Emotional Climate in the Information Technology Organization: Crisis or Crossroads?

Library Web Implementation: A Tale of Two Sites

A Small School Ventures into the World of the CWIS

Reshaping the Enterprise through an Information Architecture and Process Reengineering

Lessons from a Successful Data Warehouse Implementation

Plus:
Building Virtual— and Spatial—Libraries for Distance Learning

Library and IT Collaboration Projects: Nine Challenges

What Information Resources Managers Need to Understand about the Higher Education Enterprise

Campus Profile: The Metropolitan Community Colleges
CAUSE BOARD OF DIRECTORS

Polley Ann McClure, Chair  
Vice President, Information Technology & Communications, and CIO  
University of Virginia

Norma Brenner Holland, Vice Chair  
Associate Director  
University Computing Services  
Indiana University

Albert L. LeDuc, Secretary/Treasurer  
Director of Computer Services  
Miami-Dade Community College

Robert H. Atwell  
President  
American Council on Education

Patricia Battin  
Consultant

Mary L. Cox  
Director of MIS  
Wittenberg University

Richard A. Detweiler  
President  
Hartwick College

Zelema Harris  
President  
Parkland College

Elliott J. Haugen  
Associate Vice President  
Computing & Information Systems  
Saint Louis University

Brian L. Hawkins  
Vice President  
Academic Planning & Administration  
Brown University

Barbara H. Horgan  
Associate Vice President, Information Services  
Seattle University

Kenneth J. Klingenstein  
Director of Computing & Network Services  
University of Colorado/Boulder

Samuel J. Plice  
Chief Operating Officer  
Information Technology Division  
University of Michigan, Ann Arbor

Ann E. Stundin  
Director  
Academic Computing & Network Services  
Northwestern University

Thomas F. Moberg, Past Chair  
Vice President  
Information Resources  
Association of American Medical Colleges

Jane N. Ryland  
CAUSE President

Ex Officio Members:

Leslie Lea  
Staff Associate for Information Systems  
Saint Louis University

Robert O. Little, Chair  
Director, Computing Center  
Lock Haven University of Pennsylvania

Lore Balkan  
Data Base Analyst  
Virginia Tech

Robert R. Blackmun  
Director of Computing Services  
University of North Carolina, Charlotte

Larry D. Conrad  
Director, University Computing Systems  
Florida State University

John W. Corliss  
Manager, Research Computing  
Loyola University Chicago

Rebecca King  
Associate Director for Information Systems  
Baylor University

CAUSE BOARD OF DIRECTORS

Robert O. Little, Chair  
Director, Computing Center  
Lock Haven University of Pennsylvania

Lore Balkan  
Data Base Analyst  
Virginia Tech

Robert R. Blackmun  
Director of Computing Services  
University of North Carolina, Charlotte

Larry D. Conrad  
Director, University Computing Systems  
Florida State University

John W. Corliss  
Manager, Research Computing  
Loyola University Chicago

Rebecca King  
Associate Director for Information Systems  
Baylor University

CAUSE PUBLICATIONS STAFF

Director of Publications and Editor  
Julia A. Rudy  (rudya@cause.colorado.edu)

Staff Assistant for Publications and Managing Editor  
M. Elizabeth Harris  (eharris@cause.colorado.edu)

Staff Associate for Publications and Editor  
Karen J. McBride  (kmcbride@cause.colorado.edu)

Staff Associate for Marketing  
Leslie Lea  (ilea@cause.colorado.edu)
8  FROM THE EDITOR

32  CAMPUS PROFILE
The Metropolitan Community Colleges
Cover photo: Located in the Kansas City, Missouri, area, The Metropolitan Community Colleges serve a diverse student body, offering career and transfer degree programs, as well as continuing education courses.

CURRENT ISSUES

4  Coping with Copyright and Beyond: New Challenges as the Library Goes Digital
by Karen Hersey, MIT

FEATURES

7  Emotional Climate in the Information Technology Organization: Crisis or Crossroads?
by Margaret G. Massey and Deborah W. Stedman, Miami-Dade Community College

15  Library Web Implementation: A Tale of Two Sites
by Ann Koopman, Thomas Jefferson University

22  A Small School Ventures into the World of the CWIS
by Bev Actis, Kenyon College

30  Reshaping the Enterprise through an Information Architecture and Process Reengineering
by Nicholas C. Laudato and Dennis J. DeSantis, University of Pittsburgh

43  Lessons from a Successful Data Warehouse Implementation
by John D. Porter and John J. Rome, Arizona State University

VIEWPOINTS

51  Building Virtual—and Spatial—Libraries for Distance Learning
by Richard J. Bazillion, Winona State University, and Connie L. Braun, Mercer University

55  Library and IT Collaboration Projects: Nine Challenges
by Marilyn J. Sharrow, University of California/Davis

57  What Information Resources Managers Need to Understand about the Higher Education Enterprise
by Ronald Bleed, Maricopa Community Colleges, and Polley Ann McClure, University of Virginia
While this issue of CAUSE/EFFECT covers a wide variety of information resources management concerns and experiences, several articles relate to special challenges that result from managing information resources in an increasingly networked environment:

- understanding copyright issues;
- implementing Web-based library systems;
- the escalating importance of collaboration between campus library and information technology professionals;
- managing an Internet-accessible campuswide information system; and
- designing library buildings for the future.

Karen Hersey, MIT’s Intellectual Property Counsel, looks at how three information-related innovations are changing the way the library has to do business: electronic delivery systems, database collections, and real-time, online access services. With the careful balance between interests of providers and users of knowledge achieved by the 1976 Copyright Act seemingly tipping in favor of providers, she asks, “Are we talking about regaining an old balance, or should we be considering a new one that will work for both providers and users in the future?”

