In higher education, the level of interest and enthusiasm for infusing information technology (IT) into the teaching and learning process is notable. For most institutions, however, new technologies represent a black hole of additional expense as students, parents, and faculty alike demand access to each new generation of equipment and software. Most campuses have bolted new technologies onto a fixed plant, a fixed faculty, and a fixed notion of classroom instruction. Under these circumstances, technology becomes part of the problem of cost containment rather than part of the solution. By and large, colleges and universities have not yet begun to realize technology’s promise to generate a return on IT investments by reducing the cost of instruction.

Making use of new technologies to reduce the cost of instruction requires a fundamental shift in thinking. It requires challenging the primary assumption of the current instructional model: that the only way to achieve effective student learning is for faculty members to meet with groups of students at regularly scheduled times and places. Rather than focus on how to provide more effective and efficient teaching, colleges and universities must focus on how to produce more effective and efficient student learning. Faculty are only one of many resources that are important to student learning. Once learning becomes the central focus, the important question is how best to use all available resources—including faculty time and...
technology—to achieve certain learning objectives. Instead of asking faculty to work harder, we need to enable them to work smarter.

Responsible members of the higher education community have an interest in lowering the cost of instruction as long as such an effort does not result in a reduction of quality. But some institutions have different reasons for wanting to reduce costs. Some are concerned about reducing the cost to society—that is, the level of tuition and fees. Both of these views tend to come from outside the institution. Stakehold- ers such as students, parents, and legislators have different reasons for wanting to reduce costs. The belt-tightening activities of the past decade have left many institutions with almost no discretionary funds. Institutions are pressured to invest more in IT, but many are hard-pressed to find additional funds for such investments. Finally, those in higher education most threatened by the growth of private-sector competition need to find more cost-effective ways to maintain their position in the new marketplace.

How can IT be used to reduce costs and increase academic productivity? Many experts have pointed out that moving away from our current model of student-to-teacher in order to maintain their position in the new marketplace.

The University of Central Florida (UCF) expects to grow from its current 30,000 students to 40,000 by 2010. UCF is aggressively developing distributed learning alternatives to meet the diverse needs of its student body. As part of this effort, UCF has launched several initiatives to test and implement web-based learning. These initiatives include a new online degree program, a distance education program, and a telecommuting program. The university has also developed a new online courses management system, which allows faculty to design and deliver online courses.

Some campuses have moved beyond the use of technology to “support excellence.” The University of Colorado–Boulder has chosen the World Wide Web as its primary medium for delivering course materials. The university has also developed a new online degree program, which allows students to complete their degree requirements online. The university has also developed a new online courses management system, which allows faculty to design and deliver online courses.

Many campuses want to “integrate appropriate technology” into the academic program but do not define what is “appropriate.” Others seek to use technology to “achieve academic goals” but do not specify those academic goals.

An Institution Must Want to Reduce Costs and Increase Academic Productivity

It is important to recognize how many institutions really want to reduce or control costs and increase academic productivity. Many, for example, believe that rich in- clusion is characteristic of high-quality, quality learning experiences. At the state level, they have built their reputations on that view. Others recognize that increas- ing academic productivity is key to their future prosperity.

For some institutions, the prospect of increased productivity and more efficient and cost-effec- tive instruction can indeed reduce instruc- tional costs. The California State University system, for example, is projected to grow by approximately 100,000 students through 2008. Some of this growth will have to be accommo- dated through increases in productivity, and using IT in this effort is a key system- wide goal. The University of Central Florida (UCF) expects to grow from its current 30,000 students to 40,000 by 2010. UCF is aggressively developing distributed learning alternatives to meet the diverse needs of its student body. As part of this effort, UCF has launched several initiatives to test and implement web-based learning. These initiatives include a new online degree program, a distance education program, and a telecommuting program. The university has also developed a new online courses management system, which allows faculty to design and deliver online courses.

