Prerequisites to Large-Scale Course Redesign

Institutional Readiness Criteria

BY CAROL A. TWIGG

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

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Illustration by Glenn Ryan

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 in quality. Different stakeholders have different reasons for wanting to reduce costs. Some are concerned with reducing the cost to society—that is, the level of state and federal allocations to higher education. Others want to reduce the cost for students and their parents—that is, the level of tuition and fees. Both of these views tend to come from outside the institution. Stakeholders within the institution have other 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 methods of operation in order 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 credit-for-contact mode of instruction is fundamental. Some approaches employ a greater reliance on asynchronous, self-paced learning modes; others use a traditional, synchronous classroom setting but with reduced student/faculty contact hours. Both rely on shifting faculty time-on-task to the technology or lessening the labor-intensive quality of instruction. Both are designed to transfer the focus of activity from the faculty to the student: to student problem-solving and interactive learning rather than faculty presentation of material.

For institutions wanting to see a return on their IT investment, redesigning large-enrollment introductory courses represents an excellent opportunity. Studies have shown that undergraduate enrollments are concentrated in relatively few academic areas. Just twenty-five courses generate about 50 percent of student enrollment at the community college level and about 35 percent of enrollment at the baccalaureate level. Thus, redesigning these courses will affect large numbers of students. In addition, large introductory courses are good prospects for technology-enhanced redesign because they have a more or less standardized curriculum, outcomes that can be easily delineated, and content over which faculty are less possessive. Also, by targeting these courses, institutions will improve the large lecture course—widely regarded as a prime area of ineffective teaching. In addition, these courses serve as foundation studies for future majors. Successful learning experiences in them will influence students to persist in key disciplines like the sciences. Finally, because these courses are also feeders to other disciplines, acquiring a deeper foundation and mastery in them will help students make successful transitions to more advanced study.

While recognizing the limitations, many institutions continue to use the lecture method because they believe that it represents the most cost-effective way to deal with large numbers of students. Alternatives that improve quality and are less costly than lecture-based strategies are possible, however. They involve, among other things, shifting repetitive tasks from instructors to IT-based resources and developing IT-based interactive materials that provide rapid performance feedback to students and that increase student practice. By using such redesign techniques, an institution can indeed reduce instructional costs while maintaining or enhancing academic quality.

Yet not all institutions are ready to engage in large-scale redesign using technology. Some institutions, because of their prior investments and experiences, better understand what is required to create these new learning environments and are more ready than others to engage in redesign efforts. What follows is a list of pre-conditions—or readiness criteria—that must be in place before an institution can successfully implement such an effort and thus see a return on its investment. Examples of the ways that different institutions have met these criteria are included.

An Institution Must *Want* to Reduce Costs and Increase Academic Productivity

It is questionable how many institutions really want to reduce or control costs and increase academic productivity. Many, for example, believe that rich inputs are characteristic of high quality, and they have built their reputations on that view. Others recognize that increasing academic productivity is key to their future prosperity.

For some institutions, the prospect of increased enrollment without a commensurate growth in resources is the driving factor to reduce 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 accommodated 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 52,000 students by the year 2010. UCF is aggressively developing distributed learning programs, particularly asynchronous learning, to meet the diverse needs of its growing student population and to decrease costs through reduced seat time.

For public institutions, declining state support is another contributor to the desire to increase productivity. For example, New York now ranks fiftieth—dead last—among all states in its support for public higher education. From 1988 to 1999, state tax support for the State University of New York (SUNY) declined precipitously as appropriation per FTE (full-time equivalent) student was reduced by 36.5 percent. To deal with this resource reduction, SUNY-Buffalo, for example, knows that it must find innovative ways to maintain academic quality in the face of reduced resources. Other institutions' operating budgets have remained flat since the mid-1980s. During the past four years, the number of faculty at the University of Tennessee–Knoxville (UTK) decreased while undergraduate enrollment continued to grow. Like many other institutions, UTK faces the challenge of offering quality instruction to a steadily growing student body, with limited resources and with reduced staff. And like others, it is investigating the use of technology to achieve more efficient and cost-effective instructional delivery.