Ann Koopman’s exposure to Web-based library system implementations at two very different institutions has enabled her to identify some common management concerns inherent in such endeavors, concerns that she says must be faced by interdepartmental teams made up of library and technology professionals. The old model of the computing center providing service to the library is no longer appropriate; library and IT staff must work as partners, helping each other to bridge the gaps in their respective skills and together find solutions to the challenges of the networked information world.

The refrain of library/IT collaboration continues in Marilyn Sharrow’s Viewpoint article. Last fall, CAUSE/EFFECT focused on this theme that now seems more urgent than ever. Sharrow shares nine challenges faced at the University of California Davis as these two culturally different communities came together to achieve common goals on behalf of the academic community—challenges that are likely to be faced by any campus undertaking such partnerships.

While the launching of a networked campuswide information system is no longer “news,” the need to articulate and address the myriad management issues that surround such an endeavor are gaining in importance. Ownership, access, and privacy issues are key concerns, as are the needs to set standards and establish a policy board to deal with those thorny issues and the very practical question of who will do the work and what the locus of responsibility is for determining content. Bev Actis’s article about a small college’s experience launching a Gopher-based CWIS (now migrating to World Wide Web technology) offers lessons for any campus taking a second look at its networked information offerings.

If the library of the future will be virtual, why do we need library buildings? Richard Bazillion and Connie Braun share their views of the increasing importance of libraries and librarians in a networked world, especially one in which more distance learners will need to be served. They make a case for the stronger role the library will play in the teaching and learning process in the future.

The network affects not only the management of campuswide and scholarly information, but also the way we will capture, store, and access information in our administrative databases. The move toward distributed, client/server computing on the administrative side of the house has raised equally challenging information management issues. Two trends are emerging in this area, each addressed by an author in this issue: establishing an institutional information architecture, and implementing a data warehouse to support campus decision-making. Nicholas Laudato and Dennis DeSantis describe the University of Pittsburgh’s thoughtful enterprise-wide approach to the former, while John Porter and John Rome share three years worth of data warehouse experiences at Arizona State University, renowned for its success in this area.

Finally, two sets of authors give some excellent advice for just about any reader, one about understanding the business we’re in and the other about coping with the stress of working with technology. Ron Bleed and Polley McCliure remind us that the overarching business we are in is not technology, but higher education, and advise of the importance of staying in touch with the mission-related issues that challenge our campuses. Understanding those will help us to most effectively provide the support our campuses need. In providing that support and dealing with that technology, Deborah Stedman and Margaret Massey suggest that coping with the stress caused by massive and constant change in the IT profession can be as simple as understanding that how we react to external events is more important than the events themselves. They offer suggestions for ways that we can change our thinking that could also help to change our organizations and our lives for the better.
Sharing the Challenge of Networked Information

A major program element for the Coalition for Networked Information is to present regional conferences regarding networked information issues. This programmatic theme is developed and delivered in conjunction with CAUSE and is targeted for constituents of CAUSE, Educom, and ARL who may not have had the opportunity or the time to attend national meetings on networked information and associated technologies.

There have been four regional conferences held since June 1994, with over 900 individuals in attendance. In addition to people from the CAUSE, Educom, and ARL constituencies, these conferences have drawn a fair number of faculty and administrators (for example, from the budget and purchasing offices).

The topics of the regional conferences reflect many of the topics discussed at the CNI Task Force Meetings. Networked information development and technologies with a particular emphasis on collaboration of higher education technologists and librarians are the overarching themes.

Although CNI is sponsored by CAUSE, ARL, and Educom, the entire funding for CNI and its programs comes from the 212 institutions that pay annual membership fees to be part of the CNI Task Force. The semi-annual meetings of Task Force representatives always have a programmatic theme of current interest to the entire networked information community. For instance, one recent program topic was research activities on emerging concepts regarding new ways to search networked information.

This particular topic demonstrates the rapidity of change in networking technologies and the availability of information on the national and global networks. When CNI was formed in 1990, a major concern was that there was not very much information available via the networks. Many of CNI’s earlier efforts focused on ways to create and promote network information resources. Now, much of the work in this area proceeds from the hypothesis that there is too much information available on the electronic network. Accordingly, different methods of sifting and finding the information “needle” in this data “haystack” on the network are required.

While new search techniques are being developed, examination of the costs of distributing electronic information is a second major activity now under way at CNI. Where might there be savings in an environment where information is electronically available, and where will new costs have to be incurred?

A final example, from among CNI’s current topics that have been covered at national meetings, is the ongoing debate of how existing print-based copyright law and practice needs to be adapted to the networked information environment. CNI has been an informed participant in this national debate on reasonable property rights and reasonable use of information when such information is readily available on the network.

These topics and many more regarding CNI’s and higher education’s broad agenda in networked information form the menu for CNI/CAUSE regional conferences. The evaluations and comments of participants in these conferences confirm the usefulness and importance of these issues to higher education professionals in their work at their institutions.

CNI is pleased that the cooperative open-registration regional conferences held in conjunction with CAUSE have been so well received. More of these types of local programs are in the planning stages. Information about these activities is available on the CAUSE Web server under Professional Development. If you have suggestions for conference themes or sessions, please contact Joan Lippincott at CNI (joan@cni.org).

