Perspectives on Higher Education in the Global Market: An Interview with Sir John Daniel and Governors Michael Leavitt and Roy Romer

Assessing the New Competitive Landscape

Linking Strategic Planning with Program Implementation for Distance Education

Changing (Almost) Everything and Keeping (Almost) Everyone Happy

Plus:

Why Policy Matters

Considering Thin Client Computing for Higher Education

Enterprise Network Management: Solutions Are Needed!

Should Colleges and Universities Require Students to Own Their Own Computers?

Campus Profile: Colby College
CAUSE/EFFECT
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Colby College

On the cover: Colby College’s 714-acre campus, located in Waterville, Maine, can be identified by its Georgian architecture. The entire campus is a Maine Game Preserve and Wildlife Management Area. Photo by Dean Abramson.

Above: Colby recently adopted a dual-platform standard, supporting both Windows and Macintosh environments. Approximately 80 percent of Colby students own computers, many of which are laptops.

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At the 1998 Seminars on Academic Computing, Program Chair Mark Resmer in his introductory remarks quipped that it isn't often we have the opportunity to hear from “two governors and a knight.” He was referring to SAC's good fortune in having Sir John S. Daniel, vice-chancellor of the U.K. Open University, deliver the conference’s keynote address, with Colorado Governor Roy Romer and Utah Governor Michael Leavitt also on hand for a post-presentation Q & A session. CAUSE/EFFECT capitalized on this opportunity to bring some of the thoughtful dialogue from that meeting to our readers through an interview conducted by Polley Ann McClure, newly elected chair of the EDUCAUSE Board of Directors.

Sir John Daniel is enjoying increasing and well-deserved recognition in the U.S. as the author of Mega-Universities and Knowledge Media: Technology Strategies for Higher Education (see page 18 for a review of this title). As co-founders of the Western Governors University, Leavitt and Romer also have an intense interest in the potential of information technology to enable colleges and universities to deliver education in new ways, unfettered by space and time constraints, and consequently to new audiences—especially those who are unable to have a residential campus experience.

McClure's insightful interview questions elicited some equally insightful answers from these leaders, all of whom believe that it is imperative that colleges and universities take a hard look at their missions and roles in an increasingly global and age-independent education marketplace. For many, they say, this isn't just a question of innovation but a matter of survival.

Two other articles in this issue relate to this imperative and, in fact, both provide some very practical advice at the institutional level. Blustain, Goldstein, and Lozier offer a useful framework for assessing an institution's potential position in the distance education marketplace, identifying barriers to entry, creating a business plan to take advantage of new opportunities, and charting a sound course to compete. Authors Berge and Schrum advocate taking an integrated approach to planning for and implementing a distance education program to ensure that it will be part of the overall fabric of the institution, rather than a marginal add-on.

With the consolidation of CAUSE and Educom, CAUSE/EFFECT has become a publication of EDUCAUSE. While we will continue to be a practitioner’s journal whose primary mission is to provide a forum for sharing campus experiences and issues related to managing and using information resources, we also recognize the importance of covering issues that challenge higher education as a whole. Thus the “Current Issues” articles we bring you will address not only campus information resources policy and practice issues, but national and international policy issues as well. See Polley McClure's article on why such policy issues matter for an overview of some of the ongoing and emerging higher education issues we'll be following in the coming months.

As EDUCAUSE continues to articulate future strategies and programmatic directions, a key area targeted for attention is association publications. Building on the excellence of our predecessor organizations in this area, we want to continue to provide our members the information you need to do your job well and to understand the broader higher education context within which you do that job. To that end, within the next few months EDUCAUSE will be disseminating a survey to a sample of readers to gather feedback about our current publications and how you prefer to receive them and other member products and services. If you are among those who receive this survey, please take the time to complete it! Of course, we will share the results of the survey with you, as well as any potential changes that may occur in response to your feedback.

While periodic formal surveying is a valuable activity, don't forget that you can share comments and suggestions with us at any time (judy@educause.edu). So let us hear from you!

Julia A. Rudy, CAUSE/EFFECT Editor
One main goal for the newly consolidated EDUCAUSE is to heighten the association's effectiveness by combining the complementary strengths of CAUSE and Educom. Nowhere is this likely to be more apparent than in EDUCAUSE's policy programs. One strength that Educom brought to the merger was its historical advocacy on behalf of our institutions for technology, legislative, and policy initiatives at the national level. CAUSE also worked on our behalf on national issues, channeling many of its activities through alliances with other associations. Educom's policy emphasis tended to focus on the technology infrastructure and academic issues, whereas CAUSE focused on institution-wide administrative and management policies. Both CAUSE and Educom have thoroughly analyzed and interpreted issues through publications, conferences, and professional development activities. Their efforts assisted us, as information resource professionals, in being more effective leaders in our organizations and institutions. The combined strengths and emphases will be an even more powerful force on our behalf, both within and beyond our campus borders.

The purpose of a policy leadership agenda is to use our collective intelligence and powers of persuasion to effect change (either to bring about new technologies we need or to cause government or industry to allocate resources or to change regulations) to enable some set of activities we deem important. Each of our institutions uses a variety of advocacy mechanisms to accomplish our goals, but typically we use associations such as EDUCAUSE when the changes we seek are larger than we can achieve alone and when we have consensus about the nature of the needed change within a group of institutional representatives who are motivated to take action.

Internet development: example of success

Educom was fortunate to have both an active group of member representatives who could foresee many of the needs of higher education in the information technology domain and a professional staff with the knowledge and interest to translate those needs into strategies for change that could be articulated to policy-makers. Probably the most obvious outcome of this activity is the current Internet. As internetworking technologies began to be developed and proven in restricted research arenas, a group of leading members of our community realized the broader potential these technologies held for communication and collaboration among scholars. They formed the Networking and Telecommunications Task Force (NTTF) within Educom and assumed a policy leadership role, working with legislators, corporations, and government agencies to help bring about a viable national infrastructure. Initially this national infrastructure was just for research and education uses, but the even broader potential quickly became apparent. NTTF understood when the Internet needed to be “cut loose” from the research and education community and allowed to “grow up.” When the resulting limited-bandwidth, congested, rapidly growing network proved unusable for current and future needs of higher education, NTTF launched Internet2 to begin the cycle again.

The point of this example is that Educom/NTTF members understood the benefit that advanced communications networks could bestow on individual scholars and on their institutions (and on the whole world) and took steps to systematically remove the barriers to their development. These initiatives were carried out by a relatively small number of individuals and institutions, but we all enjoy the benefits of their work today.

“The purpose of a policy leadership agenda is to use our collective intelligence and powers of persuasion to effect change...”
A corollary element of the Educom policy programs carried out by NTTF was the advanced professional development of the involved CIO’s and networking staff. Educom’s senior staff sent out regular bulletins analyzing the major issues being discussed in Washington circles. NTTF members met as a group several times a year in conjunction with other conferences, and NTTF sponsored the annual Net9X conferences in Washington. These efforts gave all of us a much more sophisticated understanding of the topics and enabled our effective participation in the policy process. We were able to more effectively communicate these issues back to our institutions and to plan for appropriate technology on our campuses as a result. As we spoke at conferences and published articles in CAUSE/EFFECT, Educom Review, and elsewhere, the word spread to an even wider circle of people and institutions.

Enlarging the discourse: grassroots strength

In my view, one of the most exciting opportunities created by the formation of EDUCAUSE is to more effectively couple the policy process with the needs of a larger and broader cross-section of the higher education community represented by our combined memberships. As in the example of the first Internet, we all eventually benefit from these individual initiatives, but I think the new structure can provide more information more quickly to more of us and increase the rate at which the broader benefits are derived. With a more diverse institutional membership, we also ought to be able to identify a larger array of policy issues that will benefit more of our institutions. And, of course, our voice will be much stronger because we represent the professional information technology focus for all of higher education.

Until recently, most of the policy issues of concern to Educom and CAUSE members remained within the domain of our professional associations. Others within our institutions, with the exception of many in the library community (and on some issues, telecommunications directors), rarely engaged with “our” concerns. Today that is changing. Provosts and presidents are realizing that the Internet, distributed learning, and copyright issues, for example, are central to overall institutional strategy, not just to librarians and technologists. Other associations, including the presidential organizations, have begun to put information technology/resource issues on their agendas.

Meta-collaborations: logical partnerships for change

This last year the Commission on Information Technology of the National Association of State Universities and Land Grant Colleges (NASULGC) took the lead in forming the Higher Education Alliance for Information Technology. The alliance represents all of higher education at the highest levels, including members from the American Association of Community Colleges (AACC), the American Association of State Colleges and Universities (AASCU), the American Council on Education (ACE), the National Association of Independent Colleges and Universities (NAICU), and NASULGC. Its purpose is to speak with a common voice for higher education on national policies that will permit our institutions to exploit and advance the digital environment to carry out our missions. The work of the alliance is supported by EDUCAUSE, the Association of Research Libraries (ARL), and the University Continuing Education Association (UCEA).

The alliance has identified five areas that will form its current policy framework.

Intellectual property. As technologies for the representation of ideas change, it is important that our interests as producers and as consumers of information be protected. On the one hand, we want to have our intellectual property protected, while on the other we want to have fair use of copyrighted materials for educational purposes. For a third, we wish to promote an environment that supports a robust electronic commerce in intellectual property. Any new laws should facilitate our access to materials as needed to ensure that as formats change with new technologies, we can preserve and migrate scholarly information appropriately. Databases should be governed by the same principles of balance between protection and use as other copyrighted materials. We need to understand the nature of our institutional liability if individual members of our community violate copyright protections when they are using resources provided by our institutions. We should be held accountable for making sure our community is informed about the law and policies, and we should fully investigate allegations.
of misconduct, but laws should take into account our inability to assume responsibility for all individual behavior within our walls.

Free speech and inquiry. The First Amendment protection from government intrusion into individual freedom of expression must be translated effectively into the digital domain. This protection is often at risk at state and federal levels as government entities seek to limit exposure to various forms of offensive content available through the Internet.

Advanced communications. The evolution of our missions of research, teaching, and service will be enhanced by increased government funding to support advanced communications capability. Internet2 is a partnership among higher education, the private sector, and government to bring into existence the infrastructure and applications for advanced collaboration. As soon as the initial infrastructure is successfully deployed among Internet2 member institutions, we need support to extend it to all other members of the education community. In order to ensure the continued availability of enhanced technologies into the future, adequate funding for R&D should be provided. The government should adopt policies that protect our ability to successfully navigate future generations of Internet technologies through adoption of open standards.

Telecommunications policy and regulation. The convergence of communications technologies has begun to prompt reassessment of federal and state policies regulating the telecommunications industry. It is in our interest as Internet service providers that current freedom from burdensome regulations be continued. We support the philosophy behind the notion of universal service in order that all citizens have reasonable access to new network-based educational services and resources. We need the most extensive access we can get to the broadcast spectrum.

Distributed education. The pace of change and availability of information in the next century make continual learning essential for citizenship and effective participation in the workforce. Government policies should provide for seamless access to educational services from pre-kindergarten throughout a lifetime. Particularly important to this goal is the extension of advanced networking services into all homes, education providers, and workplaces.

Involvement and communication: keystones for success

As a key member of the professional support team for the alliance, EDUCAUSE will play an active role in the evolution of each of these issues. Clearly these are as important to smaller institutions as to larger, to private as to public, to research-oriented as to teaching, and to for-profit as to nonprofit. All EDUCAUSE members need to be kept informed about these issues as they change, as the issues evolve, and as new issues emerge. EDUCAUSE helps us stay informed about these issues through the Washington Update, a periodic electronic news bulletin sent to all members, and through its conferences and professional publications.

In addition to this work, EDUCAUSE has been and will continue to be effective in advocating for our interests and interpreting the landscape on other policy fronts. This year, for example, EDUCAUSE worked with the National Association of College and University Business Officers (NACUBO) to clarify the implications of the Lifetime Learning Credit and Hope Scholarships provided through the Taxpayer Relief Act of 1997. A glance at NACUBO’s Web site (see http://www.nacubo.org/website/tra97/results_issues.html) illustrates the complexity of the impact. Each of our institutions will have to ensure that our administrative systems are modified to comply with new reporting requirements. In addition, taxpayers will benefit from required investments in fees and tuition for higher education which in turn should help to promote access to our services. These benefits are less tied to traditional, full-time study than they were in the past. Without EDUCAUSE’s and NACUBO’s extensive support for this legislation, each of our institutions would be required to puzzle out all the implications for ourselves.

Distributed education: maximizing opportunities and evolving roles

Many of the above issues being addressed by national and state policymakers have massive implications for campus policy. None in my view, however, has greater implications than distributed education. New societal needs pose exciting opportunities and serious threats to the very core of our mission and academic values. Few of our institutions will escape major change as a result of the choices we make about whether
and how to alter our traditional missions in response to these new needs.

EDUCAUSE’s National Learning Infrastructure Initiative (NLII) seeks to discover the technological, economic, and policy barriers to distributed and individualized learning and to pursue new ideas for their removal. One of NLII’s most ambitious projects in this regard is the development of a set of standards and proof-of-concept implementation known as the Instructional Management System (IMS). IMS is intended to remove the barriers to the development of broadly useable educational software regardless of user or provider technological environment. Using such a platform, providers can greatly increase their ability to provide individualized access to learners at any location or time, and learners will have access to many more opportunities for education than they do now. New providers will doubtless enter the educational arena. Each of our institutions has the opportunity to exploit new markets if we choose, and we face significant new competition even within our traditional markets.

These questions of institutional strategy and policy are not typically in our domain as technology providers. But the technological capability we manage increasingly brings these fundamental matters to our doorsteps. It is necessary for our institutions to decide them with our help and guidance, and for us to provide the services and facilities to deliver on those decisions. Institutional leaders will come to rely on our interpretation of technological alternatives to help guide them through their own layer of policy-making. EDUCAUSE can help each of us be smarter so we can help our institutions succeed in their individual transformations.

Picking the issues: who, what, when, and how

An important new issue for EDUCAUSE, because of the much greater diversity of interests among its members since the merger, is how to select which policy questions to tackle, and in some cases—where we may not all agree on the same approach—what, if any, position it should take. One possibility would be to engage an issue and a position only when we can demonstrate a clear consensus among us. This sounds democratic, but would, in my opinion, be fatal. Rarely do these issues come up with adequate time for all of us to learn all that we need to in order to participate in an informed discussion that can lead to consensus. The effort to generate that broad agreement would almost surely retard any progress to such a pace as to be useless, particularly given the pace of change in our environments. EDUCAUSE’s credibility hinges on agile, rapidly applied expertise that takes the form of expert advice and advocacy to policy makers as soon as it is needed. Different kinds of institutions and different professional roles among individuals dictate the need for different responses from EDUCAUSE. One important strength of CAUSE was in creating micro-environments in which diverse interests could participate. We need to find ways for EDUCAUSE to make itself hospitable to policy diversity and be able to advocate with integrity on a broader set of issues and positions than either Educom or CAUSE. The EDUCAUSE staff and Board are committed to the goal of effective leadership for our diverse membership.

For an environment of rapid change, delaying everything to allow for development of complete consensus will cost us in credibility, influence, and the capacity for effective leadership. The consensus that we need is one that supports the notion that got us here—faith in our designated representatives on many issues to lead us and information technology in general through the wilderness before us.

Polley Ann McClure (mcclure@virginia.edu) is vice president and chief information officer at the University of Virginia. She currently chairs the EDUCAUSE Board of Directors.
Considering Thin Client Computing for Higher Education

by Mark Sheehan

Desktop computer technology has been following a well-defined growth path for the past twenty years: personal computers (PCs) have become more powerful, their user interfaces have become more graphical, and they've become more widely interconnected with others of their kind.

It's taken a while for applications technology to catch up with the potential of the desktop computer. In the last decade, client/server applications allowed us to stop using our $2,000 desktop computers as $200 terminals. Client/server applications and PC technologies have been developing in tandem, each feeding the other's momentum. Desktop computers have become bigger (in terms of storage and memory) and faster. In response, client applications have become more fully featured.

This expansion of features in both PCs and applications has not come without a price, however, and while the price may not be slowing the progress of PC and application development, it is causing the direction of technological development to change. We are now at a crossroads in the evolution of desktop computer technology, and this is a good time to stop and take a look around.

Agents of change

Several cost factors are changing the directions in which desktop technologies will grow in the next century. Purchase price has always been an issue. While the cost per unit of processor speed, memory, and disk has been shrinking steadily for twenty years, the need to increase those capacities has been growing at about the same rate. In 1982 an adequate PC cost $2,000. It costs about the same now. The difference is in what we consider adequate.

The life span of a PC is a related issue. It's bad enough to have to spend $2,000 for a PC; it's worse to have to replace it every two or three years! But the pace of technological change often requires that. When we used old PCs as terminal emulators to access legacy, mainframe-based software this wasn't such an issue. A ten-year-old PC is as good a terminal emulator as a new PC. But now, as many of us adopt year-2000 compliant, client/server administrative software and use multimedia Web sites for our communications needs, the PC client software we use is more complex and more of us—sometimes hundreds more of us at once—need up-to-date PCs on our desks.