In contrast, campus planning weak- ness can easily be spotted when gen- eralities predominate in planning state- ment. The main new TLE Initiative is the “support-whatever-walks-in-the-door” approach that characterizes most cam- pus efforts.

Yet several universities have chosen to integrate IT into the teaching and learning process as a central strategic goal. Such integration has strong support from the campus community and from the administration. In each instance, the campus has gone beyond creating an IT plan to in- tegrating plans into the organizational planning process. A basic assumption of UCF’s strategic plan for the future, for example, is that the use of advanced IT resources and services will accomplish the univer- sity’s mission. UCF has formally recog- nized distributed learning as a strategic direction, and has set clear institutional planning goals. The university has also developed a new online courses management system, which allows faculty to design and deliver online courses.

Institutional Goals Rather Than as a General Resource for All Faculty and for All Courses

Almost every college and university in the country provides some kind of sup- port for faculty to integrate technology into their teaching. Most do not, however, stop there. They do not consider the use of technology as a way to achieve specific institutional objectives. Many campuses want to “integrate appropriate technology” into the academic program but do not define what is “appropriate.” Others seek to use technology to “achieve academic goals” but do not specify those academic goals.

Institutional Learning and Society (ATLAS), is a cam- pus-based resource support from the state univer- sity system as well. ATLAS also has pro- vided some of the drive for extensive in- frastructure improvements and it forms a major part of the campus’s external pri-
(or availability) for students and faculty on their campuses because their goal is to be an early adopter of technology and demonstrate how close they are to achieving that goal.

The University of Wisconsin-Madi-
son, with 40,000 students, 10,000 academic staff, and 5,000 classified staff—can suc-
cessfully staff their own internal com-
puters and that the majority of those also own and use modern devices. In addition, UW-Madison of-
fers students dedicated learning and instruc-
tional Computer Access Desks (CAD), mathematics, statistics, engineer-
ing, auto technology, psychology, allied health, business and accounting, com-
puter graphics, electronic music, ani-
mation, film and television, English, foreign language, and African and Asian languages. DeAnza's estimates that 75 percent of its students have ac-
cess to computing through their per-
sonal means or through on-campus labs and networks. In addition, all faculty members have office computers con-
ected to the ATM-backbone network.
Ubiquitous networking is a prerequisite to achieving a return on investment. Until all mem-
bers of the campus community have full access to IT resources, it is difficult to implement significant redesign projects.

An Institution Must Have a Mature IT Organization(s) to Support Faculty Integration of Technology into Courses or Must Contract with External Providers to Supply Such Support
A "mature" IT organization is one that can provide more than technical support. It has an understanding of the goals and objectives of the institution's academic program—it can see the "big picture." More advanced IT organiza-
tions include instructional designers, ten programmers, ten part-time technicians and program-
ners all provide technical support in-
house. In addition to the above-mentioned support, DeAnza College prides itself on having identified the above-mentioned technological tenets.

Located in the heart of Silicon Valley, where technology is assumed to be a way of life, many universities and colleges are pursuing dreams of being competitive.

DeAnza College’s educational mission is to be a leader in the community in the development and implementation of the educational process. DeAnza College believes that the use of technology can enhance the educational process and improve student learning outcomes. DeAnza College has made a commitment to providing students with access to technological tools and resources that will support their learning.

DeAnza College has implemented a comprehensive infrastructure that supports a wide range of technological tools and resources. The college has invested in the latest technology equipment and software to provide students with access to a variety of tools and resources. The college has also developed policies and procedures to ensure the effective use of technology.

DeAnza College has made significant investments in technology infrastructure, including a high-speed internet connection, a campus-wide wireless network, and a variety of other technological tools and resources. The college has also implemented a comprehensive infrastructure that supports a wide range of technological tools and resources. The college has invested in the latest technology equipment and software to provide students with access to a variety of tools and resources.

