CAUSE/EFFECT

A practitioner’s journal about managing and using information resources on college and university campuses

The First Amendment in Cyberspace

Academic Access Rights

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Our Institutional Memory at Risk: Collaborators to the Rescue

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Preparing Faculty for Instructional Technology: From Education to Development to Creative Independence

Plus:

Supporting Faculty Exploration of Teaching with Technology

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In recent years the distinctions between academic and administrative computing have been blurred. It’s difficult to tell where responsibilities that were once clearly defined now lie. The need for a fully integrated information technology infrastructure is as important in the learning environment as it is in the administrative function. The integration of technology is as prevalent in teaching and research as it is in recruitment.

It’s obvious from the articles in this issue that information technology personnel are playing an integral role in training faculty in the use of technology, and faculty members and librarians are playing a critical role in determining how technology is used on campus. It’s also apparent that problems related to intellectual property rights, copyright, and other legal issues and policies are no longer simply fodder for casual discussion, but are working their way into institutions and corporations on a daily basis.

It’s true that technology has changed the way we work, the way we play, and the way we live. It has eliminated some tasks while creating others. It has made our lives easier, and harder. It has had a profound impact on individuals and organizations.

CAUSE too has been affected by the changes technology has created. As a membership organization, it’s essential to not only stay abreast of change, but to anticipate the needs of the members and act accordingly. In recent months, steps have been taken to restructure the organization in order to continue to provide valuable direction and representation for our members.

One of the key elements of this restructuring is a plan to consolidate CAUSE and Educom. Originally the two organizations served different clients. However, as our missions evolved to keep pace with the changes technology brought to higher education, CAUSE and Educom have begun serving more and more of the same constituents.

As with any change, there’s excitement and concern; apprehension and anticipation; but best of all: opportunity.

By consolidating their operations, CAUSE and Educom have the opportunity to redefine the higher education information technology organization of the 21st century. For our members, it means an organization that will more closely mirror the changes taking place in your institutions and businesses.

The new organization will mean a single voice for information technology in higher education, one that will represent members in and among your respective institutions. As issues of policy and regulations become more prevalent in the area of information technology, it also means a collective representative voice in government.

A new organization offers greater and more unified opportunities for professional development. Conferences at the regional, national, and international level can be clearly defined to serve specific constituents.

As boundaries between technology users on campus disappear, so do the boundaries between institutions. With decisions about distance education and virtual universities looming, a consolidated organization will offer a better understanding of the role higher education institutions will play in the global marketplace.

The collective resources of two organizations are greater than either of the two alone. Members stand to benefit from a single knowledge database, one that will help them connect on critical issues and share solutions to common problems. A single organization can also help form stronger bonds and partnerships between institutional and corporate members. At a time when the two entities rely on each other for their special brands of expertise, a common base is essential.

It’s important that all members take an interest in the development of the new organization, but it’s essential that the voting representatives familiarize themselves with the issues. We’ve established a Web site (http://www.cause.org/admin/neworg.html) that is full of information related to the creation of the new organization. I encourage you to read it and respond. Your insight is vital to the successful evolution of CAUSE.

James Roche, Editor
Transitions at CNI

by Richard P. West

Early in July, Clifford Lynch was appointed as CNI's second executive director. Cliff succeeds Paul Peters, who was the founding executive director of CNI. All involved in CNI were committed to making the transition from the sudden loss of Paul's leadership to a new director as smooth as possible. I am pleased that we have been able to find and welcome a successor in Cliff.

During the interim, Joan Lippincott performed the director duties. Her willingness to respond to the demands of the ongoing CNI program was outstanding. Her efficiency and focus regarding the CNI program during the last six months has continued the high-quality support that has been CNI's hallmark.

Gerry Bernbom played an essential role as well during the transition period. Gerry, who was on leave from Indiana University, was largely responsible for the success of CNI's Institution-Wide Information Strategies (IWIS) project. His willingness to come to Washington, D.C., and his ability to quickly comprehend the issues before the various program initiatives, gave Joan the time she needed to provide executive direction to the needs of our 200-member organization.

On behalf of the CNI Steering Committee and the chief executive officers of ARL, CAUSE, and Educom, it's my pleasure to publicly thank Joan and Gerry for the essential contribution they made to keep CNI's program activities on a productive course. Thanks too to the other CNI staff members who contributed so much in delivering this year's program initiatives.

Many of you know Clifford Lynch. He has been highly visible in CNI from its inception in 1990. Cliff comes to CNI from the University of California, Office of the President, where he was director of library automation. He has been at the center of innovation and research in networking and networked information. At UC, Cliff managed the MELVYL information system, providing the UC community with access to a large online catalog, a myriad of abstracting and indexing databases, and full text and bitmapped primary content resources. He also ran the intercampus TCP/IP network.

Cliff's work at UC linked directly with many important CNI initiatives. He led CNI's Z39.50 interoperability test program, which was central in moving Z39.50 from a standard to a real infrastructure component for networked information access.

In July, Cliff met with the CNI steering committee for a thorough review of the existing program and a discussion of new program directions for 1997-98. What emerged was a series of new technology-focused initiatives in areas such as authentication and authorization, expanded work on metadata, networked information implications of Internet 2, and the National Learning Infrastructure Initiative.

Our CNI transition in leadership is complete. In spite of unforeseen challenges, our 1996-97 program was completed as originally described, and the 1997-98 program continues the CNI standard of excellence. There has been only what I consider normal attrition in our membership, which is the sole source of CNI funding. Credit and thanks for this go to the task force members. Without them, there would be no CNI.

Thank you for supporting CNI by renewing your 1997-98 membership. Your continued faith in the CNI vision is a vitally important part of this transition. I am confident that new leadership at CNI will provide a program that is responsive to advancing scholarship and intellectual productivity, and will continue the high return on the membership's investment.
The First Amendment in Cyberspace

by Marjorie W. Hodges and Steven L. Worona

In July 1996, a three-judge United States District Court panel in Pennsylvania unanimously declared the Communications Decency Act of 1996 unconstitutional. Specifically, the Court held that this act of the federal government abridged citizens’ free-speech rights as protected by the First Amendment. In his written opinion, Judge Stewart Dalzell called the Internet “the most participatory form of mass speech yet developed.” He also said the Internet is entitled to “the highest protection from government intrusion.” Statements such as these contribute to the widespread belief that anyone can say anything in cyberspace. After all, “It’s a free country. I have my First Amendment rights.”

Is that true? Does the First Amendment really apply in cyberspace? And just how absolute are our free-speech rights, even in the real world? To answer these questions, we’ll explore two key factors:

- The First Amendment directly specifies what the government may not do, not what individual citizens may do, and
- Even these limitations on government action aren’t absolute.

“Congress shall make no law...”

The First Amendment to the United States Constitution stipulates that “Congress shall make no law ... abridging the freedom of speech.” Of course, U. S. citizens aren’t just subject to laws made by Congress. In our federal system, state laws are even more likely to affect our day-to-day lives, along with ordinances from cities, counties, townships, and a variety of other municipalities and government agencies. This potential loophole in the First Amendment was plugged in 1925, when the Supreme Court held, in Gitlow v. New York, that the Fourteenth Amendment (ratified in 1868 during the Civil War Reconstruction period) served to extend a variety of constitutional requirements—including free speech—to state and local governments.

This extension applies not just to governments, but to government-run institutions, such as public school systems and state colleges and universities. Public institutions of higher education are thusfully constrained by the federal Constitution, including the free-speech requirements of the First Amendment. Private schools, however—including private colleges and universities—are not. Even so, many private schools have voluntarily chosen to adopt policies ensuring freedom of speech, and several states have mandated free-speech provisions for private schools within those states.

Application to cyberspace: Institutions that are required to uphold First Amendment free-speech rights generally must uphold these rights in cyberspace as well. For higher education, this means, for example, that public colleges and universities have limited ability to filter incoming or outgoing Web pages or Usenet newsgroups based on content.

Public forums: time, place, and manner

So far we’ve noted that citizens’ free-speech rights will be observed by a wide variety of public and private institutions. But even while observing these rights, most institutions cannot reasonably adopt an “anything goes” approach. The second part of the article ad-
dresses certain speech whose content—for example, threats, libel, and shouting “fire” in a crowded theater—may legitimately be constrained, but first we'll address another class of free-speech limitation, so-called “content-neutral restrictions of time, place, and manner.” For example, on what part of the city hall grounds may citizens set up their soap boxes? And at what hours of the day or night, and how loudly may they exercise their rights to free speech? Must a municipality permit soap boxes at city hall at all?

When called upon to answer such questions, courts typically ask whether the location is a “public forum,” a public place that has public access, such as streets, sidewalks, and parks. As noted in Hague v. CIO (1939), public forums are places that have “immemorially been held in trust for the use of the public, and, time out of mind, have been used for purposes of assembly, communicating thoughts between citizens and discussing public questions.” Under common law tradition, the government could regulate speech in the public domain by time, place, and manner restrictions, but could not deny access. Current Supreme Court doctrine requires that content-neutral restrictions on speech in public forums be “narrowly tailored to a substantial government interest, and leave open ample alternative channels of communication.”

**Application to cyberspace:** Is cyberspace a public forum? The United States District Court for the Western District of Oklahoma addressed this issue in Loving v. Boren (1997), (http://www.jmls.edu/cyber/cases/loving.html). After an elected representative complained that material available in news groups stored on the public university's server violated state law, the university blocked access to some groups. A professor said this violated his free speech rights and filed suit. The court held that the computer systems of public institutions are not inherently public forums and that such institutions could limit servers to officially approved material. This decision would not prevent a public or a private institution from creating a public forum, either intentionally or unintentionally.

**Free Speech and the Private Sector**

The cocktail party seems to be a success; you're enjoying yourself, and everyone else seems to be having a fine time as well. But then you hear a commotion, and notice the host angrily ushering one of the guests out the door. The guest's hat is flung out after him, unceremoniously. Mystified, you ask the host what happened. “Sorry for the disturbance, Mike, but I never realized Bill felt that way about abortion. I just won't tolerate such viewpoints in my house.” You're outraged: What happened to Bill’s free-speech rights?

Unless that cocktail party was part of a government function, or took place in a state building, or could somehow be considered a public forum, Bill's rights weren't violated. The host's rights to control his own property are not limited by the First Amendment. The First Amendment does not give individuals the right to say whatever they want whenever they want.

Now replace the cocktail party in the above example with a classroom at a private university. Could the university's code of conduct specify expulsion for expressing certain opinions or beliefs? Yes, indeed.

**Application to cyberspace:** Many private institutions with religious affiliations prohibit blasphemy on campus. These institutions may apply the same restrictions in cyberspace, limiting expression in Web pages, e-mail, Usenet postings, chat rooms, and any other Internet communication.

**Shouting 'fire' in a crowded theater**

Even when applied to government action, the First Amendment protection of speech is not absolute. As noted above, the government and public institutions can create reasonable time, place, and manner restrictions. The courts also give some speech a lesser degree of protection—commercial advertising, for example, and “indecent” speech—and have excluded some speech altogether from First Amendment protection. “Fighting words,” threats, harassment, obscenity, and child pornography are examples of speech that receive no First Amendment protections. Moreover, there is libel law, and prohibitions on per-
Fighting words

In Chaplinsky v. New Hampshire (1942), the courts introduced the fighting-words doctrine. Fighting words are defined as having a “direct tendency to cause acts of violence by the persons to whom, individually, the remark is addressed.” One of the crucial aspects of this speech is that it occurs face to face. When the Supreme Court upheld the decision in Chaplinsky, it created a new category of unprotected speech, “[words] which by their very utterance inflict injury or tend to incite an immediate breach of the peace.” The rationale behind this ruling was that this particular kind of speech does not contribute to the exchange of ideas or the search for truth. Today, the courts rarely rely on this precedent. In fact, the courts have struck down most breach-of-peace and disorderly conduct statutes that relied on fighting words as overly broad.

Application to cyberspace

Perhaps because the parties have never met, e-mail and other Internet communications all too frequently break out into “flame wars,” with insults, name-calling, and a leap-frog series of escalating invective. Inevitably, one of the combatants will demand that the other’s fighting words be suppressed. As noted, however, a crucial aspect of the fighting-words doctrine is a face-to-face confrontation. It is thus highly unlikely that the courts will extend this doctrine to cyberspace, even when Internet videoconferencing is involved.

Threats

The courts have long upheld both state and federal statutes that prohibit threats. For example, there is federal legislation that reads: “Whoever transmits in interstate or foreign commerce any communication containing any threat to kidnap any person or any threat to injure the person of another, shall be fined under this title or imprisoned not more than five years, or both.” While this statute is constitutional, the courts review its application carefully, as noted in The People v. B.F. Jones (1886): “It is not the policy of the law to punish those unsuccessful threats which it is not presumed would terrify ordinary persons ex-

ACCEPTABLE USE/ACCESS POLICIES ONLINE

Creating or updating policies related to technology can be a formidable task. A useful approach would be to look at the policies developed by other institutions. While many institutions have published their policies on the Web, searching from site to site, or even within the Web site of a single institution takes time, and often results in little useful information.

CAUSE can help. One of the functions of our Web site is to serve as a clearinghouse of valuable information. We’ve collected the data so that you spend less time searching for it and more time evaluating it and putting it to use.

For example, there are currently more than 60 references to policies related to acceptable/ethical use and two dozen more on access. All you have to do is follow the link below to our online information resources library. You can search the library by keyword or browse through it in a variety of ways.

Take a look. We think you’ll be pleased with what you find.

Link to the CAUSE Information Resources Library:
http://www.cause.org/information-resources/ir-library.html
cessively; and there is so much opportunity for magnifying or misunderstanding undefined menaces that probably as much mischief would be caused by letting them be prosecuted as by refraining from it."

Application to cyberspace: This is one of the very few instances where a relevant case has been tried and a judgment issued. Jake Baker was a student at the University of Michigan when he was charged under the federal statute quoted above with transmitting threats to injure or kidnap another (http://www.vcilp.org/chron/news/jakebake.htm). The transmissions occurred over the Internet. This case originated with a complaint about a story that Baker posted on the Usenet newsgroup alt.sex.stories describing the rape, mutilation, and murder of a female character to whom Baker had given the same name as one of his classmates. Ultimately, the prosecution relied on e-mail messages between Baker and an individual in Canada.

In granting Baker's motion to quash the indictment, the United States District Court for the Eastern District of Michigan held that in order to qualify as a threat, the statement charged must "contain some language construable as a serious expression of an intent imminently to carry out some injurious act." The judge in this case concluded that the language used by Jake Baker "was only a rather savage and tasteless piece of fiction," and admonished the United States Attorney's office for pursuing the charges.

Harassment and hate speech

Harassment generally applies to actions, not speech, but harassing actions do not require physical contact. Some legislation complicates the distinction between actions and speech, such as laws against creating a "hostile working environment." Still, even in cases where courts have upheld harassment charges against speech, it was the actions that were at issue: unwanted and repeated behavior targeted at one or more particular individuals.

In the late 1980s, in order to address the perceived increase in incivility on college campuses, many institutions of higher education developed "hate speech" regulations. Hate speech is a term used to describe speech which is uncivil, antagonistic, or derogatory, especially when applied to classes of people. Every such regulation tested by the courts has been found to be unconstitutional.

Application to cyberspace: Sending e-mail is an action, and an individual who knowingly persists in sending unwanted e-mail to another person may well be subject to charges of harassment. It is less clear that repeated unwanted postings to a Usenet newsgroup or to a mailing list can constitute harassment, since the action of sending these messages is not targeted at a specific individual (regardless of the content). Similarly, unwanted or unflattering references to an individual on a Web page are unlikely to constitute harassment, although they may be actionable as defamation.

Pornography, obscenity, and indecency

Pornography—humorously summarized as "naked people doing nasty things"—is, in general, constitutionally protected speech. When pornography reaches an extreme of offensiveness, however, it becomes obscenity, and loses its First Amendment privileges. By today's laws, the most restricted form of pornography is child pornography, characterized by its depiction of actual children engaged in sexual conduct. Restrictions against distributing adult material to minors have also passed constitutional scrutiny. Further, material considered "indecent" may legitimately be restricted on certain "pervasive" and limited distribution channels—for example, broadcast radio— to times when children are not likely to be in the audience. For a more complete description of the various categories of adult material and the laws regulating this material, see the authors' previous CAUSE/EFFECT article.1

Application to cyberspace: The recent Supreme Court decision in ACLU v. Reno (1996) established that cyberspace content cannot be limited to only that which would be acceptable to minors. In general, First Amendment protections for adult material

have followed that material into cyberspace.

Defamation: libel and slander

Defamation entails making a false statement to a third party that harms the reputation of someone else. Libel is defamatory writing; slander is defamation by word of mouth. Neither is constitutionally protected. In New York Times v. Sullivan (1964), however, the Supreme Court found that libel “must be measured by standards that satisfy the First Amendment,” in order not to unduly restrict political discourse. This led to the “actual malice” rule in cases involving public figures, whereby such individuals can win a defamation claim only by showing that the statement was made “with knowledge that it was false or with reckless regard of whether it was false.” One of the justifications for this standard is the presumption that public figures have the ability to publicly challenge allegedly defamatory information.

Application to cyberspace: “Slander!” “Libel!” “Defamation!” These cries are sure to be heard in any Internet flame war. The handful of Internet-related cases dealing with complaints of defamation indicate that the law of defamation applies online. An interesting nuance in this area is the claim, made by some, that any individual with a visible presence in cyberspace is a “public figure,” with the ability to publicly challenge allegedly defamatory information. As of this date, the courts have refused to accept this argument.

Calls to violence

Imagine the firebrand Socialist explaining to his audience that the capitalist system can only be brought down by force of arms. Can the government stop this speech? At what point? Or must government action be directed against the crowd instead? If the speaker is engaged in otherwise lawful expression and not intentionally inciting the crowd, but the crowd is acting in a threatening manner, then the police have to go after the crowd, not the speaker. Justice Holmes, in Schenck v. United States (1919), introduced the famous “clear and present danger” test, which defined when speech can be the basis for criminal penalties. This test was later narrowed in Abrams v. United States (1919), when the court determined that we must tolerate opinions “unless they so imminently threaten immediate interference with the lawful and pressing purposes of law that an immediate check is required to save the country.” Most legal scholars agree that the clear and present danger test is merely a more ambiguous version of the content-based restriction test, requiring that the regulation be narrowly tailored to a compelling government interest.

Application to cyberspace: While no Internet-related case law exists in this area, it seems unlikely that communications taking place solely in cyberspace can lead to the “clear and present danger” envisioned by Holmes, let alone meet the narrower standard set forth in Abrams.

Conclusion

As the Internet becomes ever more pervasive, it takes on more and more of the character of society as a whole. The First Amendment is one of the fundamental principles of our society. It is therefore perfectly natural to find the First Amendment operating in cyberspace. It will, of course, take some time for the legal system to work out the details, metaphors, and nuances. For now, it’s important to understand how the First Amendment operates in the real world and how the courts have applied it to cyberspace so far, and to track future developments in case law and legislation.

Beyond this, it’s also important to keep in mind that cyberspace cuts across national borders, and that not all governments care about citizens’ free-speech rights. In recent cases, Germany, France, and Canada have attempted to apply speech restrictions on U. S. corporations and citizens. As Tim May has said, “The First Amendment is only a local ordinance in cyberspace.”
Ownership of Electronic Course Materials in Higher Education

by Dan L. Burk

The introduction of sophisticated information technology to higher education is now forcing faculty and administrators to reexamine the traditional allocations of ownership interests in course materials. This article has been prepared to alert educators and administrators in higher educational institutions to the issues surrounding ownership of electronic course materials. In particular, this article focuses on the allocation of copyright ownership in electronic course materials between faculty and their sponsoring institutions. The article reviews relevant copyright basics, the work-made-for-hire doctrine, and options for contractual allocations of copyrights. The discussion includes a series of criteria that should be considered in formulating an institution’s intellectual property policy.