Finally, we're beginning to realize the extent to which support costs distort the cost-benefit balance sheet of desktop computing. McClure, Smith, and Sitko provide an excellent overview of these issues behind these costs, which include growing numbers of support consumers, increasingly sophisticated applications of computer systems, lack of standardization in hardware and software, and archaic funding models for support. Industry calculations of the total cost of ownership (TCO) of a PC now take into account support costs and the total figures are staggering. A 1997 Gartner Group article estimates the TCO for a networked Windows 95 PC at about $8,000 per year. Network costs add about $2,000 per year.

Taking the load off

Concern over TCO has prompted, or at least accelerated, the development of several new desktop solutions. They are generically referred to as thin clients or network-centric computers. These umbrella terms embrace two distinct types of desktop device: the network computer and the Windows terminal. A third type, the network PC, is just a scaled-down PC and has had no real market success. We can safely forget about it.


Network computers

Network computers (NCs) are powerful microcomputers with lots of memory but no disk storage: no floppy disk, no hard disk. They are connected to a network, and through the network to a server. They are utterly dependent on the server computer for their operating system software, their applications, and their file storage. Each time the NC is booted it pulls down its operating system anew. Each time it launches an application, that software is downloaded to the NC afresh. Applications run on the desktop, on the NC’s processor using the NC’s memory.

NCs run two sorts of applications: those written for the NC’s processor (“native” applications) and Java applications. The range of native applications for NCs is very narrow at present. The most pervasive are Web browsers, though Java-based browsers are also available. Other Java-based applications include Lotus’s E-Suite (a multi-function office productivity package) and a number of Oracle data management applications. Several companies (e.g., Corel) have suites of Java-based applications under development, though as of this writing those projects show signs of having stalled out.

Windows terminals

The Windows terminal (WT) is harder to describe in physical terms because it can be practically any kind of desktop computer. Being a WT isn’t so much what a thing is as what it does. An old 386-based PC can be a WT, as can a new Pentium or a Mac or a Unix workstation. Several companies even make dedicated WTs, which serve no other function. (Incidentally, many NCs are also capable of acting as WTs.)

A Windows terminal contains its own operating system, either on its hard disk or on a chip. Unlike the NC it doesn’t download its operating system over the network. It does rely on the network for its applications, but unlike an NC the WT doesn’t download the application code and run it internally. Instead, the WT’s applications run in the server’s processor using the server’s memory. The WT’s data files are customarily stored on the server. The WT has to do only two things: send keyboard and mouse input to the server, and paint the screen with output from the server.

W Ts can access almost all 32-bit Windows applications, including the full, “thick” Win-
as a WT (Citrix MetaFrame), with minor software maintenance implications. But such minor changes should not require the periodic hardware upgrades that current mainstream PC software does.

In the NC world, as users’ expectations grow, the software market will respond with bigger, more complex Java applications. To keep up, NCs, which do much more with their on-board processors than NTs do, will probably require periodic hardware upgrades. For example, many recent NC buyers, wishing to adopt the Lotus E-Suite applications, found they needed to add more memory to their NCs. That is probably only the beginning of a trend.

Support costs

NC and WT manufacturers have capitalized on recent concerns about the total cost of ownership of desktop systems. For decades, they argue, IT administrators have looked too narrowly at hardware, software, and network purchase and installation costs, have given lip service to training and support costs, but have ignored or denied the so-called hidden costs of PC ownership. Most of these hidden costs are related to productivity and the amount of time information workers spend customizing, souping up, or otherwise “futzing” with their computers.

A network of NCs or dedicated WTs, properly run, can eliminate many productivity sinks.

The server administrator determines with absolute authority which versions of the operating system and application software are used by the thin clients on the network. Files are backed up regularly, under central control. With NCs and dedicated WTs, users have little ability to customize and needlessly complicate their computing environments (by bringing in software from outside the enterprise, for example).

When existing desktop computers are used as WTs, however, the server administrator may have complete control over centrally served applications, but no control over desktop configuration issues—likely the biggest support cost sink. In some scenarios, that vulnerability will counteract the favorable purchase price of legacy-PC WTs (see Table 1).

Controlling the computing environment doesn’t ensure good productivity, of course; human nature is (so far) not susceptible to technological controls. But a controlled computing environment can simplify training and support requirements and can eliminate many temptations to unproductive diversion of effort.

Overall TCO

Only long-term tracking of NC and WT use can bring us accurate TCO figures, but a number of industry groups have made predictions. In spring 1996, Zona Research predicted a five-year, total cost of ownership savings of 57 percent for Wyse Windows terminals versus

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Table 1: Purchase cost comparison: PCs versus thin clients

<table>
<thead>
<tr>
<th>Component Type</th>
<th>Workstations</th>
<th>Monitors</th>
<th>Server (estimated)</th>
<th>Licenses</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 PCs</td>
<td>$100,000</td>
<td>Included</td>
<td>None</td>
<td>Included</td>
<td>$100,000</td>
</tr>
<tr>
<td></td>
<td>(50 @ $2,000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 NCs</td>
<td>$37,500</td>
<td>$12,500</td>
<td>$7,500</td>
<td>Included</td>
<td>$57,500</td>
</tr>
<tr>
<td></td>
<td>(50 @ $750)</td>
<td>(50 @ $250)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 Dedicated WTs</td>
<td>$37,500</td>
<td>Included</td>
<td>$22,000</td>
<td>$3,000 (NT Terminal Server)</td>
<td>$62,500</td>
</tr>
<tr>
<td></td>
<td>(50 @ $750)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 Legacy PCs as WTs</td>
<td>Prior Investment</td>
<td>Included</td>
<td>$22,000</td>
<td>$16,000 (NT Terminal Server + MetaFrame)</td>
<td>$38,000</td>
</tr>
</tbody>
</table>

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“Most of these hidden costs are related to productivity and the amount of time information workers spend customizing, souping up, or otherwise ‘futzing’ with their computers.”
In the late 1990s, Microsoft suggested that savings of 46 percent in TCO were possible in the same scenario. In late 1997, Gartner Group predicted a 22 percent savings for NCs versus PCs. A return to the bad old days?

The new network computer and Windows terminal environments blend the best of the PC world—the high degree of network connectivity, the graphics, the user friendly software—with the high-productivity focus of the centrally controlled environment. At the same time, NCs and many WTs have lost one of the initial benefits and attractions of the desktop computer: autonomy.

Institutions that are about to move from a mainframe-terminal environment into a new client/server environment will want to consider the potential benefits of NCs and WTs. They make excellent upgrades for heads-down users of “greenscreen” terminals, and they can be a cost-saving alternative for library catalog access and for staff in higher education customer service environments such as business office, financial aid, and advising.

However, in offices, classrooms, and laboratories—where PCs are equipped with a variety of software tools and their users frequently push the limitations of the machines—NCs or WTs environments may prove much too confining and may actually decrease productivity. Research faculty will probably never embrace thin clients, for example, nor will most other higher education knowledge workers. The flexibility of the desktop computer environment, expensive as it is to buy and support, brings such people too many important advantages.

NCs and WTs aren't for everyone. But they represent a change, or at least a branching, in the evolutionary direction desktop computing has taken in the last twenty years. Viewed conservatively, in relation to the old, well-established direction, thin clients may appear to be recidivist: a return to the bad old days of central control and authority. Viewed more broadly, though, thin clients appear to be defining a direction of their own. Unlike PCs, thin clients won't pop up everywhere, but where they make sense they can simplify computing environments and save money.

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Perspectives on Higher Education in the Global Market

Sir John Daniel, Governor Michael Leavitt, and Governor Roy Romer, interviewed by Polley Ann McClure

At the 1998 Seminars on Academic Computing (SAC, an EDUCAUSE Affiliate), Sir John Daniel, vice-chancellor, United Kingdom Open University, presented an excellent keynote address on knowledge media for global universities, followed by a panel discussion with Governors Roy Romer (Colorado) and Michael Leavitt (Utah), co-founders of the Western Governors University.1 CAUSE/EFFECT invited EDUCAUSE Board Chair Polley Ann McClure to pose some additional questions to all three leaders about higher education in a global marketplace and to Sir John Daniel about the United Kingdom’s very successful Open University.

Q What is your vision for higher education in the 21st century, and what are the main opportunities and challenges suggested by this vision?

ROMER: The 21st century presents unique challenges for higher education. Higher education must be prepared to embrace the changes and challenges that new technology brings. There was a time, not long ago, when public education was the best means to share common knowledge and pass on common values among local community members. Today our local community is the world community and our lives are touched by people from all over the world. Most certainly membership in this global “community” creates opportunities for new learning and opens the potential experience to many who would otherwise be limited by time, resources, and geography. These changes in our concept of community also create new challenges for our education system, and they change our notion of who is responsible for the education of our citizens.

DANIEL: Clearly there will be a huge increase in volume at the beginning of the next century as the largest generation of teenagers ever hits the university. (Twenty-five percent of the world population is now under fifteen.) If the birth-rate does start to decline there may never be as big a cohort again. But that also means that by about 2045 the largest generation of older people ever will be looking for lifelong learning opportunities in retirement. I see higher education continuing to diversify. Obviously there will be more distance education, but some of the curricula foci may change. The fashion for management and computing courses will likely peak and we may see a resurgence of older subjects in an interdisciplinary guise. Possibly the corporate or for-profit providers will cream off the management and computing students, so universities will go back to an earlier academic profile.

LEAVITT: The transition to the Information Age presents an unparalleled opportunity in the way that we can and ultimately will deliver education.

“A video of this presentation is available on the EDUCAUSE Web site (http://www.educause.edu/sac/sac98/sjd.html). For information about the Open University, see http://www.open.ac.uk/
more people to become educated than has ever been possible before—people who until now did not have the access, the time, the money, the opportunity. Because of technology, higher education will no longer have barriers. This represents a dramatic expansion of opportunity for higher education, its role and its mission.

**Q** How will new networked delivery strategies alter the way higher education is organized, funded, and managed?

**Daniel**: I see more emphasis on learning systems. This will be a real headache for the funders at the state/country level who can’t be assured that their taxpayers are getting the benefit of their investment. The result will be downwards pressure on costs as the state uses this as an excuse to cut funding. There is some real work ahead for administrators, instead of just having to ensure that the classrooms are clean and the grass gets cut.

**Romer**: Higher education must be flexible in order to take advantage of new networked delivery systems. But higher education must also rethink traditional educational delivery systems, including timeframes for curricula, on-site versus off-site course/curriculum delivery, and the use of interactive technology. The Western Governors University is an exciting new educational technology initiative under way in the Western region of the U.S. that I believe embodies the shape of higher education in the future. The WGU will expand educational opportunities to all citizens of the West by using advanced technology to cross state and institutional lines.

The WGU is a bold, break-the-mold approach to learning, based on two key premises. First, regional cooperation will enable higher education to reach a wide array of students and select courses from a wide array of sources. Second, WGU certificates and degrees will be based on competencies demonstrated through rigorous assessment. Where learning takes place will no longer be as important as what a student actually learns.

**Leavitt**: New networked delivery systems are facilitating the emergence of a new academic common market, one with common currency and code. The currency of higher education at present is “credit,” the unit of time spent in class receiving instruction. It may or may not be exchangeable with another institution. In the academic common market, the currency will be competency, a guarantee to the marketplace that the student is competent in the field of his or her degree. This new academic common market will create a system that is based on learning, not teaching. It is a system that will be centered around students, not institutions. It will be a system that measures quality in terms of output, not by brand name of the producer.

Value-added market pricing will be a part of this common market, and it will invite new competitors from the private sector that will drive costs down and quality up. From suppliers of courses and curriculum to competition within academe, this common market will create an entire cast of new players and competitors. Publishing companies will develop curriculum. Corporations will develop their own universities. And the system will be driven into an atmosphere that is not mass-production oriented, but mass-customization oriented. Every student will have the ability to craft this package in a way that fits them.
Sir John Daniel on The United Kingdom Open University

The Open University has built up a very successful distance learning system that reaches large numbers of students at a low cost, with high-quality courses. The keys to its success are well-designed multiple media teaching materials, personal academic support to each student, efficient logistics, and faculty who also conduct research. EDUCAUSE Board Chair Polley McClure asked OU Vice-Chancellor Sir John Daniel about the impact of the Open University on higher education and faculty in Great Britain, and its future in the U.S.

Has the existence of the Open University facilitated or inhibited the development of distance education programs in more traditional British universities?

To begin with, as one wag put it, “The effect of opening the Open University was to close all the others even more firmly.” But that has all changed since the polytechnics became universities and started competing aggressively for part-time students. The OU greatly facilitated the development of distance education in the other universities since all of them have many members of staff who work as part-time tutors for the OU and therefore know how it works (and use OU courses for their on-campus teaching). However, fortunately for us it is easier to describe a distance education system than to build one and make it work effectively.

How have faculty responded to distance education in general and to the Open University specifically?

There are two parts to that answer. The first is that the OU core full-time faculty have responded very well. Really, all you’re doing is bringing over into teaching the team approach they’ve used in research. So it’s actually a more intellectually stimulating way of working than just going off and doing your own thing in the classroom. As far as the rest of higher education are concerned, very large numbers, many thousands, are involved, either as part-time tutors in the system or as people who work as external assessors on the course teams. We also provide more training for faculty than all universities put together, because we have to train this very large core of part-time faculty, who are full-time faculty at other universities, to operate in our learning system. There is widespread admiration for what we do. That’s not to say it’s very easy to take a campus university and transform it into what we’re doing. But certainly the idea of the faculty experience being in some way diminished is the absolute reverse of the truth. All the evidence, whether from full-time faculty or from part-time faculty acting as tutors, is that this is actually intellectually more stimulating than the traditional approach.

Do you have tenure in the Open University?

Margaret Thatcher abolished tenure. As far as I can see it didn’t make any difference to anything, because people have permanent employment. There are procedures for dismissing people and so on, but it’s not an issue. What we don’t do is to have this practice which some American universities have of hiring five people and saying that two of them will get tenure in two years time and then let them fight it out. If we think we want someone permanently, we hire them on a permanent contract with a probationary period.

Does the Open University have plans to offer courses or programs in the U.S.?

Yes. In the last few months, we have created the Open University of the United States as a body registered and licensed in the U.S., which is going for accreditation in the Middle States Commission. We’ve done that primarily in order to facilitate the partnerships we’re developing with a number of American universities. We have a memorandum of understanding with Western Governors University, we’ve got active projects going with the Florida State University and the California State University. I don’t preclude our offering some of our courses directly, because in fact we’ve already got some substantial numbers of Americans who are students of the Open University who began when they were posted in Europe, and have come back. We’ve always believed in going through the front door when we operate in other jurisdictions and this seemed to be a logical way to do it in the U.S. As of a couple of months ago, as well as my day job, I’m also the president of the Open University of the U.S.
Some of our most elite institutions have achieved their status by being highly selective, expensive, and delivering face-to-face instruction. Many feel secure in their current niche and don’t want to risk their status by changing models. What advice would you give to leaders of such institutions?

**DANIEL:** It is a fundamental issue, one I don’t think they can duck. The theme of higher education in the next century is that the link between quality and exclusiveness has been broken. I would say that in strictly educational terms. Behind that, there is a much bigger problem. That is that the emphasis on educational quality and exclusiveness—and I shouldn’t speak for the United States, but certainly in other countries—has contributed to the very serious divide we now see in society between the rich and the poor, the disadvantaged and the less advantaged. What it seems to me the quality institutions are doing is encouraging the middle classes to really try to get out of public systems and go for these exclusive places. That’s a very serious problem, producing elites who no longer really have any sense of their duty to society as a whole. It’s an issue that goes far beyond simple matters of education. The fact that it’s possible to have quality without exclusiveness in education is helpful in solving the wider problem. It requires a complete mental switch. It’s not just the presence of these exclusive universities. It’s not their fault. They’re simply responding to trends in society which are worrying throughout the Western world.

**LEAVITT:** I would add that it is, as Sir John suggests, a social trend. It’s being found in almost every other industry. If you look at the public utility industry, the telecommunications industry, the healthcare industry, the financial industry—all of them go through a pattern where we start to see certain words emerge: unbundling, cherry picking, stranded costs. All of these institutions have essentially one other thing in common. They have been driven primarily by reputation and by some kind of monopoly control, and now we’re starting to see this pattern of change in the telecommunications, the utility industry, and so forth. Higher education is going to go through it as well. If one were to be blinded to it, they would be left behind, ultimately be damaged by the marketplace. A very important element of good leadership in the 21st century will be the ability to make this transition.

**ROMER:** I would say that higher education cannot rest on the laurels of past reputation. Higher education has responsibilities to the public outside the institution—to prepare students for informed citizenship, to help address local needs through research and academic debate, and to ensure that faculty and institutional agendas address the needs of the public. Higher education cannot exist in a vacuum and still retain the public confidence to which it has grown accustomed.

There will always be a place for the traditional on-campus educational experience, and while so much is right about our higher education system, there is always room for improvement and innovation. As you know, in the last decade, the nation’s public and higher education systems have all come under close public scrutiny. Parents, educators, and community
leaders have all begun to question whether students are being prepared to enter an increasingly complex world and workforce. We must push higher education to raise its sights as we should always seek to raise the quality of our most important investments.