On the other hand, some institutions prefer to hope for better financial times rather than deal with the new economic reality of higher education. They are like alcoholics in denial. To be successful in using technology to reduce costs, institutions must begin by owning the problem. And just as the only alcoholics who can be helped by Alcoholics Anonymous are those who *want* to stop drinking, so too must institutions *want* to reduce costs in order to take the next step.

An Institution Must View Technology as a Way to Achieve Strategic Academic 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 support for faculty to integrate technology into teaching and learning. Most, however, stop there. They do not consider the use of technology as a way to achieve strategic institutional goals, nor do they target specific elements of the curriculum for IT application.

Yet several universities *have* made the integration of IT into the teaching and learning process a central strategic goal. Such integration has strong support from both faculty and campus executives. In each instance, the campus has gone beyond crafting an IT plan to integrating IT use into its institutional planning process. A basic assumption of UCF's strategic plan, for example, is the employment of advanced IT resources and services to accomplish the university's mission. UCF has formally recognized distributed learning as a strategic direction to improve access to educational opportunities for students and has chosen the World Wide Web as its primary tool to address a rapidly growing student population, a shortage of classroom space, and the need to maintain quality with available resources. Its strategic plan makes a strong commitment to contribute significant resources to employ technology effectively throughout the university.

The University of Colorado–Boulder has made the creation of a Total Learning Environment (TLE) the cornerstone of its future planning. The main new TLE initiative, the Alliance for Technology, Learning, and Society (ATLAS), is a campus-wide enterprise aimed at establishing excellence in integrating information and communication technology into teaching, curriculum, research, and outreach. Started in 1997 with a substantial ongoing resource commitment and the highest visibility of all initiatives on campus, ATLAS has received considerable resource support from the state university system as well. ATLAS also has provided some of the drive for extensive infrastructure commitments, and it forms a major part of the campus's external private, industrial, state, and federal fund-raising objectives. At UCF and UC-Boulder, the commitment to IT development is palpable on campus: these universities and others like them are putting their money where their mouths are.

Some campuses have moved beyond the level of generally supporting all academic programs to targeting specific, strategic parts of the curriculum. At SUNY-Buffalo, a Faculty Development Working Group focuses on supporting faculty and curriculum IT development in the introductory courses most affected by freshman enrollment. The University of Pittsburgh also targets large, introductory courses as one area for strategic focus in its efforts to improve undergraduate instruction. Virginia Tech's Center for Innovation in Learning (CIL) offers faculty grants to encourage technology integration in targeted curricular areas, one of which is high-demand, core curriculum courses. Each of these institutions also provides general support for instructional technology, but all have taken an important step in moving beyond the "support-whatever-walks-in-the-door" approach that characterizes most campus efforts.

In contrast, campus planning weaknesses can easily be spotted when generalities predominate in planning statements. 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. Some want to "reconceptualize undergraduate education" but are woefully silent when it comes to defining how they will do so. Many see technology use as a means to "encourage collaboration"—as if collaboration, like innovation, is an end in itself. Collaboration for what purpose? And of course, almost everyone wants to use technology to "support excellence."

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An Institution's Goal Must Be to Integrate Computing throughout the Campus Culture

The French writer Anatole France once said, "Those who don't count, don't count." In the institutional computing arena, his comment has merit. Unlike the many institutions that have established "initiatives" without specific milestones, "computing-intensive" campuses (as the University of Illinois at Urbana-Champaign describes itself) know the numbers. They know the level of availability of network access and the level of personal computer ownership

(or availability) for students and faculty on their campuses because their goal is saturation, and the numbers tell them how close they are to achieving that goal.

The University of Wisconsin–Madison—which serves over 40,000 students with over 2,000 faculty, 5,000 academic staff, and 5,000 classified staff—can succinctly state that two-thirds of its students own computers and that the majority of those also own and use modems. In addition, UW-Madison offers students sixteen general-access InfoLabs containing 1,100 computers. Students sign into the InfoLabs over 1 million times and use 3.5 million hours of computing time annually. Almost 90 percent of faculty and 72 percent of full-time staff own and use a computer.

Every member of the Penn State community (faculty, staff, and students) is given, at no cost, an account that allows—among other benefits—unlimited e-mail access, unlimited connect time via modems, large amounts of free software, and free Web space. More than 9,200 students have an active Ethernet port in their residence hall room. Within one year, every classroom at University Park will have an active Ethernet port so that faculty can easily bring technology into the classroom. University Park has nearly 1,800 public workstations and nearly 2,500 college- and department-based workstations. Similar facilities exist at all other Penn State campuses.