Copyright Basics

Copyright subsists in original creative works that are fixed for more than transitory duration in a tangible medium of expression. The subject matter of copyright comprises literary works, including computer software; audiovisual works; musical works; sound recordings; pictorial, graphic, and sculptural works; choreography or pantomime; and architectural works. Copyright exists the moment the work is fixed. Registration of the work is not required, but is advantageous to the author if enforcement becomes necessary.

The author of a copyrighted work is granted several exclusive rights: the right to make reproductions of the work, to distribute the work, to create derivative works, to publicly display or perform the work, and to authorize any of these acts. Thus, the “copyright” involves more than the right to make copies. For digitized materials, unlike print materials, all the exclusive rights may come into play at once—thus, materials that are presented via the Internet may, in the process of presentation, be simultaneously reproduced, distributed, publicly performed, and publicly displayed.

Digital course materials

Educators have long made copyrightable works the staple of their profession—books, treatises, scholarly papers, course materials, syllabi, overhead transparencies, and lecture notes are all within the subject matter of copyright. Digitized versions of these materials are also copyrightable, as are new hybrid creations such as multimedia materials, Web pages, and educational software. The latter materials are central to technological enrichment of the curriculum.

Faculty course designers and the sponsoring institution may invest heavily in the time and equipment necessary to create digitized electronic course materials. The materials may be extremely valuable, in that other educators and institutions may wish to adopt them once they have been created. Yet, because they are digitized, these materials may be easily acquired without authorization. Because it is so easy to acquire these materials, the legal barriers that deter such acquisition—that is, copyright in the materials—become extremely important to deter misappropriation and to make certain the creators of the materials receive compensation for their use.

The valuable nature of electronic course materials leads to a second important func-
tion for copyright: allocating ownership and control of the materials. Because the institution may invest heavily in such course materials and in the infrastructure to present them, it may wish to control their use and dissemination in order to be certain it receives a return on the investment. Faculty who create the materials may desire control of the materials in order to preserve their academic integrity, to fund further research, or to supplement tight salaries. These goals may or may not be fully compatible, and the potential for ownership disputes may become particularly acute when faculty leave an institution, expecting to take materials with them to their next position. Consequently, clear allocation of copyright ownership and control is critical to avoid conflicts.

Works made for hire

Unfortunately, the present state of copyright law makes clear allocation of ownership somewhat problematic. The "default" rules for copyright ownership are less than clear. In copyright law, the initial owner of the copyright will be the work's author. Generally, the author of a work will be the individual who fixes the expression. However, in the case of works made for hire, the statute provides that the employer of the individual who creates the work is considered the author. This provision has two important consequences. First, it allocates initial ownership of the work to the employer, rather than to the creator. Second, the provision alters the duration of the copyright: works authored by an individual are protected for life plus 50 years; works with an institutional author are protected for 75 years.

The test as to whether a work is made for hire is based on principles of agency law. In general, if the creator of the work meets the criteria expected for a regular employee, the work will be considered made for hire. Factors that point to the creator being a regular employee may include income tax withholding by the employer, withholding for benefits or benefits paid by the employer, a working schedule set by the employer, the employer providing materials and equipment used to prepare the work, a long-term duration of the relationship between the employer and the worker, and the right of the employer to assign projects to the worker.

If the creator of the work has considerable discretion over his or her own schedule, has a short-term relationship with the employer, pays for his own benefits and income tax, and supplies some or all of the equipment used in the project, then the creator may be an independent contractor. Independent contractors are considered the authors of the works they create unless the work is a special commission expressly designated as a work made for hire. Specially commissioned works may include the subject matter of technologically enriched courses—audiovisual works, instructional texts, tests, and answer material for tests.

The academic exception

Under the agency principles applied to works made for hire, college and university educators appear to meet the criteria for regular employees. They generally have long-term relationships with the institution, which has the right to assign them particular projects and tasks, and which can dictate to some extent their working schedule. Most college and university educators are subject to income tax withholding and receive benefit packages from or through the institution. Additionally, most of the course materials and scholarship produced in higher education are generated with resources provided by the institution.

However, several older court opinions hold that university educators are not employees for purposes of the works-made-for-hire doctrine. These opinions point to the general practice in academia of allowing educators to retain the rights in scholarship and other materials they produce. These opinions and subsequent commentary also suggest that principles of academic freedom dictate this result: academic freedom of thought and expression might be unduly curtailed if colleges and universities could control academic output in the manner that large corporations control the output of their employees.

The majority of these cases were decided under the 1909 Copyright Act, which has
since been superseded by a complete revision of the copyright statutes in 1976. Thus, there is some question as to whether the “academic exception” to the work-made-for-hire doctrine survived the revision of the law. One or two recent appellate decisions have suggested that the exception is still viable. (It may be significant that the authors of these opinions are former university professors appointed to the federal bench.) However, this is entirely judge-made law, with no explicit foundation in the statute.

Therefore, there is a legitimate question as to the status of materials created by educators in institutions of higher learning— the materials may or may not be works made for hire. Some institutions have asserted ownership over the copyrightable works of their faculty, citing the agency principles of works made for hire. Other institutions have allowed faculty to continue to assert ownership over their copyrightable works. Some institutions have attempted to allocate authorship via contract. However, it is critical to remember that the assertions of institutions or of faculty are immaterial to the actual authorship of the works. Authorship is dictated by the copyright statute—private parties are not able to change the allocation created by Congress, even if that allocation is unclear.

The exception to this rule is in the case of specially commissioned works created by independent contractors, as discussed above. The independent-contractor doctrine may be especially important when new courses are being created. At many institutions, creation of new materials for online presentation will involve special compensation to the faculty member creating the course, either as a cash payment, as release time, or some combination of the two. The creation of such materials is thus a project beyond the scope of the faculty member’s usual duties, assumed voluntarily in return for remuneration. Faculty who create online courses under these terms might be designated independent contractors for purposes of creating the new course, thus sidestepping the broader question of the academic exception to works made for hire. Ownership of newly created course materials might therefore be allocated as the parties desire, either to the independent contractor, or to the institution as specially commissioned works.

**Assignment of rights**

Even when private parties cannot change Congress’ choices regarding authorship, they can allocate ownership of a work via contract. All or part of the copyright can be transferred between parties, and the terms of the transfer can be made subject to limitations of time, geography, or usage. This means the scope of the transfer or license can be adapted to the needs of the parties—the license may be as broad or as narrow as they choose. For example, if an institution’s major concern is that it continue to have the use of materials it has invested in, a faculty author might grant the institution a non-exclusive license to use the materials in perpetuity, or an exclusive license to use the materials in online instruction, or the (very limited) exclusive right to use the materials in face-to-face instruction in the town of Searchlight, Nevada, between 12:01 p.m. and 12:13 p.m. on July 24, 2001.

Additionally, although private parties cannot usually alter a determination of authorship, they may secure their ownership expectations under uncertainty by providing for contingent allocations. For example, if a particular university wishes to make certain that ownership is allocated to the faculty creator of a work, the faculty employment contract might provide that in the event a work is deemed work made for hire, the institution assigns its rights in the work to the faculty member, whereas in the event the work is deemed the work of an independent contractor, ownership rights will remain with the faculty author.

Subsequent enforcement of the copyright is an important consideration in determining how authorship and ownership of the work is allocated. Individual faculty members may not have the resources to police infringement of the works they have created, whereas the institution may have sufficient resources. At the same time, the enforcement interests of the faculty member and the sponsoring institution may not be perfectly...
**Ownership Options**

Below are sets of different options that might be considered by universities attempting to draft instruments to allocate copyright ownership. This list is representative, not exhaustive. In particular, one should bear in mind that ownership of copyright is divisible in many ways. Licenses for the exclusive rights in a copyrighted work may be designated according to time, geography, usage, or other limitations.

**Option Set 1**

The first option set assumes that faculty members are considered authors of the works produced in conjunction with the employment at the institution.

Option 1.1—Faculty authorship with assignment of ownership to the institution

Under this option, the faculty member surrenders management and control of the work to the institution, perhaps as part of the employment agreement, or perhaps in return for some special remuneration. The institution would have standing to sue for infringement of the work. If the assignment specifies that the faculty member is entitled to some royalty, he or she will also retain standing to sue for infringement.

Option 1.2—Faculty authorship with a non-exclusive license to the institution

Under this option, the faculty member retains control of the work, while the institution gains the right to continue using it when the course is taught by others. However, the institution, as a licensee, would not have standing to sue for infringement.

**Option Set 2**

The second option set assumes that faculty are considered employees of the institution under the “work-made-for-hire” doctrine, and that the institution is therefore the author of works produced by the faculty.

Option 2.1—Institutional authorship with assignment of rights or license to the faculty member

Under this option, the course materials would be designated a specially commissioned work, and the institution would be expressly designated the author. The faculty creator could be given exclusive rights, non-exclusive rights, or a royalty as in Option Set 2.

Option 2.2—Institutional authorship with an assignment of rights to the faculty member

Under this option, the course materials would indicate that the faculty member is considered an independent contractor, and authorship could then vest in the faculty member. An assignment of rights or a license to use the materials could be given to the institution as in Option Set 1.

**Option Set 3**

The third option set assumes that faculty creating new course materials are considered independent contractors for purposes of the project.

Option 3.1—Institutional authorship with an assignment of rights or license to the faculty member

Under this option, the faculty creator of a work could be given the right to use the work in subsequent classes taught elsewhere, but the institution would retain control of the work. The faculty member would not have standing to sue for infringement.

Option 3.2—Faculty authorship with an assignment of rights or license to the institution

Under this option, the agreement to create the course materials would indicate that the faculty member is considered an independent contractor, and authorship could then vest in the faculty member. An assignment of rights or a license to use the materials could be given to the institution as in Option Set 1.
aligned. Depending upon the circumstances, it may be desirable to ensure that the institution, the faculty member, or both, have standing to sue for infringement of the work. The standing of a party to sue can be modulated by the use of exclusive licensing or royalty agreements. Exclusive licenses confer standing to sue upon the licensee, whereas non-exclusive licenses do not. A royalty agreement may also confer standing to sue.

**Choosing a model**

In determining exactly how to allocate ownership of materials, colleges and universities will likely be choosing between two general models of ownership. The first model might be dubbed the “patent model,” as this is the model that has traditionally been adopted by research universities for patentable inventions: ownership is transferred from the inventor to the sponsoring institution, which assumes responsibility for licensing and enforcement. The inventor in return receives a royalty. The second model might be dubbed the “textbook model.” This is the model that has traditionally been adopted for textbooks produced by faculty. The author of the book retains the copyright and assumes primary responsibility for licensing and managing the book.

These models differ primarily in the risk allocation of the parties: in the first model, the institution takes primary responsibility for managing the intellectual property, whereas in the second, the faculty member takes primary responsibility.

Within these two general models, legal instruments can be tailored to meet almost any set of objectives the faculty and institution decide upon. The sidebar at left lists several sets of possible options that might be considered in meeting particular institutional objectives. However, the objectives of the institution must first be determined, which may be a formidable undertaking. The objectives should be dictated by academic and business concerns, rather than by legal concerns. The particular concerns central to copyright ownership decisions will vary between institutions; what has been decided at other institutions may not necessarily be the best policy for your school. In some instances, the particular concerns that will influence policy at a given institution may not be immediately apparent, and may even seem counter-intuitive before having been fully considered.

For example, when considering copyright ownership allocation, the interest of faculty in free and unfettered academic inquiry, mentioned above, will be a compelling consideration in formulating the policy. However, in the emerging digital world, faculty may also have a surprisingly strong interest in allocating ownership to their sponsoring institution. This is due to the changing nature of publication. Under a traditional publishing model, the author of a creative work needed to seek out a sponsor with deep enough pockets to edit, typeset, publish, distribute, and market the work. Not coincidentally, such publishers also had the resources to manage licensing of the work, as well as to police infringement.

This model is now changing drastically in an age of desktop publishing, electronic distribution, and self-publishing via the Internet. Digitization, by eliminating the need for printing on physical media, has reduced the need for a deep-pockets publisher. However, authors who choose to self-publish will generally lack the resources to license, police, and enforce copyrights. In academia, one candidate to fill the licensing and policing role formerly occupied by publishing houses is the institution itself—the institution may potentially have the deep pockets that the individual faculty member lacks.

An institution’s interests may also be changing in the present environment. Colleges and universities may have an interest in gaining copyright ownership in order to control the dissemination of educational materials to rival institutions, to ensure continued access to materials used in key courses, and to gain licensing fees from materials that prove popular or valuable. However, an institution may have equally strong countervailing disincentives against gaining ownership. The full benefits of copyright cannot be achieved without registration of the work, and tracking such registrations may be costly and time-consuming. Vigorous licensing of...
such works may be equally costly. Some institutions, especially smaller colleges without an established technology transfer office or previous expertise in copyright development, may not have the resources to devote to the type of intellectual property management program that would attend acquisition of a large copyright portfolio.

Allocating ownership

Although an infinite number of copyright licensing agreements is possible in theory, a college or university is unlikely as a practical matter to be willing to negotiate a new agreement with every faculty member for every copyrightable work. However, even in the development of a blanket policy, the flexible nature of copyright lends itself to creative resolution of potential ownership disputes. Consequently, several points should be kept in mind when developing an institutional ownership allocation policy:

Different institutions may have different needs. As institutions attempt to determine their own proper balance of ownership allocation, they should not approach the exercise with prejudices about the desirability of copyright ownership. Ownership and control of a copyright portfolio may entail significant management responsibilities. For example, as part of its commitment to tenured or tenure-track faculty, a college or university may be willing to manage the licensing of copyrighted works by those faculty. However, the institution may lack the resources to manage the works of adjunct or contract faculty, preferring to allocate ownership—and responsibility—for those works to their creators.

Different faculty may have different needs. Faculty may have a variety of ownership allocation preferences, depending upon individual needs, institutional history, seniority, and career development. In some situations, faculty may prefer to simply be guaranteed a royalty from use of their creations, without having to be responsible for monitoring, policing, and enforcing copyrights. In other situations, where the institution lacks monitoring resources, or where faculty interests may be overlooked or lost in the shuffle of institutional administration, faculty may prefer to retain personal ownership of and responsibility for copyrightable works.

Different situations demand different legal instruments. The exclusive rights comprising a copyright are infinitely divisible, and institutions should avoid the “all or nothing” trap: the supposition that all aspects of the copyright must be allocated to either the creator or the institution. The needs and interests of all parties may be better met by dividing the copyright. Some faculty may simply wish to be certain that they can continue to use their creations in teaching, and will be satisfied with a non-exclusive license to the material. Others may be willing to part with copyrights in exchange for a contingent royalty. Conversely, a non-exclusive license or royalty granted to the college or university may equally satisfy the institution’s needs.

Conclusion

Clear allocation of copyright ownership and control is necessary to avoid disputes over electronic course materials. Although the law concerning authorship of educational works is not clear, much of the confusion created by the academic exception to the works-made-for-hire doctrine can be solved by careful license drafting. Indeed, thoughtful licensing can allocate copyrights to fulfill the needs of faculty and their sponsoring institutions. The most difficult problem in copyright ownership allocation is defining the needs and expectations of the parties. It’s imperative that faculty and administrators at each institution begin to determine their particular institutional goals, and then set an appropriate intellectual property policy to facilitate those goals. Appropriate legal implementation can then follow.

Note: This document is for educational purposes only, and should not be construed as legal advice. No representational relationship is created by the presentation of this educational material. Individual faculty members and a college or university are advised to consult competent legal counsel before entering into any legal arrangement designed to allocate ownership or other rights in copyrightable works.
Our Institutional Memory at Risk: Collaborators to the Rescue

by Timothy J. McGovern and Helen W. Samuels

Without reliable electronic records, colleges and universities will be unable to manage and defend themselves—they will lose their memories and be at significant risk. The authors explain the problems associated with the continuing reliability of electronic systems, and define the difference between an “information system” and a “record-keeping system.” Collaborative partnerships among information technology staff, archivists, records managers, auditors, lawyers, and others at each campus, and also among professional organizations, are proposed to address these needs.

A former employee has sued your institution claiming that she did not receive the benefits that were promised her. Although the employee’s traditional personnel folder has been located, the e-mail messages that provide the background information to this agreement are not included in the case file, nor have they been retained in electronic form.

In January 1997, your chief financial officer sent an important budget planning e-mail message to all senior officers outlining required reductions in expenditures. Attached to each customized message were that morning’s real-time budget projections generated from your financial database, projections that change daily. When one of the deans is reprimanded in November 1998 for failing to carry out these reductions, he questions the validity of the financial projections originally provided. Your financial system is unable to reconstruct the data as originally transmitted.

In 2025, Sylvia Smith, class of 1999, requests a copy of her transcript for a graduate school application. The registrar’s database was migrated to a new system in 2005 and again in 2222. Sylvia Smith’s transcript is incomplete.

Has your institution already encountered such problems? If not, how long will it be before you do, and how will you respond to these situations? How can colleges and universities ensure that the electronic information needed for legal, administrative, and historical purposes will exist and be usable in 10, 20, or 100 years?

What is the problem?

For paper records these issues were less critical. Memoranda would have been prepared and filed with the relevant correspondence. Final student transcripts were microfilmed, and both the paper and film versions were available for future needs. Student transcripts, memoranda, and financial reports are “records” that provide evidence of business activities. Records become more than just data or information, they become evidence of a business activity when they possess three characteristics: content, context, and structure.

Content represents the text or image of the message. Context is the information supplied in the letterhead, signatory lines, “cc” lines about who sent the message and who received copies, and especially any information that would relate the document to other documents and the business process or functions that caused the document to be created. Structure is the format of the document, such as a purchase order, registration form, or memorandum.

For paper records, all of the characteris-
The examples above and the general description of the problems associated with electronic records are drawn from Terry Cook’s excellent brief article, “It’s 10 O’Clock: Do You Know Where Your Data Are?” Technology Review, January 1995, 48-53.


There is extensive information available on the Web about the Pittsburgh and Indiana projects as well as the other research currently being conducted on electronic records. Information about the Pittsburgh project, directed by Richard Cox and David Bearman, can be found at http://www.lis.pitt.edu/~nhprc/. Information about the Indiana University project, directed by Phil Bantin and Gerry Bernbom, can be found at http://www.indiana.edu/~libarche/index.html. Both the Indiana and the Pittsburgh projects have been funded by the National Historical Publications and Records Commission (NHPRC), a granting arm of the National Archives. Information on other electronic records grants funded by NHPRC can be found at a site maintained by the National Archives and Records Administration at http://www.nara.gov/nara/nhprc/egrants.html.

In electronic form, the content of the message may be somewhat familiar, the context and structure are embedded in hardware and software. Without knowledge of the operating system and application software that interprets the record, the content itself is often useless, and the greater structure and context is entirely lost. Without a proper migration plan, as hardware and software are upgraded, the context and structure of records that are migrated forward can be lost, as well as the relationship among documents. The records that are not migrated, but left behind in a system that is no longer supported are, of course, at even greater risk. Without reliable electronic records, colleges and universities will be unable to manage and defend themselves—they will lose their memories and be at significant risk.

To date, discussions of risk assessment for information systems have focused primarily on three issues: 1) Disaster recovery (business continuity planning), 2) unauthorized access and use, and 3) physical preservation of the media.