It has been said that education in the agricultural era was the responsibility of the church; in the industrial era, it was the responsibility of government; and in the information age, this role will fall to the corporate sector. Do you agree with this prediction?

**Daniel:** No, I absolutely don't. I think some will. But I believe that the reason that the corporate sector is able to move into so much higher education is that in a way higher education has lost its way from its core mission. The core mission of higher education is to train critical thinkers, to inculcate a sort of attitude of systematic skepticism so that people take part as active citizens challenging what's going on. The corporate sector as a corporate sector will never be very interested in that, although some individual corporate leaders give heroic support to that core mission. I think we will see a slimming of universities to their core function. The corporate sector can probably do a lot of what universities do in training standard skills, orthodox knowledge as well, and more cheaply than universities can, so why shouldn't they? It would be very unfortunate for governments to back out of all this. What I find so encouraging in the Western Governors University that the governors here have been prime leaders in, is that here we have a public policy push similar to that which led Jefferson to create the University of Virginia. It's very important that governments hang in there and represent the public agenda.

**Leavitt:** My view is that corporate leaders don't want to be accepting this as their responsibility short of a couple who see it as a market opportunity. I had a conversation with a very large technology company CEO who told me, "If I miss one product cycle in this environment, I'm dead as a corporation. My concern is that the existing system of higher education isn't responding quickly enough to provide the needs I have in an eighteen-month product cycle. By the time I move to the next product cycle, they're just starting to teach the kinds of disciplines I needed in the former product cycle." So corporations are doing this out of a sense of survival, not because they feel like they can do it better, or they want to do it. They'd like to stick with their core mission. They'd like the higher education system to respond.

**Romer:** I believe that in the future the education of our citizens will become increasingly a public/private partnership. As our economy changes, so do the demands made on employees. Today's students need to know more and possess higher skills if they hope to compete for decent, high-wage jobs in the future. Business has a huge stake in helping transition education from a system whose objective was to pass on a discrete set of common facts, to one that equips students to think and reason. How well we educate, train, and develop the potential of our people will do more to determine our future than anything else, and it requires participation from businesses and their leaders.

Do you think that the American university system is prepared for an Open University model of higher education and, if not, what do you think we need to do in order to be prepared?

**Romer:** Let me answer the question this way. While I do believe that the American public is ready for an Open University model of higher education, I am less sure whether the American university system is ready. Much of this goes back to my previous responses. As I mentioned, it is clear that alternate forms of learning are becoming increasingly necessary in the United States due to student constraints such as time and distance. However, at the same time, today's students are required to know more than ever before. For this reason, I argue that we need an Open University system in the United States.

We must push our institutions of higher education to deliver instruction to students on campuses, on home computers, in libraries or at work, using technology to provide more educational opportunities among and across states.

**Daniel:** If by an Open University-type model you mean an American Open University, I do
think there are some issues having to do with the state jurisdiction and the whole pattern of education. If you mean the sort of core manner in which it functions, I think there's still a bit of an issue. To my perception, the American system is still very focused on the teacher and the classroom. However, having said that, with 3,500 higher education institutions, it seems there's such variety in the system, that someone will make the break. The problem is that the new technology really requires you to operate at scale. That's the big challenge which, again, projects like the Western Governors University are trying to meet by pooling the resources of a large number of institutions in a way that combines the best of the federal with the best of the local.

**Leavitt:** I think it's important to recognize what the efforts that have currently been undertaken are, and what they are not. What they are not is a replacement for the existing system. What they are is a new element in the delivery of the new system of higher education in this country, in the 21st century version of what we have today. Any institution that is not able to incorporate some element of this into their current offerings will find themselves at a competitive disadvantage. This is not something that can be seen as an exclusive model or replacement; it has to be incorporated into the existing system.

**Daniel:** I think it's complete rubbish. They don't mean dehumanizing, they mean fewer opportunities for megalomania and a little less convenience for themselves. There's lots of evidence to show that for students a good open learning system is actually much more human and much more personal than attempting to scale up the old model, which is not human and personal at all.

**Leavitt:** For those who have actually taken a good technology-delivered course and have observed it first-hand, it's clear that that statement is not true. I have asked all our board of regents and the trustees of the university to take a good technology-delivered class to see for themselves. Everyone that I've talked to, with rare exceptions, who've taken a good technology-delivered course, tells me that the interaction is not less, but more, and that the amount of interaction they have is enhanced by the fact that they use these technologies. People think of technology as just the delivery of the course on TV that goes one way. This is two-way. It requires a substantial amount of individualization. It's not a short-cut. It's a very demanding way to deliver education. It has dramatic advantages that represent quality that traditional means cannot give.

Another concern of some faculty focuses on the socialization process that characterizes the traditional residential university experience. How do you see this development taking place in a totally distance-learning setting?

**Daniel:** It seems futile to try to provide that by distance education. I’d be the last to remove that. But I understand that already in the U.S. that group of full-time, living-on-campus students is only a sixth of those registered in higher education. So it’s a minority. It’s wonderful that they continue to be served. The problem is that we define the whole system in terms of the needs of that minority. Being once president of a campus university, I think one has to really make sure that those social advantages which are claimed are really delivered. So often there are a lot of assumptions that because students and
faculty mill around on the same campus, all these good things are happening. They’re not. The whole story is to be explicit about what you want to achieve and explicit about how you are going to achieve it.

**Romer:** First of all, I do not advocate for a shift to a completely distance-learning-based higher education environment. I watched each of my seven children go off to college. Their undergraduate education was an important development milestone and one which I would not change. Distance learning should not be viewed as a replacement for higher education but rather as a technological extension of the marketplace. This new learning system will involve not only our traditional public post-secondary institutions, but also private colleges and universities, companies that provide training, and the many private businesses that are developing courses and curriculum.

**Leavitt:** A couple of years ago I took my oldest son to college. We went to the dorm and put his suitcase under the bed. I made his bed for what might be the only time it happened during the semester. We walked up and down the hall wondering how anyone studies with all this music. I want all my children to have that experience. I want them to have the personal interaction with a real curmudgeon professor who will push them further and harder than they have ever been pushed before. I also want my children to be exposed to the technologies of the future, to learn to interact. I would argue that this is not a replacement for that limited group of traditional students. We will always have campuses. But it needs to be part of their education as well. Part of quality will be learning to deal with the technologies of the future, and the delivery of this kind of education will be one way to do it.

**What do you say to those critics who claim that many of the programs delivered by technology, especially those delivered to adult populations, are more “training” than “education”?**

**Daniel:** Pure nonsense! Indeed, the more hands-on skills required, the harder it is to teach a subject at a distance, although it can be done, as the OU has shown in science and technology. Students who take distance and campus courses simultaneously (40 percent of students at the two Canadian open universities are simultaneously enrolled at other campus universities) say the distance courses are of higher quality and more demanding. I would riposte that classroom-delivered courses are often spoonfeeding, whereas technology-based learning stretches the intellectual muscles. (Our students say they like CD-ROM because it forces them to answer the self-assessment questions before moving on, whereas you can skip them in class or in the textbook.)

**Leavitt:** When people raise this commonly asked question, I simply point out that the debate will be resolved in the 21st century. Any education that doesn’t provide both education and training will be a hollow victory. One will be required to retool over and over again, rapidly and repeatedly. Education is a must to enable that. However, without specific skills, one is limited. Our objective is to provide both.

**Romer:** I believe that distance learning is a concept whose time has come. And while design-

Reviewed by Larry Conrad

From its title, I expected this book to focus primarily on the so-called mega-universities—for example, the United Kingdom Open University, with which the author is affiliated. Instead, I found this book essentially a road-map for the issues facing higher education leaders today and a challenge to the assumption that we can continue to do business as usual.

Sir John Daniel gets his reader's attention immediately by comparing the $12,500/year average cost per student for U.S. higher education with the $350/year average cost per student for the mega-universities. As more and more institutions look at delivering instruction remotely using the Internet—thus competing in a national if not international market—this is nothing less than a wake-up call for higher education!

The book goes on to build a case for using technology to leverage the productivity of faculty, students, and operational support staff. The author lays out a framework for establishing an institution's sustainable competitive advantage goals (cost leadership vs. differentiation), using a “value chain” concept to help identify the costs associated with each aspect of an institution's operations. This value chain process can be used to help an organization focus on where it should invest additional resources rather than look for more cost-effective approaches. The remainder of the book guides the reader through the process of developing a technology strategy that will support an institution's goals using the Open University as an example.

Whether or not you agree that higher education has begun the process of fundamental transformation, reading this book is a good investment of your time. Sir John Daniel's lucid writing style, compelling arguments, and cogent presentation of the issues make it a highly entertaining read. I recommend this book to higher education administrators, technology leaders and, indeed, anyone interested in an insightful discussion of the future of post-secondary education.

Reviewer Larry Conrad (larry.conrad@fsu.edu) is assistant vice president for technology integration at Florida State University.
Assessing the New Competitive Landscape

by Harvey Blustain, Philip Goldstein, and Gregory Lozier

Higher education institutions are voicing concern over new competition in their industry. But does “new competition” denote colleges’ and universities’ moving into new geographical markets and encountering established local institutions? Does it mean new delivery mechanisms (for example, Web-based virtual education) that threaten to supplant traditional pedagogical techniques? Does it refer to the development of corporate universities? Or does it refer to the fact that for-profit educational institutions are now a $3.5-billion-a-year business and growing at more than 10 percent a year?

The short answer is yes.

Colleges and universities are being assaulted from several directions with new competitors, new technologies, and new approaches to education. Many have chosen to ignore the warning signs, hoping it will all just go away. Others have rolled out a few online courses or have encouraged deans to develop new programs. Few institutions have developed a coherent strategy for ensuring success in the new environment.

Our fundamental contention here is that faint-hearted attempts to test the waters will not hold back the tide of nontraditional competition. A complex array of forces—new delivery technologies, changing demographics, the emergence of corporate universities, and a complex global economy—is creating a new competitive landscape, and institutions must think methodically about how they want to respond. In this chapter, we present a framework for beginning to do just that.

The Drivers of Education

A good place to begin the analytical framework is with the learner. Why do people seek educational opportunities? What are they looking for? What drives their desire for education?

For much of this century, higher education...
was an opportunity for a privileged minority of eighteen- to twenty-two-year-olds to gain some knowledge and acquire skills. Today, the motivations are more complex. In addition to providing young people with a venue for growing up, colleges and universities are increasingly providing services to adult learners and corporations, creating additional factors driving the market for advanced education. Consequently, higher education's mission has expanded to include the following goals:

- Provide knowledge to the workforce. Capitalism's "creative destruction" produces an unending stream of new markets, products, services, and technologies, all of which demand training. Businesses spend untold billions of dollars on educating their workforce, and many corporations have established their own universities, often in partnership with traditional colleges and universities.

- Retool people for new careers. Conventional wisdom suggests that people will change careers several times in their lifetime. Some of the retooling will come through on-the-job training, but an increasing amount is coming through targeted programs that meet the needs of selective adult consumers. Education has often been described as recession-proof since people out of work frequently go back to school to reboot their careers.

- Cater to the need for mental stimulation. The desire for self-improvement has deep roots in American culture. From matchbook courses to self-help books, from motivational seminars to elder hostels, technology and leisure have enabled a burgeoning market for education for education's sake.

Even among the traditional college set, expectations about the value of education have changed. A recent survey of 350,000 students at 665 institutions, sponsored by the American Council on Education, showed that 75 percent considered financial success to be a very important goal of education, compared with 41 percent who believed education could provide them with a meaningful philosophy of life. This was a reversal of the motivations found among students thirty years earlier. If worldly success is an important driver for education, colleges and universities in a competitive environment may need to pay attention to what their customers want, rather than to what others think they need.

**Environmental Trends**

The expansion in drivers of education has been accompanied by changes in the social environment, all of which, cumulatively, signal increased competition for colleges and universities. The major changes include:

- Demographics. Many people in higher education look comfortably at the "baby boom echo" that began to inject a surge of college-age students into the pipeline in 1994 and will continue for some thirty years. However, the second half of this era will also be the period when baby boomers retire and will place greater demands on public funds for Social Security and Medicare. Can institutions (especially public institutions) count on resources being available for expansion during this period? Or will private colleges—and for-profit providers—have to pick up the slack?

- Technology. Considerable ink and blood have already been shed about the application of technology to education. Those who still question its appropriateness, however, should recall President Rutherford B. Hayes's comment on seeing a demonstration of the telephone in 1876: "That's an amazing invention, but who would ever want to use one of them?"

- The overcoming of time and space. In a world of twenty-four-hour financial markets, real-time global video games, telecommuting, and instant images from Mars, there is no reason why pedagogy must depend on rounding up students into one room for fifty minutes, three times a week.

- An 800 number/ATM mentality. When students can get cash at 2 a.m., download library materials at 3 a.m., and order shoes from L.L. Bean at 4 a.m., it is only educational inertia that keeps them convinced that they must learn calculus by sitting in the same classroom for fifty minutes, three times a week.

- Blurring of industry boundaries. The health care and insurance industries, once distinct, have merged. The computer, consumer electronics, telecommunications, and entertainment industries have evolved into an amalgamated digital industry. Colleges and universities cannot continue to draw boundaries around themselves and say, "We are the only legitimate players in the higher education business."

- Proliferation of authority figures. Professors used to be the accepted authority on virtually
any subject. But in America today, journalists, think tank gurus, movie stars, and businesspeople speak with equal authority. Whatever pre-eminence the professoriate once enjoyed in public debate has been eroded by the omnipresence of anyone with an opinion and a talk show.

The individual as the business unit. The social contract between employers and employees has changed, and there is no longer an expectation of lifetime (or even long-term) employment. Savvy employees keep their skills current, and this has turned many people into discriminating buyers of educational services.

All of these trends have served to alter the competitive landscape within higher education. Consumers of education have new motivations and expectations, technology is challenging medieval pedagogical methods, public perceptions of education have become more democratic, and for-profit corporations have realized the wealth of a new market opportunity. The ivory tower is under siege.

**Sources of Competitive Advantage**

One element that frames any institution’s marketing strategy is the needs of buyers. When the “customer” is an eighteen-year-old freshman seeking a good education, the sources of competitive advantage are relatively easy to define:

Reputation. Is this a good school? Will potential employers want to see this school on my resume? What does my neighbor who goes there say about it?

Curriculum and educational standards. Does it offer the program I want in electrical engineering? Will it prepare me for my career? Can I get in?

Cost. Can I afford to go there? Can I get a scholarship or a loan? What kind of discount can I negotiate?

Location. Is it near my home? Is it far away from my parents? Will it give me the urban (or rural or suburban) experience I want?

Student activities. Does the school have a good athletic program? a debate team? fraternities?

Adult learners and corporations bring different sets of expectations to the marketplace, and therefore create new sources of competitive advantage for colleges and universities.

Access. Because adults and businesspeople are not looking for a residential experience, convenient schedules and proximity to work and home become prime differentiators.

Partnerships. Corporations are looking for partners with whom it is easy to do business. Having to go through numerous faculty committees before new courses are developed or instructors are appointed may diminish an institution’s perceived responsiveness and value.

Customized curriculum. Corporations often outsource education so that they can receive the latest training in skills, technology, or practices. For example, in response to external pressures, a financial services business might ask for the rapid development of an “Ethical Considerations in Derivatives Trading” course.

Flexible delivery. A corporation might ask for instruction to be delivered in New York, Frankfurt, Hong Kong, and Sao Paulo within two months. The institution that says, “Yeah, we can do that” will win in the new marketplace.

Use of technology. Adults have limited patience with a “talking head” instructional style. Accustomed to a higher standard of technology usage, corporate customers see technological sophistication as an important differentiator among providers.

The issue, therefore, goes beyond questions such as “Do we want to enter the market and if so what do we offer?” To be effective in this market may require a fundamental reorientation in how the institution does business: how it relates to students, works with partners, and manages its internal processes.

**Market Segment Characteristics**

Traditional and nontraditional markets have different growth potential and profitability characteristics. They offer various opportunities for nontraditional players, and similarly, current players are threatened differentially.

The traditional market segment includes undergraduate students, graduate professionals, and graduate arts and sciences students.

Undergraduate market. Tied closely to demography, the traditional undergraduate market will experience some growth over the ensuing decades. However, competition for the more highly qualified students and staggering increases in tuition at both public and private institutions have resulted in students’ “trading down,” and most institutions have resorted to tuition discounting, some to the point of fiscal...
crisis. As a result of this price sensitivity, profitability is low. For the immediate future, the threat from the entry of nontraditional competition is relatively low for the full-time undergraduate institution. Competition is considerably greater for the part-time adult captured by colleges and universities during the demographical downturn of the late 1970s and the 1980s.

Graduate professional market. Enrollments in professional graduate programs are relatively flat nationally, with the exception of executive programs. The latter, especially those with prestigious reputations, are highly profitable. However, location-bound programs are likely to receive moderate challenges from new entrants to the executive education market that offer a release from the time and place constraints of traditional executive programs.

Graduate arts and sciences market. Also experiencing relatively flat enrollments are graduate programs in the arts and sciences, which are closely tied to academic hiring. Institutional profitability is quite low for arts and sciences graduate programs, and colleges and universities rely on both external research funding and the demand for undergraduate instruction for fiscal support. The low profitability of these programs means that the threat from nontraditional providers is minimal.