CNI Report is a regular CAUSE/EFFECT department that provides reports about the activities of the Coalition for Networked Information (CNI), formed by the Association of Research Libraries, CAUSE, and Educom in 1990 to promote the creation of and access to information resources in networked environments.
Coping with Copyright and Beyond: New Challenges as the Library Goes Digital

by Karen Hersey

While speed, convenience, and sheer volume of information made accessible by digital technology and delivery is a boon, market factors and the business enterprise are bringing digital information to libraries at a substantial cost, not just in dollars. This article examines the tension that results as these forces meet head-on, and identifies some issues for campus libraries to be aware of in the networked information world.

Today, with the explosion of electronic-based delivery system technology, except for books and journals purchased in printed, hard copy form, virtually all knowledge and information our educational institutions and libraries wish to acquire for student and faculty research use, or that our libraries wish to add to their physical collections, comes neatly tied up in a legal document. Universities at present simply cannot acquire electronically delivered knowledge without first agreeing to legal terms and conditions that are structured by the seller of knowledge for one purpose, and one purpose only: to get the greatest possible financial return, from the greatest number of information consumers, without risk of losing control over the revenue-producing asset. It may be crass, but the packaging and delivery of information is big business today—a growth industry that moves far beyond traditional publishing.

Consequently, as the library, a public service provider, embraces new technologies to remain a relevant resource for Americans who seek to acquire and expand their intellectual capacities, it collides head-on with American entrepreneurialism in search of profit margin. Corporate America (and corporate Europe, for that matter) is focused on maximizing profits and maintaining a competitive edge for its knowledge-based products.

No one condemns the commercial knowledge provider for doing what comes naturally in this country—seeking to build a successful business and doing it better, quicker, and smarter—because the public generally benefits from this kind of activity. In reaching for the brass ring, however, an existing balance of interests between the providers of knowledge and the users of knowledge is being tipped, by using legal agreements, in favor of the providers.

To get a clearer sense of what is really happening out there, we might look at how three information-related innovations are changing the way the library has to do business and in doing so is tipping those scales away from the careful balance that the 1976 Copyright Act achieves:

- Electronic delivery systems (including journals, multimedia works, books, computer programs);
- Database collections (including maps, images, raw data, genetic materials, anything under the sun, coming to you via a friendly CD-ROM or by online access);
- Real-time, online access services (including dynamic information products such as daily news feeds and daily stock-market statistics, static collections of information such as encyclopedias residing on a server, controlled not by the library but actually at the vendor’s site).

Before the digital revolution, libraries acquired journals, books, collections, daily newspapers, trade press, etc. in print/paper format or on film, and knew fairly well where they stood with respect to permitted uses of these materials—squarely in the Copyright Comfort Zone. There were, of course, occasional disagreements between copyright holders and libraries associated with fair use and interlibrary loan, but for the most part libraries were confident about how to conduct their business.

When we ask what’s different in the world of digitized information, the answer is, in a word, everything. Publishers and copyright holders who, like the libraries, were comfortable in a
world of print, now find themselves in a world of instant mass dissemination. Information is now capable of flowing through electronic and fiber-optic networks for simultaneous delivery to millions of sites, via systems that allow the information to be copied into print or electronic format with the stroke of a key. Information work products can be added to or diminished on a computer screen, stored for later retrieval in files that can be rearranged or otherwise manipulated, all without the touch of a human hand.

So, both providers and users of information must cope in a world where they are no longer sure of the rules, and since the providers of information are first and foremost businesses, their reaction has been to cover any potential lapses in the old legal framework of copyright law by the next best thing—a strong dose of contract law.

Electronic delivery systems

In this new environment the publisher is now unsure as to whether the basic elements of copyright law will adequately protect the material that is delivered to the library electronically. The publisher should perhaps not be too harshly judged when reaching the conclusion that because the method of delivering the material has changed and is now computer-based, a new form of agreement—one that not only establishes fees, but also is useful in adding new rules to the game—is needed.

For instance, the publisher is not sure that an electronic copy sent from one library to another under the interlibrary loan guidelines or the copyright statute will be protected from all sorts of scurrilous misdeeds by libraries. Therefore, the subscription agreement may include a restriction on making copies and may prohibit electronic copying. As a result, despite the possibilities ushered in by the new electronic technology, interlibrary loan may continue only via paper and perhaps via the fax machine, if anything.

Some publishers are already making changes in the publisher/user relationship through the contract; fair use, always a burr under the saddle, has become another target. Some publishers are seeking to get rid of it, through a subscription agreement wherein the library agrees to make only such use of the journal as specifically permitted in the contract and will make no other uses. It’s no longer a matter of copyright law, but of having a contract between consenting, if not equal, parties. And the law is thoroughly supportive of contract terms!

In the following table we see how the delivery and use of materials can begin to change based on the medium. Whereas in the print medium access and use and distribution and duplication are governed by the Copyright Act, in the electronic medium these issues are dependent upon the technology available to the library and upon the terms of a legal agreement.

### Database collections

Database collections present a very interesting turn of events for the digital library that wants to provide anthologies or collections of information previously available in print, but now residing on a CD-ROM or by online access. In fact, because collections are residing on a CD-ROM, we have access to more information than ever before, so of course we want to be able to use this new wondrous technology. We are all comfortable with the copyright rules governing permitted and prohibited uses of collected information, but, unfortunately, before we can get our new database to install in the reference room, we are asked to sign a license agreement that permits the database provider to place even greater restrictions and conditions on use of the product.

For example, we are seeing, more often than not, the database provider seizing the opportunity to place trade-secret protection on the data contained in the database. The fact that the data often is public domain information or not actually owned by the database publisher seems to be irrelevant, as non-disclosure requirements are placed in the license agreement.