In addition to these important issues, we now face an additional risk: the logical preservation of the meaning and functionality of the data. Data become records when the content, context, and structure are tied together to provide both meaning and functionality. Although huge volumes of data are created and—at least in the short term—being saved, without proper planning, these data will not provide adequate evidence in the long term, and will not support the legal or administrative needs of our institutions.

For several years, members of the archivist, records management, and information technology communities have been conducting research and attempting to design solutions for these long-term problems. A promising approach, proposed by a team of researchers at the University of Pittsburgh, offers a set of record-keeping requirements to guide the design, capture, and maintenance of any automated system. The key goal has been to define what is required to transform an information system into a record-keeping system. Terry Cook distinguishes the two by explaining that, “information systems (which is what we have) contain data that are timely; efficient from a technical perspective... manipulable; and non-redundant—old data are bad data, and are therefore replaced by new, updated, correct data. Record-keeping systems (which is what we need, and largely do not have) are just the opposite; they contain records that are time-bound and context stamped; inefficient technically... inviolable and unchangeable once created; and redundant—old data are not condemned as outdated and therefore deleted, but are viewed as being just as valuable as new data.”

A record-keeping system must be:

- **Compliant**—the system complies with all legal and regulatory requirements;
- **Accountable**—the organization has the necessary policies and assigned responsibilities to manage its record-keeping systems; and
- **Functional**—the system captures, maintains, and provides access to records—content, context, and structure—over time.

Archivists and information technology staff at Indiana University have turned these functional requirements into a methodology that they hope will support the evaluation of automated systems and lead to the design of improved record-keeping systems.

Special concerns for academic institutions

All institutions that rely on electronic records share these problems. For academic institutions, however, these are critical issues as our institutions are information centered and information dependent. The library has traditionally been defined as the physical and intellectual center of any academic institution. Today the electronic network (and the information it carries) has become the central focus, providing access not only to the library, but to an even broader spectrum of information. The core functions of colleges and universities depend upon this information.

Teaching and research require access to published and unpublished sources so that faculty can prepare classes, students can support their learning, and researchers can dis-
seminate their results. Administrators require access to records about policies, as well as detailed and summary financial reports. They also need data on employees and students in order to support legal, administrative, fiscal, and planning needs. Although we acknowledge the critical importance of information in higher education, we recognize that adequate attention has not been devoted to long-term issues, such as the design and management of automated systems. For instance, consider these questions:

- Does your registrar's database capture and retain adequate audit trails and use logs to demonstrate that only authorized individuals entered and altered grades?
- Do your migration plans for moving old data to a new system ensure a minimum loss of information content, context, and structure while retaining adequate functionality and record attributes?
- Does your institution have a policy and procedure to ensure that relevant e-mail is captured as part of the adequate documentation of your business processes, and that it is retained and linked to other relevant documents?

**Collaborations at colleges and universities**

We do not have easy answers to all of these problems. We do know that solving these problems requires collaboration. These must be collaborations within and among institutions and professional disciplines. In the past, archivists, records managers, auditors, information systems professionals, and librarians each had a role in collecting, managing, and providing access to information. To solve the problem of managing electronic records, we recognize that all of these players, and perhaps many others, must work together. No one individual or profession has all the knowledge and skills required to solve these complex problems.

The first partnership that must be formed at each academic institution is between the archivists and the information technology staff. Archivists have the responsibility to identify, care for, and provide access to the records of an institution. Official archival records are generated as part of the business of any institution and include a wide spectrum of materials, including the minutes of the governing board; the correspondence of the president and senior staff; documentation of gifts, bequests, and grants; personnel and student records; and theses and research reports. Archivists bring to the partnership their knowledge of the value of the content and context of records, their skills in the identification and selection of records, and their experiences with legal issues.

The information technology organization has the responsibility to build and manage the networked environment, and support the development and use of specific applications. Information technology staff also have responsibility for the backup, security, and long-term access to these data. Staff members contribute their knowledge of the structure of records—the technical issues involved in designing, capturing, documenting, managing, migrating, storing, and providing access to electronic records.

The archivist/information technology collaboration has another partner—the clients, custodians, and users of the electronic systems. The users need to understand and be willing to support the additional requirements needed to design and manage a record-keeping system. Other professionals (e.g., legal counsel, auditor, registrar, and financial officers) must join this collaboration and participate in the key activities required to manage electronic records.

David Bearman (Pittsburgh project) has identified four tactics that can be used to achieve this goal:

- **Policy**—provides guidelines for the use of electronic systems and lays the foundation for the adequate creation, retention, and access to electronic records.
- **Design**—ensures that adequate provisions are designed into systems so that required information is created, maintained, or destroyed as authorized; adequately documented; made legally acceptable; maintained; and kept usable over time.
- **Implementation**—ensures that users and

(continued on page 49)
Forecasting Financial Priorities for Technology

by Martin D. Ringle

At the end of the 1980s many colleges and universities developed financial models for technology based on then-current assumptions about student ownership of microcomputers, hardware life-cycles, maintenance contracts, and other factors. Many of these assumptions are no longer valid. With technology costs and revenue opportunities changing so rapidly, it is clear that future financial strategies will need to be more agile and adaptable than ever before. This article presents financial models drawn from more than 20 independent colleges and universities and discusses how they have been used to define a technology financial strategy at Reed College.

In 1943, Thomas Watson, chairman of IBM, said, “I think there is a world market for maybe five computers.” Nearly 40 years later, Bill Gates, founder of Microsoft, said, “640K ought to be enough for anybody.” Remarks such as these underscore a vital point: predicting the future of technology is a risky business, even for the most successful people in the history of computing. Unfortunately, this is the business for which chief technology officers are hired. As the pace of technology accelerates, our ability to deal with an uncertain future—whether through intuition or the process of strategic planning—becomes ever more critical to our institutions.

At the center of every long-range technology strategy—beneath all the policy and procedural statements on standards, equipment, software, networking, and staffing—lies the key to success or failure: the financial model. For many institutions, however, a financial model is barely visible in their technology planning efforts. All too often, neither technology officers nor financial officers have a complete picture of how much the institution is really spending on technology or how such dollars are being spent. Under these conditions, prioritization of funding items for technology is difficult, if not impossible.

This article examines financial models for technology and the priorities they need to address. The primary data on which the discussion is based are drawn from trends among a reference group of 25 private, liberal arts colleges from 1986 through 1996. In some respects, this is an update of the 1992 paper, *The Cost of Computing: Shining a Light into the Black Hole*, by David Todd and myself.1

It should be noted that while many aspects of funding, budgeting, and expense control differ substantially between private undergraduate colleges and other types of institutions, many of the observations in this paper can be applied to almost any college or university.

“Simplicity, simplicity, simplicity!”
- Walden, Henry David Thoreau, 1854

Discussions of financial models for technology are often quite complex, especially when they focus on the maze of accounting practices that can be used to manage funding and expense control. The foundation of a good financial model for technology, however, can be understood in relatively simple terms. It must:

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1 This paper appeared in *Computing Strategies in Liberal Arts Colleges*, Martin Ringle, ed., Mass, Addison-Wesley, Inc., 1992, 69-103. David Todd is currently chief information officer at Montana State University, hdtodd@montana.edu.
• be consistent with an institution’s overall priorities;
• accommodate an institution’s financial limitations;
• address technology needs as endorsed by users;
• and be sufficiently flexible to adapt to changes in funding, technology, staffing, management, and other factors.

Institutional priorities
A common weakness of many financial models for technology is that they assume rather than explain the relationship between technology and the institution’s other priorities. Technology officers, immersed in the challenge of keeping up with skyrocketing user demand, frequently overlook the fact that senior officers are juggling funds for technology with other pressing items such as deferred maintenance, faculty and staff salaries, and financial aid. Technology officers must be able to articulate a clear understanding of how technology fits into the overall institutional strategy and what this implies for the total funding picture.

Financial limitation
An axiom of organizational funding is that there is never going to be enough to meet everyone’s needs. To be successful, a financial model for technology must be designed with sensitivity to what is possible and practicable, given an institution’s financial constraints. Models that focus exclusively on technical or user demands may fail to provide senior officers with realistic options and may not, therefore, be of much value in building a workable funding strategy. It may be necessary, however painful, to acknowledge that an institution simply cannot afford to provide certain technology services unless it is willing (and able) to sacrifice funding in some other area of the budget.

User endorsement
Technology financial planning is all too often a back-room exercise conducted by the chief technology officer, alone or with a small group of trusted colleagues. Such planning does absolutely nothing to moderate user demand nor to promote understanding of the limitations faced by the information technology organization. The more awareness that users have of information technology financial constraints, the better. It is important that a financial strategy reflect, to as great a degree as possible, technology needs as perceived by users. A user endorsement of the financial plan for technology, based on an understanding of fiscal limitations, may help to garner new institutional resources while it helps—at least temporarily—to moderate user demand.

Flexibility
With changes coming so quickly and from so many different directions, it is imperative that the priorities embedded in a financial model be as flexible as possible. Winning strategies are those that make it relatively easy to modify funding sources, allocation priorities, and technology decisions, as circumstances require. In lieu of a single comprehensive, long-range technology strategy, institutions may be better off defining a set of agile and adaptive short-range strategies that fit together to form an overall plan.

The top of the list: staffing
The first thing that usually comes to mind when considering spending priorities for technology is equipment. Increasingly, however, budgetary emphasis for technology in higher education is being directed toward people rather than equipment. In part, this is the result of the growing realization that user satisfaction seems to correlate far more consistently with staff support than it does with hardware availability.

The increasing priority given to staffing is evidenced by the growth in the percentage of the information technology budget devoted to personnel. Within the reference group of liberal arts colleges, for example, expenditures for staff salaries increased from 41 percent in academic year 1989 to nearly 58 percent in 1995 (Figure 1). During the same period, median staff size in the reference group grew from 13.9 to 19.3 FTE (Figure 2). The two areas of staffing that experienced the greatest

“...
growth were user support and network services. Most recently, new staffing has been concentrated in the areas of Web materials development and Web server management.

Despite the growth in staff size, more than 90 percent of the chief technology officers surveyed indicated that the demands for expanded user support and more sophisticated technical services have risen more quickly than increases in staff size. To make matters worse, nearly half of the schools are seeing a reduction in staff longevity, and all but a few are feeling intense pressure from salary competition with the private sector. Smaller colleges, especially those located in rural or remote areas, have been very hard pressed to hire and retain qualified staff in numbers that are sufficient to meet the demand.

By all indications, recruiting and retaining high-quality staff is going to become the single biggest financial challenge for information technology organizations in the years ahead, despite the fact that there are more qualified people in the technology job market than ever before. What can be done to address the problem (other than simply increasing the overall information technology budget)?

Allocate more funds for personnel

If the percentage of the information technology budget for staffing is relatively low, then one should consider reallocating funds from line items such as maintenance contracts (see below). Schools that are already spending close to (or above) 70 percent of their information technology budgets on personnel, however, should be very wary of increasing staffing dollars further, since this could trigger serious problems with funding for operations, equipment replacement, and so forth.

Help your staff improve themselves

Although salary budgets have increased substantially, funds for staff development—workshops, seminars, conferences, and training—have generally remained flat or have decreased during the past five years. Providing opportunities for staff to acquire new skills and take a break from daily routines can be an extremely cost-effective way to improve retention and make staff more valuable to the institution. A reasonable target for staff development funding is 3–4 percent of the total information technology budget. Currently, most schools in the reference group spend between 1 and 2 percent.

Provide unpaid leaves

Colleges that allow information technology staff to take periodic unpaid leaves often find that it helps to reduce the cost of recruiting and training new staff. Given the "burnout" conditions of so many information technology jobs, a few months away every few years can be enormously rejuvenating for the staff member and cost-effective for the college.

Outsource

In the past, private institutions, especially smaller ones, had few choices with respect to information technology outsourcing; it was
Generally an “all-or-nothing” proposition. The lower cost of “doing it yourself” generally won out. Today, there is a growing menu of task-specific outsourcing opportunities that range from piecework Web development to comprehensive network support. While there are drawbacks to outsourcing—such as staff loyalty is to the third-party provider rather than to the institution—the benefits are increasing. In a fast and forbidding job market, a third-party provider may be able to deliver high-quality staff with little or no disruption due to turnover. More and more small colleges, especially those outside of urban areas, are exploring task-specific outsourcing as a strategy for addressing recruitment and retention problems.

Distribute the cost of support staff

More and more information technology organizations, even the highly centralized ones common at small colleges, recognize that support staff in client departments may be easier for an institution to fund than staff in the central organization. Such staff can help to ease the burden on central staff in a variety of ways. Rather than being concerned with “control,” information technology organizations should focus attention on the best way to hire and deploy staff.

Restrict services

Perhaps the least attractive option for making ends meet is to reduce or eliminate existing technology services. In the long run, however, it is wiser to do a few things well than to do everything poorly. Unfortunately, many information technology officers and organizations are myopic when it comes to making this choice. If financial resources are treated as a zero-sum game, then technology services must be viewed likewise. (Feel free to send photocopies of this paragraph to your computing committees, your staff, and your boss.)

Equipment acquisition, upgrade, and replacement

In 1989, Gary Augustson, executive director of Computing and Information Systems at Penn State University, offered a perspective on financial priorities for technology that included the following statement:

Probably most easily overlooked is the need to plan for replacement of equipment when it becomes obsolete. With today’s technology, the useful lifespan of equipment is... but a few years. Universities that are struggling to... fund... equipment hardly want to worry about replacing [it] in the foreseeable future.3

These were prophetic words in 1989. As predicted, a great deal of the computing equipment on campuses is now obsolete. While colleges and universities are aware of the need for replacement strategies, relatively few have taken the necessary steps to address the problem. An informal poll of chief technology officers4 conducted during 1995-1996 indicated that while more than three-fourths of their institutions had established, or were in the process of establishing, policies for the regular replacement of computing equipment, fewer than a quarter of those institutions had identified or allocated sufficient funds with which to carry out those policies.5 Like deferred building maintenance, this is a problem that promises to get worse as time goes on. What can we do?

Don't depend on the kindness of strangers

Grants, gifts, capital allocations, and end-of-year excess funds are not the way to finance equipment replacement. The only effective way to deal with this problem is to do an inventory, price out the total replacement cost, divide by the preferred number of years in the replacement cycle, and then put the resulting figure—underlined and in red—in front of everyone: bosses, committees, trustees, staff, and constituents. The first step in getting a realistic line item in the operating budget for equipment replacement is to do the arithmetic and publish the results.

Take a careful look at unit cost

It used to be a truism that while the capacity of hardware continually increased, the unit price stayed fairly constant, somewhere between $1,600 and $2,000 for a typical desktop configuration. For strategic budgeting

“Rather than being concerned with “control,” information technology organizations should focus attention on the best way to hire and deploy staff.”


4 The poll was initiated by the author during the Educom95 Post-Conference Workshop and pursued by e-mail in spring 1996. There were 72 responses, mostly (but not exclusively) from liberal arts colleges.

5 Within the reference group of liberal arts colleges, more than 65 percent have developed or are developing policies, while only 20 percent are fully funded.
purposes, schools in the reference group used a median figure of $2,000 per desktop for more than six years. During the past year, however, the median figure has jumped to nearly $2,400, driven by the appetites of more sophisticated users who want high-resolution monitors, removable media back-up devices, high-speed network and mobile connections, and other niceties. Can we really afford to provide such platforms? Not likely. We have to restrict the baseline unit cost and somehow limit its growth to the level of inflation.

Increase the life-cycle
A majority of schools that have equipment replacement policies for desktop computers endorse a life cycle of five years, though about 20 percent have longer cycles (between six and 10 years). A number of colleges and universities, such as Wake Forest, are attempting to support cycles of four years or less. In the private sector, replacement policies of less than three years are not uncommon.

The problem with many of these “endorsed” life cycles is that schools are not fully funding them and, in many cases, simply aren’t in a position to do so, now or in the foreseeable future. Funding a four-year replacement policy at the “50 percent level” (as several schools indicate they are doing) is just a politician’s way of describing an eight-year life cycle. Schools with a fully funded eight-year cycle, however, may be better off than schools with paper policies that lack realistic institutional support. Facing up to fiscal limitations means deciding how many years (on average) a machine can be useful for faculty, students, and staff—and funding replacements at that level. If an institution can only afford a seven-year replacement cycle, then it needs to acknowledge that fact, budget accordingly, and get on with the rest of its planning activities. If it determines that it simply cannot live with such a cycle, then it needs to provide sufficient cash in the operating budget to shorten the cycle. Period.

Tighten the perimeter
During the late ’80s, many schools discovered that they could get more “bang for the buck” by reallocating used equipment.

For example, Brian Hawkins of Brown University and his colleagues correctly pointed out that:

The half-life of a piece of equipment in an engineering department may be only two years, whereas the half-life of that same piece of equipment in another department may be four years. Reallocation of equipment is essential for the effective utilization of technology over its life cycle.6

Nearly every school has exploited this strategy in one form or another. After a decade of reallocation, however, many schools are now finding that their installed base has grown enormously and they are financially unable to include all machines within a regular replacement pool. The only practical solution is to define a sub-set of the installed base—a smaller perimeter—that will be eligible for regular replacement. (Unfortunately, maintaining, rather than replacing, machines can prove to be just as costly in the long run.)

Promote student ownership
Each year it becomes a little more practical and a lot more desirable for students to own their own computers. Networked residence halls, falling prices, and more “consumer” availability are helping to accelerate student ownership, currently averaging more than 60 percent. Institutional incentives, such as loan programs, bundled software, one-stop shopping, and convenient user support, can be applied to further increase student ownership.

To lease or not to lease
During the ’80s, computer leasing became less and less attractive to colleges as desktop computing grew, the unit cost of microcomputers declined, and interest rates rose. As John Oberlin has insightfully observed, however:

Leasing has several advantages: 1) it sets a clear expectation that technology will be replaced on a regular life-cycle basis; 2) it shifts the burden of recycling to the vendor, who becomes responsible for disposition of the computers at the end of the lease; and 3) it offers the opportunity ... for the institu-

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tion to recapture the salvage value of old technology before it goes to zero.7

Schools that simply don’t have sufficient cash on hand to establish an appropriate equipment replacement protocol, should look seriously at desktop computer leasing as a way of addressing the replacement problem.

Will NC save the day?

With everyone in higher education (and the private and public sectors as well) facing similar problems with regard to equipment replacement, the prospect of a “silver bullet” is extremely tantalizing. Will the network computer (NC) envisioned by Larry Ellison of Oracle—and now heralded by Microsoft, Intel, and many others—provide a solution that will radically alter the financial picture? Current wisdom within higher education is that it will not. As many of us recall, 10 years ago it seemed as if microcomputers would have a dramatic financial advantage over mainframe technology, thanks to lower “per seat” costs. When we look at the total cost of ownership, i.e., networking, servers, software, and staffing, it is apparent that we are spending more per seat, not less. Even if the price of an NC or “thin client” falls to $500 (or less) the total cost per seat is going to involve additional network bandwidth and more server capacity than are required in the distributed environments currently used. Savings to institutions may be far less than expected and, if the experiences of the past 15 years are at all relevant, they may be nil. The NC may be a winner for functional reasons but it isn’t likely to help colleges and universities lower their information technology budgets.

Maintenance contracts

In the ‘80s, maintenance contracts for centralized hardware (and system software) often consumed 25–35 percent of information technology operating budgets at small colleges. Today, the amount has dropped below 10 percent in most cases and is continuing to decline. A significant factor in this trend has been the movement away from proprietary platforms to more competitively priced open platforms. Schools that haven’t made (or completed) this evolution, and who are still spending substantial amounts on maintenance contracts, should move more quickly in this direction.

