decided; what normal course of action is; when you should be planning for that; how to handle what is out of norm; need to know processes; have no manual regarding processes; would be nice; regarding, criteria, how things are done.”

“To encourage faculty to give more feedback; general problem; don’t get much back; major difficulty; if don’t know what people want, hard to know where to fix; always two or three squeaky wheels; others complain to others who can’t fix it.”

“Becoming aware of what is available; inviting people to educate us about what is available; what is possible; more information and knowledge about

technology; to make decisions better; to see what could be of use on campus; first prerequisite of decision making is knowledge; at committee level and campus and can have regular talks; especially at area of technology; fifteen years ago cannot have imagined where it would go.”

“Drag us all in and educate us; don’t know there is interest in what faculty needs and want; may be better if there are a lot of ‘ignorant’ people like me who are uneducated; need educated consumers.”

“Keep people informed and get input and have technology people work with those who are not technology-oriented; people all informed.”

“What’s needed is some sort of mechanism where faculty in certain areas get to see what other faculty are doing; ex., what are humanities faculty doing for research, technology; campus should take a day to show.”

Two subjects provided responses to this question that were characterized as *primarily incremental*. These related to increasing the control the faculty had within the technology decision-making process. One subject specified that the selection and retention of the IT chair was problematic. The other subject wanted strength of the “faculty voice” to be increased.

One subject gave a *mixed* response to this question. This individual suggested a combination of more money and greater information dissemination would improve the technology decision-making process.

“Having a sufficient budget would be helpful; getting lines of communication to maximum amount of faculty and staff to prioritize would be helpful.”

Seven subjects provided answers that were labeled *other*. Many of these responses suggested that making more money available for campus technology would improve the process, partly because it would reduce the competition for the available resources, which would reduce the need for compromise or having only some individuals or departments receive what they needed each year. Some subjects suggested other areas for improvement, such as improving the web pages for the

campus and having more personalized instruction to educate individuals about technology. One subject questioned whether it would make a difference about the way technology was planned for and suggested that technology was too much of a focus at the campus.

There were no *unresponsive to question* responses. All of the subjects saw some room for improvement, although how much improvement was needed varied from subject to subject.

For a number of subjects, by the time they got to this question, most of their views had been given in discussions of previous questions. Some additional points were made in earlier portions of the interviews. These responses were characterized as *primarily comprehensive* ones. They indicated dissatisfaction with political and other “nonrational” processes. Some indicated that there should be a “fair” or “equitable” process. They believed that there should be one source of decision making and one process that should be followed for every decision. There was a desire to reduce the seeming capriciousness of some decisions. There was a sense from different constituents that they had less power than other groups. Faculty generally wanted more shared authority, although some individual faculty wanted a central figure to be in charge. At the same time, there was the concern that it was difficult to get a faculty member to chair the IT committee. There was dissatisfaction that individuals who complained were able to get their requests filled before others. The phrase “The squeaky wheel gets the grease” was repeated in quite a few interviews. Many subjects desired better communication about the whole process. They also wanted more planned roll-overs, as was designed for the

technology laboratories and faculty computers and a better sense of proactive responses to changes in technology needs. Some individuals wanted more coordination of departmental needs to make sure that those that worked together would have compatible equipment and would be trained to use that equipment.

Questions D & E conclusion.

The technology planning literature promotes a number of notions consistent with the *comprehensive* model of decision-making outlined by Schmidtlein (1974, 1983). This literature assumes that by planning for the future, responses to future change can be proactive. It also recommends increasing coordination and centralization of decision-making processes by strengthening leaders who can reduce costs and focus resources and on technology. Promoters of technology planning also recommend increasing coordination by tying the budget process to the planning process more closely and centralizing information-gathering processes. In addition, they endorse increasing the use of rational decision-making processes while increasing the use of a shared vision for the future of the organization.

Subjects in this study agreed with many of these recommendations; they recommended increasing the coordination and centralization of the decision-making processes, tying the budget more closely to the planning process, increasing information-gathering, using more rational decision processes, and enhancing the use of a shared vision. They also saw that the process was effective, but in some cases they believed it should be more coordinated with budget and other campus decision-making processes. Some subjects believed that not having a broader or longer “vision” for the campus was detracting from the effectiveness of the campus’ technology decision making.

In contrast with the technology planning literature, however, many of the subjects, particularly faculty, considered shared governance of paramount importance. While they considered it important to have a centralized figure who could take control over technology planning process, this individual would be expected to continue the campus' tradition of shared authority.

In addition, the subjects in this study did not focus as much attention on the issue of having comprehensive information gathering because they saw that as less practical given the limits of time and attention of participants. They did not mention this issue specifically as an area where improvement was necessary.

Chapter 5

Analytic Research Questions And Implications For Planning And Theory

Introduction

Themes that arose in the interviews with subjects are explored in this chapter in relation to the three analytic research questions identified in Chapter 3. In each section, the relationship between the themes in the interviews and themes from the literature on strategic and technology planning are discussed. Following analysis of these questions, implications for the practice and theory of technology planning are discussed. Lastly, recommendations for future research are presented.

First Analytic Research Question

To answer the first analytic question, the following section will identify the assumptions that appear to underlay the subjects' responses to the first set of interview questions about how the campus technology decision-making process *should* work. The first research question is:

1. What decision process assumptions underlie participants' recommendations for making decisions about campus technology?

What became evident rather quickly during the interview process is that many subjects held idealized views of how decision making should work, but they also realized that these expectations were not realistic given the nature of the organization and technology. They identified desirable attributes of the technology decision-making process but provided caveats that described constraints, or trade-offs, between their desired goals and the processes they knew to be more realistic. The ideals that underlay the subjects' views are examined in the following section. Following this is a section that describes subjects' views of the constraints or

necessary trade-offs that affect how the technology decision-making process works to achieve desired goals. Conclusions about the apparent contradictions between their ideals and the trade-offs are then presented. This analysis is tied in with an examination of how these views fit in with the literature on strategic and technology planning.

Ideal Expectations

In Chapter 3, hypotheses were identified about what subjects were expected to assume were made about institutional realities based on an analysis of the strategic and technology planning literature. The first hypothesis was:

--Subjects will recommend a comprehensive decision-making process to respond to changes in technology.

In their responses to the first set of interview questions, about how technology decision-making processes *should* work at their campus, subjects' responses generally upheld this hypothesis. Subjects identified attributes of decision making that they considered to be important. These attributes were consistent with a comprehensive decision-making process: the ability to control events through planning, the need for rationality in the technology decision-making process, and the need for integration of the technology plan with other decision making processes at the campus.

Control. The notion of control was inherent in many of the subjects' responses. There was a sense in most of the interviews that subjects believed that it was possible and desirable to gain control over the changing technology situation at the campus. The notion that intentional change through some control mechanisms was possible was implicit in the subjects' observations.

In response to the questions relating to the *rate of change* and *repetitiveness* variables, subjects indicated that environmental conditions played a role in the effectiveness of the technology planning process. Subjects indicated that there was a chance of controlling the responses to the changing environment. If they had believed otherwise, they may have suggested that there was no difference between fast and slow environmental changes and between predictable and unpredictable environmental changes in terms of how the decision-making processes at the campus would work most effectively. If subjects believed that control over the environment was not possible, they may have suggested that no matter what environmental conditions were like, the decision-making process was irrelevant.

The results from the *causal relationships* variable suggest that most subjects considered there to be a direct and knowable relationship between planned actions and outcomes. Almost all of the subjects providing a response to this question indicated that they believed there was a causal relationship between the technology planning process and changes in technology availability or usage at the campus.

Relating to the *change technology* variable, most subjects stated that identifying goals to achieve for technology was beneficial and necessary to lead the campus to a successful future. Although they varied in terms of how definite goals could be created and adhered to, the subjects highlighted the notion that goals were necessary to the decision-making process because they provided a direction for future change. Thus, even though most subjects considered the environment of higher education, and changes in technology, to be rapid and fairly unpredictable, they also believed that deliberate and planned change was possible. Planning was

considered desirable to allow the campus to gain control over the seemingly unpredictable changes in technology and demands for technology. Subjects noted a desire to have intentional change rather than reactionary change in response to the changing campus environment.