Adding trade-secret protection is generally not the end of the database owner’s conditions with which users will be expected to comply. We also see requirements to submit for review research papers using any data or to provide papers for unlimited use by the database publisher. Even worse, we see total prohibitions against publishing or making a commercial use of the collected database information. Publication restrictions can go so far as to prohibit publishing research findings that use the collected data, and may prohibit publishing or disclosing the data itself, even though that data may be in the public domain. In the case of one database owned and controlled by a pharmaceutical company, a right was added to the agreement allowing the company to acquire licenses to inventions made during research projects that utilized the database.

By allowing these kinds of requirements to

<table>
<thead>
<tr>
<th>Delivery Access/Use</th>
<th>PRINT MEDIA</th>
<th>ELECTRONIC MEDIA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dependent Upon Copyright Act</td>
<td>Dependent Upon License &amp; Technology</td>
</tr>
<tr>
<td>Availability to patron</td>
<td>Purchased, copy on shelves</td>
<td>Dedicated computer/server</td>
</tr>
<tr>
<td>Making a copy</td>
<td>Photocopy</td>
<td>Need synergy of technology, copying may not be possible</td>
</tr>
<tr>
<td>Redistribution</td>
<td>InterLibrary Loan, fair use</td>
<td>No copies distributed outside university</td>
</tr>
<tr>
<td>Users</td>
<td>Anyone</td>
<td>Authorized users, i.e., faculty, students, staff, not public</td>
</tr>
<tr>
<td>Storage</td>
<td>Library shelves, Microfilm</td>
<td>Bit storage? Technology? Storage Site?</td>
</tr>
<tr>
<td>Subscription price</td>
<td>Uniform</td>
<td>Varies, concurrent user fee, pay per look</td>
</tr>
</tbody>
</table>
be included in licenses, we are straying far from the concept of copyright, which, remember, historically protects the copyright holder from unauthorized uses related to expression and nothing else.

In addition to all of the license restrictions typically used for electronic delivery systems, additional restrictions for database collections raise a series of new issues. The following questions should be asked before signing a license:

- What are the non-disclosure obligations for data, and can the library enforce them?
- What are the use restrictions—academic v. commercial—and can these be policed?
- Must copies of research papers be sent to the publisher?
- Do users have to seek permission for publication of papers?
- Does the license control rights to, and/or ownership of, inventions made using the data?

Online access systems

To introduce issues associated with online access systems, we begin with a quote from the Britannica Online Agreement:

All usage of Britannica Online is governed by the terms of the Encyclopaedia Britannica's [EB] Software Licensing Contract, to be signed in advance of access, which sets forth the terms, conditions, and limitations of use. That message from EB sends a very strong signal that we can expect to have more to deal with than just matters of copyright law!

Perhaps a quick run-through of MIT's difficulties with the Encyclopaedia Britannica license, as it was first structured, will provide an idea of what educational and research institutions are up against and why it took a team of lawyers, librarians, and computer systems people at MIT to reach a mutually acceptable arrangement with EB.

- The definition of "authorized users" was too limited to serve the MIT community. It took many discussions just to arrive at an acceptable definition of "part-time students."
- Copying was restricted except as permitted under "applicable law"—perhaps a benign admission that U.S. copyright law (including fair use) applied, but initially was not at all clear.
- MIT had to agree that it would not provide access to third parties; meanwhile the database itself sits on an EB server, not an MIT server; that meant MIT did not control access, EB did.
- In addition, we were prohibited from allowing access by unauthorized users, but it was not within MIT's control to keep them out because of our layered and hopefully seamless computing environment. Without the aid of our computer systems people, MIT would not have been able to structure an agreement with EB that would have worked. Certainly, EB was in no position to know whether the terms of its license would be consistent with the parameters of MIT's computing environment.

- There was an automatic termination of the license if MIT breached the terms of the license. EB would turn off MIT's access—an interesting concept for a library. We went through extensive negotiations to prevent a campuswide turn-off for a single breaching event by a wayward student.
- In addition, there were all of the other indemnity obligations, disclaimers of liability, etc. on the part of EB—all of those things that strike terror in the hearts of lawyers at educational institutions.

When contemplating procuring online access systems, you will be faced with the same restrictions that apply to electronic delivery systems and database collections and perhaps even more. The issues to be aware of are:

- Fee structures may be based on the size of the community served, rather than on actual usage of the system.
- Student access may or may not be permitted. Consider the case of the New York Stock Exchange online access agreement, which initially did not allow student access.
- Some providers impose prohibitions against copying for any purpose, regardless of fair use.
- Frequently there is a clause restricting disclosure of data despite the fact it's publicly available.

I hope these examples bring home the push-pull of the digital revolution for the library. On the one hand, the speed, convenience, and sheer volume of information made accessible by digital technology and delivery is a boon. On the other hand, market factors and the business enterprise are bringing digital information to the libraries at a substantial cost, not just in dollars. We are routinely accepting many more limitations on our use of information than we did in the era of print.

One final thought to ponder: How does the academic community, most particularly the libraries, regain and maintain the balance of interests between the providers of knowledge and the users of knowledge? More accurately, are we really talking about regaining an old balance, or should we be considering a new one that will work for both the knowledge provider and the knowledge user of the future?
Emotional Climate in the Information Technology Organization: Crisis or Crossroads?
by Margaret G. Massey and Deborah W. Stedman

The overwhelming impact of massive change on human beings in the field of information technology is tremendous. This change, coupled with the loss of revenue and personnel resources that many of our college and university IT shops are experiencing, creates fertile ground for emotional and physical “dis-ease” for our co-workers and ourselves. This article suggests that this potentially harmful environment can actually present a golden opportunity to positively change our cognitive behavior and increase effectiveness in the IT workplace.