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not have embraced a learner-centered viewpoint, some institutions show movement in that direction. The University of Illinois at Urbana-Champaign annually runs an Active Learning Retreat, which has been well attended by the faculty and quite well received. Although it would be a mistake to believe that “the lecture is dead” at the university, active learning approaches have become much more widespread. A campus-level committee, the Teaching Advancement Board, has recently announced an internal funding program to involve dedicated and experienced instructors in the diffusion of learner-centered approaches.

Commitment to 24x7 education is another indicator of a learner-centered emphasis. For example, the IUPUI campus network provides students with access to a virtual learning environment—anytime and anywhere—by providing a technology infrastructure that enables both traditional and distant learners to access its offerings through various media and points of connectivity. This environment increasingly provides seamless access to distributed learning applications, library resources, and student information and tools.

**An Institution Must Have Established Ways to Assess and Provide for Learner Readiness to Engage in IT-Based Courses**

Learner readiness involves more than access to computers and to the network. It also involves access to technical support for such things as using navigation tools and course-management systems. How computer-literate and network-savvy are students? Are processes in place that enable students to gain these competencies if they are lacking? In addition to technical proficiency, students need to be aware of what is required to be successful in technology-intensive courses. Are processes in place that assist them in making wise choices and that prepare them for success?

For some institutions, like DeAnza College, computer literacy is not an issue. Located in the heart of Silicon Valley, DeAnza has a very high proportion of students who are quite computer and network-savvy. Yet DeAnza recognizes that awareness of what is required to be successful in technology-intensive courses is a critical prerequisite to success in such classes. To prepare its distance learning students for that experience, for example, DeAnza recently designed and installed an extensive Web-based orientation process. Rio Salado has also made a commitment to determine learner readiness to engage in IT-based courses. Efforts include clearly listing technology requirements for Web-based courses in schedules, creating Web-based tutorials for first-time Internet students, and instituting a calling program for first-time Internet students. Rather than waiting for problems to develop, Rio calls students during the first two weeks of class to determine if they are on track or have any questions. Several other initiatives are under investigation or development, including an in-person student technology orientation, a student learning styles assessment that will help students decide which delivery modality (print, mixedmedia, Internet, or in-person) to enroll in, and a particular class, and student surveys to determine interventions that will help first-time Internet students.

UCF allows potential students in Web-based courses to assess both the technical and the skill requirements necessary for success. Technical requirements include access to the Internet, computer hardware, and computer software. Skill requirements include general computer skills, Internet skills, and study skills. Students can test their technical readiness for Web-based coursework by completing a Distributed Learning Orientation Course on the Web before registration. Before the beginning of each term, UCF holds on-campus orientations for students enrolled in fully Web-based courses. Students are exposed to the available library resources, campus services, and technical support, including the “Pegasus Connections” CD-ROM. “Pegasus Connections” assesses instructional readiness, supplies the software necessary to access Web-based materials, and provides all students and faculty with tutorials related to teaching and learning technologies. UCF plans to disseminate the “Pegasus Connections” CD-ROM to all students as they participate in the required university orientations. Making the major change from face-to-face instruction to online instruction involves far more than learning to use a computer. Many students are set in their ways after a lifetime (albeit brief) of passive instruction. They need preparation in making the transition to more active learning environments that are technology-based. Some students instinctively flourish in these new environments while others require direct intervention and assistance from faculty and staff.

**An Institution Must Recognize That Large-Scale Course Redesign Using IT Involves a Partnership among Faculty, IT Staff, and Administrators in Both Planning and Execution**

Substantive changes in the way courses are offered cannot rely on faculty initiative alone. They are systemic and involve changes in such institution-wide areas as policy, budgeting, administrative procedures, and infrastructure. Institutional policy regarding such things as class meeting times and contact-hour requirements will require revision. In some instances, obtaining the necessary governance approvals may be a prerequisite. In many cases, traditional budgeting processes do not welcome innovation and may need to be changed. Registral procedures such as the registration system or classroom assignments may need to be adjusted. Redesign may also require additional or unusual equipment purchases and deployment. The lesson of successful redesign is that many diverse members of the administration and faculty need to work together.