Take advantage of longer warranties

One of the better ideas to emerge from vendors is the three-year warranty for host and server hardware.8 Unlike desktop equipment, there is little to be gained by pushing centralized equipment much beyond a three-year life-cycle. This option allows institutions to immediately shift maintenance funds into equipment acquisition and replacement without paying the additional premium embedded in a lease or other credit arrangement.

Do it yourself

There is a perennial tug-of-war between those who favor maintenance contracts for desktop (and small server) equipment and those who provide in-house maintenance operations. Variables such as proximity to an urban retail environment and the local price of labor make a universal cost-benefit analysis impossible. It is true, however, that many schools are finding that the growing revenue from the maintenance and repair of student (and other) privately-owned equipment is sufficient to subsidize the maintenance costs for college-owned equipment. The speed, reliability, and convenience of in-house maintenance are bonuses on top of the potential financial benefit.

Software

While the unit cost of software has been shrinking, the gross cost of software has been steadily rising, because colleges and universities are using more packages from more sources than ever before. Much of the cost of software, however, has become hidden in departmental “supplies” budgets or other nooks and crannies of the institutional operating budget. Rather than seeking to draw these funds back into the central information technology budget, it is wiser simply to endorse this trend and allow software to realize its destiny as a “consumable.” (The problems of standards and support can be addressed regardless of how software is purchased.)


8 Digital Equipment Corporation and Hewlett-Packard provide three-year warranties on many, though not all, of their host/server lines. IBM provides them on PC but not on UNIX platforms.
Information technology as an institutional priority

There are numerous ways to assess an institution's overall priorities. One of the easiest is to look at the percentage of the general operating budget devoted to each item. In the case of information technology, the priority appears to have increased significantly in the past six years. In 1989-90, the median among the reference group was 2.22 percent. By 1995-96 it rose to 3.51 percent, as illustrated in Figure 3. Technology leaders within the group are now spending as much as 4 percent to 6 percent.

Another measure that can be used for comparison purposes is the number of information technology dollars in the institutional operating budget being spent per student (i.e., undergraduate FTEs). As shown in Figure 4, median expenditures per student among the reference group have almost doubled during the past six years.

While these numbers indicate a trend toward greater institutional emphasis on technology, they shed no light on where additional funds have come from. When asked, many technology officers confess ignorance or reply to the question by saying “the general fund.” As those who deal with the finances of colleges and universities are keenly aware, line items do not increase unless other line items decrease or new money is found. So where is the money really coming from?

Tuition and technology fees

A number of institutions appear to be directing larger portions of tuition increases into technology funding. In a few cases, private colleges and universities indicate that they have added identifiable “technology fees” to their room, board, and other fees. For the most part, though, private liberal arts institutions have been very hesitant about creating “required” fees outside of the tuition structure since this can be interpreted by a wary clientele as a maneuver to hide the real cost of attending college.

Cost-recovery (usage) fees

Six years ago, most colleges in the reference group indicated that usage fees played little or no role in their technology funding strategies. (This, of course, is one of the major differences between public and private institutions.) The situation seems to be changing. In addition to the accepted practice of charging for (laser) printing, schools are now levying charges for dormitory network access, PPP dial-in access, and specialized services such as scanning and color printing. Perhaps the most substantial area of usage fees has been telecommunications, where revenues from long-distance services, voice mail, and so forth have been used to underwrite networking and other operating costs.

The area with the greatest untapped potential is usage-based Internet access. Currently, most colleges charge flat fees for residence hall network connections. As institutional costs rise, however, colleges may begin to treat Internet access the same way they treat long-distance telephone services, with connect-time charges rather than flat fees.
One-time sources

A surprisingly large number of institutions still rely heavily on one-time funding sources, including capital allocations, discretionary funds, gifts, and grants, to subsidize operational increases in technology support. Though the strategy is frequently described as an “interim” approach, data collected during the past 10 years suggest that some institutions have made little or no progress in the direction of moving key operational costs for technology to stable operational funding sources.

The most problematic one-time funding sources are equipment grants. Unless long-term funding (or a long-term funding strategy) is built into the original grant, the equipment quickly becomes an albatross around the neck of the information technology operating budget. Private foundations and public funding agencies have begun to acknowledge this fact, and many are eliminating grants for equipment altogether or requiring that detailed long-term financial commitments be delineated as part of a grant proposal.

Organizational changes

Another major factor in funding source modification, especially during the past four years, has been increased integration among various technology and information resource organizations. More and more colleges are bringing telecommunications, instructional media, and other services together with computing, networking, and distance education. Most recently, integration of the library with these other services has also increased. For example, in 1989 none of the schools in the reference group had an organization that embraced both technology groups and libraries; nearly 12 percent of the schools have now moved to this type of organization. Whether this becomes a trend—and whether it ultimately helps to improve the funding picture—remains to be seen.

Other line items

This is perhaps the most common source of technology funding increases. For obvious (political) reasons, few colleges have been willing to discuss strategies for technology funding that involve reductions of other budget line items. (One school, for example, insisted that it doesn’t transfer funds from one line to another; it simply reduces allocations in one line, moves the residual to the general fund, and then increases funding in a different line.)

The bottom line

While it may be impossible to predict the next wave of technological innovation or the precise curve for the growth of user demand, institutions must develop financial strategies for technology that define flexible priorities and that fit into their overall mission and financial structure. As Gary Augustson correctly pointed out, “There is no simple prescription for success, and what works at one institution may not work at another. Nothing, however, can beat enlightened leadership.”9 It is incumbent on chief technology officers, working closely with senior officers, advisory committees, and other members of the college community, to develop a comprehensive understanding of what the institution is trying to accomplish with technology, how priorities for services and infrastructure relate to one another, where funding will be found, and, of greatest importance, how much technology the institution can actually afford without harming other critical funding priorities.

Acknowledgments

I am grateful to current and past technology officers of the following colleges for their generous assistance: Amherst, Bowdoin, Bryn Mawr, Bucknell, Carleton, Connecticut, Davidson, Denison, Grinnell, Hamilton, Haverford, Holy Cross, Hope, Kenyon, Lafayette, Middlebury, Oberlin, Ohio Wesleyan, St. Olaf, Smith, Swarthmore, University of the South, Vassar, and Washington College (MD). I would like to thank David Todd and Dave Smallen for the many insights they have provided on these issues over the years and Marianne Colgrove and Kerri Creager of Reed’s office of Computing & Information Services for their valuable assistance and feedback.

9 J. Gary Augustson, op. cit., 278.
Leadership and Transformation in an Environment of Unpredictability

by Martha W. Gilliland and Amelia Tynan

Because the external environment in which organizations operate is changing unpredictably, traditional leadership approaches, regardless of how well executed, work poorly. Effective leadership is focused on finding the solutions for the future that reside collectively in the organization and enabling them to be implemented. This requires accountability at all levels and living with substantial ambiguity. As implemented in the University of Arizona’s Center for Computing and Information Technology and the Faculty Development Program, this leadership approach has produced significant results. Without additional resources, CCIT expanded campus services 100-1000 percent, depending on the measure. The Faculty Development Program produced an alliance with Lucent Technologies, a major center, and special state funding of nearly $1 million.

The context for leadership and organizational transformation at the end of the 1990s is one best characterized by a high level of unpredictability. That unpredictability makes traditional strategic planning, traditional management approaches, and traditional leadership models obsolete and only marginally successful. This article is about a leadership model that works in an environment of unpredictability. Following a brief characterization of this environment, we discuss the leadership model generically. We then summarize its application at the University of Arizona in one major unit (our information technology organization) and one new program (faculty development).

Why Unpredictability

Two factors are primarily responsible for the shift to a state of unpredictability: accelerating change and increasing complexity. These manifest, for example, in technology, information availability, communication networks, and the geopolitical climate. Technology is in a state of perpetual innovation. In the past, one could purchase a device such as a television, VCR, or automobile with confidence that its gadgets would remain the most sophisticated for at least a few years. That is no longer the case as devices become cheaper, more capable, and more reliable on a daily basis. Our desktops hold sophisticated communication devices, not computers.

In short, for the foreseeable future organizations will be responding to an environment of perpetual change and to a level of complexity that is not comprehensible to any one individual. This alters the fundamental
nature of the leadership model and management approach that will produce success.

In the old model, when change occurred more incrementally and the future was more predictable, a smart manager could confidently study a problem, find an answer, design the organizational structure to solve the problem, "sell" the solution to the people who worked in the organization, and oversee implementation of the solution. Managers could do strategic planning with a five-year time horizon with some confidence that the strategic objectives were appropriate. This structured approach worked and is a major determinant of the success of U.S. corporations. But it won't work anymore.

A LEADERSHIP MODEL FOR THE 1990S

The leadership model for the 1990s rests on one important tenet. In an environment of unpredictability—an environment that is changing rapidly and is highly interconnected—the most and the best knowledge about "what to do" resides collectively with the people who work in the organization. Each person in an organization has different parts of the knowledge needed because each person has a different framework, a different set of understandings, and different information from the network of communications and information. Each sees different pieces of the future and different parts of the cause of the problem. The role of leadership is to access the information not only in its collective form but in its synergistic form. This leadership model is aimed at finding the solutions for the future that reside collectively in the organization. 

In developing and implementing this model, we have been influenced greatly by Wheatley, Peters, Block, Senge, and Tapscott.1

The model works as a four-part process (see Figure 1):

• Intention: Declare an intent for the organization or for a change that must happen within the organization.

• Dialogue: Create opportunities for dialogue and awareness about what the intention means and how it can be manifested.

• Action: Take action on activities and projects that are aligned with the intention and, as a leader, enable others to take actions that are aligned.

• Evidence: Document and celebrate the results of the action, regardless of how successful they were; recognize and celebrate both successes and failures.

Repeat the cycle at the next higher level of intention. The next level is a level that would never have been possible without the earlier level (see Figure 2). Success depends on the four elements—intention, dialogue, action, evidence—proceeding continuously.

For an organization, the intention is stated. The organization engages in a dialogue that interprets that intention into action in a host of different ways, many of which are unexpected. The leadership must act by moving on projects and providing the opening for others to act on projects that emerge from the dialogue. As things happen, evidence must be developed and communicated. Through this process, change becomes an emergent property of the organization rather than something imposed from above. The result is substantially different from and produces substantially better results than if the

(continued on page 51)

FIGURE 1: Four-Part Leadership Model

<table>
<thead>
<tr>
<th>Intention:</th>
<th>Evidence:</th>
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<td>A declaration and offer to change</td>
<td>Outcomes, standards</td>
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<th>Dialogue:</th>
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<td>Relationship building and dialogue</td>
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<th>Action:</th>
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<td>Projects, structure for taking action</td>
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BOWIE STATE UNIVERSITY

On 320 acres of gently rolling countryside in the center of a triangle formed by Baltimore, Annapolis, and Washington, D.C., lies Bowie State University.

Founded in 1865, Bowie State is one of the oldest historically black colleges and universities (HBCUs) in the country. The more than 3,400 undergraduates and nearly 1,850 graduate students who make up the student body represent not only the Maryland region it serves, but also students from throughout the United States and more than 50 other countries.

Part of the University System of Maryland, Bowie State is a regional comprehensive university and offers undergraduate majors in more than 20 fields. The school takes pride in its close-knit community atmosphere and boasts a student to faculty ratio of 18 to 1.

THE ROLE OF TECHNOLOGY

Technology plays a critical role in the ongoing development of Bowie State, its students, faculty, administrators, and constituents. Throated throughout its mission statement are reminders of the value placed on technology: “The University will enhance the quality of instruction and learning through a combination of traditional classroom teaching and application of telecommunication technologies. It will increase library access through increased technological support systems.”

Bowie's technology role is apparent at the undergraduate level, where it specializes in the computer science curriculum. And at the master's level, the university produces more African American recipients of master's degrees in computer and information sciences than all but four other institutions nationwide. Also underscoring the University's commitment to technology is its special collaboration with NASA's Goddard Space Flight Center, which has produced a number of research and outreach partnerships. In fact, Bowie State was one of only six institutions to be designated a Model Institution for Excellence, which was accompanied by a $27 million grant to Bowie State from NASA and the National Science Foundation.

OFFICE OF INFORMATION TECHNOLOGY

As have other institutions, Bowie State recognizes the need to reorganize its technology infrastructure, and is currently seeking to fill the newly created position of dean of information and technology services, a position akin to chief information officer. Currently, Acting Director of Information Technology Harold Watkins oversees the office. Watkins stresses that the Office of Information Technology (OIT) at Bowie focuses on the functionality, outcomes, and ease of use of technology, as opposed to being strictly concerned with the purchase, distribution, and implementation of hardware and software.

This is borne out by developing programs that make it extremely easy for the users to get data they need to perform their tasks, rather than spending time struggling with the technology. It also is realized by making sure that faculty and staff receive the training they need to use the technology as a functional tool and are able to spend more time using it in such applications as teaching, communications, data evaluation, and analysis.

For example, using Microsoft Access, Watkins and his team have developed a series of front-end programs that allow authorized users access to the University's database. The programs, which are easy to use and incredibly fast, allow an almost instant delivery of data at the click of a mouse. The method of delivering this information is virtually transparent, which gives users time to concentrate on the analysis of the data, as opposed to the delivery system.

The next step, said Watkins, is moving much of this information to the Web. Especially useful on the Web would be programs such as the academic advisement package. “I'd like to have it so that if a student says, ‘What happens if I change my major?’ it shows them in a matter of seconds.” According to Watkins, within seconds, from any Web site, students would be able to know which courses they've taken, how a change would affect their program, and what new courses they would be expected to take.

Watkins said Bowie State is moving toward a legacy database system, where OIT would maintain a single database, instead of the existence of multiple databases throughout campus. This would allow the University...
to maintain the integrity of its data and deliver a more functional and reliable system to the user.

Technology training is another critical factor at Bowie State, and much of this falls under the direction of the OIT. The University offers an extensive collection of training programs, ranging from an introduction to the personal computer to using sophisticated statistics programs such as SPSS. Also covered are courses for Windows, word processing, presentation and spreadsheet software, and Web and e-mail related programs.

Part of the success of the training program may be due to the fact that before faculty members get their own computers, they have to show they are competent in the use of technology. According to Bowie State University President Nathanael Pollard Jr., “Every faculty member who demonstrates competency in the use of the computer and shows how he or she will integrate it into their teaching will get a computer.” This approach, says Pollard, has led to a well-trained faculty and staff.

**Connectivity at Bowie State**

The emphasis on user access and training has not kept the OIT from providing a solid technology infrastructure throughout campus. With one exception, all of the major buildings on the Bowie State campus are connected to the fiber optic network, which operates with a 100Mbps backbone and 10Mbps dedicated lines. All full-time faculty in the Martin Luther King Jr. Communication Arts Center and Robinson Hall are fully connected, complete with Internet access. Offices in the William E. Henry Administration Building are also connected to the network, as are instructional and student computer labs in the Thurgood G. Marshall Library. The current exception to network connection is the Leonidas James Physical Education Complex, which is slated for wireless connection later this school year.

Because it was recently constructed and wiring was built into it, Alex Haley Residence Hall is the only one of the University’s four dormitories currently connected to the campus network. Work on connecting the other buildings began this semester.

**Reaching for the Stars**

Use of technology is prevalent throughout the Bowie State campus, but perhaps it’s most apparent in the Bowie Satellite Operations and Control Center (BSOCC) program.

BSOCC is a joint venture between BSU and NASA’s Goddard Space Flight Center, which is located just 10 miles from the University. Bowie State is the first university to receive a satellite collaboration with NASA. It’s also the first and only HBCU to establish a satellite operation and control center on its campus.

The satellite that BSOCC controls...
is used to study the sun and the solar effects on the earth. It's known as SAMPEX, for Solar, Anomalous and Magnetospheric Particle Explorer.

Working in conjunction with NASA scientists and engineers and industry representatives, the select group of Bowie undergraduate students who make up the Flight Operations Team must first complete a rigorous training program before they take control of the SAMPEX satellite. BS O C C 's Mission Operations Room contains the hardware required for satellite operation. Students use the room to measure "real-time" SAMPEX data concurrently with the Small Explorer and Mission Operation Center at Goddard.

According to Nagi Wakim, interim associate provost and dean of the School of Graduate Studies and Research, the primary purpose for BS O C C is to train a new generation of students in spacecraft operation and control. "We wanted to provide an opportunity for students who are pursuing a career in a technical area such as computer science, mathematics, or engineering, to have a chance to get some hands-on experience. So training students is our number one mission in spacecraft operation control."

The benefits of the Bowie and NASA partnership are well defined. Besides the practical hands-on training for the students, the university benefits by having the opportunity to develop a new curriculum centered on space operations. This also gives the University one more opportunity to infuse technology into every aspect of learning.

TECHNOLOGY IN SCIENCE, ENGINEERING, AND MATHEMATICS

Bowie is also using computer and information technology to build a science, engineering, and mathematics (SEM) infrastructure intended to be a model for other higher education institutions. The foundation for this is the Model Institutions for Excel lence (MIE) program, which is sponsored by NASA in cooperation with the National Science Foundation. Only five other schools nationwide are part of the MIE initiative.

One of the goals of the MIE program is to "build a viable infrastructure of technology and people, capable of utilizing the cutting-edge information technology in every aspect of teaching, learning, and administration of the effective delivery of quality services to our students."

According to Wakim, who is the MIE director and principal investigator, this meant establishing computer labs and workstations that exceeded those typically found on campus. "Because of the needs in the sciences for computing that goes beyond the desktop PC-based applications, we decided to set up an SEM computing facility."

As a result, computing in SEM is somewhat independent in respect to the programs and applications it uses, but it works closely with OIT when it comes to general computing. Where most of the campus runs Novell, the SEM facilities also operate in a UNIX and Windows-NT environment.

"We also installed fast Ethernet switches, so we actually have 10-megabit dedicated lines to each workstation, which is not the case throughout campus. We've done that with every computer-lab PC, as well as faculty and staff workstations, and we have a 100-megabit backbone running. We also have taken our network to the campus router, so that we have faster access to the external Internet line, rather than tie it into the campus network," Wakim said.

One example of the SEM facilities is the Scientific Data Visualization Laboratory. Established in January 1997, the lab gives students the opportunity to study the techniques and applications of visualization and spatial analysis in ecology, mathematics, and other disciplines where visualization can be applied. The students work with high-speed workstations from Sun Microsystems and Silicon Graphics, and use software that allows them to work with image processing, scientific visualization, geographic information system technology, remote sensing, Web development, and high-level graphics presentation.

As a result of their training and exposure, the Bowie State students are in demand. According to Wakim, many of the students, especially at the graduate level, are recruited by industry even before they receive their degrees. "We cannot keep our students around. Because of the environment and the tools the students have to learn with, industry is snatching them before they graduate."

As with most campuses these days, Bowie State is concerned with keeping its qualified information technology faculty and staff on board. According to Wakim, this is one of the greatest challenges. However, he notes, there are ways to keep your IT people coming back: "You have to be responsive, you have to continually upgrade skills and send them to training. You have to keep them abreast of what's going on; you have to keep their salaries up. Another thing that keeps them around is that we are always bringing in new systems and new software so that they don't get into that routine thing. I make sure that they are always challenged."
TECHNOLOGY AND EDUCATION: A PRESIDENT'S PERSPECTIVE

No one is more enthusiastic about the institution-wide integration of technology on the Bowie State University campus than President Nathanael Pollard Jr. Pollard is quick to point out that the total commitment to technology at Bowie State is not just part of a strategic plan, but is a vital part of the school’s mission, as put forth by the state and the University System of Maryland.