Stress is malignant in the American workplace. As reported in HR Focus, “Stress in the workplace is costing American businesses staggering amounts of money. It is estimated that companies lose about $68 billion every year from lost productivity and spend up to 10 percent of their profits on stress-related disability claims. Health care professionals claim that as many as 90 percent of the patients they encounter suffer from stress-related symptoms.”¹ These figures should astound the health-conscious employees of the 1990s. Moreover, they should serve grave notice to those of us working in dynamic, demanding information technology organizations where rampant change and increasing expectations have long been the norm.

Stress in the workplace

Job-related stress can be traced to the beginning phases of the Industrial Revolution, when farm hands and independent craftsmen were gathered from their fields and villages to fill production lines and newly-formed chains of command. The goals of industry then were not too unlike those of today: manufacturing, information exchange, customer service, capitalization of new opportunities, etc. For society, this revolution was an economic boon: a never-ending climb to a higher standard of living. Yet in trade for new opportunities there was a down side for society to bear. By necessity, workers were crowded into urban environments, employee liberties were compromised, and there was an ever-growing need for greater produc-

The only reasonable solution, of course, is to manage human resources as carefully as any other resource of the organization...
amined several administrative units to make suggestions for improving efficiency. Computer Services was one of the organizational units examined. Although a seemingly benign study, the level of employee stress in the IT offices increased noticeably. College-sponsored reviews by consulting firms are commonplace and valuable. But in this case the study proved stressful because the employees were concerned about the precision of the report, or worse, a threat to job security. While no negative employee action was actually threatened, the study still increased an apparent level of stress among the staff. One must understand, of course, that many of these employees have learned by example to fear phrases like “increased efficiency,” “downsizing,” and “outsourcing”—these being popular euphemisms for layoffs. Similar terms were tossed around at Eastern, Pan American, and National Air Lines in Miami before those Goliaths of the airline industry became extinct.

Stress is inherent in technology. Client expectations are shaped and heightened by the fast-paced changes occurring in computer and communication-based technologies. Furthermore, the aggressive marketing of software manufacturers and their representatives continually promote system upgrades, modifications, and replacements. Client departments, of course, the principal targets of such marketing schemes. Often they are presented with claims that leave the information technology organization in an unenviable position: that is, having to react to seemingly popular recommendations that may not be in the best interest of the organization. Often the pressing desire to always be on the cutting edge of technology places an undue burden on the availability of resources to implement and manage the new technology if purchased.

Dwindling resources, hiring freezes, administrative policies, and new state mandates often dictate much of the agenda for the information technology professional. A feeling of “loss of control” is voiced both by managers and their subordinates. Sometimes, information management specialists joke that the most important skill of their trade is organizational politics.

Such pressures, combined with heavy workloads, short deadlines, and external stresses, can lead to serious emotional and physical problems. At Miami-Dade we determined that it is in the best interest of the employees and the college to provide a balanced workplace that promotes a healthy emotional and physical environment. Thus we began to address stress in our IT workplace, beginning with an informal survey conducted via the Internet.

Findings of our survey

In November 1994, we conducted a survey through CUMREC-L to discover how other information technology professionals feel about stress in their places of work. When asked if respondents believed that their job is more stressful now than it was five years ago, 86 percent of respondents answered “yes.” When asked to what they attributed this added stress, 46 percent cited “understaffing” as the predominant cause, and 42 percent said “additional responsibilities.” (See survey findings in Table 1.)

These findings are congruent with those of growing ranks of stress management experts, who find that job stress is related to a feeling of high responsibility and little control.2 Certainly it is common to find the “high responsibility and loss of control” scenario in today’s IT organizations.

Often it is the most conscientious workers who are inclined to develop job stress.3 There seems to be an awareness in the IT community that the very nature of the work in our profession demands a high degree of meticulousness and attracts the types of individuals who are already prone to stress.

Many information technology professionals have lived with stress so long that they overlook the symptoms as simply normal or typical for their age. Moreover, they are fearful of being labeled a “complainer” and do not address the problem of stress until they are on the brink of emotional or physical illness. Menon suggests that physical illness is treated while most of the time the cause is ignored: “Psychiatrists, not doctors, are in fact becoming the main healers of the 90s ... more than 80 percent of my patients suffer from stress-related symptoms, and what they need is counseling more than medicines.”4 This is certainly true for information technology professionals who daily face stress associated with evolving technologies, system malfunctions, backlogs, pressures to reduce costs, loss of control over their work, and lack of planning.

Symptoms of stress

As IT professionals, we have a responsibility to learn to identify the signals our body and mind are sending that alert us to the fact that we are reacting to stressors.

Stress can be thought of as acting on three different levels: the physiological level, the psychological level, and the social level. All of these interact and influence how our mind and body will react to certain circumstances. The physiological reactions arise when some stressor affects us. Whether this stressor is external (such as if we were being chased by someone with a gun), or

---

internal (such as the thought that we have a fatal disease—whether the disease is real or imagined), will cause the same physiological reactions. When we are stressed in some moment to the extent that our mind identifies a threat to our being, our body goes through an automatic alarm reaction. This reaction has been referred to as the “fight or flight” reaction as described by Kabat-Zinn: “If our social status is threatened or our ego, or our strongly held beliefs, or our desire to control things or to have them be a certain way (‘my’ way for instance), then the sympathetic nervous system lets loose. We can be catapulted into a state of hyperarousal and fight or flight whether we like it or not.”

