In 1989, Brian Hawkins, who edited and introduced the book Organizing and Managing Information Resources on Campus (part of the Educom Strategies Series on Information Technology), and Ken King, who wrote the book's concluding remarks, both clearly saw higher education as being in the midst of a revolution. Citing the Carnegie Foundation for the Advancement of Teaching, Hawkins summarized the observation this way: “Higher education no longer merely anticipates a revolution in computer use; the revolution is under way” (p. 1).

Now, nearly fifteen years later, the turbulence of the computer revolution is subsiding. The revolution is not over by a long shot, but information technology (IT) has found its way into every aspect of higher education institutions, and we are beginning to deal with it as a “grown-up” instead of as the unruly youngster Hawkins and his contemporaries described in 1989.

The purpose of this book is to take a new look at the role of IT in higher education from the perspective of trying to be good managers of this major institutional resource. We will find ourselves addressing some of the same old questions, some of which will have new answers and some the same old answers. In addition, some new questions have arisen, and some old ones have grown in importance.
In grappling with both old and new questions, IT managers must take into account the tradition and culture of higher education as a social institution. Higher education is the environment within which the IT function has evolved and currently operates. This environment has shaped structures and practices, and it determines ways of thinking about future options. At the same time, all the other elements of colleges and universities are adapting to and being changed by IT. Some environmental influences and adaptations are common throughout higher education; others are particular to individual institutions. In this book, we think about the management of IT in this dynamic frame of reference, examining ways in which higher education, both generally and specifically, has shaped the present and will shape the future for our IT practices.

The Influence of Higher Education's Decentralized Structure

One significant characteristic of higher education in general is its stable self-protecting structure, as Clark Kerr (1980, p. 9) points out: “Taking, as a starting point, 1530, when the Lutheran Church was founded, some 66 institutions that existed then still exist today in the Western World in recognizable form: the Catholic Church, the Lutheran Church, the parliaments of Iceland and the Isle of Man, and 62 universities. . . . They have experienced wars, revolutions, depressions, and industrial transformations, and have come out less changed than almost any other segment of their societies.”

Higher education institutions exhibit this persistence because of their political and economic isolation and because it is part of their mission to transcend social change, which they exist to analyze, record, communicate, and interpret (Bowen, 2001). Persistence results also from the nature of the structure of higher education, which has been described as loosely coupled anarchy. While this kind of structure contributes to an institution’s survival, it also con-
tributes to its inability to evolve quickly—to the frustration of many change agents. It is difficult for a relatively new and dynamic element such as IT to invade and find a comfortable place within a structure so resistant to change.

Calling higher education institutions loosely coupled is another way of saying that their subunits are highly independent. While some outside observers exhort these institutions to behave more like businesses and exhibit the directedness of corporations, the management options within the IT function are defined by the reality that institutions of higher learning run themselves more as communities of autonomous members than as hierarchical bodies. Individual colleges, even individual professors, often operate as autonomous elements, optimizing their own performance with little regard for that of other units within the institution. From one campus to another, internal economies may vary along a continuum from more centrally planned to highly entrepreneurial, but all are characterized by a concentration of economic power at the periphery. Indeed, institutional goals and priorities arise more often from the individual faculty, departments, schools, and colleges than from the president’s office.

Consequently, institutional decision-making processes rely on broad representation and consensus rather than managerial prerogative. This approach to management, which is key to higher education institutions’ success as creative and critical engines of ideas, does present challenges when it comes to deploying an institutional enterprise IT infrastructure.

The degree of centralization at any given institution is a fairly intractable, highly significant attribute to take into account in designing effective IT management strategies. For example, if only a small number of people can authorize practices for IT, decision making is relatively straightforward. The larger the number of individuals involved (the more decentralized the environment), the more complex the decision-making process is.
Along the same lines, greater centralization usually corresponds to easier, less expensive deployment of information systems supporting administrative processes, because these processes are generally more coherent and more widely understood and because the network itself is generally more coherent (less fragmented) than in highly decentralized environments.

In general, between the decentralized nature of higher education and the distributed nature of today’s desktop computing, higher education institutions are battling powerful centrifugal forces. These forces work against true enterprise standards and the efficiencies they could yield. One of higher education’s most important challenges is to develop specific mechanisms to resist the excessively disruptive effects of these forces.

The Influence of Financial Architecture

Another important environmental variable for IT managers is an institution’s financial architecture. Two main types of models have emerged: the responsibility-centered model and the centrally planned model.

If the institution operates under a relatively responsibility-centered economy, in which constituent units have both income and expenditure responsibility (often referred to as “each tub on its own bottom”), the central IT function will tend toward fee-based services, and in many cases the constituent units will have greater autonomy in deciding how to provision themselves with IT services. Fee-based services often leave the door open for free choice, which can lead to greater heterogeneity and complexity.