For the *location of resources* variable, half of the subjects indicated the desire to have someone in control of the situation, thus assuming that control was desirable and possible. Who this leader would be varied, from a Director of Information Technology (DIT), the chair of the Information Technology (IT) committee, to the Instructional Design Specialist (IDS). In addition, sharing authority, relating the budget process to the technology decision-making process, and information gathering also all were expected to affect the type of outcomes that were determined through the technology decision-making process. Again, the feasibility of control was implicit within these issues.

With the *functions* variable responses, subjects indicated the importance of the manner of decision making and identifying alternatives. In terms of political bargaining, subjects noted their desire to have a “fair” process, thus suggesting that having either a fair or unfair proceeding could alter the outcomes one way or another. Suggesting that multiple alternatives be identified indicated that some difference is expected to result from the decision. These statements hold also for the *goals* variable with subjects believing that clear, prioritized goals should be identified.

The *deadlines* variable, which related to the amount of time available to make decisions and the time-frame within which decisions were to extend, shows a similar

set of responses with subjects implying the ability to maintain control over events. Again, time would not be an issue, as for the *rate of change* and *repetitiveness* variables, since without being able to control events, it would be unimportant what type of response time or time-frame was allowed for decisions.

Overall, subjects' responses implied that control over changes in technology was viable and desirable through the technology decision-making process at the campus. Subjects did not indicate an inability to alter events or to anticipate and plan for future events. Although they may have indicated barriers to implementing specific plans, they suggested that control over decision-making processes and outcomes at the organization was possible and appropriate.

“Rational” processes. The second attribute of the technology planning process that subjects considered important relates to the concept of “rational” processes. In this situation, “rational” refers to a decision process based on a more formal, logical system. The desire for having a fair, logical system was considered important by most subjects. Collecting complete sets of information, identifying all possible alternative solutions, using an algorithm or other systematic method of comparing alternatives, and neutralizing political bargaining or apparent inequities of power are all aspects of the decision-making process that were identified by the subjects as components of an appropriate or ideal decision-making process. Fairness was noted as a goal of such a process; many subjects noted that an uneven distribution of resources or a greater weight towards one constituency group was unjust and undesirable.

For the *rate of change* variable, most subjects indicated that a technology decision-making process is most effective when the environment is changing slowly. In this set of responses, subjects signaled their concern for the amount of time available to make decisions. Many of the subjects believed that it was important to have enough time to respond well to the changing environment. For example, they indicated that a slowly changing environment allowed the decision-making process to work best since a sufficient amount of information could be attained and examined and well thought-out decisions could be made. Some subjects stated that the committee processes that had been identified for the technology planning process would work more effectively when the environment was changing slowly than rapidly. Presumably this would be because committee work is inherently slower than individual actions because of the need to promote discussion and coordinate different views of committee members. Another concern that was registered about a rapid rate of change was the understanding that decisions may become obsolete if the environment or demands for technology changed too rapidly.

The results from the *repetitiveness* variable suggest that many subjects considered it possible and desirable to work from a mission and/or vision statement and objectives that led to a predetermined outcome. Many subjects indicated the ability of the campus to make decisions about technology systematically, beginning with a determination of a general statement of mission and following through with the identification of prioritized alternatives. This implies the belief in rational processes with their assumptions of a cause-effect relationship, as suggested by their belief that decision-making processes could be used to control future events. The

second domain covered by the *repetitiveness* variable (and thus also for the *deadlines* variable, which shared the same question) related to the issue of deadlines and the time-frame for the technology decision-making process. In relation to these variables, subjects implied that there was the capacity to define clearly the steps that would lead from mission-setting to determining alternatives, and implementing the decisions.

For the *location of resources* variable, subjects indicated a desire to have someone who was considered politically neutral. This individual would be able to collect information and dispassionately determine the best way to distribute the campus technology resources. In addition, most of the subjects desired shared authority, with faculty having a large influence upon the campus decision-making processes. This was because the faculty were considered to be experts in the field of technology and/or experts in pedagogy. Thus, they would be able to provide a large amount of expert input into the determination of campus technology needs and ensure a fair distribution of resources. There was a belief among a number of the subjects, however, that to increase the fairness of representation, staff should have a greater presence and have more influence regarding allocation of resources. Regarding the creation of the budget, most subjects stated that the process should be systematically examined and aligned with the technology decision-making process. It was considered to be important to submit the budget to the same “rational” processes that the technology decision-making process was going through. Also, most subjects expressed the desire to collect large amounts of information to enable the decision makers to analyze technological and pedagogical alternatives.

Regarding the *functions* variable, the notion of fairness again arose.

Although political bargaining was seen as unfair and undesirable by just a few subjects, most subjects believed that political bargaining was a necessary component of the technology decision-making process. However, many subjects held the view that steps should be taken to ensure that the political bargaining be fair. Some subjects expected political bargaining to occur only after a formal logical analysis of alternatives. Thus, the political bargaining was to involve a rational examination of the alternatives and then provide a method with which to choose amongst the alternatives. The hearing process employed by the campus Strategic Planning committee was considered to provide the vehicle for a transparent bargaining process. Transparency, rather than behind-the-scenes bargaining, was considered important by many subjects.

In terms of the *goals* variable, most subjects believed it was important to have clearly defined goals that were prioritized and, in some cases, integrated into plan. This clear definition of goals alludes to the “rationality” of the decision-making process desired by many of the subjects. Goal formation would allow for a clear-cut process between the desired outcome of the decision-making process and the actual outcome. Consensus, seen as an objective by many subjects, provided a sense of fairness and opportunity for all voices to be heard within the decision-making process.

In summary, it is clear from most of the subjects’ responses that they desired a “rational” technology decision-making process although some noted impediments. They reported, in response to a number of interview questions, that it was important

to have fair and objective analysis of possible outcomes within a decision-making process with transparent procedures.

Integration. In the interviews, subjects reported the desire to integrate the technology decision-making process within the broader campus and college decision-making processes. There was a sense that technology decision making could not stand alone for two main reasons. The first reason has to do with the financial limitations at the campus. Subjects almost universally agreed that because of the high cost of technology, it was important to ensure that the technology plan was meaningfully integrated into the campus strategic plan or at least aligned with the strategic planning process at the campus. There was a desire to integrate the budget and the technology plan as well. This was expected to allow the planning process to drive the budget rather than vice versa.

The second reason for integrating the technology decision-making process with other campus decision-making processes was because there was a perceived need to use technology to further the goals of the campus rather than just for its own sake. For example, many subjects cited the need to identify the pedagogical goals of the campus and align the technology plan to meet those goals. The goals were to be derived from an overall “vision” of the campus, identified in the strategic plan and echoed in the technology plan. Subjects also wanted to have regularly scheduled, comprehensive surveys of campus needs. Many subjects also wanted someone to provide information to campus decision makers regarding what is available in terms of technology solutions. They wanted such information to be integrated into the technology plan.

Thus, in addition to being able to control technological changes, and to have a system within which this could be attained, subjects considered it important to frame technology decision-making processes within the broader structure of the campus and the college, primarily. It was considered unworthy of the cost and effort if the technology decision making did not support other endeavors of the campus and college.

Constraints

The subjects' idealized views about the importance of control, rationality, and integration in the technology decision-making process were consistent with the assumptions of the comprehensive decision-making model identified by Schmidtlein (1974). While there is evidence that many people believed that attributes of comprehensive decision-making processes were desirable, there were also suggestions that these attributes are not entirely compatible with the nature of higher education organizations and technology.

These suggestions were borne out in the interviews with the subjects in this study. The subjects described a number of constraints that affected the decision-making process and kept it from resembling their more idealized process. It was not uncommon for subjects to report a desired characteristic of the technology decision-making process beginning with "In a perfect world..." or "In an ideal situation", but then follow that with an explanation of the trade-off, such as "Given human nature..." or "If we weren't so busy...".