Nontraditional-market students are typically part-time, employed part- or full-time, and older than twenty-five (and increasingly older than forty). They are a mixture of people seeking credentials in the form of a degree, certification, or licensure and others taking individual courses for career upgrade, career transition, or self-renewal and enrichment. In contrast to the traditional markets, programs for the nontraditional student have high growth potential and high profitability margins if costs are managed and technology costs are built into the structure from the outset. As more and more institutions seek new sources of revenues, niche programs are becoming increasingly important. This may favor the more entrepreneurial new entrants who are more successful in identifying and targeting needs of nontraditional and corporate students.

MISTAKES MANY SCHOOLS MAKE
Increasingly, institutions are seeking to find new markets and to develop new sources of revenue. As they move forward, however, they often fall prey to a common set of pitfalls:

Failure to provide adequate guidance. Senior administrators often fail to provide guidelines for and parameters of an acceptable plan. For example, a private university seeking to increase nontraditional revenues asked its deans to develop business plans. Each of the deans was given wide latitude in how to approach the issue, and the resulting plans, not surprisingly, varied widely in their quality and specificity.

"If we build it, they will come." There is no point in developing a new program unless prospective students recognize its value and are willing to pay to enroll. One private university offered a program that would allow students to take courses on a nondegree basis, provided they paid full tuition. Although twenty such students were budgeted for annually, the school never attracted more than two during the three years the program was in operation. The university had failed to recognize that students would not pay full tuition if their coursework would not count toward a degree or credential.

Supply-side focus. A related problem is the lack of attention to what potential customers really want. To move quickly, institutions tend to build on existing capacity and strengths. Faculty tend to identify new programs that leverage their interests. Too little attention is paid to the basic market research that identifies market needs, targets specific clienteles, defines marketing approaches, and determines pricing strategies.

Program cannibalization. Institutions often fail to ask whether the projected enrollments for new programs will reflect students who would not otherwise have enrolled at that institution or whether the program will siphon off students who would otherwise have enrolled in an existing program. New programs that increase retention are to be highly valued, but moving students around who would be there anyway provides no new net revenue.

Lack of specific action plans. Having identified a new program, many plans fail to outline next steps. Defining a logical sequence of activities, milestones, and resource requirements provides the management framework necessary to translate good ideas into tangible programs.

A PUBLIC RESEARCH UNIVERSITY THAT DID IT RIGHT
In the spring of 1997, the president of a leading public research university appointed a com-
committee to determine the university's potential position in the distance education marketplace and to propose a university action plan. The committee began its assignment by preparing three working papers: a summary of the distance education context and of relevant trends and assumptions; an internal audit of the university's current offerings in distance education; and an analysis of the cable TV industry in the state, to provide an understanding of delivery options.

With this information in hand, the committee addressed the question, "How prepared is the university to pursue a distance education strategy, and where should it invest?" To answer this question, they needed to:

- Assess the leadership's real commitment to distance education
- Identify readiness for distance education within the institution's units, including administrative sponsorship and commitment, faculty involvement, level of instructional activity, and infrastructure availability
- Identify cultural barriers and enablers, including policies and practices, that would affect the institution's ability to be successful
- Identify alternative strategic directions to guide institutional initiatives
- Identify program opportunities and develop business plans for three opportunities.

Eager to move from planning to action, the university was most anxious to develop the business plans. However, to ensure that the plans would be developed for opportunities with the prospect of market and financial viability, it was crucial to drive toward a vision with multiple pathways. The initial analysis unveiled dozens of alternative directions, of which ten were considered viable for financial investments based on the criteria of brand recognition, institutional strengths and weaknesses, and positioning relative to competitors. Examples of the directions considered included "innovate existing curriculum content," "build from brand-name opportunities," and "provide personal enrichment opportunities."

Ultimately, guided by three preferred strategic directions, the university selected three distance education program opportunities for business plan development. The plans they developed included

- A definition of the product concept or program opportunity
- A description of current and prospective program customers
- A profile of the competition and their level of penetration in the market
- A discussion of product development issues, including product pricing, promotion, and distribution
- An examination of operational considerations, such as faculty training, technology support, instructional development, and availability of student services
- A high-level financial projection of possible costs and revenues over the initial years of program development and enhancement
- An analysis of the risks and rewards of pursuing the product venture.

Armed with a concrete description of each program, knowledge of the potential and future market, the readiness of the academic unit to deliver, an understanding of the required support infrastructure, and a sense of the potential financial profits or losses, the university was positioned to make strategic investments in distance education.

Institutional Strategy: Charting a Course to Compete

Most institutions have had the same strategy for decades, with little variation in their range of program offerings or target student population. With few exceptions, the geographical boundaries that framed their strategy were the walls that defined the campus perimeter. Institutions have competed with a stable set of peer institutions with predictable patterns of competitive behavior. Under such a relatively stable set of competitive conditions, there has been little need for the rigorous business planning and competitor and market analyses frequently undertaken by corporations. Rather, colleges and universities have focused on where they can make incremental investments to raise the quality of their programs and student body through their faculty recruiting and tuition discounting strategies.

The rise of nontraditional competition significantly alters the challenges and questions that institutions now face. Today, institutions...
must devise strategies and tactics not only to find new sources of revenue but also to preserve the traditional sources they have enjoyed. Decision makers must consider not only their range of program offerings but also where they will compete, what programs they will compete with, how they will deliver their programs, and who is likely to compete with them.

The rapid growth of nontraditional markets for education and the expanded delivery mechanisms (for example, the Internet, distance learning, satellite campuses) create a multitude of entrepreneurial opportunities for an institution's schools, departments, and faculty. The scope and benefits of new ventures will be enormous, but so will the risks.

Deans, provosts, and presidents must view their responsibility in setting strategy as that of managing a broad portfolio of programs and opportunities in a highly dynamic market. Higher education's leadership will routinely be asked to sift through numerous proposals each year to invest in new programs. Like a venture capitalist, they must determine which programs offer the greatest potential for benefit and the greatest likelihood of success. They must have structured means for evaluating the revenue potential, investment requirements, level of quality, and level of risk associated with each new venture. As investors of scarce institutional resources, they must be able to evaluate the many opportunities laid before them, as they can fund only a relatively small group of programs. The choices that deans, provosts, and presidents make must be consistent with a broader set of institutional strategies and directions.

To evaluate and manage these new opportunities for growth effectively, institutions must put in place three critical planning components:

- Strategic guidelines and program development parameters
- A rigorous business planning process for evaluating potential new ventures
- Rapid evaluation and decision-making processes

**Strategic guidelines and program development parameters**

Before individual schools or faculty are asked to develop proposals for new ventures, the institution as a whole needs to define its broad strategy for competing in new markets. This will enable the institution to establish and communicate the range of new ventures they will support. For faculty, this institutional strategy provides initial criteria that they can use to self-screen their own entrepreneurial ideas for new ventures.

This institutional strategy should not be overly defined. In fact, there is a risk that a strategy that is too rigorous will be too rigid and limiting and will cause the institution to miss opportunities. Instead, the strategy should provide general definitions as to the types of new ventures that would be consistent with the institution's mission, existing strengths, and available resources.

Guidance for new program development should consider five elements:

**Program offerings**

- Is the institution interested primarily in taking its traditional courses and programs of study and offering them to expanded markets? Or will the institution support the development of customized sources of study for a particular audience (for example, an MBA curriculum tailored to a single corporation)?
- Does the institution have the resources and flexibility required to rapidly alter and tailor its courses as it encounters new markets?
- Will the institution focus its programs on any one set of programs (business, for example)?
- Will it encourage some of its schools to pursue new markets (for example, professional schools) and discourage others?

**Market segments**

- In which market segments will the institution compete for students?
- Do the institution's strengths lie in pursuing traditional undergraduate and graduate students?
- Does the institution have the reputation and resources to move beyond its traditional market segments?
- Can the institution reach a group of adult learners that will participate in multiple programs over the course of their lifetime?
- Will the institution market its programs directly to students? Or will it approach corporations or other organizations?
What quality standards must be maintained as new opportunities and markets are identified?

Geographical boundaries
- Will the institution place any restrictions on where it will compete?
- Will it view new ventures as a way to bring more students to its present campus?
- Would it consider launching satellite campuses to reach specific markets?
- Does its name recognition and existing strengths lie locally, regionally, or globally?

Delivery methods
- Will the majority of courses be delivered through traditional classroom methods?
- To what degree will the educational delivery be virtual?
- Will the institution support the use of Internet, satellite broadcasts, or cable TV as methods of delivery for instruction?
- Are the institution's existing technical infrastructure and support services capable of supporting these types of ventures?

Investment
- What level of resources is the institution able and willing to invest in new programs?
- Are new markets being pursued as experiments to gain experience?
- Is the institution dependent on creating new revenue streams for its long-term viability?
- Is it seeking to invest heavily in a targeted set of programs that must generate large returns?
- Or is it considering making small investments in a broader set of programs?

Given the almost limitless potential for generating ideas for new ventures and the very real constraints of available resources, how an institution answers these questions will bring important focus to the development effort. Just as maintaining the status quo is not an acceptable option in the face of new competition, neither is doing everything.

Structured business planning
To optimize decisions about opportunities for new ventures, the institution must be able to consider and evaluate structured business plans. Adopting a standard approach to business planning will provide decision makers with a systematic method for evaluating and comparing individual proposals for new programs. A well-developed business plan should answer the following questions:

Market questions
- To whom will the program be offered? What geographical area will it cover? What will be the demographical profile of a typical student?
- Why will people want to participate in the program? To pursue an interesting hobby? To fulfill a requirement for continuing professional education or certification? For worker retraining?
- How large is the potential market?

Program questions
- What will the program offer?
- How will this proposal capitalize on existing institutional strengths? Will it utilize existing faculty? Will it focus on acknowledged areas of programmatic strength? Will it better utilize existing infrastructure?
- How will quality standards for students and curriculum be measured and maintained?

Financial questions
- What investments will be required to develop the program? (Specifically, what will be required for course development, marketing, space, and technology?)
- What will its ongoing operating costs be?
- How will the program offering be priced? What will the tuition be? Will financial aid and scholarships be offered?
- What revenue will the program generate? In its first year? In subsequent years?
- What assumptions are being made in the financial model for the program being presented?

Risk questions
- With what other institutions will this new program compete for students?
• Why will students come to this program rather than to a competitor's?
• How sensitive are the financial assumptions?
• Can the program still generate viable revenues if those assumptions are wrong by 10 percent? 25 percent? 50 percent?
• Does the program present any risk to the institution's overall reputation for quality or high academic standards?

Rapid evaluation and decision making

The process of answering these questions will not only produce a business plan that can be used to explain and evaluate the new proposal, it will also refine the idea itself. The rigorous nature of the process will help further the development of the concept of a new program before it reaches any institution-wide review process. It will also cause the idea generator to perform a self-evaluation of his or her proposal and voluntarily screen out those ideas that do not appear to hold up under the scrutiny of the business planning questions.

To make the planning process effective, all plans should work through a discussion of these questions in a standard manner. Common templates for financial planning should be provided, and the format and appearance of plans should be standardized. This will provide for a more fair and efficient decision-making process. Proposals requiring larger investments should include original market research data to further validate assumptions about market demand and pricing.

Finally, institutions need to be prepared to decide quickly which programs to pursue and which to decline. In a competitive market, an opportunity identified at the beginning of a planning process might not be viable within one or two years. Traditional multiyear planning and decision-making timetables will not be sustainable. Institutions must also be prepared to continuously reevaluate and adapt programs as new competitors emerge with new offerings and as the needs of students change. In approving a new venture, an institution must also identify what factors or warning signals it will look for to decide when the program should change or be shut down.

Barriers to Entry

The development of an institutional strategy for nontraditional markets must also be framed by an acknowledgment of current barriers within higher education generally and, more specifically, within each institution. Of course, not all colleges and universities share these in equal measure, and at some institutions these considerations are insignificant. But together these factors do inhibit, to one degree or another, an institution's ability to be proactive (and sometimes even its ability to be reactive). Barriers to entry include the following.

• Fixed costs in faculty. Faculty are often resistant to moving in new areas, and opportunities to develop new programs may result either in a commitment to new faculty lines or to the use of adjuncts that have little institutional commitment.

• Fixed costs in the physical plant. Colleges and universities have an incentive to fill up existing on-campus classroom space and facilities. This can inhibit their flexibility in bringing educational services out to the market.

• Pre-Gutenberg pedagogical methodology. As practitioners of medieval modes of teaching, the faculty (individually or collectively) are sometimes resistant to technical innovations. The recent decision by a Canadian university that professors will not be forced to use technology is a case in point.

• Professional paradigms. The use of sophisticated technology often demands that the instructor team with curriculum designers and technical specialists. Similarly, corporate partnerships require that curricula be developed in concert with the customer. For many professors, such collaboration constitutes an intrusion into and a threat to their professional autonomy.

• Little leverage in professorial models. Despite its obvious virtues, face-to-face classroom interaction limits the reach of each instructor. Where institutions are unwilling or unable to leverage technology and alternative delivery methods, the economics of education will be limited by how many people can fit into the classroom.

• Potentially large investments in technology. Virtual education and distance learning do not come cheap. And where the corporate partnership involves technical or scientific
education, there may need to be considerable investment in facilities and equipment. One university has spent over $1 million in a state-of-the-art facility for providing Novell, Microsoft, and other types of technical certification to the financial services community.

- Non- or anti-business orientation. There is a strong ethos within many universities that any involvement in corporate or sponsored education is a deal with the devil. In some cases, even overt discussions of new programs as revenue generators can elicit negative reactions from the campus community.

This, then, is the new competitive landscape: new sets of buyers with new expectations, a growing set of competitors who see a lucrative business opportunity, and existing higher education institutions that are steeped in tradition. Ultimately, culture may be the greatest factor affecting the ability of colleges and universities to succeed in the new market.

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Founded in 1813, Colby College is a liberal arts institution located in the Belgrade Lakes region of central Maine. The campus—brick buildings draped in ivy—sits on Mayflower Hill in the city of Waterville.

Colby is well known for its emphasis on off-campus study and its fresh approaches to the academic experience. More than two thirds of Colby students study abroad during their undergraduate careers, and additional students participate in domestic programs. The idea of devoting a one-month term to a single topic or project originated at Colby in 1961. And incoming students take advantage of another popular innovation, Colby Outdoor Orientation Trips (COOT), as an introduction to each other and to a part of Maine.

With approximately 1,750 students, Colby boasts high faculty-student interaction. Technology is also a high priority, and it's enhancing what this liberal arts college has to offer.

Making decisions

Officials at Colby pride themselves on planning well and making good decisions in terms of information technology. In a recent re-accreditation process, the College chose to focus on three critical areas, one of which was information technology. Colby is currently reengineering its registration processes, some pieces of which have already been implemented. This fall faculty and advisors were able to access photo rosters of their students online.

At times Colby has gone against the mainstream. The College adopted the Macintosh as a standard platform back in 1985, when IBM was the standard computer of business and science and Macs had only been on the market for a year. But after a time, explains Raymond B. Phillips, director of Information Technology Services, "the Mac became recognized as an extraordinarily valuable tool in an academic setting, because of the strength of academic software and the graphical capabilities." And the value of a standard was also soon recognized.

In the last year, however, the community decided that it needed to change its standard, and moving to Windows made sense. But while many faculty members would benefit from moving to a Windows environment, others, such as those who used graphic applications, would suffer. "It didn't seem appropriate to push them to switch in the name of standardization," Phillips says. "Plus, what we learned from a visit to Cupertino was that Apple was in fact doing some very exciting things that are really highly relevant to what a college like Colby is doing." So instead of changing to a new platform standard, the College moved to a dual standard, creating both complications and opportunities.

"One of our strengths has been reliability," explains W. Arnold Yasinski, administrative vice president. "We're still learning, having expanded this fall, how we're going to create similar reliability across two major platforms." The goal is for faculty to receive seamless support so that they can focus on content.

Staying on the same page

The Colby community is involved in technology at every level. The board of trustees has an information technology committee that includes faculty, administrative, and student representation. Yasinski believes that "it creates confidence on the board, given the amount of money we request for information technology." Representation on the board committee overlaps slightly with the College IT Committee, which consists of three faculty, three students, and two administrators, all chosen by their own constituencies. Also on the committee are Phillips and Suanne Muehlner, the director of Colby libraries.

The IT Committee focuses on policy and strategy issues, advising both Phillips and President William R. Cotter. According to Phillips, it is a primary mechanism for communication with the faculty, students, and staff. It was a subcommittee of the IT Committee that addressed the platform standard issue. While the IT's directors are not members of the committee, they do attend most meetings and their participation in discussions is critical.

Information Technology Services consists of five departments: academic information technology services, foreign language technology, administrative technology services, media services, and technical services. The director of each department reports to Phillips, who reports to Yasinski.

While it's a balancing act to assure that proper focus is placed on academics, Yasinski says Colby's reporting structure has always been conducive to good communication and relations among departments. Many institutions, for example, have had battles between the academic and administrative computing areas. At Colby, the two have always lived under the same roof, and those battles haven't taken place.