The fight or flight reaction releases stress hormones into the body. The most familiar of these hormones is adrenaline. The adrenaline
release leads to heightened sense perceptions so that we can take in as much information about our surroundings and internal processes as possible. The pupils of our eyes dilate to let in more light, the hair on our body stands erect so that we are more sensitive to vibrations. The output of the heart jumps by a factor of four or five, which causes our heart to pump more blood, which raises our blood pressure, so that more blood and energy can be delivered to our extremities, in case we are called upon to fight or run. The body’s digestive system shuts down, so that the blood can be redirected to our arms and legs.

If the automatic alarm reaction is not terminated by the act of either fighting or fleeing, the body stays in this hyper-aroused state. If one’s body is subjected to this hyper-arousal often, with no outlet, in essence the stress is being internalized. We carry around the arousal inside in the form of the stress hormones and agitated thoughts and feelings. “There is mounting evidence that chronic stimulation of the sympathetic nervous system can lead to long-term physiological disregulation, resulting in problems such as increased blood pressure, cardiac arrhythmias, digestive problems, chronic headaches, backaches, and sleep disorders, as well as to psychological distress in the form of chronic anxiety.”

Being faced with the chronic stressors inherent in our work, followed by a stress reaction which we internalize, or get “control” of by denying the stress or “pushing it down” out of our consciousness, becomes our normal way of functioning. This cycle becomes so familiar that we view it as normal. Our body reactions, such as changes in our eating or sleeping patterns, chronic muscle tension, “butterflies” in the stomach, heart palpitations, impulses to lash out in anger or get in arguments or fights, overuse of stimulants or depressants such as alcohol and tranquilizers, are explained away.

William Roiter, a psychologist with American PsychM anagement, which directs employee assistance programs for more than sixty corporations, states, “If a worker is predisposed to drink, stress can trigger alcoholism. If you are predisposed to anger, you will start yelling, if you are predisposed to pushing your feelings down, stress can trigger depression.”

**You are what you think**

Even though over the years our profession has evolved into a more structured discipline, with the concepts of shareable code, object-oriented design, system development methodologies, and CASE tools being the standard, many of the people attracted to the profession are, in a sense, artisans. IT professionals experience a delight in the creation of a good system design, or an exquisitely written and executed program.

The ability to solve complex puzzles is another skill that many in our profession proudly possess. The intrinsic rewards—such as pride in one’s accomplishment, realized by a person when he or she has achieved a goal—and the opportunity to experience this reinforcement often is what attracts many of us to this profession. We have a heightened sense of ownership about our work, and relish the recognition that the mastery of a difficult technical skill or concept can bring.

This constant reinforcement can be addictive. The “trouble” comes if we take our identity from our job, or job performance, as opposed to being able to separate the work we do from our being—who we are. The problem with this identification is that if we feel that our job or job performance is threatened, it is as if our being is at risk. It’s as if we believe that we are the job.

The general rule for what causes psychological stress is that how you see things and how you handle them make all the difference in terms of how much stress you will experience.

The way we think, our cognitive behavior, dictates the way we see ourselves and the world and our relationship to both. Our thoughts and core beliefs about ourselves influence our ability to make things happen and how we react to what is happening.

Dr. Martin Seligman and his colleagues at the University of Pennsylvania have been studying health differences between people who can be identified as being basically optimistic or basically pessimistic in their thinking about why things happen to them. These two groups of people have very different ways of explaining the causes of what Dr. Seligman calls the “bad” events that happen to them in their lives. (“Bad” events include natural disasters, such as floods, hurricanes, or earthquakes; and personal defeats or setbacks, such as loss of a job or rejection by someone you care about.)

Some people tend to be pessimistic in the ways they explain to themselves the causes of a bad event. This pattern involves blaming themselves for the bad things that happen to them, thinking that the effects of whatever happened will last a long time and that the bad event will affect many different aspects of their lives. These people carry their thoughts to catastrophic conclusions, such as, “This is my fault; this is going to last forever; it’s going to affect everything I do.” This mode of thinking is sometimes called catastrophizing. An example of this might be: “I always knew I would fail and this proves it; I can...”
“As human beings, we have choice at every moment as to how we mentally and emotionally perceive and react to every event in our life, even though we may not have control over the actual event.”

Crisis or crossroads?

At Miami-Dade Community College, among the ranks of the management team in the Computer Applications Programming department, it was clear that the stress that all of us were experiencing was taking a dramatic toll on our productivity and physical and emotional health. As we looked for coping strategies to ease our stress and that of our co-workers, we were urged by mental health professionals (both on staff and through the written word) that it was necessary to reframe our perception, to look at the problem from a different angle. As human beings, we have choice at every moment as to how we mentally and emotionally perceive and react to every event in our life, even though we may not have control over the actual event. We can choose to view our stressors from a “learned helplessness” perspective and react as we have described earlier, or we can see this turmoil as an opportunity to acquire and practice new living skills, which have the potential to literally change our lives.

By changing our self talk (cognitive behavior)—that constant chatter in our heads which offers unrelenting judgment, criticism, and comment—we can literally change our perception of the world and our life.

Albert Ellis, in his rational emotive theory, describes that it is not the action or event that causes a consequence, but rather the individuals’ beliefs about themselves in relation to the event that causes the consequences. If one were to lose a job, the long-term consequences of that job loss would not be determined by the mere job loss. Rather, the long-term consequences would be determined by the individual’s belief about himself or herself and what the loss meant. Beliefs such as, “I knew it all along, I am not worthy and they found me out,” will have powerful long-term effects on how the individual will recover from the action. A different individual facing the same action but whose core beliefs are healthier and more positive will experience very different consequences from the same action.

Armed with this knowledge, our stressful environment can be used as a practice field, if you will, to learn to change our core beliefs and our cognitive behavior. At Miami-Dade, some of the techniques that we are beginning to use to make these mental and emotional changes are counseling, meditation, and creative visualization.