“If you look at the mission as approved by the Maryland Higher Education Commission and the board of regents of the University System of Maryland, you would find that a mandate to our institution is that we should become a premier institution in the application of technology to learning.”

Other colleges and universities are embracing the use of technology in the delivery of education, but Bowie State plans to take it at least one step further. For example, not only is teaching with technology important, but validating and tracking the successful uses of teaching with technology allows Bowie State to share its knowledge and experiences with others.

“We have an opportunity at Bowie State University to be the authority on validating technological models for delivering instruction, for delivering service, and for delivering research.”

Pollard sees Bowie State as a repository of models that work in technology. “If, for example, you want to know about a model that might work in a small classroom teaching English with technology, Bowie State University can pull it off the shelf and say, “Here’s a model that works.”

According to Pollard, the Bowie State collaboration with NASA, especially the BSOCC project (see article), is an opportunity to develop teaching and technological models that can be transferred to any other department on campus, or shared with other institutions.

A new $21 million Center for Learning and Technology is expected to provide major impetus for not only integrating technology into academics at Bowie State, but also validating the effectiveness of technology in instruction. According to Pollard, the center will be equipped with state-of-the-art resources for the delivery of instruction using various telecommunications means.

Delivery of courses on and beyond the Bowie State campus is something else Pollard views as part of the Bowie State mission. His vision is for Bowie State to use technology to deliver instruction not only in Prince George’s County in Maryland, but around the state, the nation, and the world. Bowie State is well on its way to what Pollard calls “global connected learning.” This, he notes, relies on connecting the various deposits of learning that are available elsewhere, with technology being the vital margin to add value to the learning process. Bowie State currently offers courses on four continents: North America, South America, Europe, and Asia.

Closer to home, Bowie State offers courses and services through its Telecommuting Center. The Center is part of a $1.4-million contract between the University and the General Services Administration in Washington, D.C. Through the contract, Bowie State provides workstations for individuals who work for the GSA and who normally would commute to the District of Columbia, so they can come to campus to complete their work assignments. The Telecommuting Center also allows BSU to connect with community colleges throughout Maryland and with the National Guard network of learning centers to offer courses to these outlying institutions.

Pollard has every reason to believe that Bowie State will be at the forefront of the use of technology to deliver higher education. “I think that what we are doing at Bowie is not only innovative, it is setting a precedent for a regional comprehensive university, to give that kind of focus and dimension to the use of technology.”

He cites winning a $27-million grant from NASA as an indication that Bowie is recognized as an institution on the cutting edge. Bowie was one of six to receive the grant, out of 25 applicants. Spelman College in Atlanta, which has the largest endowment of any HBCU, was one of the other recipients.

“We’re in that league,” said Pollard.
Preparing Faculty for Instructional Technology: From Education to Development to Creative Independence

by Karen L. Smith

Technology has entered academia as an attractive, even seductive addition to or replacement for the face-to-face learning experience. Often, faculty choose to add technology to their courses because it is available, because peers are doing it, or because administrators expect faculty to create distributed options for the courses. Lately the choices are made because technology has a clear place in the process of achieving desired learning outcomes. This article examines theoretical and methodological tools that can help faculty design flexible learning environments that incorporate appropriate technologies to meet individuals' needs and course or curriculum goals.

Research

As this millennium nears its end, higher education is faced with enormous challenges brought about by increased demands from corporations for employees who will require less training. These employees of the 21st century must be skilled at working in teams, have learned how to learn, be able to effectively solve problems and to process and apply information, and have a high level of expertise with a variety of technologies. The teacher as primary source of knowledge no longer suffices in a world where knowledge doubles every seven years and 10,000 scientific articles are published every day.¹

An education process that pushes students to the center changes the teacher's role to one of facilitator, guide, and coach. It places emphasis on students as active participants in the process of finding, organizing, analyzing, and applying information in novel ways to solve problems. Students become part of a learning community where they collaborate to discover information from a variety of sources, including peers, teachers, experts, real-world data, simulations, and experiences. Ultimately, they apply that information in novel ways to solve problems, communicate ideas, and continuously add to their knowledge base.

In response to this external pressure, educators have recently jumped on a cooperative or active-learning bandwagon. Based on research, this popular approach offers cooperative activities such as “think-pair-share” and “jigsaw” techniques as a means of placing students in the center of the learning process. However, this methodology ignores the needs of receptive, analytic, linear learners who may be disadvantaged by an active approach.

This article suggests that a single approach will not suffice and that teachers must be well versed in current research from cognition and learning theory in order to understand how learning occurs and to create their own, eclectic techniques. It falls upon the teacher to constantly recreate the instructional process and offer a variety of choices for approaching

information and tasks in order to meet learners’ ever-changing, individual needs.

A firm theoretical foundation offers teachers a starting point from which they can build a series of learning opportunities, responding to all styles and encouraging a wide range of strategies in order to encourage successful learning. Innovative classroom approaches plus access to appropriate technologies will lead to the creation of new learning environments that are flexible and provide a custom education for each student, regardless of class size, time and distance constraints, previous preparation, and personal factors. Selection of “appropriate technologies” is defined by desired learning outcomes and students’ needs to tackle tasks according to their individual styles and strategies, not an imposition of technology because it offers a fun or flashy approach to learning.

Modifications to the face-to-face environment create additional opportunities for interaction at a single place in a single time. The addition of technology supports places the learner at the center of a process that removes the confines of the traditional classroom through access to information, interactions with peers and experts, and opportunities for simulated and real experiences.

Figure 1 employs a fractal model informed by chaos theory to demonstrate that within a learner-centered process, students can create infinite combinations of people, opportunities, and information within the confines of finite resources. Rather than depend on a single set of materials and activities within a content area, all learning becomes interdisciplinary as students expand on prior knowledge, pursue interests, combine information in new ways to solve problems, and reach new understanding of old knowledge. Learning becomes a dynamic, customized pursuit of new solutions rather than the acquisition of a preconceived package of facts. It becomes possible for learners to discover what even experts do not know. Thus learners become teachers even as experts remain perpetual learners within the new recursive cycle of exploration and discovery.

Figure 1: The learner-centered process

“Learning becomes a dynamic, customized pursuit of new solutions rather than the acquisition of a preconceived package of facts.”
Technology adds the tools that facilitate access to the people, content, strategies, activities, guidance, and opportunities to apply new information that make learning a personal process. Technology adds the ability for students to choose how, when, and where they participate in the learning experience and to bring together a vast wealth of learning resources, including people, places, and things to which they might otherwise never have access.

**Learning styles and strategies**

Table 1 summarizes some of the possible learning styles that students bring to the common learning experience. However, not all learners are equally proficient with all styles. Guidance, opportunity, and practice can help them acquire new ones and expand their potential for success in a variety of situations. Since multiple styles are dominant in learners to varying degrees, teaching to styles is a daunting task in a traditional, teacher-centered, face-to-face classroom. Teachers, as the sole information source available to students, would be forced to bring in materials and approaches that simultaneously present information from the global perspective as well as the detailed perspective, offer concrete experiences as well as discovery options, and present facts in a non-linear and linear fashion. Preparation for a single class would require teachers to create multiple lesson plans and to accumulate a library of material on each topic. Clearly, this is impossible for one person to accomplish for even one class let alone for an entire course or curriculum.

Traditional, lecture-based approaches to education emphasize receptive, reflective, abstract, analytic, and linear learning styles. A collaborative, learner-centered approach offers opportunities for all learning styles to succeed, provided adequate information delivery, analysis, and application opportunities are made available to students. Adding technology-supported learning options improves and greatly expands the ability to accommodate style variations. Table 2 suggests a few technology-supports that accommodate different styles, offering students the opportunity to benefit from dominant ones while learning to use new ones.

Research has shown that, in addition to the individual styles, successful learning, task completion, and problem solving depend on the implementation of a variety of strategies. O’Malley and Chamot suggest three different types of strategies through which learners tackle knowledge acquisition opportunities: metacognitive (thinking about and planning for learning), cognitive (active participation in the learning process) and social/affective (interaction with others and control of affective factors). While this research emphasizes foreign language learning, the strategies are global and apply to all learning environments. Awareness of the need to enable a variety of

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Table 1: Contrasts of learning styles

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<th>Field Dependent:</th>
<th>details, internal motivation and rewards</th>
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<tbody>
<tr>
<td>Analytic Reasoning</td>
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<tr>
<td>Dynamic:</td>
<td>discovery, intuition</td>
</tr>
<tr>
<td>Visual/Auditory:</td>
<td>reception</td>
</tr>
<tr>
<td>“Right-brained”:</td>
<td>non-linear processing</td>
</tr>
<tr>
<td>Serialist:</td>
<td>sequential</td>
</tr>
<tr>
<td>Abstract Perceiver:</td>
<td>analysis</td>
</tr>
<tr>
<td>Reflective Processors:</td>
<td>reflection</td>
</tr>
<tr>
<td>Field Independent:</td>
<td>global, external motivation and rewards</td>
</tr>
<tr>
<td>Innovative Reasoning</td>
<td></td>
</tr>
<tr>
<td>Common Sense:</td>
<td>concrete, experiential</td>
</tr>
<tr>
<td>Tactile/Kinesthetic:</td>
<td>hands-on participation</td>
</tr>
<tr>
<td>“Left-brained”:</td>
<td>linear processing</td>
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<tr>
<td>Holist:</td>
<td>hierarchical</td>
</tr>
<tr>
<td>Concrete Perceiver:</td>
<td>experiences</td>
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<tr>
<td>Active Processors:</td>
<td>application</td>
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</tbody>
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strategies creates a new dimension of complexity for teachers in traditional classrooms, especially when faced with providing opportunities for students to plan for learning.

Passively hoping that learners will be able to activate appropriate strategies without guidance is insufficient to ensure successful learning and development of the ability to trigger the strategies as part of lifelong learning skills. Instead, strategy development and application can be actively included in learning opportunities. While there is no evidence that adding technology to an existing curriculum can improve teaching or learning, there is anecdotal evidence that technology can improve access to communication opportunities and information. We can hypothesize that appropriate technologies enable teachers to provide students with choices as to when, where, and how they access people and information. These choices allow students to apply a variety of strategies that help organize and advance the learning event.

Table 3 adapts strategies described in O'Malley and Chamot and offers one possible set of contrasts between how students can apply these strategies in a face-to-face environment versus one that is technology enhanced. By seeking a “best fit” between face-to-face and technology enhanced options, teachers open the door to personalized learning— and to success for every learner, regardless of background and individual differences.

Of course, it is possible for students to engage in every action listed as an online technique inside the traditional face-to-face class. The difference is that in the face-to-face class the teacher is responsible for finding, organizing, delivering, coaching, coaxing, and responding. In the online environment, the students choose what is important and must justify the choices through successful learning or initiate another search/organization/application effort. Experts come to the face-to-face class through visits and other infrequent or extraordinary means. In cyberspace, all experts are within reach, as long as they are willing to connect. Online might not be easier, and it might not cost less, but it does transfer control to the learner, and it does open up a universe of learning possibilities.

**Choices**

Technology adds choices as to how, when, and where students access learning opportunities. Thus, technology can reduce barriers

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**Table 2: Sample technology supports for learning styles**

(learning styles are in bold)

<table>
<thead>
<tr>
<th>Field Dependent/Independent</th>
<th>Field Dependent/Independent</th>
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<tbody>
<tr>
<td>presentation software</td>
<td>tutorials</td>
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<tr>
<td>tutorials</td>
<td>Web searches</td>
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<table>
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<tr>
<th>Analytic/Innovative Reasoning</th>
<th>Analytic/Innovative Reasoning</th>
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<tbody>
<tr>
<td>simulations</td>
<td>tutorials</td>
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<thead>
<tr>
<th>Dynamic/Common Sense Reasoning</th>
<th>Dynamic/Common Sense Reasoning</th>
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<tbody>
<tr>
<td>collaborative discussions</td>
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<tr>
<td>simulations</td>
<td>models</td>
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<tr>
<th>Visual-auditory/Tactile/Kinesthetic</th>
<th>Visual-auditory/Tactile/Kinesthetic</th>
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<tr>
<td>multimedia supports</td>
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</table>

<table>
<thead>
<tr>
<th>“Right-brained”/“Left-brained”</th>
<th>“Right-brained”/“Left-brained”</th>
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<tbody>
<tr>
<td>tutorials</td>
<td>tutorials</td>
</tr>
<tr>
<td>organization software</td>
<td>(outline, flow chart, spreadsheet, etc.)</td>
</tr>
<tr>
<td>decision software</td>
<td>(outline, flow chart, spreadsheet, etc.)</td>
</tr>
<tr>
<td>collaborative discussions</td>
<td>collaborative discussions</td>
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<tr>
<th>Serialist/Holist</th>
<th>Serialist/Holist</th>
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<tr>
<td>tutorials</td>
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<tr>
<td>collaborative discussions</td>
<td>collaborative discussions</td>
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<thead>
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<th>Abstract/Concrete Perceivers</th>
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<tr>
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<td>presentations</td>
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<tr>
<td>simulations</td>
<td>simulations</td>
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<tr>
<td>models</td>
<td>models</td>
</tr>
<tr>
<td>experiences, role playing</td>
<td>experiences, role playing</td>
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<table>
<thead>
<tr>
<th>Reflective/Active Processors</th>
<th>Reflective/Active Processors</th>
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<tbody>
<tr>
<td>presentation software</td>
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</table>

“Online might not be easier, and it might not cost less, but it does transfer control to the learner, and it does open up a universe of learning possibilities.”
<table>
<thead>
<tr>
<th>Strategy</th>
<th>Traditional/In-class techniques</th>
<th>Technology-enhanced techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SELF-MONITORING:</strong></td>
<td>Check personal comprehension level • ask questions • check work against answer sheet, model simulation • keep journals, logs • take and review notes</td>
<td>• consult peers, experts through computer-mediated communications • participate in electronic learning dialogues • compare work to simulated and real-world models, interact with tutorials</td>
</tr>
<tr>
<td><strong>DIRECTED ATTENTION:</strong></td>
<td>Decide in advance to focus on particular tasks and ignore distractions • set personal deadlines • establish a plan to complete exercise • conduct library search • scan texts for key information • plan for important events</td>
<td>• follow steps in software lesson • outline online search process • avoid surfing • scan databases to identify relevant information areas</td>
</tr>
<tr>
<td><strong>SELF-MANAGEMENT:</strong></td>
<td>Decide in advance to focus on specific information • create a checklist of priorities, goals • work in small groups or with partners to outline process</td>
<td>• explore Web and make selections • consult peers and experts • plan scripts, designs for new simulation, modeling activities</td>
</tr>
<tr>
<td><strong>METACOGNITIVE PLANNING:</strong></td>
<td>Develop personal objectives and select appropriate strategies • list personal goals • match goals and activities • determine progress &amp; personal success • use teacher’s feedback to assess effectiveness of strategies</td>
<td>• share personal goals with peers and experts • seek advice on selecting strategies • search Web for guidelines, plans, etc.</td>
</tr>
<tr>
<td><strong>DEDUCTIVE/INDUCTIVE:</strong></td>
<td>Applying rules / guessing • solve problems • complete experiments • rank possible solutions • vote</td>
<td>• consult peers, experts electronically • work with real-world models • interact with tutorials • vote electronically and analyze results</td>
</tr>
<tr>
<td><strong>RESCOURCING:</strong></td>
<td>Use reference materials • refer to textbooks, handouts, teacher-supplied data, library materials</td>
<td>• use electronic libraries, listservs, online tutorials, Web-based information • consult archives of discussions</td>
</tr>
<tr>
<td><strong>NOTE-TAKING:</strong></td>
<td>Write down key words and ideas • takes notes, create tables, draw diagrams</td>
<td>• bookmark and organize Web sites • create Web-page summary of findings • use information organization software (outline, flowchart, etc.)</td>
</tr>
<tr>
<td><strong>COLLABORATION/COOPERATION:</strong></td>
<td>work with classmates to solve problems, help build confidence • small-group activities, team experiments • service learning experiences, build learning communities with peers</td>
<td>• electronic collaboration with e-mail, real-time chat sessions, etc. • role-playing, simulations, modeling</td>
</tr>
<tr>
<td><strong>MENTORING &amp; GUIDANCE:</strong></td>
<td>Provide personal support and instruction • individual and small-group interactions • peer editing and critiques • individual work with teacher</td>
<td>• interaction through computer-mediated communication • role playing and simulations</td>
</tr>
</tbody>
</table>
imposed by affective factors (I'm tired, I'm hungry, I'm distracted by personal problems) on a single time, place, and mode of learning. Learners gain access to people, information, and experiences as they choose to come to class and enjoy a traditional social experience or select online learning options. Learning becomes a personal experience combining personal interactions with media supports and online learning and communication activities. Illness and personal crises no longer remove learners from the education experience. Instead, they remain connected to peers, experts, information, and experiences through threaded conference discussions, video records, and real world data simulations in an anywhere, any time frame of access.

Administrators and faculty often fear that addition of technology supports can spell the end to on-campus, residential learning experiences. However, research suggests that availability of traditional plus virtual learning options will create new environments in which students make choices to customize the learning experience to suit their personal and changing needs. Thus, this technology-supported, choice-based model of education can increase access to education and experts. It can blur distinctions between courses, rendering separate remedial or advanced courses unnecessary. Through choices offered as extensions to traditional, face-to-face classes, high school students can join college students as well as lifelong learners in corporations in an on-going process that offers access to learning modules, courses, and entire programs.

Within the face-to-face classroom, choices enhance collaboration, decision-making, and problem-solving activities by removing the need for taking turns and giving everyone equal chances to perform. Teachers as guides, facilitators, and coaches interact more fully with students as the technology takes on repetitive tasks. Teachers participate in collaboration sessions, guide experiences, provide feedback, and mentor individuals while technology supports present key concepts and basic information, link students for recorded discussions, bring experts to the students, and offer opportunities to explore databases and real world information archives. In the smart classroom, presentation software, networked computers, simulations, models, and decision-making programs actively engage the students in a variety of activities or simply allow them to passively explore a canned presentation at their own pace.

Of course, addition of technology choices does not tend to save teachers any time. In most cases, development of a technology-rich learning environment involves far more time than does preparation of a traditional lecture. The emphasis shifts to design and development and away from lecturing, correction, and feedback as peers and the students themselves become more involved in exploration, discovery, and performance-based modes of evaluation and assessment. Students may also find that the technology-rich classes require more time as they become involved in information searches, online discussions and interactions, simulations, and experiential learning opportunities.

Online classes can be fun, personal, customized experiences that help students successfully process information and expand their knowledge bases. This claim is now supported by anecdotal evidence rather than extensive research. The University of Central Florida proposes to fill the current instructional research void by engaging in systematic evaluation and assessment of how new learning environments impact a variety of learning outcomes.

From research to development to independence

Instructional technology can be imposed on existing courses, materials, and approaches. Or faculty can learn to make appropriate choices in order to create new learning environments that apply research insights into memory functions, learning strategies, learner styles, personal interest, and motivation.

The University of Central Florida has created a model faculty education program and support infrastructure that engages faculty in a recursive process of research, design, development, and assessment that leads to research-based, technology-supported, student-
centered learning environments. Figure 2 provides an illustration of the cycle of progress from application of current research through the creation of new knowledge that contributes to the growing body of research, thereby helping faculty design these new learning environments. Thus, the process constantly moves to a higher level as assessment projects yield new knowledge.