Teaching and learning are clearly the highest priorities at Colby, and it makes sense that administrators are quite sup-
CAUSE/EFFECT's campus profile department regularly focuses on the information resources environment—information, technology, and services—of an EDUCAUSE member institution, to promote a better understanding of how information resources are organized, managed, planned for, and used in colleges and universities of various sizes and types. This article is based on a visit to Colby College by EDUCAUSE Writer/Reporter Shannon Burgert.

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Teaching with technology

One Spanish professor claims that up until two years ago, she was a "non-user"; she didn't even know how to work a VCR. But these days if you walk by Barbara Kuczun Nelson's office, you're likely to hear talk of "dynamic HTML," and "JavaScript," and students can expect to submit their assignments electronically.

Nelson's immersion in Web-publishing tools happened through a grant from the Mellon Foundation which is designed to encourage resource sharing among institutions. The language grant, now in its third year, was the first of three grants that Mellon awarded to Colby, Bates, and Bowdoin (CBB) Colleges as a consortium. Jackie Tanner, the director of foreign language technology for the three schools, has aided faculty members in applying for stipends to use technology in teaching languages.

Nelson's Web pages link to other resources, songs, and photos, and she's created a number of interactive grammar lessons. In the last year, Nelson has used the experience she has gained to give eight presentations—including a keynote speech—at conferences around the country, and she was recently elected as chair of the College's Information Technology Committee.

Another of the Mellon grants builds on years of cooperative work that Colby has done with Bates and Bowdoin to coordinate library services. The colleges now have in place linked Web-based catalogs which can be searched simultaneously, and they've also implemented common circulation. Through the grant the three similar institutions are also working on a three-way videoconferencing system and establishing joint user education programs for libraries and information services. The third grant, still in its early stages, focuses on creating off-campus study centers for the CBB Mellon Consortium.

A grant from the National Science Foundation, together with support from Colby Trustee Paul J. Schupf, has enabled the College to buy fifteen Silicon Graphics machines, eight of which are contained in the Paul Schupf Scientific Computing Center. Thomas W. Shattuck, associate professor of chemistry, uses the lab extensively in his classes:

"The software that we use spans almost the full range of computational chemistry, including being able to do calculations on individual molecules and being able to look at some of the processes that are used in the pharmaceutical industry for designing new drugs."

Through one of five available databases, students have access to more than half a million chemical reactions. The software packages allow the user to model the motions of complex molecules, and 3D glasses at each workstation enhance the screen view. According to Shattuck, "It's very rewarding to the students to get a dynamic view of...
chemistry, because chemistry is really a dynamic process. Things are moving, and you don't get that on the printed page."

Similarly, Yeterian's psychology students have benefited from using electronic brain atlases before working with real tissue. The electronic atlas is also accessible anytime, whereas tissue is not as easily available.

Enhancing the learning experience

While Yeterian's students are able to take advantage of technology to help them learn, he notes that the classroom experience hasn't changed much. "My teaching in class is still very much talking with the class. I try to develop a relationship with the students such that they want to pursue it on their own."

Once they've been introduced to the electronic resources, students can use them on their own time.

Phillips adds, "One of the things that I think will change the most is what students do outside of class, the way they prepare for the next lecture, or the way they are perhaps filling in gaps in their own backgrounds to catch up with others. The range of resources outside the class has changed dramatically, especially in terms of the Web."

While the Internet has made resources increasingly accessible—central Maine no longer seems remote when it comes to doing research—a new dilemma faculty face is teaching students to determine good information from bad on the Web. According to G. Calvin Mackenzie, Distinguished Presidential Professor of American Government, "We have a pretty good idea how to do that in a library, because we know if something has been published in a reputable academic journal that is reviewed, it's likely to be good information. On the Web, sometimes you don't even know who put a site together."

"One of the things that I've found most useful about technology is that it's enhancing communication with my students," says Yasinski, who teaches English. "I find that it actually enriches how we interact when I meet with them one-on-one. Since we're taking care of the smaller details through simple electronic memos, a lot of communication has already occurred. Students know where I stand on certain things that I think would be most useful for them, and I also know what their concerns are."

Thomas R. W. Longstaff, Crawford Family Professor of Religious Studies and an active member of the IT Committee, notes that not all Colby faculty use technology extensively. Different faculty members are placing technology at various priority levels. Phillips adds that members of the faculty are careful about adopting new technologies: "They're skeptical about using technology unless it is, in their view, demonstrably improving the way they're interacting with the students. I think the faculty take a great deal of pride in the quality of this interaction."

For more information about Colby College, visit http://www.colby.edu/
T he widespread implementation of distance education, still a marginalized operation on many American campuses, has become a major challenge demanding attention and resources. At a time when the demand for distance education programs and courses is growing, most college campuses do not have the infrastructure or culture to change in ways that will meet the demand. From its start in correspondence study to its present proliferation on the Web, distance education has suffered from an enduring negative attitude based in “traditional academic suspicion of—and resistance to—change, intellectual elitism, and the scandal-ridden history of proprietary correspondence schools.”1 This legacy has left many institutions scrambling in the face of increased consumer demand and competition from other institutions.

To many newcomer practitioners who are now being asked to orchestrate the delivery of education off-site, distance education is perceived as a brand new field rather than one with a long history having its own body of research and theory.2 The question now becomes how to integrate that recorded experience with teaching and learning at a distance into clearly articulated contemporary plans and action.3

Distance education is defined here as the process of linking learners with (human and non-human) remote resources for instructional purposes, where the instructor and students are geographically separated for at least some of the instruction and the students earn an institutional credential (a grade, certificate, degree, etc.). Some differentiation has been made between distance learning, which focuses on the learner at a distance, and distance teaching, which focuses “on the process of course development by which a distance education institution prepares learning materials for students.”4 Keegan in Foundations of Distance Education and Moore and Kearsley in Distance Education: A Systems View see distance teaching and distance learning as components of distance education. Keegan proposes it as “the only term for international usage.”5 For our purposes here, distance teaching, distance education, and distance learning will be used synonymously. We will use the phrase “technology-enhanced learning” to mean a broader concept that includes the use of technology in teaching and learning both on campus and at a distance.

This article outlines some of the major factors and issues involved in planning for distance education within the broader scope of technology-enhanced learning on campus. It also points to elements critical to the implementation of distance education. It is important to recognize that on-campus programs and courses may often use the same resources and infrastructure as those delivered to students at a distance.

1 Barbara L. Watkins and Stephen J. Wright, The Foundations of American Distance Education: A Century of Collegiate Correspondence Study (Dubuque, Iowa: Kendal/Hunt, 1991), 109-110.
3 David A. Keast, “Toward an Effective Model for Implementing Distance Education Programs,” The American Journal of Distance Education, 11(2): 39-55.
4 Keegan, 31.
5 Ibid., 33
...a bewildering number of policies and procedures form barriers to the efforts of educators who wish to implement a program at a distance."

BENEFITS AND BARRIERS

Learning is a lifelong pursuit. Distance learning uses many technologies including telecommunication and computer systems for two-way interaction to promote lifelong learning without regard to geographic location or time zone. A few examples of the benefits of technology-enhanced learning are:

- For the institution, potential new students who reside outside the geographic area served are now a part of an expanded market.
- For the students, enormous resources are available at the click of a mouse. This can support a national and international student body that can share ideas and thoughts no matter where they live in the world.
- For the faculty, while up-front design and development time is usually increased, technology-enhanced courses are often easier to update and easier for learners to participate in.
- For both students and faculty, feedback and evaluation can be more immediate and accomplished more conveniently through e-mail and online conferencing.

However, a bewildering number of policies and procedures form barriers to the efforts of educators who wish to implement a program at a distance. This, along with the meager resources available on most college campuses, makes implementation of certificate or credit programs a formidable challenge. There are also issues of coordination and control for those on campus who are charged with standardizing educational efforts, reducing duplication of effort when it is cost effective to do so, and accounting to university or other governing agencies. For these administrators, the ad-hoc, grassroots efforts of faculty and departments to develop and implement technology-based learning may be viewed as maverick efforts that create planning and implementation challenges.

The Role of an Advisory Committee

The challenges of planning and implementing distance education programs include pedagogical changes, institutional issues, and organizational structure. Given these concerns, a committee is often formed by campus administrators to more systematically analyze campus needs. The composition of such committees can be as varied as the campuses on which they are formed. However, commonly participants include a person or persons high enough in rank to champion technology-enhanced learning, faculty members interested in distance education, a person or persons in charge of infrastructure and support services (e.g., the director of campus computing, the director of instructional development, the dean of the library), and other administrators and staff with a stake in promoting successful technology-enhanced learning. The charge to this committee may include the following:

- identify the purposes and goals of initiating and supporting a distance learning program on its campus;
- collect and summarize information on current distance education programs and the strategic plans of various academic units;
- evaluate strategies and technologies for delivering distance education programs (advantages, disadvantages, costs) and reach agreement on which strategies and technologies will be proposed;
- define what is needed to deliver technology-enhanced learning programs effectively, including equipment and facilities, skills and training, and policy development and cultural change;
- investigate successful models at other institutions;
- specify needs and incentives for faculty who become involved in developing and implementing technology-enhanced learning;
- estimate costs and resource commitments;
- identify potential barriers to successful implementation of the recommended strategies and technologies and suggest how to manage these;
- establish a process for at least annual review of new technologies and other aspects of the distance programs to assess their potential for improving the delivery of distance education and reducing associated costs.

6 For more detailed information, readers are directed especially to Toby K. Levine, Going the Distance: A Handbook for Developing Distance Degree Programs, published by the Annenberg/CPB Project and The PBS Adult Learning Service in 1992, and to two reports published by the Pennsylvania State University: Distance Education and the University Culture, The Report of a Policy Symposium (1995) and The Report of the Task Force on Distance Education (1992).

7 Nancy Franklin, Michael Yoakam, and Ron Warren, Distance Learning: A Guide to System Planning and Implementation (Bloomington, Ind.: Indiana University School of Continuing Studies, 1995).
• report findings and recommendations to senior decision-makers;
• define needs for particular academic programs.8

The advisory committee can provide leadership in policy revision and remove barriers to the mainstreaming of technology-enhanced learning. Each incentive or disincentive, the reporting and accountability structures, and the determination of major resource allocations have a role in changing the institutional culture. Identifying external and internal policies affecting distance education, especially during the initial phases, is critical to overall success. Examples of policies that may require review include:
• fees charged to out-of-state students;
• registration policies that might require that each course be filled at each site, rather than counting an aggregate of cross-site registrations for a course;
• access to educational resources such as the library, laboratories, or specialized technology by persons at a distance;
• credit transfer acceptance from other institutions as part of a degree earned at a distance;
• procedures for revenue sharing generated by students at a distance;
• definitions of faculty “workload” for technology-enhanced course design and development;
• state policies that do not recognize off-campus courses for institutional funding purposes or that treat students taking distance learning courses differently from students enrolled in on-campus courses for purposes of financial aid.

The committee may experience tensions as they determine whether to review these campus policies and procedures to determine which, if any, are in need of change in light of emerging technology-enhanced or distance learning activities. Philosophically, some members of the committee may believe it is best to work through policy change and planning to affect change; others will be anxious to select a “test case program” and, as that is implemented, discover changes that need to be made to the campus systems, policies, and procedures. Both have advantages and disadvantages, but in our experience working with a program to get it into operation in a concrete way is more effective and efficient than a comprehensive review of all policies and procedures when that review takes place outside of the context of a specific program or technology-enhanced learning project. These activities can, and should, be done concurrently.

STRATEGIC PLANNING
One of the goals of strategic planning is to create and define the environment—with its boundaries and parameters—in which students learn, teachers teach, and the institution competes. The idea is to gather data, analyze information, and decide on an implementation plan that has a high possibility of success while avoiding expensive pitfalls.9

Integration with the institutional mission
For example, how distance education programs fit within the mission of the institution must first be determined before any major resource allocation should be expected.

Resources inventory
A first step is to take an inventory of resources such as available hardware, software, distance delivery technologies, technical and faculty support staff, and identify any technology-enhanced learning projects already functioning. Indicators of resources capacity (e.g., length of time individuals have to wait to get assistance in lesson design or technology support, and the availability of expertise represented by an instructional technology support unit) might also be included. Armed with a current institutional inventory, planners are in a position to judge what existing space, facilities, equipment, and staff a program may use and what reallocation from within may be required.

Financial and market assessment
A thorough review by the advisory committee of the strategic financial planning and opportunity costs should be made. Often, an outside consultant is hired to expedite this strategic assessment process, which should be designed to answer the questions: Why should the institution offer distance education? What is the competition? Are an adequate number of qualified faculty available who are willing to teach

“The highest priority regarding technology-enhanced learning is its integration within the overall strategic plan of the institution.”

8 Radford University, Goals of Distance Learning Task Force (1996); University of Kansas, Charge to the Distance Education Strategies and Technologies Planning Team (1996), online at http://www.kumc.edu/de_strategies/charge.htm.
online for the program? What regulatory factors will have an impact upon the program? Cost issues for the institution need to be analyzed because technology-enhanced courses usually cost more to produce and deliver than traditional courses. What is the cost of the additional equipment, infrastructure, and staff needed for developing a distance education program? Once the analyses are made, the distance education program needs to be compared to other resource allocation opportunities that are presented both to the advisory committee and to the broader institutional decision-making structure for assessment and decisions on whether to move forward with the program and resource commitments.

**Evaluation of academic standards and roles**

Strategic planning can help establish a timetable for the roll-out of specific courses/programs and ensure equitable distribution of learning resources for all students, whether remote or local. Quality standards must be consistent regardless of delivery system employed or location of the students completing the program. For example, course approval for a program can generally follow the same procedure whether the course(s) or certain sections of a course are on-campus, use technology-enhanced formats, or are designed solely to be delivered at a distance.

Programs can be developed that recognize the increasingly diverse ways in which faculty and students interact with subject matter and each other. The standards of accountability do not change simply because a course benefits from technology. However, it should be noted that changes often do occur in the teaching methods used in technology-enhanced courses.

Distance education often serves as a catalyst for the adoption of learner-centered approaches to instruction.

**Programmatic Implementation**

While most distance education programs are designed as long-term programs, especially those offering credits and degrees, it is helpful to consider the initial implementation of such programs through the lens of project management.

Operationally, distance education requires different resources than classroom teaching, and often a greater initial investment. Since courses taught at a distance should be designed and produced to fit the available technology, they may require extensive written lesson notes, exercises and practice by students, or scripting of computer code. High-quality distance learning demands more planning, as well as the development of materials and delivery methods beyond the skills of most faculty. This requires the development of partnerships among academics, instructional designers, administrative support staff, and course delivery experts. The role of the instructor usually changes, as he or she becomes a "content specialist" instead of an independent course preparation and delivery expert. If distance education, and technology-enhanced learning generally, is to make a sustained improvement in education both in the in-person classroom and at a distance, change must occur on an operational level. Behavior patterns and functions within the organization must change to reflect the changing roles of individuals.13

**Support services for students**

Whether the administration of distance education is situated on campus or at the student's locale, admission and registration must take place efficiently. Student advising, computer accounts, library services, and financial aid must be provided. Student access to computing and to the campus network and the Internet are critical for the success of technology-enhanced or distance learning programs. Faculty members have a right to expect that students will come to distance learning experiences prepared to study effectively at a distance. The support team could develop a student handbook, a pre-screening survey, or even a "mini-course" that would ensure that students understand their rights and responsibilities in a distance learning course.

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10 See especially Chapter Four in William J. Rothwell and Peter S. Cookson, Beyond Instruction: Comprehensive Program Planning for Business and Education (San Francisco: Jossey-Bass Publishers, 1997).


12 Dalhousie University Distance Education Task Force, Distance Education at Dalhousie Review, Guiding Principles and Action Plan (1995), online at http://www.dal.ca/~daww/derp.html.

13 Keast, 39-55.
Support services for faculty

Technical support is critical to the success of teaching and learning at a distance. Faculty who ask, “How do I teach with this technology?” or “In what ways does the use of the technology change the nature of my teaching?” should be encouraged and supported as quickly as possible. The goal is that delivery technologies should become as transparent to student learning as a blackboard or the overhead projector have become in a place-based classroom.

Faculty development and instructional system development services must also be provided. Faculty members who have started online courses using computer conferencing or video conferencing are usually rewarded little, if at all, for their efforts. These faculty look to the advisory committee and on-campus support services to assist their efforts in the implementation of distance education.

Administrative support

Existing on-campus departments or colleges are typically responsible for the development of distant degree and credit programs. On a campus familiar with technology-enhanced learning programs, administrative management for distance education is usually located within a continuing education department or some other special unit.

When a campus is quite new to distance education initiatives, a question often arises as to the locus of administration for the program. Several academic and administrative units are likely candidates (and competitors) for this administrative location. The administrative location of distance education must be where it is most likely to be integrated into the academic mainstream.

A similar consideration arises when deciding whether a specific director of technology-enhanced or distance learning should be hired. While a director of distance learning activities can often supply needed leadership, the cost justification for such a hire may be lacking when initiating distance education on a campus. If one person can be hired to take the lead in overcoming obstacles and to concentrate efforts toward promoting distance education, that may be the best solution. Generally, however, the institution does not have the budget to do this immediately, and compromises are frequently made in this area. It is a task of some consequence to study the implications of different management structures and to select the one that best meets specific situational and cultural needs.