Counseling

In our CUMREC-L survey, when asked “Does your place of employment have a professional counselor,” 71 percent of the respondents said that it did. The follow-up for those who answered “yes” might be to ask how many have taken advantage of this service. Even in the “enlightened” ’90s, there is still some perception that availing oneself of counseling services may be a sign of weakness, or illness. Our socialization has molded us to believe that, unlike our physical health, we can handle our emotional health alone, and asking for help somehow labels or taints us.

When we are used to looking at problems and solutions through our own filter, we miss alternatives that may not be part of our experience. Very often, it takes someone on the outside to be able to see the whole picture through an objective lens. There is a wonderful sculpture of a man in a cage that illustrates this point. The man is struggling to pry the bars apart so that he can escape, while directly behind him, the door to the cage is wide open. Counseling can be thought of as helping us look at problems and life events from a different angle, which we may not otherwise be able to see.

Naturally, in an office setting, deep, long-term, family-of-origin therapy work (exploring how we learned to think and feel the way we do) is not the most appropriate. However, one of the ways that we are using counseling in our organization is to help each other recognize what we are really feeling. As we stated earlier, most of us are so used to feeling a certain way, even though it may not be healthy, that we assume that it is normal, and we deny, suppress, or displace our feelings. It is very common, for example, to feel

---

9 Ibid.
angry and act out those feelings, when in reality if we peel back the layers of our feelings, we are really experiencing fear or pain. So learning to “listen” to our psyche is one of the prime goals.

Another prime goal is to make sure that we are not “catastrophizing.” As Mark Twain stated, “I have suffered many catastrophes in my life ... most of them never happened.” In stressful times, we tend to take an incident and make huge, imaginary leaps to catastrophic conclusions. “That meeting did not go well today, the VP didn’t look at me ... I’d better start looking for another job.” Counseling can teach us to live more fully in the present and lessen our past recriminations and future catastrophicizing.

Finally, just being able to express feelings and problems is cathartic for many. Having a congruent, empathic person available to listen, who exhibits what Carl Rogers (the father of Person Centered Therapy) calls “unconditional positive regard,” can deflate the potentially harmful build-up of emotions. 

**Meditation**

As we discussed earlier in this article, our feelings and perceptions of the circumstances in our lives can have a profound effect on the outcome of how we experience and handle our life events. If we are filled with negative self-talk, for example, our experiences will be self-fulfilling, and thus negative.

Our minds seem to be constantly filled with the “shoulds,” “oughts,” and “woulds” of our daily existence. They are filled, too, with all of our plans about how to get what we want, while planning to ward off the things that we don’t want. We can feel overwhelmed by all of the important things that just have to get done. Much of the time, we are desperately trying to do them all but not enjoying the “doing.” Wayne Dyer, in his book, You’ll See It When You Believe It, says, “We are not human doings, we are human beings,” while Jon Kabat-Zinn says, “Meditation is really non-doing. It is the only human endeavor I know of that does not involve trying to get somewhere else but, rather, emphasizes being where you are already.”

The practice of meditation is designed to help us quiet the mind. It is a very enlightening experience because it allows us to “watch” the incessant and relentless activity of our own mind and how much we are driven by it. With practice, we are able to quiet our thoughts and go to the center of our being, where we can find an inner balance that helps us face the turmoil of life.

The practice of meditation is nothing more than setting aside a special time and place for “non-doing.” It is best to sit with eyes closed in a comfortable erect posture, in a place that is quiet and devoid of interruptions. All concentration should be directed to your slow and steady breathing. When you notice thoughts present, you gently let the thought leave your mind and re-direct your attention to your calm, steady breathing.

Thoughts of past and future, thoughts of “what if,” “I should,” and “I ought” are gently released. It is the thoughts about what we should have done, and what is ahead, that keep us spinning through life. It is the momentum of all of this doing that takes over. Meditation helps us to focus on the present, and live in the moment.

At first you will notice how much activity your mind is engaged in, an insight that may be surprising. With practice, you will begin to feel small spaces of calmness, when there appear to be no thoughts taking place; it is at these quiet moments that we experience peace. In essence, meditation is designed to help you change your mental behavior, while getting in touch with the calm center of your being.

**Creative visualization**

William James said, “The greatest discovery of my generation is that human beings, by changing the inner attitudes of their minds, can change the outer aspects of their lives.” Our focus, the object of our mental energy, is a powerful phenomenon. Most of us can relate to the experience of wanting to purchase a new car. When we decide which make and model we wish to buy, almost as if by magic, it seems that the road becomes filled with that very car, when only the day before it seemed there were hardly any on the street. This curiosity can be explained by thinking of our mind as a computer. When we feed in the data of the type of car we are interested in, our mind sets up, in essence, a list of specifications. Then when we encounter a car that matches our specifications, a signal is sent to our brain which alerts us that we are encountering a “match.” It’s not that there are more cars of our selected type on the road, it’s just that we have programmed our minds to be alert for that model and to signal us when we come upon it.

Creative visualization is a process in which we program our minds to “look” for objects or situations which will help us meet our goals. The theory is that just like the cars that were always on the road, whatever we need to reach our target is also available. We just need to train our mind to filter through all of the stimuli and pick out the parts that will help us reach our mark.

At the height of stressful situations, we can become caught up in the vortex of the negative whirl that surrounds difficult situations. When
our focus is cast on the negativity or stressors that surround us, our mind will be programmed to pick out only the negative stimuli, and thus our negative focus becomes a self-fulfilling prophecy.