Key to the success of this approach to faculty education has been providing teachers with skills and expert tools that ultimately lead to their independence as learner-centered curriculum designers. The faculty education paradigm progresses from awareness of our current understanding of learning and assessment, curriculum design, and instructional techniques to providing access to equipment and support personnel as part of a curriculum design and development process. Finally, it provides information on learning outcomes that will advance campuswide efforts to establish new evaluation and rewards procedures recognizing the value of appropriate instructional technologies in the teaching and learning processes. This information is provided by the Office of Instructional Resources, the University Library, and Computer Services. These groups surround faculty with a variety of support opportunities that enable them to turn their vision of learner-centered, choice-based environments into reality.

Key to the success of this approach to faculty education has been providing teachers with skills and expert tools that ultimately lead to their independence as learner-centered curriculum designers.

Figure 2: Cycle of progress

Within the FCTL, faculty are immersed in education and support opportunities for the purpose of completing a curriculum-innovation process that applies learning theories and innovative instructional techniques to face-to-face and technology-enhanced teaching and learning. This provides a firm foundation for curricular change and helps faculty incorporate appropriate technologies into their classes. Beyond the FCTL, the faculty receive support from four additional members of the partnership: the Distributed Learning Course Development Team, the Office of Instructional Resources, the University Library, and Computer Services. These groups surround faculty with a variety of support opportunities that enable them to turn their vision of learner-centered, choice-based environments into reality.

- The Distributed Learning Course Development Team utilizes a combined approach of workshops and individual support options to guide faculty through the process of creating asynchronous learning environments. In order to maximize limited resources, the Course Development Team (CDT) unites instructional designers, programmers, and content specialists (the faculty) in a synergistic relationship that results in a professionally designed Web-based or Web-enhanced course that places the student in the center of the learning process. To date, the CDT has assisted faculty design and offers 47 courses. An additional 14 courses are under development for fall 1997.

- The Office of Instructional Resources provides a variety of support options for utilizing traditional and digital media sources. The OIR facilities offer faculty opportunities to learn to use interactive television as a teaching medium; to design and deliver visually enhanced presentations; and to create a wide variety of media-supported course materials. The state-of-the-art technology in the Digital Image Processing Lab and the Fac-
ulty Multimedia Center allows faculty to produce high-quality presentations and instructional materials.

- The University Library (http://pegasus.cc.ucf.edu/~library/) staff members teach faculty new techniques for information access, management, and applications using electronic research tools. Classes in the Sprint Multimedia Lab offer faculty and students an introduction to text-based and Internet-based information access and management.

- The Instruction and Research (I&R) Support section of Computer Services provides public access facilities, short courses and classes, test scoring, and other instruction and research assistance to faculty and students. Support personnel help faculty gain access to the UCF network and learn to communicate and share information using computer-mediated communication strategies.

The University of Central Florida's faculty education process begins in current research. Its purpose is to apply this existing body of knowledge to the creation of new teaching/learning strategies in order to increase our understanding of how learners reach desired outcomes. This means that the process will never end: as we gain more knowledge of how students learn and how we can support and encourage that process, faculty will repeatedly return to acquire new knowledge and new skills.

Through symposia, workshops, focus groups, and individual counseling efforts, faculty become aware of our current state of understanding of learning, assessment, and teaching processes. Collaborative learning and other hands-on activities encourage faculty to begin to modify segments of their lessons, classes, and curricula as part of these training sessions. Introductions to technology supports and their application to the learning process motivate some to seek means of expanding their instructional opportunities to remove traditional barriers to learning.

Raising awareness and interest occurs across campus as well as within the FCTL. Each awareness session inspires more faculty to explore ways to incorporate technology supports into existing or new courses. To initiate curriculum innovation, these interested faculty are invited to enter a planning and design process within the FCTL. Teams of specialists in learning and assessment theory, instructional techniques and procedures, curriculum design, visualization, knowledge management, programming, and video distribution meet with the faculty to show them existing models and to help them combine content with learning objects and desired performance outcomes.

Together these experts create a course that is based in learning theory and incorporates innovative methods and appropriate technologies. Each project design phase also includes a research design component that outlines procedures for collecting baseline and experimental data to determine the impact of the new learning environment on factors such as student learning outcomes, time-on-task, student retention in the course, and student satisfaction.

Once the design phase is complete, faculty are assigned a mentor. The mentor assesses their support needs and assigns personnel and high-end development technology to their project. The mentor also reviews existing projects to determine how new and existing teams can collaborate to avoid duplication of effort and maximize resources. Once the development team is formed, the group works with the faculty to create a work plan designed to complete the project in a timely manner in order to avoid content obsolescence. Throughout the development process, experts in learning theory, methodology, curriculum design, and assessment/evaluation work with the team to help ensure that the emerging course will produce the desired learning outcomes.

As the project nears completion it moves to the refinement and delivery stage, seeking support from the Digital Image Processing Laboratory to refine the visual impact of the course materials. High-end graphics workstations allow faculty to develop animations and even virtual reality modules for incorporation into their courses. In addition, the faculty and their students use facilities in the...
library to test the new material before offering it to a larger student population. Faculty also use UCF’s video classrooms as presentation areas where they share their project with audiences of peers, students, and support personnel for constructive critiques. Their support team helps them incorporate all pertinent suggestions to ensure that the final product is as polished as possible.

Once the new learning environment is available to the students, the UCF Distributed Learning Assessment Team launches a formal research project to examine its impact on learning outcomes and teaching strategies. We anticipate that results of these investigations will help show how the new environments can enable learning, thus adding to the general understanding of how learning occurs.

**Challenges**

Although the project process is well defined, a number of challenges can impede its smooth implementation: time, access to technology, and tangible rewards.

**Time**

Increasing demands on faculty time make it difficult for professors to commit the effort necessary to develop new learning environments. The reluctance of regents and legislators to recognize the intensive time commitment required to research, design, and implement a course change has led to reduced access to release time for curriculum innovation.

Understandably, these groups protest the need to remove faculty from the classroom to create a new course. This has led to a heavy dependence on graduate students and computer experts for the design and programming phases of project development. The role of faculty as director rather than participant in this process can have at least two negative consequences: 1) a gap occurs between the vision and the final product, and 2) new courses become so dependent upon graduate students and computer experts that when the support personnel is no longer available, the project dies.

For this reason, a goal of the UCF instructional innovation process is to support projects that can become models and even replicable tools for curriculum design. The first projects apply theory-based course design techniques as well as innovative instructional methods and approaches. Support teams work with faculty to understand course goals, desired learning outcomes, and relationships that students must build with peers, experts, information, and the discipline. The resulting curricula lead to customizable templates that accept unique content into an instructional template that promotes collaboration, problem solving, and other student-centered learning activities. Templates merge face to face with technology-enhanced teaching options to provide the greatest teaching and learning flexibility possible.

Two projects supported by the FCTL involve the development of interdisciplinary learning communities for the College of Arts and Sciences and cohort groups for the honors program that transform the nature of the face-to-face class and its relationship with online, distributed learning options.

**Access**

Limited access to technology, both to workstations and the Internet, is a barrier that impedes the implementation of a wide variety of technology-supported choices for courses. While we have taken a centralized support approach as well as offering grants to help faculty purchase labs and individual development equipment, the gap between the haves and the have-nots is still great and threatens to impede our progress.

**Rewards**

Finally, the lack of a widely accepted promotion and tenure/continuing review system that recognizes and rewards both teaching excellence and teaching innovation has prevented junior faculty, those who tend to possess the highest level of technology skill, from becoming part of the transformation effort. We must provide valid and reliable research-based evidence as to the impact of new learning environments on student outcomes before department heads and deans will be willing...

(continued on page 48)
Supporting Faculty Exploration of Teaching with Technology

by Janet R. de Vry and Paul Hyde

Branding the gap between technology’s perceived potential and its effective classroom use, PRESENT (Practical Resources for Educators Seeking Effective New Technologies) has opened its doors to University of Delaware faculty and teaching staff.

PRESENT is bridging a number of existing gaps: the gap between recent innovative uses and current mainstream options; the gap between faculty learning technology in a class and applying it to a class; and the gap between obtaining or developing technology-based materials and actually trying them in a classroom setting. PRESENT offers a place to address these issues with all of the university’s resources organized for easy use. The result is more effective educational use of technology and the inclusion of users who were previously hesitant to apply technology to teaching.

Background

PRESENT is one recent step in the University of Delaware’s long history of weaving technology into the academic fabric and listening to faculty concerns at each step in the process. The university has created a teaching, learning, and technology roundtable (TLTR) to address a number of broader issues. Concurrently, we are surveying faculty about their technology experiences and hope to initiate a network of mentors.

To help organize existing resources and identify gaps in our services, we assembled a Tool Kit for Teaching with Technology (see http://www.udel.edu/learn/technology/). It addresses the faculty need for a single information source to the diverse and sometimes hard-to-locate resources at the university. This ensures that all faculty, not just the technology “regulars,” have all the information they need to find out about teaching with technology. Concurrently, we have implemented an online database in which faculty can enter their teaching-with-technology profile. The database provides a convenient way to list and search the teaching-with-technology initiatives at the university and provides the basis for a mentor network.

Goals

The mission of PRESENT is to bridge the gap between “gee-whiz” technology and effective classroom use of technology. It is a hands-on evaluation site for technology-based strategies used in instructional delivery. Established technologies, including Web-based solutions, presentation applications, and distance learning options are available for learning and experimentation in a simulated university classroom environment. Personalized attention is given to identifying the appropriateness for, and making the connection to, specific areas of instruction. The site serves as a resource for current advances and fresh insights in classroom technology, highlighting university faculty success stories as models for others.

We identified goals that faculty could achieve based on a prior survey, class evaluation forms, our own needs self-assessment, and current research. These are:

- encouraging individual exploration using interactive learning modules
- developing teamwork skills using team-based Web and multimedia projects
- adapting to fast-changing content using library networked databases and other Web resources
• acknowledging diverse learning styles using multiple media learning materials
• overcoming space and time limitations using asynchronous communication options
• providing practice on demand with feedback using drill and practice with assessment components
• facilitating role playing, learning simulations, and apprenticeship

To meet as many goals as possible with the resources available, the site’s goals are being phased in over three stages. The first stage emphasizes installing multimedia computer systems, reallocating existing resources that were primarily in staff offices, transferring classroom materials into digital form, and meeting needs that were not met elsewhere on campus. These include a room for testing classroom presentations and Internet server demonstrations. The second stage focuses on laptop configuration assistance for classroom use and improving the site’s facilities. The final stage complements the previous two by creating an all-encompassing facility, which provides one place for faculty to try technology and then be able to buy it or use it somewhere else on campus.

Staff planning

Determining the demand for staff at the PRESENT site will be an ongoing process. When we began, the one staff member with faculty development in his job description made PRESENT his full-time focus. We asked other staff with an interest in consulting with faculty on teaching to volunteer their time. We offered nothing more than the opportunity to do interesting work and learn new skills. Initially, an “Adopt-a-High-Tech-Way” program was developed to allow interested staff to volunteer to develop support and documentation for one of the high-tech ways of teaching that the site has to offer. Staff presented the technology they had adopted at several open houses designed to spread the word on campus.

From the beginning, we understood that one of the staff’s main roles was to provide a thorough needs analysis. The needs analysis ensures that appropriate technology is selected for the stated educational goals. In addition, staff work with the faculty member to understand what skills and equipment are needed, assist in breaking the project into manageable parts, and see it through to a successful conclusion.

What we have discovered after the initial enthusiasm is that some staff have been able to make more time available than others and that we need to think creatively about leveraging our resources. We are doing this in several ways, including making templates out of successful projects, documenting the most often used processes, facilitating customized workshops for several faculty members at a time who have similar goals, and hiring students. We have sought out student workers with complementary skill sets—one computer science major, one graphic arts major, one honors biology student with high-level HTML skills. Two students regularly provide follow-up assistance to faculty in the site during normal working hours while the others are available on an as-needed basis.

Equipment and space planning

The first purchases were aimed at meeting our first-level goals for the site. We also wanted to maximize our existing departmental resources, so we relocated many peripherals to the site. All staff would still have access to specialized devices such as scanners and videotape players, and we would now be providing the opportunity for more extensive use by faculty users.

To prepare a budget for the first year’s site purchases, the three-stage goals were used again. Rather than identifying exact purchase recommendations that would most likely not be valid in six to 12 months, we budgeted for best-of-class prices in the second and third stages. As we move into these stages and actually finalize our purchase decisions, we will probably be able to purchase more features for the same or less money than originally forecast. We estimated that the on-going budget for the site would be one-third of the initial equipment outlay. This is consistent with the university’s three-year hardware purchase cycle.
The room is initially situated in 22' by 18' of space. The equipment is aligned around the perimeter of the room. In the center of the room is a large folding conference table, which can be replaced with 20 chairs to accommodate larger group presentations. All of the video and audio outputs from the various computers are directed to a central portable video projector and sound system for group presentation of any function. Other initial planning considerations included: access, security system, telephones, network connection, IP numbers, domain names, paint, window treatments, floor conduit for cables, inventory database, loaner calendar, library of documentation, and software.

Getting the word out

We have given presentations on the facility to the User Services faculty advisory committee, the Multimedia User Group, the TLTR, and Committee on Information Resources Planning and Management. We've held open houses for our departmental staff, campus computing support persons, and all faculty. Some departments have accepted our invitation to hold one of their regular meetings in our site or to have a brown-bag presentation. We have written articles for our campus newspaper, sent e-mail announcements to various faculty groups, developed a Web site detailing all the services and equipment available at PRESENT, and developed a site brochure and “business cards.” The brochure was mailed to all faculty.

Operations

The key feature of our operation is that it is process oriented and faculty focused. This means we will strive to guide faculty through the teaching-with-technology process, not just solve the “crisis du jour.” When faculty members express interest in the site, they are asked to participate in a needs assessment. This helps us determine those services that would best fit the faculty member’s abilities and future goals. It provides the framework for continuing to work with the faculty after their initial needs are met. We also inform the faculty from the outset that we are interested in what they produce, either as an inspirational example for other faculty or as a lesson that can be made into a template for other users.

The site will host various events and attractions to inform faculty of new developments in the field and provide continuing opportunities for new faculty to participate in the site’s offerings. These events include our faculty institute, brown-bag meetings, and faculty and vendor demonstrations. The on-going operation includes the mundane, yet necessary, work of maintaining current information, equipment, services, and tracking projects through an internal database.

Effectiveness

We have effectively created a unique and positive identity for PRESENT on an already technologically rich campus. Faculty say this is just what they needed at just the right time. Approximately 150 faculty have participated in at least one event in the site. They are now making appointments to get started with some of their ideas for teaching with technology. Several have already completed projects.

Juliet Dee, director of the Legal Studies Program, wanted to have a Web page for that program but simply didn't know how to go about the process. After working at PRESENT, she has a Web page online with information about what the program has to offer. She is particularly pleased to have links to Supreme Court decisions and to all of the U.S. Court of Appeals, bringing a wider array of resources to the legal studies minors than before.

Dave Barlow, chair of the Department of Health and Exercise Sciences, came to PRESENT wanting to use digital video to make his anatomy lessons more dynamic, but he only had several weeks time and wasn't sure what was feasible. “The staff at the PRESENT brainstormed with me about various approaches and helped me pick the best one given my particular constraints. Once the approach was decided upon, then the staff in the PRESENT provided the guidance and technical resources so that I could complete the project successfully.

“...we will strive to guide faculty through the teaching-with-technology process, not just solve the ‘crisis du jour.’”
“I was able to capture high-quality motion images of actual cadaver dissection for use in a PowerPoint presentation. For example, I was able to illustrate minute locations on the heart, and present knee joints from different angles, thereby adding a surgeon’s view of organs in a way I never before thought possible in a presentation.”

Jorge Cubillos, assistant professor in the Department of Foreign Languages and Literature, summed his experiences up this way. “The PRESENT has provided an optimal environment for the development of instructional materials for my foreign-language courses: the equipment is well selected and maintained, the software fits my needs, and most of all, the staff is knowledgeable and eager to help. I particularly appreciate their concern with the pedagogical issues that motivate my use of technology. More than a clearinghouse for technological ‘bells and whistles,’ the PRESENT has become a place for the supportive exploration of alternative instructional options. Also, by visiting this facility, I have discovered unexpected connections with faculty across campus.”

User Services has always provided consulting services for faculty and a high level of support for the application of technology to education. What is new is that this is a formalized process that takes place within a simulated classroom environment that is reserved strictly for faculty.”

Faculty...

(continued from page 44)ing to encourage their faculty to participate in ongoing innovation efforts. Ultimately, such evidence must inform substantive changes to existing policies in order to acknowledge and reward teaching innovation.

Moreover, the catalyst for instructional innovation extends beyond the confines of academia. Development and design of new courses no longer rests in the hands of academic institutions alone. Response to corporate pressure for new approaches to learning requires that higher education partner with corporations, not only to create new learning experiences but to create new tools that help transform the way we conduct research and organize the learning experience. The University of Central Florida is working with The Walt Disney Company, Eastman Kodak, and other corporations to design such a process for collaboratively creating new learning environments.

As faculty across colleges and even across universities begin to collaborate to develop theory-based learning environments, the body of research will grow, validating the need to transform the way we deliver higher education. Together we can employ the UCF’s model of a recursive research/development process to evolve beyond the lecture paradigm, meet individual needs, and create a dynamic new education system for the coming century.

For further reading:


Institutional Memory...
(continued from page 21)

- **Implementation**—ensures that users and technical support staff understand what is required to manage electronic records.

- **Technology standards**—encourages the creation and use of appropriate standards.

Collaborations at the professional level

Although each college and university must address the concerns unique to its situation, academic institutions face many common problems. Despite hardware and software differences, our dependence on information, the legal and regulatory environment in which we operate, and our overall purpose and programs have many similarities. We believe that the diverse professional organizations that represent the academic communities, such as CAUSE, must play a vital role in addressing the questions of electronic records. We also believe that Bearman’s four-pronged tactical framework is valid for these interdisciplinary collaborations. To this end, we recommend the following valuable cooperative projects:

**Policy**

Draw on CAUSE’s past efforts to publicize best practices and policies. A collaborative group of archivists, information technology staff, and other professionals could develop a model policy for electronic records. Such a policy would help individual institutions address this complex problem by articulating the issues and suggesting the norms that will ensure the adequate creation and retention of, and access to, electronic records.

**Design**

There are several approaches that could be taken to address design issues:

- Develop a design methodology to examine the process by which automated systems are designed and procured, and suggest how and when to address issues of long-term maintenance, access, and legal acceptability of these processes.

- Encourage cooperative projects for specific types of records. CAUSE could play an important role by bringing coalitions of like professionals together to work on aspects of this problem. For instance, the American Association of Collegiate Registrars and Admissions Officers (AACRAO) and the National Association of College and University Business Officers (NACUBO) could each work with CAUSE to address the particular problems posed by their specific record-keeping systems. Registrars face very similar issues surrounding the proper creation, maintenance, and long-term access to student information. Archivists and information technology professionals could join members of AACRAO and CAUSE to carry out this project. AACRAO’s involvement in a cooperative project would not only bring the issue more visibility but also provide a common set of recommendations that would carry greater weight within this community and save each institution much effort.