Specific program market analysis

Another facet of the competitive and market analysis is to determine demand for a particular distance education program or course. This can be done using telephone interviews with current and past learners, government publications on industry and job trends, surveys of potential students in the program, and questions posed to business leaders in the area of proposed study. It might also be important to determine the types of technology that potential students for this program own, their qualifications to be admitted to the program, and typical experience that they may have in using technology or in studying at a distance.

Program evaluation

Distance education program planning should include specific evaluation components in addition to the traditional ones. These include a role for students as evaluation participants, determination of ways their learning should be assessed, the frequency of evaluation, distribution of evaluation results, and ways in which longitudinal studies will be conducted to assess changes in the program over time. Faculty and student perceptions of the delivery system and desire to participate in similarly delivered courses should also be collected.

Linking Planning with Implementation

Key to the success of campus initiatives in technology-enhanced learning and distance education is the support of campus leaders. These leaders will need to exhibit enthusiasm for, champion, and allocate resources to these programs while encouraging and rewarding faculty cooperation. Such leaders can build credibility for distance education, maintain currency in the field, and gather support and partners for programs from among members of the business communities. The most important function of institutional leadership may be to create a shared vision that includes widespread input and support from the faculty and administration, articulates a clear educational purpose, has validity for stakeholders, and reflects the broader mission of the institution. Both top-down and

bottom-up support is needed for successful distance education.

In addition to the establishment of a vision, leadership in four areas—budgeting, infrastructure development, staffing, and policy revision—is key to linking strategic planning and specific program implementation (see Figure 1). Leaders working in or through such groups as a technology-enhanced learning advisory committee can help decision-making at both the program level and at the campus level in those key areas.

Establishing a budget

Providing funding support as a line item from the central resources of the institution establishes technology-enhanced learning as part of the institutional infrastructure. The institution must decide what equipment and resources are considered infrastructure and what are considered operational expenses. A review of cost analyses of all distance education programs may show that a program(s) will appear to lose money if technology infrastructure costs are included in the program budget. Still, a budget, to give a true indication of costs, must cover all areas including support services (e.g., instructional development, registration, library services), infrastructure, and faculty development.

Revenue sharing for academic units and incentives and rewards for faculty represent a quintessential model and will build commitment by faculty members and academic departments. Faculty are usually unwilling to continue to teach distance education courses as a perpetual overload responsibility. Faculty expect corresponding increases in pay when class size increases significantly over similar, place-based courses, or when these courses are not given the same weight when it comes to promotion, tenure, and career advancement.

Faculty and others seeking to initiate technology-enhanced learning must make a business case for new programs. Understanding this, leaders in distance education must acknowledge the entrepreneurial efforts and other risks of innovation that faculty and academic units are required to take and properly reward them by using different incentive models than those that have worked in the past. Profit sharing, funding from vendors, and other external partners must be aggressively sought.

Figure 1: Linking institutional strategic planning to programmatic implementation through leadership and vision
LINGING CAMPUSWIDE STRATEGIC PLANNING
 WITH DISTANCE EDUCATION IMPLEMENTATION

Institution-Wide Strategic Planning
✓ Integrate technology-enhanced learning initiatives with the institutional mission and widely gain support from faculty, students, staff, and the campus community
✓ Make an existing resources inventory
  • hardware
  • software
  • distance delivery technologies
  • technical support staff
  • faculty support staff
  • instructional development support staff
  • related projects already started/being maintained
✓ Conduct an environmental scan and market assessment for new program initiatives
✓ Conduct an assessment of how widespread academic roles or philosophy may need to change across campus
  • Make explicit to faculty and students that quality is design dependent more than technology dependent

Programmatic Implementation
✓ Conduct a walk-through of faculty and student support services
  • registration
  • admissions
  • advising
  • financial aid
  • computer account generation and help desk
  • library support
  • other...
✓ Provide technical support services for faculty and students
✓ Conduct market analysis of specific proposed programs and summarize for assessment purposes
✓ Plan for the evaluation of the program (both summative and formative)

Linking Planning with Implementation
✓ Provide funding support as a line item from the central resources of the institution
✓ Determine the infrastructure and functions that are common across all programs
✓ Plan, recruit, and determine how to retain expert faculty, support staff, and administrators for technology-enhanced learning
✓ Review the fit of the proposed programs with existing campus policies and any procedural changes needed for success
While decentralization may appear to unnecessarily duplicate efforts and costs, it may more closely align expertise with program needs.

Determining functional infrastructure

Some infrastructure resources and functions should be common across all distance programs, and others are more useful decentralized. While decentralization may appear to unnecessarily duplicate efforts and costs, it may more closely align expertise with program needs. Centralization of services may allow administrators of all distance education programs more direct access to top decision-makers and encourage a more efficient use of resources. The risk is in overburdening specific programs with bureaucracy and overhead, while not meeting specific program needs. Generally, centralization is favored for the following functions: marketing, instructional design and development support, technology help desk and infrastructure, professional/faculty development, faculty reward, promotion and incentive structures, and registration.

Staffing the program

It is hard to imagine anything more important to program implementation than recruiting and retaining expert faculty and support staff. Are all faculty equally suited to teach in distance education programs? The answer is generally, "No." It might be wise to begin with a small cohort of willing faculty. If time and energy are spent in training this cohort, and it is given support for its development and implementation, its successes will often inspire others.

In some institutions, an initial group of enthusiastic faculty has been trained in effective distance teaching methods, and the individuals comprising the group then become mentors for the next group of teachers. Ongoing support is given to these faculty through workshops, online discussion groups, and strategic feedback. Occasionally, a faculty member works as an apprentice to a practitioner who is teaching a distance course, and the following term is mentored as he or she practices what was learned.

A timeline is helpful to new distance education teachers as they begin to conceptualize their tasks. Answers to the following questions, and the availability of specific training as needed, will go a long way toward retaining new distance educators: At what point should the syllabus be in place? What materials need to be developed and tested? Is the hardware and software already in place and functional? What are the options when something goes wrong?

Revising policy

Several critical issues unique to program planning for distance education emerge. Institutional policy and procedures need to be reviewed to remove potential barriers to program success, such as:

- residency and financial aid requirements that would not make sense for a distance education program,
- a required number of "hours of contact" between instructor and student per credit hour,
- required on-campus registration,
- policies that require transcripts to differentiate courses taken at a distance,
- limits on the number of distance credit hours that can be applied to a degree program.

Conclusions

For institutions of higher education to integrate technologically enhanced learning at a distance, leaders must link institutional strategic planning to programmatic implementation through decisions about the budget, infrastructure, staffing, and policy. This leadership should come from both academic planners and the implementation team. Leaders championing distance education within their institution must be able to show that such programs are adding value, are relevant, and may increase enrollment and retention, and thus warrant a change in some policies. We will know this has happened when the existing campus culture includes distance education in routine strategic planning for the institution, and decision-making intrinsically links to smooth implementation of technology-enhanced learning.

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Changing (Almost) Everything and Keeping (Almost) Everyone Happy

by Craig A. Stewart, Douglas Grover, and R. David Vernon

Four years ago, the information technology organization at Indiana University/Bloomington undertook a major computing technology conversion that affected 40,000 people. This article describes the project and highlights the factors that contributed to its success.

Background

Indiana University's primary academic computing environment from the mid-80s to the mid-90s was based on VMS technology. During the summer of 1993 we added Alpha-based VMS systems to our VMS cluster. We suffered a number of "early-adopter" problems that resulted in severe system outages and dramatic difficulties in use of e-mail. IU's technical experts were convinced that we could not meet the growing demand for academic computing services with further expansions of the VMS cluster. Instead, completely revamping IU's central academic systems became an organizational priority.

Those involved initially in the project agreed upon the following guiding principles:

• People do not use operating systems; they use applications. Thus, we planned the migration in a fashion that focused on applications, rather than systems.

• Extensive communication with and support for computer users would be critical to success. We were especially concerned with providing good support for people with special-case problems.

• User-centric concerns would be as important as technical considerations and both would need attention. Thus, the project participants were organized into two subgroups, one focusing on technical issues and one focusing on marketing, communication, and support issues.

• Success would be measured from a user-centric point of view. The goal we set for this
migration project was that at least 95 percent of the users affected by it would agree that the improvements in the quality of their computing environment more than outweighed the difficulties they experienced as a result of the conversion.

System architecture

The VMS cluster at IU had become a “one size fits all—poorly” system. E-mail often interfered with the performance of research applications, and vice versa. In evaluating new computing systems it was clear that RISC-based systems offered the best price/performance. Use of RISC-based systems meant adopting UNIX as the predominant operating system. However, UNIX was not widely viewed as user friendly. We recognized that the advantages of better price/performance for RISC systems would only be realized in practice if RISC-based systems were accepted, and thus used heavily, by the intended users of these systems. While drastic change was essential, we faced substantial obstacles in designing a new architecture that would be accepted by our user community.

IU’s academic computing environment in 1994 included, in addition to the VMS systems, three aging DEC Ultrix systems, a group of IBM RS/6000s dedicated to batch processing, and a pair of experimental UNIX systems—one devoted to e-mail and one devoted to Internet information clients. These systems dedicated to specific types of services had shown great promise because they could be configured and tuned optimally for the tasks performed on each system. We thus decided on a new system architecture based on multiple systems, each dedicated to a particular service. The services we targeted were e-mail, Internet information access, research computing, instructional computing, file serving, and general-purpose UNIX computing. The approach of a complete restructuring, including plans to phase out our Ultrix systems, did much to ease suspicions that someone in the computing center was “out to get” VMS.

A major problem in phasing out the VMS cluster was that it had been the point of integration for IU’s academic computing environment; it was where people received mail, where files were stored, and where applications were run. We established two new points of integration in the computing environment—the desktop and a common file store for central academic systems. When this project began, many of the desktop computers in use at IU were capable of supporting distributed computing applications (such as desktop Web browsing), but many were not. Because of this, we established multiple Telnet sessions to multiple hosts (each performing a specific function) as the least common denominator for desktop integration.

Figure 1 shows the changes over time in the capacity of general purpose central computing systems as compared to systems dedicated to specific services. To manage a smooth migration to the new architecture, we put in place

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“...The approach of a complete restructuring, including plans to phase out our Ultrix systems, did much to ease suspicions that someone in the computing center was ‘out to get’ VMS.”

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the core of the new system architecture first, and then gradually decreased the capacity of the VM S cluster. This approach permitted the migration to proceed without anyone experiencing a substantial degradation in system performance, whether using the new systems or the old.

**Marketing and customer communications**

Even prior to our initial announcements it was obvious that the project to phase out the VM S systems would meet substantial resistance. Our communications began internally with our own computing center staff, then with our faculty advisory committee and departmental computing support staff, and finally with the general University population. The discussions with the faculty advisory committee provided good advice and endorsements of our plans. These endorsements helped to mitigate any perceptions that the computing center was issuing edicts to the faculty. Our focus on customer satisfaction was a key factor in gaining the endorsement of the faculty advisory committee and the support of the University’s computing staff.

Notification of the general computer user community began in February 1995 with an e-mail message to every VM S account holder. This message outlined the need for the conversion and the general timeline, and gave e-mail addresses and phone numbers for questions and help. We named the effort the “Central Systems Retooling Project” to emphasize the complete restructuring and improvement of the central academic computing systems rather than the elimination of VM S.

At the start of the migration project, we declared the VM S cluster to be a legacy system. No upgrades or enhancements other than those required for system security would be provided. After the end of the 1994-95 academic year new VM S accounts would be available only on a separate system dedicated to VM S applications used in instruction. E-mail was not offered on this system. This ensured that the user base of the VM S cluster and VM S e-mail would shrink over time as students graduated, while permitting faculty members some leeway in converting course materials from VM S to the new systems.

Since no single means of communication will reach all users we employed several simultaneous means of communication throughout the project. Information was sent to users in many ways, including e-mail, memos to all faculty, advertisements in the University newspaper, articles in the computing center newsletters, news segments on the University’s radio and TV stations, brown bag talks throughout the University, posters, and buttons for our staff. We also worked extensively with the University’s departmental computing support staff using IU’s leveraged support model. We received a very small number of complaints about our communications—a few from people who missed all of our communication efforts, and a few from people who complained of being bombarded with information.

**Migration of information access**

In analyzing usage patterns of IU’s VM S systems, we know that the most widely used applications were e-mail and information access through the Academic Information Environment (AIE). The AIE was a text-only, menu-driven system for sharing information within the IU community. Information and services available through the AIE included the campus calendar of events, answers to commonly asked questions about computing, and library services such as requests for interlibrary loans. Only a small percentage of the VM S users used applications other than e-mail and the AIE.

As of early 1995 relatively little within the AIE was considered mission critical. It was thus a good first step in the migration from VM S to other computing systems, because it would involve many computer users but not activities that were highly critical to the operation of the University. The World Wide Web was still new to most users, but it was sufficiently well established that it was a realistic choice for the University’s information exchange. Migration from the AIE to the Web was announced in February 1995, to be completed by the end of June. The publicity campaign for this phase of the project was based on the theme, “Catch the world in your Web,” which caught people’s attention and added an upbeat tone to the initiative.

The migration from the AIE to the Web involved tens of thousands of computer users, so enabling them to learn about and use the Web was a critical challenge. We produced extensive documentation about using the Web and...
offered classes about switching from the AIE to the Web. We also made it easy for people who had suitable desktop systems to install Web browsers configured for IU’s computing environment, and thus provided these people access to the most current graphical Web browsers. For students dialing in to IU’s computer systems, or people on campus whose desktop computer could not support a graphical Web browser, we upgraded the central system dedicated to Lynx and other Internet information clients.

A key tactic employed in the AIE-to-Web migration, and then throughout the rest of the project, was to make changes self-documenting whenever possible. Thirty days before we removed the information in any portion of the AIE, we posted the information within it on the Web. A notice was added to the affected section of AIE announcing its impending migration. Once information was removed from the AIE, we put a notice in its place providing its new Web location and information on how to get help adapting to the changes. This assured that people using the AIE received good information about the changes even if they missed our notification efforts completely. The AIE was gradually and successfully reduced to a shell containing nothing other than pointers to the new Web locations for information sources by the end of June 1995.

The concerted effort to move from the AIE to the Web put IU in a leading position among universities in using the Web as a means of institutional information exchange. Comments from our advisory committee and informal feedback from IU’s computer users indicated that the project had been successful in improving IU’s ability to access information through computers.

Applications software

After the migration from the VMS-based AIE to the Web in the first half of 1995, we turned our attention to applications software from DEC and third-party vendors. In migrating applications software we deviated from the traditional wisdom of systems management intentionally and successfully. Traditional wisdom is that changes should be made at times when system usage is low (which at universities is when classes are not in session), tested by the computing center, and ready for use when students and faculty return to campus. The critical flaws in this approach are that the computing center is generally not able to adequately test changes, and the times when people are returning to campus (typically at the beginning of a semester) are the times when they are least able to tolerate problems with computing services. We thus took a different approach.

When we migrated applications software from the VMS systems to new UNIX systems, we made changes in small increments, while classes were in session and typically during the middle of the week. If a change caused a problem that had not been revealed by our testing, we found out about it immediately and were able to either fix it quickly or back it out. By

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**Buy-In Begins at Home**

Many computer center staff were deeply invested in the technologies we were planning to phase out. How did we gain their acceptance of the plan?

- Senior management of the computing center demonstrated firm support for the project by statements of commitment and allocation of personnel and funds to the project.
- Very few computing center staff were dedicated exclusively to the project, but a large number of staff were involved in it as a part of their ongoing responsibilities.
- We spent a lot of time listening to the concerns expressed by the staff. Many people didn’t get their way, but almost everyone felt their concerns had been heard and considered carefully. (This also helped us avoid problems because we received and heeded some very good advice.)
- We were careful to provide career paths within the computing center for people who found themselves with skills no longer in great demand (such as VMS system administration). We constantly reiterated our goal to simultaneously improve the services delivered to users and carry out the migration in a fashion that would be acceptable to them. Several staff called the goal of achieving 95 percent user satisfaction “crazy,” but focusing on this goal caused some key opponents of the project to either become actively involved in it or at least to withhold judgement until we could demonstrate some early successes.
- Success in the early phases of the project helped to ensure final staff buy-in.
ensuring that changes were frequent but small, the computing center was able to react quickly to any individual problem and provide good support for the people affected. Because changes were very fine-grained, each user was directly impacted by changes only once in a while. Because we provided deadlines for availability of specific applications, rather than dates on which people would lose their accounts, people could decide for themselves when to make the switch to a different system as their primary computing platform. Removing systems from the VMS cluster provided a gradual decrease in the capacity of the VMS cluster (as usage decreased) and greater capacity in UNIX environments (as two VMS systems were converted to Digital UNIX). The periodic removal of a system from the VMS cluster also helped remind people that the project was progressing steadily and could not be ignored.