If the institution operates more as a centrally planned economy with most funds coming into the central administration, which then allocates funds among units, IT services are more likely to be perceived as free goods. In this situation, it is easier to deploy standards, which can lead to a generally more coherent architecture.
The economic model in effect—whether central funding or dispersed responsibility for recapturing costs—colors all dimensions of IT management.

The Influence of History

Events and practices in an institution’s history also shape thinking about how to manage the IT function. History can even have long-term effects on the way higher education institutions evaluate their management options. For example, some institutions exhibit a cannibalistic reaction to particularly successful IT functions. It is not unusual to see the best IT organizations taken down a notch by other elements of the institution. When these reactions are taking place, the IT manager has a different set of options and issues to contemplate than when the function is in favor.

Growth of the IT Function

Besides bearing in mind particular environmental influences—including degree of decentralization, type of financial architecture, and accumulation of historical events—we also need to remember how new the IT function is among the well-established functions in higher education institutions. Many colleges and universities in the United States have existed for more than a hundred years, while IT has been around for less than one-third of that time.

More important, during that short time, IT has grown faster than anyone in the field or in society at large imagined. At Cornell University, for example, between 1982 and 2002, the number of personal computers grew from probably fewer than 250 to well over 25,000, each with greater computational power than all of the computers on campus combined in 1982. Total computational power across campus went from something like 0.002 to somewhere around 12,900 gigaflops.
In 1982, modern high-speed data networking did not exist. Cornell had limited point-to-point connectivity, consisting mostly of “dumb” terminals attached to mainframes. The fastest modem speeds were 1,200 bits per second. Intercampus communication happened mainly through Bitnet, a popular store-and-forward network that operated at about 4,800 bits per second. Today, the university’s fiber-optic gigabit backbone connects every computer on campus with at least switched 10/100 megabit per second bandwidth, and the connections to the Internet operate at more than 300 megabits per second.

Moreover, two decades ago, nothing like the World Wide Web existed. Today we take it for granted as an easy, intuitive tool for finding information of all kinds.

We have no records of volume of e-mail traffic in 1982, but we do know that Cornell published volume 1 of A User’s Guide to the Cornell MAIL System that year. It seems safe to speculate that the volume of messages was well under 1 million that year. During the first nine months of 2002 alone, Cornell e-mail servers processed more than 250 million messages.

In 1982, it was almost exclusively scientific researchers who used the network and academic computational resources. Today, almost every student and employee at Cornell and everywhere else depends on the network to access important information, entertainment, and other people. Students have grown up in a networked, multimedia world. Their expectations about technology on campus are very different from those of students in 1982.

Twenty years ago, IT for the most part was the domain of the IT specialist. Today, no one in the academy can avoid taking some responsibility for its impact. Managers all over the institution “own” it. In managing the function, we must accept the reality that it is no longer a singular entity that anyone can directly control.

Growth of this magnitude has necessarily strained many fronts. As IT has forced its way into all facets of our institutions, it has displaced other priorities and caused us to change the way everyone
on campus works. It has spawned entirely new academic disciplines. It has opened new approaches and ideas in almost every established field. This kind of growth raises many management issues, not the least of which is cost.

**Cost Management**

Computers and networks have been, and still are, very expensive. Because few institutions have found totally new funding sources for this purpose, in many cases resources have been taken away from other priorities to buy and support IT. For example, Cornell's central IT budget (minus telephone services) went from about $8.6 million in 1982—1.8 percent of the total expenditure budget—to $33.4 million in 2002, or 2.0 percent of the total.

Even as the central IT budget has encroached on other spending, IT expenditures outside the central organization have grown even more significantly. We do not have precise figures for the total IT expenditures at Cornell for 1982 or 2002, but we do know that approximately two-thirds of the technical IT staff at the university in 2002 are not in the central organization. If other noncentral IT expenses have grown proportional to the staff, the total percentage of university expenses is close to 6 percent for 2002.

Clearly, expenditures of this order deserve careful management. And we have learned a lot about how to budget and plan for IT costs. Early on, many administrators treated IT purchases as one-time expenditures, funded through year-end surplus funds or provided as gifts. Today, we all realize that each new computer will need to be replaced in three years, and each new capability will require care and feeding in perpetuity. We have become and need to continue to be long-term strategic thinkers with regard to managing costs.

**Convergence of Technologies**

Concurrent with IT's rapid growth, the elements of technology have been undergoing significant convergence. At one point, institutions
provided access to movies and other illustrative materials through audiovisual centers. Meanwhile, the business functions received IT support through administrative computer centers, reporting usually through the chief financial officer, while the academic computer center, reporting to the provost, provided tools for research computation. Telephone service was purchased from the local Bell company; if it was provided on campus, the telecommunications department was usually part of business services. Each of these functions reported through a different vice-presidential line, and their respective technologies were completely different.

During the past two decades, these technologies, and in many cases their underlying protocols, have converged. As was the case with technology growth, this convergence initially caused great stress on organizations. With time, we have seen how to reorganize IT to take advantage of the underlying commonalities. Most campuses today have one or at most two central IT support organizations instead of four or five. The ongoing convergence of technologies will continue to drive IT organizational and management practices.