The constraints identified by subjects in this study resemble those identified by Schmidtlein (1974) who described five different types inherent to a decision-making environment: time, knowledge, "availability and distribution of resources"

(p. 9), consensus, and functional demands. These constraints, he suggested, affect the ability of the decision makers to impose change upon the organization. The types of constraints identified by Schmidtlein (1974) are useful for analyzing the constraints described by subjects in this study.

Time. Schmidtlein (1974) suggested that “The amount of time available to engage in formal decision-making processes is a function of the rate of change in the policy area, deadlines placed on particular decisions, extent to which there are competing priorities, and degree to which events in the policy area are repetitive” (p. 9). These same issues regarding time arose in the interviews with the subjects as they described constraints on time that impinged upon technology decision-making processes at the campus.

In relation to the *rate of change* variable, some subjects were concerned about inertia or lacking a sense of urgency that would reduce the effectiveness of decision making if the environment was changing too slowly. These subjects indicated that convincing some individuals to act during times in which the environment is changing slowly would be more difficult than if they perceived the need to make decisions quickly as necessitated by a rapidly changing environment. Several subjects, over the course of the interview, indicated that given their busy schedules and competing demands, individuals had to make decisions about which aspect of their to-do lists they could focus on at any given time. Thus, a sense of urgency would provide these individuals with the sense that this particular item needed attention.

In response to the questions regarding the *repetitiveness* variable, some subjects stated that the rapid changes in the environment of higher education and technology made it more difficult to have a long-range plan for technology. They suggested that although they would prefer long-term goals and missions, shorter spans would have to suffice given these conditions. Many subjects also mentioned that given the competing priorities they and others had to face, it was important to have deadlines identified so that some time would be dedicated to the technology decision-making process. At the same time, many of the subjects suggested that flexibility was necessary to adapt to emerging situations.

Knowledge. Schmidtlein (1974) stated that “Lack of knowledge about causal relationships among the elements of a particular situation makes prediction difficult and places a premium on cautious incremental actions and continuous monitoring of the action’s effects in order to make timely corrections” (p. 9).

In the present study, subjects often mentioned the need to collect information, both about the constituents’ needs as well as the solutions through technological and pedagogical advances. Many subjects considered their own lack of time and expertise to be problematic and indicated a desire for there to be someone else who would be able to maintain this information. In addition, in terms of identifying goals for the technology decision-making process, subjects indicated the difficulty of having extremely specific goals because of evolving technology and the complexity of the types of goals that campus constituents might identify.

Availability and distribution of resources. Schmidtlein (1974) described the constraints posed by the availability and distribution of resources, not only economic

goods and services, but also social assets, such as “status, legitimacy, authority, coercive power, and obligations” (p. 9), human skills and qualities, and information.

This view of constraints was mirrored in the responses of the subjects as they explained why the ideal decision-making process may not be realistic at the campus. Many subjects pointed out that financial limitations curbed the possibilities of the technological gains, in terms of equipment, personnel, and other resources. There was a lot of concern about making sure that there was a fair distribution of these resources and consideration of the needs of different campus constituents.

Most subjects considered shared governance of utmost importance at the campus and in keeping with the values of the campus. These subjects suggested that having an equitable distribution of power and authority was necessary for the proper functioning of the campus. The difficulty of this task was considered to constrain the technology decision-making process at the campus, with a constant struggle to maintain a power balance.

The imbalance in expert knowledge and ability to use technology was considered problematic in achieving the “perfect” system within which technology decision-making processes could emerge. As it was, subjects suggested that political bargaining had to be engaged in carefully to maintain a balance between the needs of expert and nonexpert users of technology.

In addition, many subjects explained that disseminating the information gleaned from different parts of the campus was essential. There was also an understanding that information gathering was a demanding task that, while

important, may have been beyond the capacity of technology workers because of the heavy competing demands upon their time.

Consensus. Schmidtlein (1974) stated that decision making is constrained when there are different levels of knowledge or different perspectives on the same issues. It is assumed by some, he suggested, that given the same information, the same decisions would be arrived at by anyone. This assumption, Schmidtlein explained may be false, however, because of the different perspectives, values, and self-interests held by different individuals at the organization.

This view is reflected in subjects' responses that suggested that it would be almost impossible to get unanimity on decisions from all constituents. The reason for this varied. Some suggested that different levels of knowledge (similar to the assumption identified by Schmidtlein, 1974) were barriers to agreement about what was needed. Other suggested that the needs of different constituents varied, while still others considered that it was just human nature to have disagreement among so many different individuals.

Functional demand. The fifth constraint identified by Schmidtlein (1974) regarding what he dubbed "functional demands" which related to: "Different roles of individuals in an organization place restrictions on their behavior" (p. 10). In other words, the problem faced by decision makers is that the tasks required by one individual's particular role in the organization create a filter through which all information is sifted and understood. Thus, it is difficult for an individual from one place in an organization to understand the interests of an individual in a different location.

In the current study, subjects pointed to issues such as these that made it difficult to make decisions that would satisfy all campus constituents. Many subjects described difficulty in understanding what technology was possible and available. Others suggested that limited understanding of the jobs of others reduced the ability of the technology decision-making process to accommodate the needs of all campus constituents.

Many subjects hoped that the new IDS who was to be hired soon would be able to provide a better understanding of educational technologies that would improve teaching and learning. Most of the subjects who responded that there should be a single leader of the technology decision-making process also suggested that this person would be able to collect enough information to be knowledgeable about the needs of all of the campus constituents.

Explaining the Assumptions and Constraints

In support of this study's first hypothesis, which was based on the literature on strategic and technology planning, many subjects indicated that they believed the technology planning process should resemble a more comprehensive approach, with a focus on control, rationality, and integration with other campus processes. The desire for comprehensive decision-making processes appears to appeal to the cognitive biases that were set forth by Birnbaum (2000). The cognitive bias whereby individuals believe that their actions lead directly to change can explain why individuals report the desire to have a more comprehensive decision-making process. In addition, the *role bias* relates to the notion that managers believe they should be rational. This also fits with Mannheim's (1940) belief that rationality and attempting to gain control are "evolved" responses to a changing environment.

Subjects' beliefs about constraints on this process are consistent with theoretically and empirically derived statements about conflicts between comprehensive decision making and the characteristics of higher education organizations and technology. While the basic assumptions of the subjects regarding how technology decision-making processes *should* work fit with the comprehensive approach, their views of the constraints inherent in the campus technology decision-making process fit more closely with the incremental approach. The comprehensive model assumes that deliberate change is possible, while the incremental model assumes that it is not always clear what processes lead to change, change technology is not available, and causal relationships are too complex to be able to perceive easily. In addition, so-called "rational" decision-making processes are incompatible with the characteristics of higher education organizations, which tend to favor decision-making processes that include social, political, and cultural values and tend to be more heuristic in nature. Integration is also inimical to highly decentralized higher education institutions which tend to be loosely coupled, with "garbage-can" decision-making processes.

In summary, while subjects indicated a desire for a technology decision-making process with comprehensive attributes, they also recognized constraints resulting from the nature of institutions and technological change. The constraints were consistent with the incremental model's assumptions about the nature of higher education organizations.

Second Analytic Research Question

The results from the second set of interview questions, regarding how the technology decision-making process *did* work, are used to answer the second analytic research question, which is:

How closely do observed decision-making processes correspond to planning and incremental decision-making models?

To examine this question, subjects' responses to the second set of interview questions, which probed how the campus technology decision-making processes had operated over the four years prior to the interviews, are explored in the following sections. Results from the first set of interview questions showed that subjects had idealized views of technology decision-making at their campus with the recognition that fulfillment of these idealized views was impeded by organizational realities.

This study hypothesized that, given the conflict between the constraints on decision making, the technology decision-making processes would resemble more closely an incremental process than a comprehensive process. This hypothesis was supported by the results of this study. Given the characteristics of the organization and technology, the actual technology decision-making process at the campus in this study resembled more closely an incremental approach more than a comprehensive approach as these concepts were identified by Schmidtlein (1974). In the next section, subjects' reports of characteristics of the processes that fit the incremental approach are summarized, followed by those that fit the comprehensive approach. Following this is a section analyzing conclusions regarding the second research question.