Altogether we migrated more than fifty applications software packages from the VMS cluster to other platforms. IU’s computer users knew and liked VMS and were sure that they would dislike UNIX. Our communications with users emphasized the view that they would benefit from the switch to RISC-based UNIX systems because their applications software would run more quickly as a result. We also emphasized that knowledge about any application is largely transferable from one operating system version to another, and that most computer users know far more about the applications they use than the underlying operating system. This view led us to create a document targeted specifically at the UNIX-wary. This document was entitled “UNIX: The least you need to know,” and included just that—the least a person could know about UNIX and successfully run applications in a UNIX environment. Also included in this document were sample scripts for batch jobs (electronic copies of which were easily accessible online) and a VMS-to-UNIX command translation table. Pico, with its on-screen menu, was made the default editor on all UNIX systems to ease the pains of changing editors.

As with the migration of the AIE, changes in applications software were made self-documenting. For example, when a person typed the command for an application that had been removed from the VMS cluster, s/he was presented with information about changes in the software’s availability rather than a cryptic error message.

Most users migrated from one time-shared system to another. However, some people possessed desktop systems of sufficient power that a switch to microcomputer versions of software packages was a good option, particularly because this change was usually accompanied by an improvement in the user interface. Site licenses for commonly used software were especially effective in encouraging people to migrate from shared systems to their own desktops. For VMS-based applications with small numbers of users, it was sometimes better and less expensive for the computing center to purchase a microcomputer version of the application for each user than to move the application to a different central server.
One surprise in the migration of applications was the relatively light demand for consulting help. During the course of the overall project we produced more than one hundred written documents (made available both online and in print). We believe that the production of good documentation at the beginning of the project greatly eased the demand for consulting.

As part of the transformation from an environment of general-purpose academic systems to an array of hosts, each specialized for a particular purpose, we also phased out our general-purpose Ultrix systems. These migrations came primarily during 1996, after the bulk of VMS applications had been moved. The staging of application removal from Ultrix platforms again made the transition straightforward to manage. The migration from one UNIX environment to another presented little difficulty for most users. There was a relatively small group of users, mostly people interested in computer science, who claimed a need for a general-purpose UNIX environment within which a person could, for example, simultaneously access newsgroups, send mail, and run Perl scripts. For these people we provided a small but fast general-purpose UNIX server so that they could work in a fully functional, general-purpose UNIX environment.

### E-mail migration

E-mail was by far the most critical part of the conversion. Our first step in e-mail migration was to encourage voluntary migration from VMS mail to Pine during the early spring of 1995. Pine was delivered at that time from a Hewlett-Packard SP system. A utility program was written that made it simple for people to migrate their stored mail, maintaining folder structures, from VMS mail to Pine.

After some early successes, we began to experience some performance problems. Hewlett-Packard was very considerate in loaning us a larger SP system to get through the year, and we asked people to stop migrating from VMS mail to Pine until after the end of the 1994-95 school year. We decided to switch to a horizontal scalability approach using multiple smaller HP systems, with each user assigned to one system. Because the name of the original system had been tainted by its performance problems and to spark interest in the new systems, we held a contest to name the new systems. The winning entry, submitted by a student, was a suggestion to name the systems after characters in Shakespearean plays. The contest created a sense of participation on the part of the students and helped maintain an upbeat tone.

Worries about the impact of even a short period of disruption of e-mail services caused us to make the change from a single SP server to multiple single-processor systems during the summer. We felt that with systems that were relatively simple—delivering only e-mail—we could adequately test the changes. Thanks to good use of name serving, all mail sent to or within IU/Bloomington was simply addressed to username@indiana.edu, making it easy for users to adjust to the changes in host names.

When students returned to campus in the fall of 1995 we discovered that the new e-mail architecture delivered excellent performance, and informal reaction to the new systems was highly favorable. We resumed plans during academic year 1995-96 to phase out the use of VMS mail. We adopted a strategy similar to the IRS approach to tax-filing deadlines. By default, every user (except seniors) would lose access to VMS mail on March 15, 1996. If a person requested an extension of access to VMS mail an extension until June 30 was granted automatically. Requests for access beyond June 30 required an explanation of the continuing

### KEYS TO SUCCESS

- Setting the project goals in user-defined terms and providing a mechanism for users to assess whether the goals were met.
- Scheduling software changes in order of increasing impact so the first few months of the project would be visible but painless to almost everyone.
- Producing good documentation at the beginning of the project.
- Crafting our communications according to the audience, both in tone and in medium.
- Openly communicating with users from the start and offering them a mechanism to provide feedback and request changes to our plans.
- Continually asking, "How can we do this in a way that is easier for our users?"
need. Early adopters migrated from VMS mail in the fall. The sense of imminent change created by the March 15 deadline encouraged a wave of migration early in the spring semester. The people who delayed changing and requested extensions beyond March 15 at least understood that they needed to switch from VMS mail to Pine in short order. We received fewer than 500 requests for access to VMS mail after June 30, 1996.

Once the migration from VMS mail was completed, the remainder of the project was largely anticlimactic. The Ultrix systems were phased out with the same strategies and tactics we had used with the VMS migration. Usage of VMS dropped drastically, and only people who had complicated migration problems were left using the system. At the beginning of the next academic year we announced that unless people asked for an extension, accounts on the VMS system would be terminated as of June 30, 1997. There are now only a handful of people using our lone, small VMS system, and we plan to eliminate VMS completely by July 1, 1999.

**Things we learned**

Overly ambitious initial project goals increase the difficulty of gaining user acceptance.

Early discussions about the project within the computing center involved unrealistically short timeframes for the project. These discussions became known through the rumor mill, generating negative feelings prior to our initial public announcements about the project and increasing the challenge of gaining user acceptance. Thus negative (and generally incorrect) information was traveling around campus before we were ready to make announcements about our plans. We reacted to this situation by speeding up announcements and going on an intensive information campaign. Still, the negative feelings caused by rumors resulted in greater initial upset on the part of our users initially than was necessary and caused us to devote more time in face-to-face communications with worried users than would otherwise have been necessary.

Notification far in advance of changes helps customers adapt to the idea of change.

We provided extremely long notification periods for system and service removal primarily because we feared that users would have very long and complicated migration tasks. The primary benefit, however, was that our customers got over their initial emotional reaction to change prior to the actual initiation of migration work.

Student turnover can be of great help in migration projects.

We timed the large-scale aspects of our migrations so that in any given year, most seniors could ignore the changes. Retraining experienced users is often harder than initial training of new users, so this strategy greatly enhanced customer satisfaction and eased the support burden faced by the computer center.

It’s all right to be a little corny.

We did a number of things that were a bit corny, such as the “Catch the world in your Web” theme for the AIE-to-Web migration, a “movin’ on up” theme for the VMS-to-Pine migration, and the contest to name the new mail systems. This was helpful in that it encouraged public awareness and injected a bit of fun into the process.

Proactive documentation provides greater value than reactive consulting.

At the beginning of the project we responded to many requests for documentation and demands for extensive consulting. By providing extensive documentation (paper and online, including good access to online manuals) we often gave users the tools they needed to solve their own problems with little or no consulting help from the computing center. People benefited greatly from knowing that consulting was available, but many needed little or no consulting help.

Change is a constant.

One of the most frequent questions we received during this project was, “If I make this change now, can you promise me I’ll never have to go through this again?” We always answered this question with “Absolutely not!” In that sense, this migration provided extremely valuable long-term user education by setting an expectation of continual change in computing systems.

“We timed the large-scale aspects of our migrations so that in any given year, most seniors could ignore the changes.”
Conclusions: the user response

We achieved our project goal of 95 percent customer satisfaction. IU’s University Information Technology Services conducts a formal customer satisfaction survey each spring in which surveys are sent to a random sample of IU’s faculty, staff, and students. The spring 1996 survey included the following question:

“During 1995-96 the computing center has made a major effort to improve our shared computing systems. This Central Systems Retooling Project included as its goals migration from the Academic Information Environment (AIE) to the World Wide Web (WWW) and migration from VMS Mail to Pine. Please rate your overall satisfaction with this project.”

On a standard Likert (1-5) scale, with 5 being “very satisfied” and 1 being “very dissatisfied,” the average score was 3.99 (±0.11), with 94.4 percent (±3 percent) of the respondents providing a response of 3 or higher.

The spring 1997 survey, conducted after the migration from VMS had been essentially completed, included another question about satisfaction with the migration project. The average score was 4.00 (±0.07), with 95.8 percent (±2 percent) of those surveyed responding with a 3.00 or higher.

This project, while very demanding of both the computing center and our customers, was extremely successful. IU has a better computing environment today as a result. The project was widely criticized when first announced; in the end, however, the vast majority of the people affected by the change were satisfied with the benefits they accrued as individuals as a result of changes in the computing environment. People were also satisfied with the way in which the changes were implemented. We could have done the same project more quickly, but at the expense of customer satisfaction. By working carefully with our customers to ensure that their concerns and needs were addressed throughout this project, we were able to achieve simultaneously technical excellence and tremendous customer satisfaction.

Acknowledgements

This project would not have been successful without the leadership, advice, and support of many people in Indiana University’s UITS organization, too numerous to name, and the good will and patience of the IU user community. Special thanks go to the members of our faculty advisory committee and the members of the project team.

The authors are staff of University Information Technology Services at Indiana University. Craig A. Stewart (stewart@indiana.edu) is acting director, Research and Academic Computing; Douglas Grover (grover@indiana.edu) is operations and instructional support supervisor; and R. David Vernon (vernon@indiana.edu) is senior technical advisor.

2 Details regarding the UITS user satisfaction survey are available via the Web at http://www.indiana.edu/~uitssur/survey/index.html.
Enterprise Network Management: Solutions Are Needed!

by James S. Cross

Enterprise Network management—end-to-end management of networks, systems, desktops, and applications—is a hot topic as we approach the 21st century. Heightened interest in this topic is being fueled by the proliferation of “netcentric” computing, the double-digit growth rate of advanced intelligent network services, the unabated growth of the Internet, and the convergence of the Public Switched Telephone (PST) network and networks based on the Internet Protocol (IP). These developments, coupled with the advent of powerful new desktop computers and Internetworking technologies, have ushered in a new era in network management.

Although the idea of voice, data, and video integration is not new, several developments have renewed interest in using a common transport and an enterprise network management approach. Perhaps the biggest are the core elements of the netcentric computing puzzle illustrated in Figure 1: continued growth in desktop computing power, expansion of the Internet, and the trend toward the replacement of the traditional shared-media, frame-based local area networks (traditional Ethernet and token-ring) with switch-based, frame-cell local area networks (ATM and fast Ethernet). Industry has also embraced the universal serial bus, a new physical interface for connection of telephones to PCs.

The growth of the Internet has also brought enhancements in wide area network (WAN) and local area network (LAN) infrastructure technologies such as improved latency, class-of-service (CoS), quality-of-service (QoS), and non-blocking connections that enable LAN to support voice communications. According to a survey conducted by Beyond Computing, the Internet and associated technologies such as client/server, network computing, data warehousing, and data mining will have the most impact on businesses and organizations in 1998.1 Finally, from a management perspective, SNMP (Simple Network Management Protocol) has become the management protocol of choice for data-oriented LAN products and voice PBX systems.

As more and more vendors climb aboard the voice-over-IP and IP telephony bandwagon, next-generation IP switches, routers, and call processor servers (PBX) will enable network managers to integrate and manage voice and video traffic on their IP networks. A survey of the literature indicates: (a) all of the major players from the telecommunications and data communications industries have announced initiatives for the burgeoning voice-over-IP market; and (b) spending on LAN backbone connections will continue its exponential growth well into the next century.2

The next-generation network will be built around software-controlled switches, virtual routers and hubs, servers, and a policy/performance-based network management system that allows dynamic reconfiguration, to meet the needs of delay-sensitive voice, bandwidth-hungry multimedia, and virtual-reality applications. According to a report by Business Communications Inc., expansion of the Internet, increased automation, and a telecommuting workforce will continue to boost the growth in the computer telephony marketplace by well over 30 percent for the next five years.3

A taxonomy of challenges and tools

Little happens on campus that does not involve the network—from the simplest phone call to mobile computing to biotech research to electronic commerce to the most complicated...

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digital operation. Many challenges network managers face emanate from the substantial increase in traffic in recent years on wide area networks, caused by a proliferation of network-based applications. In the distributed model, you could expect that about 80 percent of LAN traffic would remain on the LAN segment. As more users adopt the centralized server model, only about 20 percent of LAN traffic will remain on the local segment. Traffic to and from file and print servers is also of particular interest because it can have a profound impact on network traffic patterns, often accounting for more than 50 percent of all traffic.

In mission-critical networks, performance is always important, but uptime, reliability, and bandwidth management are paramount. The following represents a taxonomy of areas of growing concern to campus network managers, particularly from the perspective of availability (or lack thereof) of tools to facilitate an enterprise network management approach.

### Circuit management

In circuit management, we need a whole new generation of frame/cell performance and service-level management tools to deliver the performance and availability that mission-critical applications demand. The tools must consist of both network access probes and centralized trending and analysis management software that work together to provide customers and service providers with a circuit-to-socket view of how the network is performing against committed service-levels. According to research statistics published by Datamonitor, the worldwide market for ATM and frame relay switches will triple between 1996 and 2001, growing from $1.5 to over $5.2 billion.4

### Object and agent management

For successful object technology management, it will be imperative for system and network managers to have the tools to control and manage the downloading and testing of executable object code in a neutral environment as the use of Java and ActiveX continues to proliferate. Although the benefits have been highly touted, many believe allowing object technology code to move across a network and be executed on a user's desktop, without direct intervention or monitoring, poses serious security risks and exposures. The challenge for network managers is to assemble a cadre of tools to minimize the risk and maximize the benefits.

### Directory services management

In the directory services area, network managers must have the tools to integrate disparate directories and better manage user access, security, and accounts across a rapidly expanding networking arena. The magnitude of the directory management challenge is indicated by the number of different directories being used by organizations. According to a survey conducted by Forrester Research, Inc., the following range of installed directories were indicated when fifty large companies were asked what types of directories they used: e-mail, NT Domain, Netware NDS, mainframe, netware binderies, DNS, UNIX, and a host of other homegrown applications.5 The Lightweight Directory Access Protocol (LDAP) is one evolving standardized solution that lets users integrate and gain access to information locked in proprietary databases. Although LDAP implementation is still relatively immature, it will go a long way toward easing some of the challenges involved in directory management.

### Quality-of-service management

In the quality-of-service area, the advent of powerful new multimedia desktop systems and applications has ushered in a new era in network management. Every week, some company announces the latest “must-have” application
that pushes the limits of network performance. With growing demands for these "gee whiz" technologies, network managers are faced with a precarious balancing act of providing the bandwidth-hungry, high-performance network features and resources that users demand, without sacrificing QoS. According to a recent survey by International Network Services, over 40 percent of users are currently dissatisfied with the overall quality of network performance management. That same survey found that no single tool dominated this area, with a plethora of products cited by respondents, including Network General, HP Openview, Ciscoworks, Bay Optivity, Cabletron Spectrum, SunNet Manager, IBM Netview, and a host of homegrown applications.6

Cost accounting and management
As the cost of workstation ownership and network management continues to escalate, users are more and more required to balance technology needs with business objectives. Priorities now include applying business metrics to technology investments and demonstrating the value of network initiatives. Nowhere are these considerations more crucial than in planning, implementing, and integrating new technologies and applications within the enterprise network. According to a study conducted by the Gartner Group, the cost of workstation ownership per year ranges from just over $2,000 for a thin client workstation to well over $14,000 for a "custom fat" workstation.7

Security management
In the security area, the system must provide the capabilities to support a broad range of security techniques incorporating single signon and authentication. Protecting your network starts with door locks—locks that control and filter access to servers, applications, and databases. A number of packages are available to support network security planning and audit management when the remote user is not actively sending and receiving data, and automatically re-

Traffic management
In the traffic management area, quality-of-service and class-of-service management are evolving to be the defining features of the next-generation network. The goal is to adapt the high-speed technology of satellite, microwave, and fiber to a wide array of applications and service types to ease net congestion and guarantee packet delivery. Three activities worth noting are the working group reports and specifications for the Subnet Bandwidth Manager (SBM), Integrated Service over Specific Link Layer (ISSLL), and High Performance Routing (HPR). High-performance routing combines the best features of advanced peer-to-peer networking, frame relay, IP, and System Network Architecture. It draws upon the non-disruptive rerouting capabilities in IP as well as congestion control and class of service to provide improved network performance and utilization of bandwidth.

Software management
Software management for most campuses will continue to be characterized by a plethora of packages, applications, protocols, operating systems, and desktop systems. According to a study conducted by IDC, UNIX is still the predominant Internet server operating system with Windows NT gaining momentum.6 Netware, Mac OS, and IBM OS/2 are also still active players that have to be considered.