Located in the heart of Silicon Valley, where technology is assumed to be a way of life and not just a tool for accomplishing certain tasks, De Anza College prides itself on having been identified as the "most wired community college" by *Yahoo! Internet Life Magazine* in 1997. In 1995, DeAnza opened the Advanced Technology Center, a 66,000-square-foot building focused on instructional technology. Approximately 95 percent of the building contains dedicated labs or classrooms for direct instructional support, including nearly 1,000 networked computers. About 10,000 students use this building each day for subjects as diverse as computer science, CAD, mathematics, statistics, engineering, auto technology, psychology, allied health, business and accounting, computer graphics, electronic music, animation, film and television, English composition and literature, ESL, and foreign languages. DeAnza estimates that 75 percent of its students have access to computing through their personal means or through on-campus labs and networks. In addition, all faculty members have office computers connected to the ATM-backbone network.

Ubiquitous networked computing is a prerequisite to achieving a return on institutional investment. Until all members 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 organizations include instructional design capabilities and specific experience with supporting course redesign.

Rio Salado College, one of the ten Maricopa County Community Colleges, has been involved in online education for the last three years and distance education for the last twenty years. Currently, 80 percent of its general education courses are delivered via technology. Twenty-three full-time and ten part-time technicians and programmers provide all technical support in-house. In addition to the typical campus units that support hardware and software (Information Services) and Help Desks for students and faculty, Rio's Web Development unit supports the development and maintenance of its Web-based courses.

UCF has a special unit, Course Development & Web Services (CD&WS), with responsibility for faculty development and Web-based courses. The CD&WS staff includes five instructional designers, ten programmers (called "TechRangers"), six digital media specialists, four software engineers, and three administrative staff. The full-time staff, supported by part-time students, interns, and graduate researchers, make up five cross-disciplinary teams that work on multiple projects. The instructional design team creates and delivers professional-development curriculum and consults with faculty to assess course needs. TechRangers produce Web-based materials for courses and other strategic campus Web sites. The digital media team produces all graphics and photos for Web sites, print material, CD-ROM, and video and does video and audio production and editing. Software engineers create databases and systems to support large projects. The administration team provides planning, project management, facilitation, and clerical support. This comprehensive support unit enabled UCF to enroll nearly 6,000 students in Web-based courses during the spring 1999 semester.

The Advanced Information Technology Lab at Indiana University–Purdue University at Indianapolis (IUPUI) has developed OnCourse, an Internet-based course environment, in collaboration with its Center for Teaching and Learning. OnCourse provides a comprehensive platform for creating, using, and maintaining Web-based teaching and learning environments. OnCourse can dynamically create Web sites for all IUPUI courses and can automatically provide instructors and enrolled students with network ID-based access to the sites. Course sites include up-to-date class rosters; a user profile (home page) for everyone associated with the class; tools for chat, mail, and conferencing; and the ability to integrate online testing, Web authoring, and multimedia resources. OnCourse can be used with university databases, enabling course templates to be pre-populated with course, student, and faculty information. During spring semester 1999, faculty conducted more than 350 course sections at IUPUI by using OnCourse.

Just as many campuses today no longer develop their own administrative applications but instead turn to contractors, institutions do not necessarily need to develop in-house units for technical instructional support. They can contract with one of the growing number of external service providers that have specific expertise in developing online learning environments. Before beginning to develop their own instructional products and services, campuses should think carefully about whether to build or buy. They should also take care not to confuse technical support with instructional design support, whether its source is on or off campus.

A Substantial Number of an Institution's Faculty Members Must Have an Understanding of and Some Experience with Integrating Elements of Computer-Based Instruction into Existing Courses

Some faculty may have a great deal of enthusiasm for large-scale redesign but little prior experience in this area. It is difficult to complete a successful large-scale redesign project by starting from scratch. Having experience with integrating smaller IT elements into courses helps faculty to prepare for large-scale redesign efforts. Some experts have said that 13 to 15 percent of the faculty constitutes critical mass.

Once again, knowing the numbers matters. The following institutions contrast with those that can cite only goals and plans for faculty involvement or "participation in training and development workshops"—without any clear idea of how such training experiences translate into new kinds of learning experiences for students.