Incremental Characteristics

Questions relating to the *rate of change* and *repetitiveness* variables probed subjects' views of environmental conditions that affected the organization during the four years in question. Most subjects agreed that there had been a rapid rate of change and high level of unpredictability. They cited examples of how quickly computer software and hardware had changed and how rapidly demands for new information technology had grown over this period. Most subjects also reported that the environment of higher education and changes in technology had become less predictable over the previous four years. Schmidtlein (1974) stated that the incremental model of decision making is more appropriate for both rapid and unpredictable change because it allows for flexibility in responding to such change. When change is rapid or unpredictable, having a comprehensive response tends to lead to obsolete plans which are unable to keep up with changes that are occurring rapidly or unpredictably since *a priori* decisions must be made and information that was gathered may no longer be relevant at the time that it is to be used.

Regarding the questions probing the *causal relationships* and *control technology* variables, most subjects reported being unfamiliar with the details of technology purchases which were made as a result of the technology decision-making process at the campus. Most subjects indicated a mix of reactive and proactive responses of the campus to the changing demands for information technology. These results suggest that although subjects may believe that the causal relationships and control technology are available, they did not have much specific evidence for this belief. Subjects who were most familiar with actual technology purchases indicated that there were less direct links between the broader technology

planning process and the purchases; the technology planning process was designed to identify general needs for equipment which was then determined months later when the C&IS department had time to update equipment and network systems, typically in the summer months whereas the planning process usually was completed in the early spring.

In response to questions which probed the *location of resources* variable, the responses were consistent with the incremental approach to decision making, outlined by Schmidtlein (1974). There was decentralization of leadership, shared authority, a loose connection between the budget process and the outcome of the technology planning process, and intermittent information gathering.

Many subjects indicated that there had been an individual leader of the process. However, the traditional sense of what a leader is (c.f., Birnbaum, 1988) in which the person creates a vision and leads the campus to fulfill that vision, differs from what the leader was considered to be doing in the present case. In this case, a number of subjects reported that there was a leader, but that the leader's role was to support and facilitate the progression of the decision-making process. The leader was not described as someone who took charge of the situation and pushed ahead with his or her own vision, but as someone who was able to organize the IT committee and shepherd the decision-making process from the beginning of each year through the hearing process of the Strategic Planning committee several months later. The leader was identified as one of a number of individuals who were highly involved in the technology processes at the campus: from the IT chair, who changed from year to year; the C&IS manager; to the registrar who had taken responsibility

for the technology processes in the early years of the campus technology decision-making processes. From all of the reports, it can be assumed that there were a number of individuals who maintained leadership positions in the technology decision-making process at the campus.

Most subjects in this study reported that shared authority was particularly strong at the campus. Many of these subjects explained that shared authority was supported in a number of ways. In particular, the Campus Executive Officer was cited numerous times as having institutionalized shared authority shortly after he had arrived at the campus years ago and continued to support shared governance through campus structures and processes. In addition, the authority of the IT committee was considered to be proof of the shared authority of decision-making processes with faculty often leading the way for the campus. There were cases in which the formal procedure was bypassed, as mentioned above, but these appeared to be exceptions to the rule of shared authority.

The technology budget process, although aligned with the rest of the campus' budget process was loosely organized because, although requests were made and approved, the requests were usually for general items (e.g., 20 new computers), the specific details were not determined until later in the year, at the time when the purchases were to be made.

Information gathering is an interesting topic, given that most subjects reported that, although it was considered desirable, there were few, if any, individuals, who had the time and ability to do gather information systematically. Occasionally, surveys of individual's needs had been created, although response

rates were typically low. High hopes were held for the incoming IDS who might be able to help with gathering and also dispersal of information regarding needs and solutions. Given that technology changes so rapidly, it may be difficult for one individual to keep up with the information needs as described by the subjects.

The results from the *functions* variable were consistent with the incremental decision-making model which predicted politically expedient and heuristic measures being used to determine outcomes (Schmidtlein, 1974). In response to the question probing the *functions* variable, subjects generally considered the technology decision-making process to be an unavoidably political process. Some subjects indicated that this was not necessarily negative; they indicated that political bargaining was an intrinsic part of the decision-making process. For instance, it was believed that because of a limited budget for technology, discussion and bargaining were necessary to determine what items could be afforded each year. Trade-offs among groups were expected by many and accepted as inevitable, although, as mentioned previously, there was a more positive view of this bargaining, when it was considered to be above-board and fair.

Subjects reported that, although the campus technology planning process had a “vision” based on the strategic plan, this vision was not always followed. The main reason that the process was not always followed was because politics were a part of the process, according to the subjects. For example, some subjects reported examples of purchases made by the campus that were a result of bargains between individuals and administrators rather than as a part of the overall campus planning process.

In keeping with the incremental model, for the *goals* variable, some subjects indicated that the technology decision-making process was haphazard and ambiguous. However, subjects who reported that were generally those less unfamiliar with the process. For the *deadlines* variable, subjects who had less familiarity with the technology decision-making process at the campus tended to report that there was not an orderly sequence of events. Subjects who were very familiar with the process were likely to suggest that short-term deadlines were used to force decision making.

Comprehensive Characteristics

As described in the section regarding the first set of interview questions on how subjects through the technology decision-making process *should* work, three comprehensive characteristics were used to describe how subjects believed the process *had worked*: control, rationality, and integration.

The responses subjects provided, that fit with these characteristics, focused primarily on the three-year rollover plan that was designed to allocate funds to update computer laboratories and faculty computers every three years. Many subjects cited this as evidence that the campus was now being more proactive and in control of the changes that were occurring at the campus. However, this recognition of change did not identify the nature of the new technology that would be needed.

Subjects also cited the procedure by which the campus approached the technology planning process. The system of meetings of the IT committee and the process of hearings with the campus faculty senate and Strategic Planning committee were considered proof that the campus had integrated the technology decision-making process into the campus and university decision-making processes. The

subjects, particularly those on the IT committee, were most likely to refer to the technology decision-making process as orderly and rationally determined. They reported the process as being well-organized and well-delineated. Explanations for how the budget process was built into the overall processes also provided apparent evidence for this belief.

Explaining the Combination of Incremental and Comprehensive Processes

Just as Schmidtlein (1974, 1983) predicted, the actual decision-making process at the campus entailed a combination of both incremental and comprehensive processes. The technology decision-making process had evolved to suit the environmental conditions at the campus. Subjects described environmental conditions which were similar to those that Schmidtlein (1974) stated were more compatible with an incremental decision-making process; most subjects described the environmental conditions as rapidly changing and unpredictable. The decision makers had developed a process to cope with the rapid pace of change and the high level of unpredictability; the decision-making process was better structured than in previous years, but provided flexibility for specific decisions. Thus, there was a low level of specificity during much of the technology planning process, but with a process that was becoming more clearly defined, particularly within the year prior to the interviews for the current study. The IT committee had undergone a time-consuming process to re-evaluate its mission and processes, as described previously. The leadership of the committee had undergone change: only faculty were now permitted to hold leadership positions in the committee and staff were relegated to supporting positions. At the same time, the process by which the IT committee's funding requests were evaluated by the committee, as well by the campus Strategic

Planning committee, were clearer and followed more consistently. There were still some technology decisions being made through administrative processes and through processes external to the IT committee (e.g., college-level and university-wide). Thus, the processes had evolved to recognize the nature of the campus and achieve somewhat greater predictability, particularly for the faculty, but allowed for flexibility regarding the final decisions.