Remote access management
Cheap and loaded with functionality, a new generation of remote-access platforms has evolved in the marketplace. The growing number of organizations establishing or planning to establish high-quality remote LAN connections has driven vendors to roll out a new generation of scalable products with significant increases in functionality and the number of users that can be supported. According to Dataquest, remote-access routers account for over 35 percent of the $4-billion router marketplace.10

There are two differentiating features of the new generation of remote access server (RAS) products: first is a technology called adaptive switching that allows the aggregation of digital and analog circuits; and second is the ability to minimize dial-up cost by breaking the connection when the remote user is not actively sending and receiving data, and automatically re-

7 Reported in "Java," Sun Microsystems, LFC 3.2H E290-0, October 1997, 4.
8 Wreden, 27.
Connecting when the line is needed. The net effect of this new generation of RAS technology is less hardware/software, more efficient RAS management, tighter security, fewer circuits, reduced costs, and a simpler migration path from today's predominantly analog dial service to tomorrow's principally digital service.

Although there is a wide array of new products and services, determining which to buy to meet the security needs of your campus remote and mobile computing users can be difficult and confusing. There are high-capacity enterprise central site switches (e.g., Bay Networks Bay 8000 series); there are SOHO (Small Office Home Office) mid-range/low-end servers that support a specific LAN environment and a limited number of dial up sessions (e.g., Cisco 765/766 line of routers); and finally there are software-based products (e.g., Microsoft's Remote Access Services running under Windows NT Server).

**Conclusion**

Success in managing the many faces and challenges of enterprise network management cannot be met with yesterday's tools. We need a broad range of tools and capabilities to manage and control netcentric computing in a number of areas (see sidebar): security, information resources, help desks, configuration, software, storage, device monitoring, traffic congestion, business, and performance.

We need solutions that address:

- the new application demands of desktop conferencing, video on demand, IP telephony, voice on the net, and IP multi-casting and associated traffic profiles;
- infrastructure and the diversity of devices and application profiles;
- prioritization, evolution of service, and policy management; and
- the unique features of LAN and WAN operating environments and the mapping of CoS and QoS issues across these domains.

We must be proactive in working with our vendors and software suppliers to develop the tools and solutions we need to solve our enterprise network management challenges.

**For further reading:**


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Should Colleges and Universities Require Students to Own Their Own Computers?

by Kathryn F. Gates

In 1983 student computer users were mainly science and engineering majors. In 1998 all students need access to computers to succeed in school regardless of their majors. The intervening years have witnessed the growth of computer use in word processing, data analysis, and presentations; the explosion of the Internet and its centrality as an information resource; and, equally important, the infusion of computer-based learning applications and environments into the curriculum to the degree that what was of marginal utility to most in 1983 is an essential tool for all in 1998.

Students now use computers to complete assignments, to communicate with faculty and other students, and to research subject matter using online databases and Web resources. Students critique each other’s work and communicate with experts at remote sites by means of online chat sessions. Many textbooks now come with companion tutorials which are computer-based.

Beyond their capability to enhance instruction and research, computers can make participation in campus life more convenient by providing Web-based services and easy access to information. Some universities offer online ride-share boards, classified ads, electronic services for finding roommates, and other applications geared toward social needs.

The question to be asked then is, “Should a student be required to come to campus with a computer?” While computer requirements are fairly common among small private schools, most state-supported institutions are still recommending rather than requiring that students come to campus with a computer in tow.

Questions beget questions

Once an institution answers the student computer requirement question with a “Yes,” many more questions arise. Are all students required to purchase the same model through the university, or can students purchase computers on their own as long as they meet a minimum

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2 See “Student Computer Ownership” at http://www.sco.gatech.edu/.
3 See “UF Computer and Software Requirement” at http://www.circa.ufl.edu/computers/.
set of requirements? Are students required to purchase laptops for maximum flexibility, or can they get by with less-expensive desktops? Ideally, a student can take a computer all over campus—from the residence hall to the library to the classroom—and, at U M, even to "the Grove"; yet getting comparable processing power in a laptop over a desktop can add a thousand dollars or more to the purchase price.

There are numerous variations on this theme of choice. Students and faculty at Wake Forest are given standard-issue IBM ThinkPad laptops which are replaced every two years, while students at the University of Florida can choose the model as long as it satisfies a minimum configuration requirement. Some argue that certain brands may be better suited to certain fields, as is the case with Macintosh systems for graphic design. Virginia Tech students can choose between laptop and desktop models and between Macintosh and PC versions to accommodate the "wide variety and diversity of disciplines and course offerings." UNC-CH recently selected IBM as its laptop supplier, but students will be free to choose another vendor if they can find a better buy. Some staff and students have criticized the school's computer requirement plan for limiting student choice. On the other hand, technical support is easier to provide when hardware and software are standardized.

Should computers be student- or university-owned? Software can be obtained at reduced prices with a campus site license, but some licenses require that the computer be university-rather than student-owned. Should computers be leased or purchased, or should both options be available? What options are available for students who can't afford the added cost? Should the added fees be folded into tuition or charged separately? UNC-CH students will be able to purchase the laptops from campus stores, finance the purchase over four years, or apply for grant assistance to cover the cost of the computer.

Benefits

Universities that have adopted a computer requirement cite success in enhanced learning, improved retention rates, increased communication among faculty and students, and universal access. Clearly, the experience gained can enhance the student’s marketability. While a computer requirement adds to an already expensive education, the cost of the computer can be calculated into "demonstrated need" for financial aid; moreover, the requirement creates equal opportunity for all students with regard to computer access. Some claim that computers encourage more, not less, interaction between faculty and students.

From a management perspective, if students have their own computers, then it may be possible to recover some valuable microcomputer lab space; institutions that require laptops can move toward supporting laptop spaces in classrooms, with a power supply and network connection at each seat, rather than more expensive desktop-based classrooms. A student computer requirement can also mean standardization on hardware and software, which can translate into less complex support from an IT management perspective. Finally, it can also facilitate the negotiation of site licenses that provide significant savings.

Issues

While the notion of a computer requirement is attractive, there are several important points to consider before adopting this approach. First and foremost is support. The universities that have added a computer requirement have reported a substantial "ramping up" of their technical support services. Students and faculty must be trained to use the computers. Some claim that student computer labs and personal ownership together provide adequate access but that the missing piece is the lack of an incentive for faculty to pursue a technological direction. How will computer repairs be handled? What about software installations and upgrades? What is the impact of the additional computers on the campus computer/network infrastructure? How do colleges and universities fund the infrastructure required to support the computer requirement plan? One of the most widely publicized programs is the “Plan for the Class of 2000” at Wake Forest where students pay $3,000 in extra tuition annually.

If computers are university-owned, then a policy is needed to protect against damage or loss. The support team must set up a receiving/configuring distribution point for issuing computers to students and faculty. Likewise, a scheme for returning/upgrading/scrubbing/storing computers at the end of the term must be established. If the computers are university-owned, then how often should the computers...
be replaced with new models? What options are available for salvaging or disposing of the models that are replaced?14

If laptops are required, then classrooms must be converted to provide a power supply and network connection at each seat. Students will need secure places where they can store their laptops during the day. Some students at universities with laptop requirements have complained of “laptop noise.” They find the clicking and clacking of multiple laptops in classrooms and libraries disruptive. At least one administrator reports that public labs are growing at his university in spite of laptop requirements, because students get tired of carrying their laptops and prefer working at a desktop. Others note the importance of the social interactions that occur in lab clusters. For example, in departmental labs graduate students may play an important role in mentoring undergraduate students. There are many other related issues. Should we continue to channel funds into computer labs as more and more students own their own computers? How should we renovate classrooms so that they are multimedia-enabled and can accommodate students with their own computers? What sort of support is needed to help faculty incorporate technology into the curriculum to leverage the growing student computing capability?

Interest is rising as several large, state-supported institutions now require students to come to campus with a computer. College and university administrators are watching closely to see how computer requirement programs evolve at other institutions and whether they are successful. Should students be required to purchase their own computer? While the answer to the question may not yet be an unequivocal, “Yes,” it is certainly a question that every campus should be asking.

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WWW RESOURCES ON STUDENT COMPUTING REQUIREMENTS

“Notebook Colleges and Universities,” by Ray C. Brown, lists colleges and universities with laptop requirements (http://www.vcsu.nodak.edu/offices/itc/notebooks/other.htm)

“Mandatory Computer Ownership at Law Schools: A Survey,” by James E. Duggan, provides information on Law Schools that have adopted a computer requirement (http://www.siu.edu:80/offices/lawlib/survey.htm)


“Three Years and Eight Days,” in Change magazine, by G. Phillip Cartwright (http://contract.kent.edu/change/articles/julaug97.html)

Georgia Tech’s Web site describing student computing ownership (http://www.sco.gatech.edu/)

Dartmouth College’s Web site describing computer ownership requirements (http://www.dartmouth.edu/comp/new-info/)

The University of Florida’s official policy on computer ownership requirement (http://www.circa.ufl.edu/computers/)

A press release about the laptop ownership requirement at the University of North Carolina at Chapel Hill (http://www.unc.edu/news/newserv/univ/feb98/elaptop.html)

A Web site describing Virginia Tech’s Fall 1998 freshman computer requirement (http://www.comprep.vt.edu/)

A summary of discussion from the (then) CAUSE CIO listserv in May of 1998 (http://www.educause.edu/page2/cio_computer_requirements.html)

“Computers for All Students: A Strategy for Universal Access to Information Resources,” by Mark Resmer, Diana Oblinger, and James R. Mingle, a summary of a SHEEO publication on this topic (http://www.educom.edu/program/nlii/keydocs/csu.comps.4.kids.html)
One of the main tools used by colleges and universities for assessment and development of instruction is student evaluations. At Saint Michael’s College in Colchester, Vermont, we are experimenting with enhancing this process using Web-based tools. This is a faculty-initiated project that aims to use the flexibility and ease of browsers to get more useful information out of the process than is possible with static paper forms alone.

The problem and the approach
For at least a decade, Saint Michael’s has asked all students in all classes to fill out paper class evaluation forms that are provided by a vendor and then returned to that vendor for processing off-site. Although outsourcing the job has advantages, two disadvantages are that all classes fill out the same form—the one that is given to all of the vendor’s customers—and that it takes too long to get the results back (about six months). Instructors object to both of these drawbacks, saying that they reduce the value of the information as feedback for continuous improvement and instead make it more like a grade for the class from the students. One solution is to leverage the existing information technology to address the disadvantages of the current system—to do it online.

In a new system under trial at Saint Michael’s, students use a Web browser to fill out a form for each class. These forms contain both Likert items (“rate one to five”) and open-ended items (“type your comments”). The forms differ from class to class, except for four questions that are common to all classes, which are useful for comparisons. Students say that the forms are easy and intuitive.

The core of the project is that the instructors compose the forms. So an instructor in a class without a laboratory simply does not include the question asking students about the lab, and an instructor who tries something new can include a question targeted at this innovation.

To make construction of these forms as easy for the instructors as their use is for the students, we have developed a “make-a-form” form. After picking the class and section from a list, the instructor chooses a list of questions for the students in that class, selecting from about two dozen prepared questions, and also from ones that the instructor may compose. For each chosen question, the instructor clicks to include either a Likert component or an open-ended component, or both.

In the last week of class, the resulting evaluation forms are opened for access and left open until the day that finals begin. Then, on the day after grades are due, the summary reports are sent out.

The entire process is more flexible and faster than with paper, and the cost of outsourcing will be eliminated.

Feedback instead of criticism
Learning research has established that in the performance-improvement process, feedback must be prompt to be effective. This is one major advantage of our new system, since the responses reach the instructor at the earliest possible time.

Another advantage is that students give many more open-ended responses than they have given on the paper forms. For example, in past years the students in Elementary Statistics have usually given fewer than ten such comments, so that the information received was mostly restricted to averages. Under the electronic system, there were over forty comments. Instructors have said that this is the main reason that they prefer the new system. The process is now more of a dialog.

Where the bits go
After the instructor selects the questions to be asked and submits the form, a CGI script turns the submission into the class evaluation form that will be seen by the students. At the
same time, a small database is created. During the comment period, the class's database is filled by another CGI script that processes the students' feedback. At the end, the data is turned into a report. Because this report is locally generated, we can put in exactly what we think is most useful (for instance, input from a member of our Faculty Council, which is responsible for promotion and tenure decisions, prompted us to add the ability to give department-wide averages for the four in-common questions). These reports can be sent on paper or electronically.

Instructors want as many students as possible to submit a form, but they also want to be sure that each student can submit only one form. For the first concern, we have found that if students are simply told the address for the form, then the response rate is not adequate (below half), but if students are sent an e-mail allowing them to click to get to the form, then the response rate is strong (about three quarters). For the second concern, the system currently requires students to give their ID number, which is checked against the registrar's list before the response is accepted. A better solution, using a Private Key/Public Key client verification system, is under consideration.

Where the bytes are

Our software was developed on a Linux system using tools available from the Open Source software community (Apache as the Web server, Python for the scripts, and TeX for the reports). In the same spirit, our software is also freely available (see http://joshua.smcv.edu/evaluations), and because Python and TeX run on most platforms, our solution should be transportable.

Conclusion

The Web offers many chances to improve the way we generate and use information. Saint Michael's looked at the paper-based class evaluation system and decided that we could do everything that the current system does, and some of it better, with the Web systems that are newly available. Our students, faculty, and staff have been pleased with the results.

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**Question:**

Have you developed or are you in the process of developing Service Level Agreements (SLAs) with the customers/departments that your IT organization supports at your institution? If so, please briefly describe your experience and provide the URLs for the SLAs or related documents that are sharable on your Web site.

**Duke University** has two central IT groups—the Office of Information Technology and the Medical Center Information Systems—who have been working very closely, particularly in the area of support. The two main help desks use common tools for call tracking, workflow automation, and problem resolution, in effect creating a “virtual help desk.” As mission-critical client/server applications are rolled out it is critical to have institutional SLAs to set expectations for the customer (internal or external) on response times, accountability, escalations (what happens if agreed-upon timeframes and responses are not met), hours of operation, etc. Once these processes are reengineered and agreed upon, they can be relatively easily automated.

From our experience so far, we have found the following to be critical success factors:

- Reengineer your process focused on customer needs, then automate.
- Have all members of the support team (cutting across all organizational boundaries) using the same tools.
- Include non-IT parts of the support structure (for example, those who answer the functional questions) in your SLA and common tool interface.
- Finally, report on your successes and failures.

Check out http://www.dunk.duke.edu and click on the “about DUNK” section for more details.

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**At California Lutheran University,** we were concerned about managing expectations in terms of what levels of service we could offer and support as opposed to the levels that our clients may expect, want, or need. We developed a draft for our help desk service level agreement and then presented it to our campuswide technology committee for feedback. Living with the response time seems to be our biggest problem with implementing the SLA. We have been cautious about implementing the SLA due to our current staffing levels. We are not certain that we will be able to respond in the time periods listed. For a look at the current draft, point to: http://www.dunet.edu/iss/help/helpsla.html.

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Information Services at **Purdue University North Central** began developing service level agreements (SLAs) in January, 1997. Our goal is to have a document covering every core area of support we provide the university community. The first two we drafted were “technical support” and “help desk” SLAs.

We sought to clarify: our hours of operation, how to contact us, our work order system, the priority of service and our response time, what we expected our customers to do before they called, what we would do as a result of their call, some things that might result in problem escalation, and who to call in the event of dissatisfaction.

Initial feedback from reviewers prompted us to change the name from “service level agreements” to “terms of service.” This change has more appeal to our constituency.

We now have three terms of service (TOS) documents online. The third TOS focuses on multi-discipline academic computing lab support (see http://www.purdueenc.edu/is/faq/slainfo.html). We are currently working on TOS for student lab assistant support, single-discipline lab support, and academic support.

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The service agreement that affects the most people at the **University of British Columbia** is for the ISP service. The URL for this is http://www.interchange.ubc.ca/interchg-v2/services/agreement/.

We also have a more detailed SLA for the administrative departments, which I will send as an attachment upon request.

Dave Amos
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(continued on page 27)
CAUSE98 is an excellent opportunity to share new ideas with colleagues from around the world. This year’s theme — The Networked Academy — focuses on the tremendous impact that networks and the Web are having on the work of all information professionals.

The plenary sessions, track presentations, interactive poster sessions, small group discussions, corporate presentations, and other settings offer an exciting variety of ways to meet new colleagues and learn about new developments in our field. Listed below are our general session speakers for this year and the tracks for the topics covered by our presenters.

Check the EDUCAUSE Web site often for the latest CAUSE98 information.

General Session speakers:

**Molly Broad**
President, University of North Carolina • Developer of a systemwide strategic plan for information technology for the California State University

**Charles Garfield**
Company restructuring and redesign consultant • Computer scientist for Apollo XI • One of the nation’s preeminent presenters on high achievement

**Steve Jobs**
Interim CEO and co-founder of Apple Computer, Inc. • Founder, chairman, and CEO of Pixar, the Academy Award–winning computer animation studio (creators of Toy Story)

Conference tracks:

- Distributed Computing and Networking Technologies
- Applications Development in the Age of the Web
- Changing Organizational Structures and Information Professional Roles
- Staff Development and Training to Meet the Needs of a Distributed Environment
- Curriculum Support in the Networked Academy
- Providing Support in a Networked Environment
- Information Architectures, Standards, and Policies
- Achieving Results Through Business Process Reengineering and Work Process Simplification

Detailed conference information and registration form are online at [http://www.educause.edu/conference/c98/c98.html](http://www.educause.edu/conference/c98/c98.html)