Virginia Tech’s administrative leadership has strongly promoted innovation in methods, content, and infrastructure. Although some faculty members have been developing new methods and materials for many years, it was administrative initiative that brought opportunities to the attention of the wider faculty and provided the infrastructure and support that enabled people to commit their time to course redesign. Meanwhile, curriculum oversight committees at Virginia Tech have learned to expect and encourage innovative course designs that break the traditional molds, providing the scheduling flexibility and
contact requirements needed by truly new approaches.

The University of Southern Maine has found that faculty and administrative collaboration is required even in the planning stages of large-scale course redesign. In addition to the time spent by faculty in redesigning one course, the registrar and the vice-president of enrollment management are considering the overall impact of asynchronous registration and course delivery and of reduced contact hours on the campus. They must also decide how to dedicate additional classroom space to computer laboratories. The provost is exploring with the University of Maine System Office of Human Resources and the faculty union, how instructors of nontraditional courses will be compensated. In conjunction with the Center for Teaching, IT staff, and administrators whose purpose is to provide input and direction to the design and implementation of distance learning courses and the technology that is used to support them. Meeting weekly, the team researches new developments in distance learning and technology, reads and discusses current publications and articles, and helps design long-range goals for distance learning and technology.

UCF is proud of its cohesive approach to addressing large-scale problems such as the shortage of on-campus classroom space. UCF recognizes that this endeavor requires collaboration and a partnership approach rather than independent action by individuals. The administrative leaders, including the president, the provost, and the deans of colleges, are committed to the use of technology as a solution to growth and space problems. This collaborative effort is evident in the institutionalization of distributed learning. UCF has developed a cross-functional group composed of faculty, IT staff, and administrators whose purpose is to provide input and direction to the design and implementation of distance learning courses and the technology that is used to support them. Meeting weekly, the team researches new developments in distance learning and technology, reads and discusses current publications and articles, and helps design long-range goals for distance learning and technology.

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For those institutions that want to see a return on their IT investment but are uncertain as to the steps they should take, these institutional readiness criteria can provide a target as they develop the necessary capabilities. Taking stock of where an institution is in relation to these criteria can be an enlightening exercise, especially if all campus stakeholders are asked to assess institutional performance independently and then are brought together to compare notes and discuss their differing points of view. Institutions can also use these criteria to establish milestones between where a campus is today and where it wants to be and to set a timetable for achieving readiness in each category.

Arriving at a state of institutional readiness is no small task. It is the result of many years of effort and several millions of investment dollars. Even the most advanced colleges and universities demonstrate greater strength in some readiness areas than others; few can claim superiority in all eight. Each of the criteria requires a somewhat different emphasis. Wanting to reduce costs and increase academic productivity, having a strategic approach, and recognizing the partnerships and institutional-wide interconnections needed for large-scale redesign are primarily attitudinal factors, requiring a significant shift in point of view from where most institutions are today. Creating a computing-intensive campus and developing mature IT support services necessitate substantial up-front investment, but such investment is essential before a return can be generated. Developing critical mass of faculty with experience in integrating IT into their courses requires both a clear institutional strategy and a rather lengthy timeline; no one has accomplished this task overnight. Making a commitment to learner-centered practices, whether they involve IT or not, and establishing ways to assess and provide for learner readiness also begin with attitudinal change. Implementing new practices is, as always, the most difficult part of the equation, but it is the key to successful redesign.

In each case, less developed institutions do not have to reinvent the wheel but instead can learn from the institutions that have made substantial progress. The bad news is that this process takes both time and money. The good news is that the most important ingredients are free: the will to start on a path and the knowledge of which paths are most likely to lead to success.