It is interesting to note that most subjects indicated that the campus was becoming more proactive in relating to future technology change. Their evidence for this was the three-year rollover plan for the computer lab and faculty computers. This “plan” had neither detail about what would be the replacement technologies nor any specifics about anything else. This basic plan was the most commonly cited evidence for a reasonable response, particularly a proactive response to the changing environment, given by subjects during the course of the interviews. Subjects indicated in their views of how things should be that they preferred the idea of proactive rather than reactive responses to future changes. Thus, the sense that there would be a planned change, even with little specificity, was considered appropriate and acceptable. This was also in line with what subjects said about how the campus had had a “sea change” in its attitude about technology change, going from a view of technology needs as one-time changes to an on-going requirement. Creating a permanent C&IS budget to cover regularly occurring costs that did not have to be approved in the strategic planning process was also considered evidence of an improved response by the campus to on-going change. Subjects seem to have interpreted the three-year-rollover plan as evidence to support their notion that they

should be planning and that there *should* be comprehensive decision-making processes. It is an interpretive process that leads to the sense that this is evidence of a plan rather than it actually being evidence of the uncertain nature of the specific changes that would occur. The “plan” just indicated that there is an understanding that change will happen and that the campus had to be aware of this fact rather than any sense of what form the change would take or how the campus would actually respond. This response to change made more sense given the environmental conditions, with rapid change and unpredictability, than actually identifying specifics that would undoubtedly change. At the same time, the plan fulfilled individuals’ expectations about what an intelligence response to future change should be like.

The technology planning process at the campus in this study developed in a manner which was consistent with the values of the campus, as suggested by Schmidlein and Milton (1990). It was integrated into the existing strategic planning process, at least in terms of how the hearings were held and how the consultation process was held. Decentralization, shared authority, and development of consensus or political discourse were upheld as values that many individuals at the campus considered important. The overarching framework of the technology decision-making process at the campus can be considered a planning process, but given that the specific details of future purchases and usage were not provided, the framework allowed for decisions to be made at the final deadline for purchases. Thus, overarching goals and objectives had been identified within the strategic planning process, but were general enough to provide flexibility for purchases to be determined by the IT committee and the C&IS department. Few individuals at the

campus were aware of the final decisions that were made in terms of product specifications. There was no mechanism in place to ensure that the details of the strategic plan were followed. No one interviewed questioned the final decisions, but there was a sense that the process had been fairly carried out and that final decisions had to remain in the control of the technology experts to determine the best way to meet the needs determined by the strategic planning process. Few individuals reported being unhappy with the final decisions. However, one individual was unhappy because software was changed without consultation with those who used it. Another individual was concerned that the technology that was available was too expensive and unnecessarily advanced for most ordinary users.

Was the result of this “evolution” a problem described by Wildavsky (1973) in that planning is “nothing” or did it avoid the *fallacy of detachment* as identified by Mintzberg (1994)? It seems that many subjects were rather happy with the technology decision-making process at the campus in this study because it took into account the values of the campus constituents, with their desire for future-thinking and for shared governance. At the same time, the scope of the process was limited to new, large-ticket items, rather than requiring an analysis of all technology decisions that had to be made. This distinction allowed the decision-making process to let the campus decision makers set the direction with a few important decisions, but reserved the everyday decisions for a small group of individuals who were familiar with the needs of the computer users on the campus.

In summary, most of the observed technology decision-making process included a mix of both incremental and comprehensive components. As Schmidlein

(1974) indicated, most real-world decision-making processes would include aspects of both models. The campus' technology decision-making process had, over the past few years, become more comprehensive, with increased focus upon the "vision", goals, and procedures through the re-formulation of the IT committee and its procedures. At the same time, however, there was still the awareness of the need for flexibility and incremental responses to changing needs and technologies.

Third Analytic Research Question

The third analytic research question is:

Do comprehensive and incremental decision-making models provide an adequate framework for analyzing technology decision-making processes at the campus?

The following sections will examine this research question by first examining the fit of the subjects' responses to the interview questions and then by describing how well responses fit the theoretical framework of the this study.

In response to the third analytic research question, it is important to examine the utility of the models identified by Schmidtlein (1974) in relation to the responses provided by the subjects in this study. To answer this question, responses that were considered the *mixed* and *other* responses were examined. When the data were first coded and characterized, only four types of responses were identified: *comprehensive*, *incremental*, *other*, and *no answer*. Further analysis showed that these types were inadequate for a number of reasons. First, many of the responses had components of both the *comprehensive* and *incremental* approaches rather than of only one or the other types of responses. Second, the *other* response was a hodgepodge of different items, from those that could not be characterized as one of the first two types, because they ranged from those that were equal mixtures of both

to some that did not answer the question in a format that could be clearly characterized. The first two response types were changed to include the term “*primarily*” because it was considered that most answers would have at least some components of both decision-making models and it would be more accurate to identify the model the response most closely resembled. The *mixed* response category was added because it accommodated subjects considering a combination of the two models of decision making. This helped distinguish such responses from those that were non-responsive to the question. Thus, *other* responses are more reflective of issues that do not pertain to the *comprehensive* and *incremental* models as identified by Schmidtlein (1974).

Most of the subjects’ responses to the first set of questions, regarding how the technology decision-making process *should* work fit one of the first three types of responses (*primarily comprehensive, primarily incremental, and mixed*). Fewer than ten responses total for all of the variables were consider *other* responses. Most of the responses that were labeled as *unresponsive to question* to the first set of questions appeared to be a result of subjects’ being unfamiliar with the events in question (e.g., the amount and type of change in the environment) or from a misunderstanding of a question (e.g., particularly for the *causal relationships* question).

For the second set of questions, regarding subjects’ views of how technology decision-making processes *had worked* at the campus, most responses fit the *primarily comprehensive, primarily incremental, or mixed* responses. Slightly more responses were labeled as *other*. Many more responses were labeled as *unresponsive to question*, but these tended to be a result of subjects’ lack of awareness of the

details of the technology decision-making process, rather than a result of responses that were not relevant to the questions.

Overall, therefore, it appears that the two theoretical models of decision-making that were identified by Schmidtlein (1974) adequately covered the subjects' responses. No new variables appeared that were not in Schmidtlein's (1974) classification system. There was some needed clarification for two of the variables: *functions* and *deadlines*. The *functions* variable was vaguely identified in Schmidtlein's (1974) analysis and it was embellished for this study based on inferences drawn from the theory. The *deadlines* variable was frequently interpreted by respondents as a motivator for individuals to act rather than as a constraint on the time available for analysis of options.

It is important to note that Schmidtlein (1974) cautions that the models are "ideal types":

In practice, conditions rarely exist that permit decisions to be made on the basis of these "ideal types". However, like the concept of "perfect competition" in economics, these "ideal types" provide a framework that facilitates the analysis of what one finds in an examination of practice (p. 6).

It is more likely, therefore, that an amalgam of the two "types" is to be found in a given situation. Subjects in this study in fact suggested that their ideal planning process was different from the reality that they expected to experience.

Schmidtlein's (1974) theoretical framework is valuable because it breaks down the process into its component parts. Having defined components helped clarify that the subjects did not consider the actual campus technology decision-making process as either completely comprehensive or incremental. Instead, it became obvious there were certain components that subjects expected or preferred to

be more comprehensive or more incremental than others. For example, subjects desired increased centralization of the technology decision-making processes, with the IT committee in charge of the decisions, but at the same time they preferred shared governance. Also, subjects desired “rational” decision-making processes, but understood that political bargaining had to be accommodated.

It was important to characterize the subjects’ responses to the interview questions to get a sense of what values they held regarding the decision-making process. As Schmidtlein (1974) had predicted, the subjects’ views of decision making do not fall completely at one pole of the continuum as completely comprehensive or completely incremental. It made sense in this study to characterize the subjects’ responses as *primarily* comprehensive or *primarily* incremental. It did appear that subjects who had a more idealistic view of the decision-making process, always in the comprehensive direction, suggested that ways to improve the decision-making process entailed making it more comprehensive. Typically, these individuals were less directly involved in the final technology decisions.