**Evolution of the IT Organization**

The IT support organization is not only consolidating but also maturing. Twenty years ago, the top positions were typically occupied by those whose concept of managing was mainly about being the sharpest technologist. Even a decade ago, IT units on campus were often little more than a collection of independent practitioners. Today, many of these units use formal planning and reporting mechanisms. Their leaders have had careers in the IT industry and are seasoned managers. These organizations have also grown on the soft side, with training, help desks, and communications taking respected places alongside direct hardware and software support.

As we emerge from the revolutionary period, central IT organizations are absorbing the campus utility functions of administrative systems and communications. If we can survive the enterprise
resource planning phase, there is some reason to anticipate a period of stability in these functions, and during that time we may be able to improve on the efficiency of IT performance. Conversely, day-to-day instructional technology will probably evolve to be supported largely by the schools and colleges within universities, as has already happened with all except the highest-powered research computing. Institutions that have strategic agendas that depend on instructional and research computing will continue to support those elements at the institutional level.

**Basic Elements of the IT Function**

The IT function has the following basic elements (see Figure 1.1):

- The services delivered to the institution (for example, e-mail, payroll services, and electronic conferencing)
- The technologies (that is, the hardware and software) that deliver services

![Figure 1.1. Elements of the IT Function](ch01.McClure  4/28/03  10:45 AM  Page 9)
• The people who manage the services and technologies and support other people in their use

• The financial resources invested by the institution in the first three elements

• The institutional cultures that shape the other four elements

Only by considering all of these elements, and the ways in which they interact, can an institution effectively manage IT. The chapters that follow suggest ways to achieve alignment between these basic elements by implementing synergistic processes that enfold them all.

Tools for Managing the Basic Elements

The art of IT management is to design processes and structures that successfully combine the five basic elements. Ideally, the basic elements are managed through planning, organizing, funding, assessing, governing, and nurturing (see Figure 1.2).

Setting up these processes and structures is not something that is done regularly, and changing any one of them represents a major project in most organizational settings. We tend to think about them when the existing way of doing things quits working, when we have to change one element for some reason and that change raises questions about others, or when some truly new opportunity presents itself. In these situations, we need to make the major investment to redefine our strategies.

The chapters that follow provide many references, direct and indirect, to the five basic IT elements and the institutional processes for managing them. In Chapter Two, James Penrod describes the mechanisms of governance as they are designed to respond to other aspects of culture and environment. He calls special attention to the needed alignment between various governance and decision-making processes. James Neal and I examine options in Chapter
Three for structures to organize people under various cultural and environmental conditions.

In Chapter Four, David Smallen and Jack McCredie explore sustainable funding models for technology use and development in a variety of institutional settings. Next, in Chapter Five, Alan McCord helps us think about new mechanisms for acquiring IT services from internal or outside providers. These mechanisms will have major impacts on the other elements of institutional IT function.

Tracy Mitrano discusses in Chapter Six the governing aspect of policy, its formulation, and its relationship to institutional policy generally and some contemporary developments in IT policies specifically. In Chapter Seven, Ronald Johnson, Tracy Mitrano, and R. David Vernon look for ways to provide secure IT systems by managing people’s behavior. Some of the mechanisms for doing this are technological; others are cultural.

Marilyn McMillan and Toby Sitko show that managing business continuity has become a university-wide priority, not simply a concern for technologists. They outline in Chapter Eight an approach...
for engaging all of the right people in the essentials of continuity planning and emergency preparedness. Finally, in Chapter Nine, Brian Hawkins and Carole Barone develop ideas about new forms of assessment.

All of the chapter authors contribute valuable perspectives on some aspect of management that IT managers deal with almost every day.

The IT Manager as Gardener

It is common to talk about reengineering higher education or elements of it, like teaching. Reengineering may be an idea that IT managers can use, but only in the context of the higher-level processes that I have been describing. An analogy I like to use is gardening. IT management is akin to planting seeds of ideas and waiting to see if any will germinate. If they do, we scurry around to find water and nutrients, and we try to keep the weeds at bay, so that the practices we need to encourage have a chance of taking hold. As they grow and develop, we are constantly called on to cultivate their soil and to stake and prune and protect them.

To take the analogy in a slightly different direction, the main challenge of the next decade will be harvesting the benefits from the profound institutional changes that have followed the computer revolution. Because this challenge is not about IT itself, IT leaders will play only a part in it—a less visible part than others, perhaps, but indispensable nonetheless. The big question we will need to address is this: How can we continue to deliver the infrastructure, applications, and services in the most efficient way possible to enable these institutional benefits? The answers offered in the following chapters are varied and inspiring.

References

Bowen, W. G. "At a Slight Angle to the Universe: The University in a Digitized, Commercialized Age." ARL: A Bimonthly Report on Research Library