  The recent report of the CAUSE Task Force, “Privacy and the Handling of Student Information in the Electronic Networked Environments of Colleges and Universities,” serves as an excellent example of a project carried out with AACRAO that provides guidance to all institutions about a similarly complex problem.7

- Develop acceptable language for RFPs. Many academic institutions are buying rather than designing and building their own systems. Therefore, a solution now being used by several government agencies (in the United States and abroad) is to include language about required record-keeping abilities in all RFPs for new software. A CAUSE task force could develop appropriate language for an RFP and make this available to the members with an explanation of the rationale behind this approach.8

**Implementation**

The most important component of any implementation plan is education. CAUSE and other professional organizations can play a critical role in informing their members about these issues. Efforts have already started

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1 CAUSE Task Force, Privacy and the Handling of Student Information in the Electronic Networked Environments of Colleges and Universities, serves as an excellent example of a project carried out with AACRAO that provides guidance to all institutions about a similarly complex problem. (Boulder, Colo: CAUSE, 1997)

8 Both the City of Philadelphia as well as the government of Canada have taken this approach. The language used in their RFPs can be found as part of a description of the Philadelphia Electronic Records Project (http://www.phila.gov/city/departments/ems/rfp3.html) and is also available as a publication from the National Archives of Canada (http://www.archives.ca/www/english/mgr/order.html “Records/Document/Information Management—Integrated Document Management System—RFP requirements: file name 4RDIM S”).

 “… a solution now being used by several government agencies ... is to include language about required record-keeping abilities in all RFPs for new software.”
on a small scale. Following a briefing session which focused on this topic at the 1996 CAUSE annual conference, a constituent group on managing electronic records was established, and additional sessions have been proposed for future CAUSE meetings.

**Standards**

CAUSE can play a role in supporting the use of existing standards and the design of new standards that will facilitate record-keeping requirements. In addition, CAUSE could exert pressure on software vendors to incorporate appropriate standards and record-keeping requirements into the products they market to the academic community.

**Conclusion**

Colleges and universities can no longer put off confronting these issues without incurring significant risks. We believe that in order to survive and continue to succeed, academic institutions must create, manage, retain, and destroy information in a manner that supports sound management and best business practices. Our institutions must develop and exercise appropriate risk management strategies that can respond adroitly to all communities and constituencies served. Automated business systems must be designed and managed to support the sound administration of our institutions and to minimize potential risk.9

As individual professionals at academic institutions, we each have knowledge and skills that will contribute to the solution of these large problems. As professional societies—CAUSE, the Society of American Archivists (SAA), the Coalition for Networked Information, and others—we can bring visibility to this issue and work together toward solutions. If we fail to act as individuals, institutions, and organizations, our future is at risk.

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The authors expressed these risk issues in the white paper they prepared for MIT in 1995 entitled, "Managing Electronic Evidence: A Risk Management Perspective."

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**CAUSE/Educom Consolidation**

At CAUSE97 you have an opportunity to have a direct impact on the future of CAUSE. At the annual business meeting on Friday, December 5, the vote on whether to consolidate CAUSE and Educom into a single organization will be held. All CAUSE voting representatives are encouraged to attend the meeting and vote on the proposed merger. The meeting begins at 7:00 a.m.

Between now and the business meeting you can keep abreast of CAUSE and Educom consolidation discussions in several ways.

- For an ongoing discussion of the proposed consolidation, subscribe to or monitor the activities of the NEWORG listserv. You can access it through the CAUSE Web site at: http://www.cause.org/admin/neworg.html
- The prospectus for the new organization and a page of answers to frequently asked questions are also available at that site.
- If you need more information, join us for the CAUSE/Educom Forum at CAUSE97 at 6:00 p.m. on Wednesday, December 3.

Regardless of whether you're a voting representative, we'd like to know what you think about the proposed merger. Drop us a line to share your ideas, questions, or concerns — info@cause.org
change elements had been developed and imposed by an individual or a group “at the top.” Such a process, however, requires major shifts in leadership style and in how leadership spends time.

The four steps are not a sequence nor do they define one set of answers. Rather, lots of parallel processes are ongoing. These processes do not always line up or fit together. They are often based on the passion of persons trying to interpret and implement the intention. Breakdowns occur as some people, perhaps some that have held leadership jobs, lose sight of the initial intention, never make the shift in style, revert to old approaches, or can’t assume accountability. Constancy of purpose—maintained primarily by top leadership—as these breakdowns occur is a key determinant of success. The following focuses on the role of the leader at each stage.

### Intention

The intention is the vision, literally what the organization intends to be and do and how it will behave. It is not a mission statement. Leadership must accept responsibility for declaring and communicating the intention, although a participatory process in developing it is central to beginning the dialogue. Equally important, leadership must stay constant with that intent, always referencing it as the change unfolds. This constancy is tested and is difficult to maintain.

### Dialogue

Dialogue at its best is that synergistic interaction among individuals that can occur when trust exists. Leadership must shape and direct dialogue. Dialogue supported by leadership is the very vehicle through which change occurs and through which the right actions happen. Dialogue, as first introduced by Bohm and developed by Senge, is an exchange of ideas, quite distinct from discussion in which someone’s idea wins. In dialogue, individuals are willing and able to set aside their assumptions and develop a new meaning in collaboration with others; they are able to reach higher levels of understanding and insight that go beyond the best idea of any one individual. Establishing this culture of dialogue requires substantial commitment. Perhaps most difficult, leadership must set aside assessments and judgments and fully believe that others are seeing things they are not seeing. The leader(s) must trust the process.

### Action

Action is projects that transform intention into reality. Dialogue, by itself, won’t produce change. Leadership must also be willing to act on the results of the dialogue. Leadership must allow solutions that are proposed by others to move forward and be implemented, with the project team itself being accountable for results but not afraid of the consequences of failure. To the extent that the interaction between the project team and the leadership has been meaningful in dialogue, it can then transform intention into reality.

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“In dialogue, individuals are willing and able to set aside their assumptions and develop a new meaning in collaboration with others ...”

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3 Senge, 1990.
then surprises are minimal. But, one cannot expect accountability if solutions that are brought forward are not supported with the time, space, resources, and policy changes needed to make them happen.

**Evidence**

Evidence is the performance results for the organizational intention. It is the data, the project report, the reward and recognition, the promotion, that are aligned with steps that accomplish the intention. The results of a project speak much louder than words—they are what provide the organization the internal force to move to a higher level of success. Results should be documented, communicated, and celebrated.

**Summary and next level**

The next level of intention (Figure 2) originates again from whatever the leadership in an organization is seeing. It comes both from the past results and from the broad environmental scan. It is simply a declaration—of genius, of intent, of creative thought. Importantly, it does not arise from the data of the past but from the dialogue and information processing of leaders.

In this model, the future emerges from within the organization. It is an emergent property, not one decided from above.

The most difficult dimensions of this model for leaders are supporting the dialogue and enabling its outcomes to be implemented. Leaders have traditionally viewed themselves as responsible for the intention. But, then, they have assumed also that they must have the answers about how to attain it and must tell others what to do so that the solutions can be implemented. In contrast, in this model, the leadership is still responsible for the vision, but then everything changes. Leaders must release control, give up having the answers, and support others as they interpret the intention and shape what to do. This is very difficult for most of us to do. It requires living with chaos, confusion, and ambiguity. It requires accountability at all levels. In the end, however, it is the only mechanism for access to the collective intelligence. And, the results are amazing, if not sometimes miraculous.

What follows are supportive leadership behaviors and corollaries to these fundamentals.

**Provide information about the organization to everyone**

Everyone in the organization must have access to information about the institution and the external factors impacting the institution. Only when people have information can they integrate it into their own framework and factor it into solutions to problems, behaviors, and ideas for achieving the intention. People with a stake in the outcome automatically act on that information. Colleges and universities need to provide ways for everyone to have information about budgets, perceptions of parents, employers, government, and taxpayers so that they can act on it creatively. Controlling information flow out of fear that it will be misused is counterproductive. If, as leaders, we expect people to provide solutions to problems, then we need to give them all the information.

**Act as a coach**

In promulgating this leadership model, leaders spend most of their time guiding, coaching, asking questions, holding project groups to a timetable, and supporting accountability. Enabling people to come forward with projects that will produce progress toward the intention does not mean leaving them alone. Quite the contrary, it means a lot of listening and shaping ideas into action, trusting that the group sees potential that you may not be seeing.

**Ignore the terrorists**

An enormous amount of leadership time is wasted on people who are complaining, finding everything that is wrong, or simply not participating in solutions. We fondly refer to these as the terrorists. Listening to complaints that are not tied to proposals for solutions or offers of assistance is time consuming. Similarly, carefully constructing plans in order to lay people off under the organization's complicated policies and procedures takes too much time and energy. Rather, leaders must focus that precious re-
source—time—on the individuals and the teams that are committed to their project and being part of the solutions. The others will gradually be ignored by their colleagues. More specifically, one cannot mandate productivity; one cannot mandate commitment or passion. But when individuals or groups do step forward, they are appropriating their spirit to the organization. It is that spirit that will produce success. It must be nurtured, enabled, and rewarded. This ought to be the focus of one's time.

Some distinction, however, should be made about how to handle terrorists that are part of the top leadership group vis-à-vis others at other levels in the organization. Those at the top can undermine the effort in a rather significant way. They may, in fact, need to be removed, and that in itself provides powerful momentum. Usually, most people in the organization know who is not aligned; removing them sends a message of commitment. Other terrorists, however, can only undermine if the leadership devotes time to them. They can slow the momentum, but the increase from those who are acting offsets them. Gradually, those who are listening to conversations of blame move toward those who are acting and being rewarded for the action.

Provide training and development
Leaders build the capacity for performance in an organization. A person or a group with a commitment about an idea is not enough. Those people need training and development opportunities in order to perform. Central to success are opportunities to learn and apply information about total quality principles, teamwork, effective meetings, leadership style and leadership models, customer surveys, facilitation, change management, business process engineering, and market perceptions about the organization.

Let go of structure
Give up the attachment to organizational charts. Real results happen as a consequence of relationships anyway; most of us already know that. Many people want to stay in their box in the organizational chart because, if they stay there, they will know who to blame and they will feel safe. They will not have to be accountable for real results; they can hide.

Be willing to live with a high degree of ambiguity and chaos
Moving to solutions is chaotic when one is relying on a lot of people without a lot of structure. But the ambiguity and chaos is the fertile garden for dialogue and creativity.

Don't wait for consensus
Waiting for everyone in the group to agree before acting causes paralysis. Consensus is not achievable anyway. Act with those who are aligned and ignore the rest.

EXAMPLES
The application of this approach in the Center for Computing and Information Technology (CCIT) and the Faculty Development Program at the University of Arizona is described below. Both the process and the results are summarized. In both cases, the four-part leadership model was carried out iteratively. It began with a glimpse of what must happen and the declaration of an intent/vision about that. As people became involved in achieving that intention, a fuller understanding of what was needed unfolded, and a new iteration started as we produced evidence of success about the first level, leading to a new intention/vision to achieve higher level results. In this way, the organization continues to understand more and continues to move to a higher level. Because of the iterative nature of the process, these descriptions are necessarily over simplified. What actually happened and is still occurring is not nearly as orderly as implied here. Rather, it is usually confusing, chaotic, and nonlinear, but creative.

CCIT—A change imperative
The business of campus computer centers has changed irreversibly. Only a decade ago, all computing resources resided physically in a single location and were managed by one organization, serving all campus constituencies. Today, technology resources are dispersed throughout the campus, expertise is shared at varying levels and depth, and new
technologies are adopted daily and easily by end users. Support monopolies are no longer the rule. Without a doubt, the players, rules, dynamics, and requirements for survival and success in information technology have changed.

**Outsourcing as context of information technology challenge**

At the University of Arizona, the threat of outsourcing provided an additional challenge. In 1994, the university engaged an external firm to evaluate whether or not to outsource many of the functions then being performed by CCIT. Many factors led to administration's decision to pursue outsourcing seriously, such as the president's interest in accelerating technology progress, doubts that CCIT could be agile because of a long history of centralized monopoly and bureaucracy, growing pressures for major technology investment, and a general skepticism about CCIT's ability to restore customer satisfaction and credibility. For a period of six months, a thorough review was conducted with campus focus groups, technical team experts, and site visits from the consulting firm.

The findings of the consulting firm revealed significant organizational gaps but conceded that the resources, both human and technological, existed within the organization that could enable it to overcome its problems. Clearly CCIT was not achieving the goals and objectives of the university community since many of its customers were aggressively seeking other providers of computing services. Given a choice, CCIT could be downsized to a minor player in university affairs or could rise to the challenge and become a vibrant and significant partner in the future of the university.

**Intention.** CCIT accepted the challenge to reframe itself. With a new leader and challenge from senior university administration, a process of self-review and transformation was initiated. Quite literally, it began with a formal declaration of a new intention: "to support a flexible structure that will accelerate electronic information exchange through campus partnerships for the successful design of the university's future." In addition, CCIT committed to implement the consultant's recommendations published in Information Technology at the University of Arizona: Strategic Directions for the Year 2000. The intention, and this plan, became the magnetic north and focal point that guided the next two years in CCIT.

With this shift, CCIT embraced a new role of facilitator/partner rather than a monopolistic provider of technology services. What followed is a period of breakdowns, breakthroughs, and major organizational accomplishments. The original statement of intent has evolved into next levels of stronger articulation. In a recent IT campus planning session, integration became a stronger emphasis; agility and flexibility, part of the original intention, are now assumed as the modus operandi.

**Dialogue.** Selling the intention, the offer to change CCIT, meant countless open meetings, major preparation for cabinet presentations (never before done by CCIT), campus focus groups, and visits to department heads and stakeholders. Internally, this declaration of change naturally caused upset—this was a vulnerable transitional period between the old and the undefined new identity. A management consultant advised CCIT to expect resistance, emotionality, and even "terrorism." Vocal employees expressed doubt; job searches were self-initiated, though only a few left for other positions. For many, this transition meant freedom to pursue new initiatives and define a more creative future for the organization. The mood of empowerment energized a number of self-appointed teams, e.g., the momentum team and a project opportunities team.

Internally, CCIT teams were empowered to create an environment of opportunity where individuals were encouraged to excel and to participate. The pyramid of directors gave way to bottom-up project teams. In a paradigm shift, CCIT made a dramatic shift to a flattened organization that encouraged openness to new ideas and adoption of cross-functional collaborations.

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Action. Vision does not translate into action. The successful delivery of results proved to be a key step in restoring internal and external confidence in CCIT. Armed with the outsourcing partner’s report, CCIT launched and accomplished strategic projects linked with key recommendations in this published plan. Projects and opportunities were enthusiastically discussed and new grassroots initiatives were born. Top-down, bottom-up, laterally, and vertically—the coordination of action and cross-functional pursuit of results picked up momentum.

It did not matter who brought it to the surface—work plans, action groups, and new projects were enabled. Until staff were engaged in action, the idea of the abstract intention did not truly come to life. To date, there is not a full consensus in philosophy and organizational ideology, but there are many projects that demonstrate alignment, competence, discipline, and accountability. This internal process of enabling rapid results required us to abandon or ignore prior structures—functions that had become silos of turf, budget protectionism, and conflicts of interest. By declaring organization-wide initiatives, the clearing was available for all functions to participate, take leadership and risk, and emerge as contributors and successful project teams.

Evidence. What evidence of success do we have to show since 1994? CCIT accomplished major strategic projects linked with the plan commissioned by the university’s president. CCIT started documenting and sharing evidence to depict service responsiveness and to portray proactive leadership on campus. The graphs in Figure 3 speak success. Without major investment increases, CCIT delivered an incredible expansion of campus services, particularly network applications. While all universities experienced similar network growth, the University of Arizona’s progress was fueled by a new context of discipline and accountability. A good example is the university’s dorm connectivity project dubbed “port per pillow” project. All 17 dorm locations were connected in a three-month timeframe in partnership with Student Affairs. Under previous circumstances, this would have required lengthier discussions, coordination, and funding delays.

The two-year period of unparalleled growth was astounding even to CCIT staff. During that period they saw:

- five-fold increase in computers on the central network
- nine-fold increase in modem activity
- 10-fold increase in Web activity
- 25-fold increase in Internet traffic

During this same period and using existing budget resources, CCIT acquired or replaced major systems. Final negotiations for a supercomputer for research computing are under way. IBM 3090 was retired and replaced, IBM SP2 for mail and instructional services was put in place, a cluster of HP servers was deployed, and a disaster recovery program was implemented. A major business process reengineering study was completed, including an integrated information architecture map for institutional data.

Today, simple process improvements can be initiated without fanfare or formality (e.g., the account creation process now takes 10-20 minutes, compared to the two- to three-day turnaround a year ago). The idea of “partnership” is now firmly imbedded in CCIT and is the standard of practice in all endeavors. Countless formal and informal partnerships are now supported, including faculty development, campus standards coordination, classroom renovation, and technology planning. A staff-initiated Project Opportunity Web page screens and reviews project ideas for formal adoption by the organization.

Relationship-building and partnership success had its biggest payoffs in the business side of information technology. In alliance with campus budget officers, CCIT made major strides in strengthening its fiscal state, including the retirement of a computing deficit and the successful disengagement from federal regulatory constraints. CCIT’s willingness to be subjected to an open and
honest financial review led to a more credible stewardship role for IT infrastructure management.

CCIT results have not gone unnoticed. External validation of a new CCIT identity comes from several fronts. Monthly random customer satisfaction surveys substantiate the positive turnaround in CCIT relations. In 1996, the governor of Arizona awarded five service awards to CCIT in a statewide competition for quality and excellence. For three years in a row, individual CCIT staff received campus awards for excellence (including the vice provost for University Information Technology). In 1997, the president’s annual team award went to the telecommunications installation team. Through CCIT’s leadership, the university successfully obtained an NSF grant for vBNS (Very high Bandwidth Network Service) connectivity, a nationwide competitive grant program. Campus IT planning sessions now attract large attendance, whereas in the past, open forums were ignored or attended only by a handful of technicians.

In summary, transformation at CCIT involved stepping into unexplored territory. It started with a declaration, a statement of intention made to our senior administration,
but without the knowledge of how to do it. Reframing people's attitudes about their technical role required breaking through thick walls of traditions; it required adoption of a new mental framework while the loyalty remained with the status quo. The structures from our past had to be ignored as the campus engaged in a frenzy of projects to leapfrog to the next level. The coming years will involve new intentions that are different from the initial one. As the concerns of the market changes, so will the intentions.

**Faculty Development**

In November 1994, a faculty development program was initiated with the commitment to allow the faculty to determine the shape and elements of the program and to support what they felt was needed individually and collectively.

Volunteers from the faculty were solicited via an article in the university newspaper with a clip-out coupon for return. Everyone who turned in the coupon was invited to an initial meeting that was a formal brainstorming session aimed at developing some initial projects and the intention. Some faculty never returned after one meeting, having come primarily, it seemed, to identify past injustices. Those who committed to the effort took charge of several projects aimed at capturing the attention of the faculty. This began a process that continues to spiral toward more results.

The intention that emerged from this initial team was: “Faculty development provides the climate and support through which faculty can become independent creators of new learning environments. It provides expert technical support; mentoring and collaboration opportunities; inspiration, information, and infrastructure; technology for courseware creation, teaching, and learning; and approaches for measuring learning outcomes.”

This intention emerged only after several false starts. Its power is in the fact that what it says enables others to act. It is in stark contrast to an intention that delineates an organizational structure or identifies specific activities that will be supported. In fact, one of the early suggestions that failed miserably was to set up a hierarchical structure with departmental level committees and deans having certain responsibilities to oversee faculty development activities aimed at improving and supporting teaching.

Similarly, this intention does not identify a location or an administrator. What it says is: this is an effort that supports, with resources, what a faculty member or group of faculty members see would be helpful. It says that the leadership will trust ideas that come from the grassroots and, furthermore, will embrace these ideas and support them. In so doing, it implies that the leadership will trust the faculty to know what to do.