By including the *mixed* response and describing the nuances of the responses, the various views of the subjects were fleshed out. Subjects had different concerns about different aspects of the decision-making process. For example, some subjects were mostly concerned with perceived fairness and how power was distributed while others were more concerned with integrating the technology decision-making process into other campus decision-making processes. It had been this researcher’s expectation that more subjects would have primarily comprehensive views about

how decision making *should work* at the campus. It turned out that subjects had a more sophisticated understanding of how processes worked than expected. The particularly interesting finding is that just a few subjects knew specific details about how the decisions were made. People were content to let a few individuals make the decisions as long as they perceived the process leading up to the decisions to be open and fair.

Implications for Technology Decision Making And Theory

The next two sections will describe the implications of the results of this study for technology decision making at higher education institutions and for the usefulness of the theoretical framework used in this study.

Implications for Technology Decision Making

This section will provide a list of recommendations for higher education organizations regarding technology decision making. The combination of comprehensive and incremental processes provided the campus with a strong method for blending the strengths of both decision-making models. The comprehensive model lent the process the imprimatur of being forward thinking, which was desired by almost all subjects as indicated by their beliefs how about the campus should work as well as through their responses to how the campus decision making could be improved. The incremental model lent the process the flexibility that was necessary to respond to a rapidly and unpredictably changing environment and technologies.

Integrate technology decision making into other decision processes at the campus. One of the greatest strengths of the technology decision-making process at the campus was that it used the same decision-making framework used for the on-going strategic planning process. Unlike some organizations, which have

discontinuous decision-making processes, with technology planning processes isolated from other campus decision-making processes, this campus used an integrated procedure which fit well the campus values and time-frames. It is not clear whether the annual cycle of the strategic planning process strengthened the technology decision-making process, although it is possible that this is the case, since providing the means with which to have decisions made regularly, worked with the ever-changing characteristics of technology. Thus, it is possible that the strength in the process came from using a compatible framework or that it was regularly scheduled, or both. Further investigation of a variety of organizations may shed light upon this matter.

Inform individuals about decisions. In some cases at this campus, subjects reported dissatisfaction with the technology decision-making process which resulted in changes that affected their own work when they were not prepared for having to change their use of software or hardware or both. There was concern that abrupt changes occurred without consultation or education on the use of new equipment. Individuals who will be affected by such changes should be identified in the course of the decision-making process, consulted about the change, and sufficiently educated on the use of new equipment.

Provide an open decision-making process. Given how much effect changes in technology may have on individuals' work, it is important to operate the decision-making process in an open manner so that those who wish to participate are able to do so. At the campus in this study, many individuals had been members of the IT committee or the Strategic Planning committee and so they believed they understood

how the decision-making processes worked and felt comfortable with the decisions being made.

Include representation of all campus constituents. One concern that was repeated by a number of subjects in this study was that some campus constituents were not sufficiently represented. There was a sense that the IT committee did not always understand the needs of staff members, for example, since staff members' roles had been decreased with the change in the rule that barred staff from becoming committee chair people. It is important that all campus constituents' needs are represented in the technology decision-making process since changes in technology affect all members of the campus community.

Educate all campus members. Many subjects reported their level of technology expertise to be low or medium-low. Many of these subjects described their lack of knowledge of how to use technology, particularly in pedagogical matters. There was a wide range of technology knowledge and a concern that the available technology was being underused by many individuals on the campus. The new IDS position would be logical to assign this responsibility, given the job requirements and the description of this position.

Plan broadly; work incrementally. Given the nature of technology, with its frequent changes and high cost, it makes the most sense to work incrementally to determine the specific details of equipment to be purchased and its uses. Rather than make drastic changes in the work environment which would be apparent to all users, it would be beneficial to pilot test significant new projects. Such pilot testing would

allow for problems to be sorted through, solutions to be determined, and educational programs to be developed in anticipation of wide-spread changes that might follow.

Understand people's desires for planning, but recognize the constraints. It is evident from the technology planning literature and in discussion with the subjects for this study that many individuals desire a comprehensive process. Incrementalism is considered negative by many. As in the present case study, it is apparent that subjects were pleased with the three-year rollover plan for the campus because it signaled a willingness and ability to plan for the future. Subjects generally felt uncomfortable with the sense that the campus had no strategy for dealing with future changes at the campus. When developing a decision-making process, it is important to recognize that constraints on time, knowledge, resource, consensus, and functional demands affect such a process. Thus, fulfilling people's desires for comprehensive processes must be tempered with the understanding that these constraints exist.

Implications for theory

This section will describe implications for the theoretical framework that arose in the analysis of the results of this study.

Emphasize ideal versus realistic. The theoretical framework of Schmidtlein (1974) emphasized the "ideal" poles of a continuum. This is also true of many of the calls for technology planning in the literature. It is important to make it clear that the "ideal" types will not deal with the constraints that Schmidtlein (1974) identified and that were evident in the current study. If an organization attempted to carry out a more comprehensive technology decision-making process, such as are described in the literature, it would be important to understand the types of constraints that will be experienced by all institutions and those that might be experienced by a specific

institution. For example, most institutions would experience problems creating and following a five-year, comprehensive plan given technological and resource changes. Thus a comprehensive plan would be problematic. Also an institution could experience problems by attempting to have a centralized decision-making process which runs counter to a tradition and culture of shared governance.

Define terms carefully. One of the biggest difficulties using Schmidtlein's (1974, 1983) theoretical framework was the ambiguity of some of the terms or examples. For example, the *deadlines* variable lacked clarity and was given more than one meaning by respondents. The current study provides a clearer explanation of the different functions of this variable. Using the respondents' interpretations and responses to questions relating to these variables helped to clarify the theoretical framework. Consensus, as it related to the *location of resources* variable, was expected to be a goal of the decision-making process, with individuals agreeing upon the choices that were made. The process of building consensus, however, relating to the *functions* variable, related to an incremental process whereby individuals worked together over time to achieve agreement. It is important to consider which sense of the term is intended.

Suggestions for Future Research

The findings and conclusions of this study have suggested questions that should be addressed by future research. Some of these questions are:

1. The time period under study in this research involved relatively good economic circumstances, with state and university resources at high levels. How will the technology decision-making process be viewed in less favorable economic times?

2. Changes in staffing at the campus were underway at the time of the study. How will general satisfaction with the technology decision-making process fare under the direction of a new Campus Executive Officer (the one interviewed for this study retired less than a year following the interview). The IDS position was filled following completion of the study. Very high expectations were held for this position. Were these expectations upheld? If not, how did subjects readjust their expectations for the issues related to leadership and information-gathering?

3. The campus studied in this research had specific characteristics that most likely affected the technology decision-making process. Would the results be different for other campuses with different characteristics and different planning processes. Also, this campus was a branch campus of a regional research university. How would the results differ for a community college or small liberal arts college which has a different governance structure?

4. The level of satisfaction with the technology decision-making process was relatively high at the campus in this study. How would subjects' perceptions of technology decision-making differ at a campus where satisfaction with campus procedures or other aspects was low?

5. The types of responses subjects provided in this study were affected by how they interpreted the questions and what aspect of the technology decision-making process they discussed. How would changes in the interview questions or the definition of the variables relating to the theoretical framework affect subjects' responses?

6. Most of this study involved an analysis of the decision-making processes and how they resembled the theoretical models of decision making. Further study should be made to determine an appropriate way to evaluate such decision-making processes in the future. A streamlined survey process should be studied which would allow self-study at institutions that wish to examine their own processes and determine the proper course of action.

Caveats

It is important to note that this study did not directly examine the question of whether a true crisis exists in higher education today as indicated by many calls for the use of technology or technology planning. As indicated in the introduction to this study, the notion that sounding a call of “crisis” may allow parties with special interests, commercial and professional, to interpret certain events in a manner which will support their positions. For example, calls for transforming higher education through the use of technology (e.g., Norris & Dolence, 1995, 1996), while possibly based upon completely false premises, i.e., that higher education institutions are not actually facing dramatic threats to their existence and identities, may motivate individuals and groups within higher education organizations to demand and accept change. Technology with applications for pedagogy and the support of higher education organizations may have developed coincidentally with a paradigm shift towards increasing demands for pedagogy in the late 20th Century. Supporters of change may have seized upon technology as a mechanism to effect changes they desired. Technology appears to have an attraction to many within academe and has been labeled by some as a remedy to many problems.