The University of Pittsburgh has about 3,000 faculty at its main and regional campuses. Pitt estimates that at least one-fourth of its faculty use Web and other computer-based materials in their teaching. In the past year alone, nearly 200 faculty members have participated in training on the campus course-management system, *CourseInfo*. As a result, about 125 faculty have used *CourseInfo* for their courses, affecting about 5,000 students. The rapid deployment of the *CourseInfo* software reflects the high level of faculty readiness for integration of technology into their courses.

SUNY-Buffalo recently conducted a survey of all undergraduate courses in its new College of Arts and Sciences, looking for courses with a significant Web-related component (i.e., beyond mere electronic posting of syllabi). The university now knows that about 20 percent of its current courses are using computer-based IT. These courses are distributed evenly among humanities, social sciences, and natural sciences and mathematics.

UCF describes faculty use of the Web in three ways. Each has an associated level of university-provided support. In the first category are those faculty who are using the Web to create an online presence for their courses, ranging from an online syllabus to extensive links to related course materials. The second level includes courses running in the university's standard course-management environment, WebCT. Currently, there are nearly 700 WebCT accounts, with more than 24,000 registered users. In the third category are media-enhanced and fully Web-based classes that involve extensive faculty training and team-produced materials. Faculty preparing to teach these third-category courses take an eight-week course on Web-based instruction. To date, 138 faculty members have completed this course, and 200 such courses have been developed. UCF's goal is to move faculty toward increasingly higher levels of training and quality and to bring *all* UCF courses to the Web.

An Institution Must Have a Demonstrated Commitment to Learner-Centered Education

In learner-centered education, (1) the locus of activity has shifted fundamentally from the instructor to the learner and (2) student engagement independent of time and location is not only permitted but promoted. Community colleges frequently have a clearer commitment to learner-centered education than other sectors because of the emphasis of their missions. Part of Miami-Dade Community College's mission is to "provide accessible, affordable, high-quality education by keeping the learner's needs at the center of the decision-making process." The college recognizes that each student is different and, therefore, should have available a variety of modalities that support academic, personal, and career development.

Likewise DeAnza College points to the range of pedagogical practices it uses to address the variety of student learning styles. These include distance learning, self-paced modules, learning communities, and collaborative learning; a strong staff-development program to assist faculty, staff, and administration in shifting from a teaching institution to a learning institution; and the institution's personnel practices, which incent and reward those who excel at contributing to student access and success.

Rio Salado College has embraced the concept of learner-centered education for decades. Rio begins each of its distance learning courses twenty-six times a year. This means that students never have to wait more than two weeks to start a class. In addition, although each distance course is advertised as a fourteen-week class, students are allowed to accelerate or decelerate as needed. Such flexible scheduling involves the creation of new processes and support mechanisms. Learning takes place year-round, and learning support services are provided year-round as well.

Even though an entire campus may

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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 proficiencies, 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, mixed-media, Internet, or in-person) to enroll in for 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 via technology. 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 learning 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. Registrarial procedures such as the registration systems 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, other academic administrators are investigating how one initial large-scale redesign might benefit other courses in the institution, as well as exploring how this first course might be useful to other campuses in the state. In effect, even though Southern Maine's initial effort has been focused on a particular course, everyone involved sees this as the first in a series of improvements designed to enable the campus to achieve its institutional goal of more effectively serving students in southern Maine and also the rest of the state.

Many years ago, Rio Salado College recognized that distance learning and technology could not exist as departments separate from the rest of the college. The processes that support distance learning and technology are integrated throughout the entire college, which has learned to make any changes and adjustments from a systems perspective. One of the core process teams, called the Development Team, is 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.

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. Units are structured to develop the technical infrastructure, to provide administrative support and leadership, to implement systematic faculty development, to provide learner support, and to conduct ongoing assessment.

Institutions that have not recognized this interdependence view redesign as primarily a faculty matter, frequently as an individual faculty member's task for his or her particular course, with some support from the IT organization. Such a view will inevitably resign institutional advancement to—in Eduprise.com founder Bill Graves's apt phrasing—"random acts of progress" rather than substantive accomplishment. And inevitably these efforts will be undersupported and incapable of generating a return on institutional investment.

Conclusion

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 institution-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 a 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.