When we were clear about our intention and when we felt it was stated in a clear and even powerful way, faculty groups were invited to participate in dialogues about this intention. Of course, many did not trust that we, as administrators, would support what they said needed doing. Nevertheless, some faculty did take on projects, and we did support them. Beyond the results of the project, which were themselves significant, the real power was in the change in the way we were doing business—supporting ideas that were aligned with the intention but came from the bottom up. As that cultural shift was experienced, the number and quality of projects grew. As a corollary, the leadership cannot support projects that are not aligned with the intention. Any of these old pet projects will be put forth.

The initial dialogues were between the faculty development team and us, between the team and other interested faculty, and between the team and the president's cabinet. Several of the team members organized a Valentine's Day forum with opportunities for faculty to drop in and out all day, be heard, and hear the intention.

Four early projects produced substantial momentum. First, an orientation was developed for new faculty, with workshops on teaching resources at the university, the nature of University of Arizona students, pedagogy, and the use of technology to enhance learning. Second, a symposium for all faculty with similar workshops was offered over a period of a week, culminating in a recep-

"[This intention] says that the leadership will trust ideas that come from the grassroots and, furthermore, will embrace these ideas and support them."

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tion with prizes from technology vendors. We, of course, asked deans and department heads to encourage their faculty to participate in the workshops; some did and some did not during the first attempt. Third, a group produced a video on technology enhanced learning. The video was shown to the Board of Regents, the president's cabinet, and small groups of legislators. Fourth, another group created a video of teaching excellence models from our own faculty.

As a consequence of growing momentum, the president's cabinet decided to make a faculty development effort a priority for new funding from the legislature; $940,000 to support the effort was acquired. This caused even the cynics to notice. We stayed true to the intention and did not set up a new structure with new administrators. Rather, the money was used in two ways. First, four existing organizations formed a partnership and agreed to hire technical support people who could be made available to the faculty. The new faculty development partnership included CCIT, the library, the University Teaching Center, and the Trestman Center for New Media (a part of the College of Fine Arts). Second, a grant program was launched with a request for proposals to the faculty for curriculum and course development with an offer of equipment and technical support for successful proposals.

The results were of two types: improved teaching and learning and a feeling on campus (now with clear evidence) that the administration was supporting faculty initiatives and was supporting teaching. Again, for the long run, the latter is more powerful than the former.

For 18 months, the program remained a "virtual" faculty development effort run by a faculty team and the original four partners plus the university's video services unit, which decided to join. Together these partners provide a complete infrastructure for supporting all aspects of curriculum innovation project design, development, delivery, and assessment. Recently, 7,500 square feet has been set aside to bring the partners together. The next-level intention, developed by the partners, is to provide education and support for faculty who are engaged in creating new learning environments that:

- apply current knowledge of how learning occurs,
- provide opportunities for students to employ a variety of learning styles and strategies,
- introduce creative teaching techniques and procedures, and
- use appropriate technologies to provide anytime/anywhere student-centered access.

This new Faculty Development Center has become the heart of the UA/Lucent Technologies Alliance for Learning. The alliance is aimed at combining content specialists from the university and communications specialists from the Bell Laboratories to design "classrooms" for cyberspace aimed at merging voice, video, and data to create integrated learning environments.

These outcomes—the amount of activity, the quality of the activity, the creativity in the projects, the number of faculty participants, and the space and dollars that have begun to flow toward this program—could never have occurred or been predicted using a conventional administrative process that creates an official organizational structure and establishes programs predetermined to be the most needed.

**Summary**

In the context of rapid, unpredictable change and global access to information, the old models of leadership and change management are no longer effective. We think the process described in this article is effective in a spectrum of scales of activities from a meeting, a project, a series of projects, a reorganization of a unit within a large organization, to the organization itself. In this model, the role of the leader becomes that of accessing that knowledge and engaging it into action through projects.
Recommended Reading

this article is online at http://www.cause.org/information-resources/ir-library/html/cem973a.html

Artful Work: Awakening Joy, Meaning, and Commitment in the Workplace
by Dick Richards
(Berrett-Koehler, 1995, $25, 119 pages)
ISBN 1-881052-63-X

Reviewed by Donna Dorl-Adams

Is there an effective way to deal with the chaos, constant change, and insecurity of our current organizations? How do we as workers find ourselves fitting into the new “rules” of organizational life? How do we as managers provide the leadership required to create effective organizations? Dick Richards’ Artful Work: Awakening Joy, Meaning, and Commitment in the Workplace offers a framework in which to ponder these and other issues.

To a manager, the subject of providing leadership to a diverse group with many competing demands on their time is a crucial one. It is easy to get caught in the “administrivia” of management. Richards reminds us that, “Leadership is making dreams come true by activating the energy of others to nourish a collective vision.” Effective leadership is creating a vision and then fully engaging people, in mind and spirit, to achieve that vision. Trusting intuition and feeling, expressing things with passion, appreciating process as well as task, and cultivating a willingness to seek the unknown are just few of the ways Richards finds to bring art to your leadership. Amidst the chaos of change, seeking to be an artful leader is an absolute requirement.

Accepting personal responsibility for finding joy, meaning, and value in our work may be the fundamental shift that allows us to function in organizations that no longer assume the role of taking care of the employee for life. It is exciting to consider that we own our work processes and that, by bringing all of our mental, physical, spiritual, and emotional energies to our work, we can not only find personal fulfillment, but also begin to affect the organization in positive ways. Richards believes all work can be artful. He urges us to reunite the scientific and artistic views of the world, and draws upon the ways various artists view and value their work to lay the foundation for his ideas. He clearly defines his vision of the components of artful work and centered organizations as well as the characteristics of individuals engaging in such work.

This book, by the author’s own admission, can be considered “way out there.” It may make you a bit uncomfortable; it may force you to consider the world of work and organizations in new ways; and it won’t give you a cookbook method for adding joy, meaning, and commitment to work. Therein rests its value. As noted creativity author and consultant Roger von Oech says, “A whack on the side of the head may be the only way to unlock your mind for innovation.” Artful Work can be the whack that allows us to bring innovation to our work and organizational lives.

Reviewer Donna Dorl-Adams is Director of Customer Support in the Division of Information Technologies at Loyola University Chicago.

The Connective Edge: Leading in an Interdependent World
Jean Lipman-Blumen
(Jossey-Bass, 1996, $28.50, 403 pages)
ISBN 0-7879-0243-8

Reviewed by John E. Harper Sr.

You can almost hear it being said: “Oh, no! Not another book on leadership!” Anyone with an interest in leadership studies the past two decades has seen many different theories of leadership styles and techniques presented as the most effective. Then, after a short time of actually using the new concept, the theory falls out of favor. Why then should this new strategy that Jean Lipman-Blumen presents in The Connective Edge be considered?

The Connective Edge defines a new approach to leadership that substitutes competition among groups with the recognition of
interdependence among groups. This approach also recognizes the diversity of groups within and among all organizations, whether large or small, public or private. A strategy is needed to balance the conflicting demands of honoring diversity and the extreme dependence on one another. Lipman-Blumen calls this the Connective Era, in which alliances shift and re-form very quickly. In this environment, inclusion is critical and connection is inevitable. This requires the leader to be politically astute as he or she serves the "independence, separatism, tribalism, and individualism" of diversity and at the same time equally serves the "alliances, collaboration, mutuality, and universalism" which is created by interdependence. "In the Connective Era, leaders cannot just issue orders; instead, they have to join forces, persuade, and negotiate to resolve conflicts."

While this book is written largely for a business audience, I believe it provides effective strategies for leaders in the public, not-for-profit arena as well. As I read the nine-part strategy recommended by Lipman-Blumen, I recognized the appropriateness and effectiveness of this new style of leadership to the higher education community. Think of the many and complex constituent groups that make up the higher education environment—faculty, staff, students, governing boards, civic officials, business leaders, taxpayers, and such. Anyone responsible for managing change associated with technology will appreciate the commonsense but effective steps this book presents. Following the prescribed steps will yield success in the art of relationship-building and synergy from the power of cooperation. The book is organized for easy reading and ready reference. Lipman-Blumen does not just present ideas—she supports them with empirical data and specific examples.

Reviewer John Harper is Executive Vice President for Finance and Business Services and Treasurer of Cuyahoga Community College District in Cleveland.

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"In the Connective Era, leaders cannot just issue orders; instead, they have to join forces, persuade, and negotiate to resolve conflicts."

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Reinventing the University: Managing and Financing Institutions of Higher Education
Edited by Sandra L. Johnson and Jillinda J. Kidwell
(John Wiley & Sons, 1996, $57, 178 pages)
Reviewed by Steven W. Relyea

The title of this book may immediately conjure up visions of another publication about reengineering or total quality management. Fortunately, these popular topics serve only as a springboard for a collection of enlightening papers about partnerships, technology, and changing the roots of the academy.

Reinventing the University is a medley of six essays that could each stand on its own and provide valuable insights to the present and future of colleges and universities. The book is organized into three sections with two essays (chapters) in each section. The structure of this book is perfect for those of us who don't have many contiguous hours for reading a long tome, but who might have an hour here and there on a plane flight or other opportunity for catching up on interesting topics that affect our professional lives.

While many of us have dared to attempt only redesign of administrative support processes, the first chapter of Reinventing the University forges into the sticky area of tampering with the core businesses of the university, namely teaching and research. Following an insightful discussion of administrative process redesign, Jill Kidwell and William Massy describe the impediments and challenges of restructuring academic processes.

Richard Katz presents a compelling argument that universities sit atop a "mountain of gold," referring to instructional content that is begging to be leveraged using technology and marketing. In his chapter, Katz effectively forces us to consider the unthinkable and view universities as the future engines of delivering instruction beyond the physical boundaries of the academy.

The book contains a splendid treatment of partnerships between vendors and universities, opening with a presentation of out-
sourcing and partnering principles and then following with three case studies involving the Boston/Mellon Consortium of Colleges, the University of Virginia, and Carnegie Mellon University. This is coupled with a discussion of partnerships between industry and the university, which, using a case study of MIT’s Leaders for Manufacturing program, makes a strong case for a new model that leverages the university’s knowledge resources in the 21st century.

Best practices in administrative computing and financial aid comprise the remainder of the book. Whether or not your job has any involvement in the financial aid process, you will likely find this chapter interesting and informative. The description of administrative computing practices spans topics such as client/server, data warehousing, intranets, EDI, and a number of other timely subjects.

Reinventing the University is not a prescriptive, theoretical work, but rather a thoughtful combination of case studies, best practices, and challenging principles for how those working in a university might survive the turn of the century.

Reviewer Steven Relyea is Vice Chancellor of Business Affairs at the University of California, San Diego. He is a member of the faculty of the CAUSE Management Institute on Partnerships.

Managing by Values

Reviewed by Scott E. Siddall

Total quality management, process reengineering, continuous quality improvement—all are management techniques of the past decade. Could managing by values be the latest in this series of fads? I recall Carole Barone’s talks and papers, which for me dismissed many “recipes” for management. I thought about the practical challenges of empowering and motivating people in a hierarchical organization, and how difficult it can be to help staff preserve their professional identity during periods of rapid change. I’ll admit I was pessimistic about Blanchard’s and O’Connor’s methods as I began the book.

Managing by Values is very easy to read; I finished it in one 90-minute session. This is not a textbook on management, with references and deep, intellectual analysis of issues. It is a thought-provoking story that follows a fictional, corporate leader who finds himself disillusioned in the face of failing management practices. Yes, the examples are corporate, but not so much so that we in higher education cannot easily see the parallels. The authors worked many of their core principles into the story as motivational posters, which made me feel that these folks had been reading too many airline magazines, but I found few other distractions in the story.

“Managing by values” as a concept (“MBV”—we must have an acronym) is not fundamentally a difficult concept. The core of MBV consists of three processes: clearly defining institutional values (not just goals or a mission), communicating those values effectively among all involved, both clients and employees, and aligning daily practices with those values. MBV is about closing the gaps between what we say we believe and how we operate on a day-to-day basis.

Blanchard and O’Connor give us a short, readable book that can raise our sights above our own daily routine long enough to remind us that there may indeed be better ways of conducting business. I recommend Managing by Values for anyone in information services—senior administrators, managers, front-line staff—who is being called upon to do more and do it very well. Isn’t that all of us? This book is worth the time it takes to read it.

Reviewer Scott Siddall is Director of Academic Computing at Kenyon College.


2 Barone, 11.
Question: How is your institution addressing the issues related to universal network access (as framed in “A Framework for Universal Access,” by William H. Graves, CAUSE/EFFECT Summer 1997, pages 48-52), i.e., providing all faculty and students convenient and affordable access to your campus network?

According to the William Graves article, there are five ingredients of universal access. Southeastern Louisiana University has addressed all five.

Connections between campus buildings—Due to a massive campus cabling effort, each building on campus has multiple strands of multi-mode fiber optic cable connecting the building to all network services.

Connections from the campus network to off-campus programs—We have three off-campus programs, and are in the process of addressing each of these with a WAN, giving excellent telephone, LAN, and video services.

Connections within buildings—The focus of this year’s infrastructure effort is to improve the building wiring by updating each building with Category 5 and RG-6 coax cable. These upgrades will be complete by May, 1998.

Mobile connections to the campus network by individuals—An RFP is being released to vendors this month requesting dial-up access to Internet and the campus network from anywhere in the United States. If successful, this service will be offered to the faculty, students, staff, and alumni. The goal is to reduce the cost for this service to about half of what is currently available from vendors.

Personal and convenient access to a computer—Faculty and staff have personal and convenient access; students have access in all of the open labs (and some of the restricted ones). Initiatives are planned to have students purchase their own laptops. A student technology fee is planned for the fall; this will update all open labs and add student support on a large scale.

Memorial University of Newfoundland completed a $4 million upgrade to its campus network in 1996, implementing an ATM connection to all 27 buildings on campus. A new 11,000 drop Category 5 wiring plant provides free network access to all offices, labs, etc. The network is rapidly becoming the university’s foremost communications medium.

Off-campus service is provided through our own modem pool, which we choose to manage to a better than P.05 service level (i.e., first-ring answer) rather than charge or outsource this critical service at this time. This objective is accomplished through the use of an innovative quota system (see http://www.mun.ca).

We are working on the issue of student access and have been considering the “ThinkPad U” model. However, the academic community appears reluctant to consider such rigid standardization and the associated increased costs to the students. We rely heavily on TCP and believe that a free connection to the network gets the job done best. More aggressive promotion of student computer ownership is supported through customized financing arrangements, and on-campus sales, service, and support. Discipline-based computing courses are likely in the future.

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At the Rochester Institute of Technology (RIT) we are implementing a strategic infrastructure initiative that will result in high-speed network service to all components of the campus.

In December of 1996 we completed the installation of switched Ethernet service to every location in our residence halls. All rooms (port per pillow) were connected using level-five twisted pair, and every location was activated. We completed 3,768 installations between June and December of 1996.

We are in the process of implementing...
level-five twisted pair to other campus buildings, including RIT-owned apartment complexes. This summer we are wiring five buildings, approximately 2,500 connections. We are in the process of doing the remainder of the academic and administrative areas, another 10,000 connections. We expect to complete these connections by December of 1997, and all connections will be switched Ethernet. Currently we are deploying 100-Mbps connections to servers and 10-Mbps connections to client machines.

The core of our network is currently switched FDDI using Digital Giga switches. Our Cisco routers form the second tier of our network, and the Cisco switched hubs form the third tier. We are limiting user counts to approximately 100 users per router port to ensure responsive service. Routers are located in controlled areas and will have UPS power systems to insure reliable operation.

RIT provides “dial-up” access (dial service that supports IP protocol) through 168 56 kb modems and 80 28.8 modems. Access from the public telephone network is delivered directly to our computer room on fiber. We also have a campus contract to provide dialup service. We do not plan to increase our modem pool size. Instead we are encouraging our customers to acquire service through an ISP.

Ron Stappenbeck
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Wheaton College, in Norton, MA, has taken advantage of its moderate size, New England location, residential nature, and central control of technology decisions to provide its students, faculty, and staff with access to network resources that support its liberal arts mission.

- Public labs, to guarantee a minimum level of access for all members of the college community. (Demand continues to grow even as personal ownership increases.)
- A network outlet at every residence hall desk, in every office, every lab, and every teaching space—all college-owned computers connected to network.
- Dial-in access through an ISP for non-resident students, faculty, and staff anywhere in New England, funded by the college. (Still need to address national coverage.)
- Computer resale at minimal markup to encourage personal ownership, which is now greater than 85 percent, among entering students.
- Standardization on Internet protocols for all services—every resource must be available through telnet, ftp, or WWW; every device must speak TCP/IP.
- Central purchasing of all college-owned computers with a minimal number of configurations and a regular replacement cycle.

The above represents only the infrastructure: extensive education and support are necessary to turn mere availability of technology into true access to resources. That is where we are concentrating our energy.

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NUSNET-III is the campuswide network of the National University of Singapore, supporting a user population of 27,000 including academic and administrative staff users and students. There are more than 6,000 network nodes interconnected by a high-speed ATM backbone with 100/10 Base-T switching to the host and desktop computers. It has been a long-term goal for the university to provide instant, convenient, affordable, and seamless access to a myriad of network services to every individual desktop computer, ranging from Web-based, multimedia and client-server applications to the most basic, but crucial, file and print services.

“A student technology fee is planned for the fall; this will update all open labs and add student support on a large scale.”
Free network and Internet access—There are no usage or time-based charges at this moment for Internet and intranet access. Computer clusters with Pentium-based multimedia PCs and high-quality laser printers are available in the Computer Centre, faculties, libraries, and halls of residence for student use. Every academic staff is allocated a desktop PC with full multimedia capabilities.

Student systems on the Web—Examination Result System allows Web access to the most sought information as a complement to the touch-tone telephone system implemented in 1995. Student Feedback System is an effective mechanism in collecting feedback via the Web on such things as course contents, presentation skills, and rating of the lecturers.

Lecture-on-demand—Lectures from prominent visiting scholars and professors are recorded in a video-on-demand server to enable students to have convenient access at their own leisure. The system provides 30 frames per second and is able to support 100 sessions simultaneously.

E-mail and voice integration—Currently, voice mail and e-mail reside on different systems, and users find it inconvenient to access them. It is an upcoming task to integrate the systems so that voice mail is retrievable via the e-mail system and notification through voice mail can be made once a new e-mail arrives.

Round-the-clock smart card access—Selective computer clusters are accessible via smart card control without compromising the physical security in order to provide round-the-clock network services on the campus for students.

Network wiring to the residence halls—Extending the network UTP wiring to every room of the residence halls provides an affordable and convenient access to the network at the comfort of the hostels.

Plug-and-play network access—Live network outlets are made available in designated areas of the campus for students and faculty staff’s convenient and easy access to the network with their own laptop or notebook computers. There is no specific software required as authentication is made via the Web with all the detailed procedures performed at the background transparently to the students.

High-speed remote access—High-speed remote access is the critical success factor for distance learning. In order to provide the most cost-effective solution to suit individual needs, a wide variety of technologies are supported, including ADSL, cable modem, ISDN BRI, and the most affordable analog dial-up.

Bulk rate for Internet access—Internet access for students can be made even more affordable by negotiating for a bulk rate with the Internet service providers by taking advantage of the economic scale for a huge student population of the university.

Detailed information is available at http://www.nus.edu.sg

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Winter 1997 Readers Respond Question

How does your campus handle computer policy violations? Does your institution have a special procedure for technology-related incidents, or does it rely on its existing campuswide judicial process?

Please send your response, along with your name, title, e-mail address, and phone and fax numbers by electronic mail to Elizabeth Harris, CAUSE/EFFECT Managing Editor, at eharris@cause.org.