It is important to be aware that much support for the increase in technology has come from technology companies and others who will gain financially from higher education's investment in technology (Croissant, 2001; Noble, 1998; Slaughter, 2001; Tang-Martinez, 2002). Commercial interests have increasingly been encroaching upon higher education interests in a manner that makes it difficult to notice the changes that have occurred (Bok, 2003). As noted in this study, only one subject questioned the need for continuously upgrading technology. There is an accepted notion at the campus in the study, and presumably at many other higher education institutions, that technology must be constantly updated and that change is inherently good.

The current study does not investigate whether the assumptions that technology is needed and whether it is effective in accomplishing what it is expected to do. A different type of analysis would be needed to proceed with such a study, but such research probably would be useful. Given that technology requires a large proportion of a campus' budget in many cases, it is important that questions about its efficacy and necessity be introduced into the decision-making processes.

Conclusion

The results from this study supported the hypotheses that, while participants desire comprehensive decision-making processes, environmental and institutional realities make technology decision-making processes resemble more closely incremental processes. Hypotheses that predicted that subjects' dissatisfaction with the decision-making processes appear to result from the difference between their espoused views and the realities of the processes.

Schmidtlein's theoretical models of decision making (1974, 1983) were used successfully to examine participants' espoused and actual views of technology decision making at the campus in the study. Recommendations are provided for tightening up the models and applications.

Given the nature of a case study analysis, with a single campus being investigated, the results of this study must be considered tentative and not necessarily reflect experiences at other institutions. At the same time, however, this endeavor provides a promising method of analysis of such processes at other campuses. Future studies should include a variety of other institutional types and sizes which use different processes to respond to changes in technology and demands for technology.

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Appendix A: List of research questions, hypotheses, and information needed for study

Research Questions	Hypotheses	Information Needed	Source of Data
Descriptive			
What process do participants recommend using to respond to changes in technology? (#1)	Participants will recommend a comprehensive decision-making process to respond to changed in technology. (#1)	Participants' espoused view of decision-making for technology.	Interviews
How are technology decisions made at the campus? (#2)	The actual technology decision-making processes at the campus will resemble more closely an incremental process. (#2)	A description of the processes involved in technology decision-making process	Interviews Planning and supporting documents
How effective is the current technology decision-making process from the perspectives of the participants? (#3)	Problems perceived by participants will be a result of the difference between one's espoused view of how technology decision-making should work and decision-making process realities. (#3)	Participants' reports of problems experienced during the technology decision-making process.	Interviews
How can the process of responding to technology demands be improved, according to the participants? (#4)	Participants will recommend changes to the technology decision-making process to make it more consistent with the comprehensive model's assumptions. (#4)	Participants' suggestions on how to improve the technology decision-making process	Interviews

Analytic			
What decision process assumptions underlie participants' recommendations for making decisions about campus technology? (#5)	Participants' recommendations for making technology decisions will be consistent with the comprehensive model of decision making. (#5)	A comparison of the process desired by subjects and theoretical assumptions of theoretical models.	Interviews
How closely do actual technology decision-making processes correspond to comprehensive and incremental decision-making models? (#6)	Actual technology decision-making processes at the campus are expected to resemble most closely the incremental decision-making model. (#6)	A comparison of the technology decision-making process with theoretical assumptions regarding decision making.	Planning and supporting documents Interviews

Research Questions	Theoretical Assumptions	Information Needed	Source of Data
Do comprehensive and incremental decision-making models provide an adequate framework for analyzing technology decision-making processes at the campus? (#7)	The comprehensive and incremental decision-making models are expected to provide an adequate framework for analyzing technology decision-making processes at the campus. (#7)	A description of the processes involved in technology decision-making process	Interviews Planning and supporting documents

Appendix B: List of variables with corresponding interview questions

ENVIRONMENTAL CONDITIONS	B. GENERAL QUESTION #1: What process do you believe the campus should use to make decisions that respond to changes in information technology and changing demands for information technology?
<i>rate of change</i>	Bo. Do you think a technology planning process is most effective when the environment is changing rapidly or slowly? (rate of change)
<i>repetitiveness</i>	Bm. Should the campus have a long-range mission, objectives, or priorities for technology? If so, how often should that mission be reevaluated? (repetitiveness) Bn. Should there be deadlines for decision making regarding technology? Why or why not? If so, what types of deadlines should there be? How long should the time horizon for the planning process be? Why? (repetitiveness)
<i>causal relationships</i>	Ba. How should the technology planning process work to affect decision making at the campus? (causal relationships)
<i>change technology</i>	Bi. How should goals (if any) be reached? (change technology)
<i>location of economic, social, human, and information resources</i>	Bb. Should there be a leader of the campus technology planning process? Who should lead the planning process? What should leader's role be? (location of resources) Bf. Should the budgeting process be related to the technology planning process? How? (location of resources) Bg. What type of information is needed to make good decisions about technology at the campus? Who should collect this information? How often? Who should have this information? How should it be used to make decisions? (location of resources) Bc. What role should shared authority [governance?] between faculty and administrators, play in the decision making about technology? (location of resources)
<i>Functions</i>	Bd. What is the role, if any, for political bargaining in the decision-making process regarding technology? (functions) Bj. Should alternatives be identified in the decision-making process? What types of alternative choices should be considered? How should the choice be made among the alternatives? (functions)
<i>goals (competing priorities, outputs, quantification, consensus)</i>	Be. Should consensus be an aim for the technology planning process? (goals) Bh. How should success of technology planning be determined? Should goals be set? What type of goals should be there be? (goals) Bk. Should alternatives be prioritized? How should the priorities be determined? (goals)
<i>Deadlines</i>	Bn. How difficult is it to change the plan and planning process?

ENVIRONMENTAL CONDITIONS	GENERAL QUESTION #2 How have technology decisions been made at the campus?
<i>rate of change</i>	Co. How rapidly did the technology or demands for technology change during the four years in question? (rate of change)
<i>repetitiveness</i>	Cp. How well did the campus technology planning process predict the future changes in technology and technology demands for the campus? (repetitiveness) Cq. Do you believe the environment of higher education has become more predictable, less predictable, or about the same? Technology changes? In what ways? (repetitiveness)
<i>causal relationships</i>	Ca. In what way or ways has planning affected how the campus uses technology? (causal relationships) Cn. Were the specific items in the plan carried out in later purchases? In technology usage? How so? (causal relationships)
<i>change technology</i>	Cb. Has the decision-making process been reactive or proactive in responding to changes in the environment or technology? How so? (change technology)
<i>location of economic, social, human, and information resources</i>	Cf. Has there been a leader for the technology planning process? If so, who was it? How was this decided? What was this person(s) role in the process?(location of resources) Cg. What role did shared authority between faculty and administrators play in the decision making about technology? (location of resources) Ci. Has the budget been coordinated with the technology plan? If so, how? (location of resources) Cj. What type of information has been collected prior to the technology planning process? How was this information collected? Who collected it? Who was able to use this information? How often was information gathered? (location of resources)
<i>functions</i>	Ce. Has the campus had a “vision”, mission, objectives, or priorities for where technology is going in the future? How was this determined? Has it been revisited since it was determined? (functions) Ch. How was political bargaining, if at all, involved in the decision-making process? (functions)
<i>goals (competing priorities, outputs, quantification, consensus)</i>	Cd. How have the purposes for the technology plan been determined? What types of goals were identified? (goals) Ck. Were alternative scenarios identified and prioritized? How was the choice between alternatives made? (goals)
<i>deadlines</i>	Cc. How difficult was it to change decision-making process? (deadlines) Cl. What time frame was identified for the future for the

	technology planning process? One year? Five years? More? Less? (deadlines) Cm. How much time was devoted to the technology planning process at the campus? Was this amount of time sufficient? (deadlines)
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D. GENERAL QUESTION 3— In your opinion, how well has the technology decision-making process at the campus worked to deal with changing technology needs?

E. GENERAL QUESTION 4—How can the process of responding to technology demands at the campus be improved?

Appendix C: Interview Guide

A. BACKGROUND INFORMATION

B.A./B.S.

M.A./M.S./M.B.A.

PH.D./Ed.D.

Other:

Position status:

Staff

Faculty

Administrator

Years in this position:

Years at this institution:

Years working with technology:

Self-assessed expertise with technology:

High

Medium

Low

Years working with technology decision-making?

Self-assessed expertise with technology decision-making?

High

Medium

Low

On information technology committee: YES NO

(within last five years?)

On strategic planning committee: YES NO

(within last five years?)

On Ad Hoc Committee on Pedagogy & Technology (IDS Committee)? YES

NO

B. GENERAL QUESTION 1--What process do you believe the campus should use to make decisions that respond to changes in information technology and changing demands for information technology?

- a. How should the technology decision-making process work to affect decision making at the campus? (causal relationships)
- b. Should there be a leader of the campus technology decision-making process? Who should lead the process? What should the leader's role be? (location of resources)
- c. What role should shared authority (governance?), between faculty and administrators, play in the decision making about technology? (location of resources)
- d. What should be the role, if any, for bargaining in the decision-making process regarding technology? (functions)

- e. Should consensus be an aim for the technology decision-making process? (goals)
- f. Should the budgeting process be related to the technology decision-making process? How? (location of resources)
- g. What type of information is needed to make good decisions about technology at the campus? Who should collect this information? How often? Who should have this information? How should it be used to make decisions? (location of resources)
- h. How should the success of technology decision-making be determined? Should goals be set? What types of goals should there be? (goals)
- i. How should goals (if any) be reached? (change technology)
- j. Should multiple alternatives or options be identified in the decision-making process? What types of alternative choices should be considered? How should the choice be made among the alternatives? (functions)
- k. Should the alternatives be prioritized? How should the priorities be determined? (goals)
- ~~l. How difficult is it to change the decision-making process? (deadlines)~~
- m. Should the campus have a long-range mission, objectives, or priorities for technology? If so, how often should that mission be reevaluated? (repetitiveness)
- n. Should there be deadlines for decision making regarding technology? Why or why not? If so, what types of deadlines should there be? How long should the time horizon for the decision-making process be? Why? (repetitiveness)
- o. Do you think a technology decision-making process is most effective when the environment is changing rapidly or slowly? (rate of change)

C. GENERAL QUESTION 2—How have technology decisions been made at the campus?

- a. In what way or ways has the technology decision-making process affected how the campus uses technology? (causal relationships)
- b. Has the decision-making process been reactive or proactive in responding to changes in the environment or technology? How so? (change technology)
- c. How difficult was it to change decision-making process? (deadlines)
- d. How have the purposes for the technology plan been determined? What types of outcomes were identified? (goals)
- e. Has the campus had a “vision”, mission, objectives, or priorities for where technology is going in the future? How was this determined? Have they been revisited since being determined? (functions)
- f. Has there been a leader for the technology decision-making process? If so, who was it? How was this decided? What was this person(s) role in the process?(location of resources)
- g. What role did shared authority between faculty and administrators play in the decision making about technology? (location of resources)

- h. How was political bargaining, if at all, involved in the decision-making process? (functions)
 - i. Has the budget been coordinated with the technology plan? If so, how? (location of resources)
 - j. What type of information has been collected prior to the technology decision-making process? How was this information collected? Who collected it? Who was able to use this information? How often was information gathered? (location of resources)
 - k. Were alternative scenarios identified and prioritized? How was the choice between alternatives made? (goals)
 - l. What time frame was considered when examining technology decisions? One year? Five years? More? Less? (deadlines)
 - m. How much time was devoted to the technology decision-making process at the campus? Was this amount of time sufficient? (deadlines)
 - n. Were the specific items in the plan carried out in later purchases? In technology usage? How so? (causal relationships)
 - o. How rapidly did the technology or demands for technology change during past the four years? (rate of change)
 - p. How well did the campus technology decision-making process predict the future changes in technology and technology demands for the campus? (repetitiveness)
 - q. Do you believe the environment of higher education has become more predictable, less predictable, or about the same? Technology changes? In what ways? (repetitiveness)
 - r. Do you believe the technology decision-making process has significantly shaped people's perspectives on technology? on technology planning (interpretive). If so, how? If not, why not?
- D. GENERAL QUESTION 3— In your opinion, how well has the technology decision-making process at the campus worked to deal with changing technology needs?
- E. GENERAL QUESTION 4—How can the process of responding to technology demands at the campus be improved?

Appendix D: Characteristics of Subjects

Six administrators (three dual faculty/admin)

CEO, DAA, registrar's office, College Officials, Student Affairs

Twenty-one faculty (faculty only position)

16 departments represented:

Business
Admin.
Chem
Economics
Educational
Psychology
Engineering
English
History
Human
Development
& Family
Studies
Information
Sciences
Technology
Kinesiology
Library
Math
Physics
Psychology
Statistics
Philosophy

Five staff (one dual faculty/staff)

Admissions, Continuing Education, Computer & Information Sciences, Business Office, Finance Office, Registrar's office

Years at Institution

0-5 years: 7

6-14 years: 9

15 or more years: 16

Strategic Planning members?

16 yes, 16 no

ITC?

16 yes, 16 no

(not the same 16 as were on SP)

Ad Hoc Committee?

6 yes, 26 no (only faculty were on this committee)

Experience with technology

med-low or low: 6

med: 11

med-high or high: 15

Experience with tech dm

med-low or low: 9

med: 13

med-high or high: 10

Degrees

H.S.: 1

Baccalaureate: 3

Master's: 8

PhD or Ed.D.: 20

Appendix E

Number of responses (percentage of total) for each variable by response category

Responses for first set of interview questions on how technology decision-making processes should work

	Primarily Comprehensive	Primarily Incremental	Mixed	Other	Unresponsive
Rate of change (1 question)	18 (56)	5 (15)	5 (15)	1 (3)	3 (9)
Repetitiveness (2 questions)	34 (53)	8 (12)	20 (31)	0 (0)	2 (3)
Causal relationships (1 question)	24 (75)	1 (3)	0 (0)	1 (3)	6 (18)
Change technology (1 question)	22 (69)	4 (12)	2 (6)	0 (0)	4 (12)
Location of resources (4 questions)	65 (51)	39 (30)	23 (18)	0 (0)	1 (1)
Functions (2 questions)	26 (41)	23 (36)	12 (19)	1 (2)	2 (3)
Goals (3 questions)	61 (64)	7 (7)	26 (27)	0 (0)	2 (3)
Deadlines (1 question)	15 (47)	5 (16)	10 (31)	0 (0)	2 (6)

Responses for second set of interview questions on how technology decision-making processes did work					
	Primarily Comprehensive	Primarily Incremental	Mixed	Other	Unresponsive
Rate of change (1 question)	6 (19)	17 (53)	2 (6)	0 (0)	7 (22)
Repetitiveness (2 questions)	17 (27)	20 (31)	13 (20)	0 (0)	14 (22)
Causal relationships (2 questions)	26 (41)	4 (6)	13 (20)	2 (3)	19 (30)
Change technology (1 question)	7 (22)	10 (31)	15 (47)	0	0
Location of resources (4 questions)	29 (23)	41 (32)	22 (17)	2 (2)	34 (27)
Functions (2 questions)	16 (25)	24 (38)	6 (10)	1 (2)	17 (27)
Goals (2 questions)	18 (28)	15 (23)	4 (6)	0 (0)	27 (42)
Deadlines (3 questions)	15 (16)	20 (21)	14 (15)	3 (3)	44 (46)

Responses for third set of interview questions on how improvements to technology decision-making processes could be made

	Primarily Comprehensive	Primarily Incremental	Mixed	Other	Unresponsive
Question D	15 (47)	0 (0)	1 (3)	13 (41)	3 (9)
Question E	22 (69)	2 (6)	1 (3)	7 (22)	0 (0)

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