Creative visualization helps us refocus and reprogram our minds. It can be used to help us relax, prepare for an upcoming event, solve problems, heal, or achieve a goal. The basic exercise is very simple and for the purposes of this article, we will describe a relaxation exercise.

Essentially, it is necessary to find a few uninterrupted minutes in a quiet place. You will sit with your eyes closed, and picture a scene which is very peaceful for you. It is important that you create every detail of this tranquil place. Some people pick the ocean, or the mountains or the forest as the backdrop of their scenes. It is important to create this picture in as much detail as possible. The colors, textures, sounds, and smells of your surroundings and the feelings that you are experiencing, are important components of this visualization.

Once you have created your special, relaxing place, you will scan your body mentally so that you can detect where the physical tension is occurring. Is your neck stiff? Have you been clenching your teeth and putting tension in your jaw muscles? What other parts of your body are feeling tense?

When you have identified the areas of tension, see if you can visualize what that tension "looks like," "sounds like," "smells like," or "feels like." It is helpful to get an impression from each of your senses about the tension. This will help you create a detailed metaphor for the tension in your body. For an example, one might picture the tension as tightly twisted ropes. With your eyes closed, you would picture the ropes being squeezed tightly together, and then you would picture these ropes slowly and gently untwist. As you visualize the ropes unwinding, you will feel the tension leave your body, and feel yourself enjoying your peaceful surroundings. "Five minutes of visualization can cancel out hours, days, even weeks of negative thinking or acting. Three five-minute sessions a day can change a habit that took years to form and reinforce."

In conclusion

One of the questions we asked in our CUMREC-L survey was, “Do you think it would be beneficial to have a professional counselor or psychologist closely associated with the information technology department who is familiar with the kind of stress that information technologists encounter?” Several respondents suggested that they would rather “see money spent correcting some of the causes of stress,” than to spend the money for a mental health counselor.

As human beings we have been conditioned to believe that external forces control our being, and in order to make changes in our lives, we must change our outside circumstances. As many of us know too well, there will always be people or forces that can disrupt our work, threaten our jobs and our role in the industry, or make what we say one day irrelevant the next, no matter how much power we may think we have accumulated. Additionally, there are usually limits to how much we can do to change things or resist certain changes within our institutions, even if we have a lot of power and influence.

We do, however, have choice at every moment of how we perceive and react to external events and relationships. The power of thought is enormous. In this article we have touched on some ways in which we can change our thoughts. We suggest that this change in our thinking is the key to changing our life and our organizations for the better.

The tenets we have touched on in this text can not simply be implemented throughout our departments and colleges as we implement computer systems. They are not dependent on getting others to buy into the same way of thinking or performing; rather, these suggested practices must be absorbed and practiced individually. However, once you begin to think and feel differently, you will automatically affect everything and everyone around you. We believe that information technology organizations have much to gain as we turn our crisis into a crossroads for enormous leaps in personal and professional growth.

This article is based on a presentation made by the authors at CUMREC95.

16 Ibid., pp. 152-153.
17 Kabat-Zinn, p. 203.
Library Web Implementation: A Tale of Two Sites

by Ann Koopman

One of the keys to a successful implementation of a Web-based library information system is an effective collaboration between campus library and information technology professionals—a long-term commitment to the breakdown of organizational barriers, empowerment of individuals, and shared vision rather than protection of turf. This article provides an overview of two such implementations.

The University Library of Indiana University-Purdue University Indianapolis (IUPUI) and the Academic Information Services and Research (AISR) unit of Thomas Jefferson University have both built exemplary World Wide Web sites. A comparison between these two substantially different academic institutions and their implementations of Web services reveals a pattern of similarities and potential pitfalls. Cooperation and partnership between elements of the campus information infrastructure is crucial to produce such services. Interdepartmental production teams are the winning strategy.

IUPUI: The Urban Experience

Indiana University-Purdue University Indianapolis is the cooperative urban campus of two Big Ten schools. Only twenty-six years old, it is home to most of the IU professional schools, and over 170 different degree programs reaching over 27,000 students. The range of experiences and abilities of those students is as widely varied as the population is diverse. Much of the student population commutes and attends part-time, or is returning to school after years in the workforce—a classic “non-traditional” student body.

Because of the rapid growth of the campus, the University Library has always had to struggle to provide adequate print resources. Funds simply haven’t been available to build the print-based research collections for which IUPUI’s parents are both so noted. So it has been natural for the University to focus on the promising new technologies for delivery of electronic information to its client population. When a new library building was undertaken in the late 1980s, it was seen as an opportunity to enter an ambitious new electronic future. The building was completed in late 1993 and dedicated in April 1994 when the new library information system was unveiled.

The house that IUPUI built

The theme of the IUPUI environment is one-stop information shopping. Students may come to the library, use printed materials, and turn immediately to nearby workstations to access video and audio libraries or Internet resources. Using their personal information storage space, several methods of electronic communication, and access to a wide variety of applications on every station, students may create text or multimedia products in a single session. Those products may be stored for future use or shared electronically on the spot.

To make this possible, IUPUI built a

---

Ann Koopman (koopman@jefflin.tju.edu) is the Coordinator of Electronic Information Services at Thomas Jefferson University. She co-chairs the team that develops content for JEFFLINE and teaches workshops related to JEFFLINE access and resources. Previously, she was the Science and Engineering Librarian at Indiana University-Purdue University Indianapolis, and Content Editor of its Library Information System. Inquiries about the IUPUI system may be directed to the current Managing Editor Robin Crumrin (rcrumrin@library.iupui.edu).
... while all of this in-house development was going on, the Internet virtually exploded around us ...

The IUPUI Library Information System

IUPUI formally unveiled its Library Information System (LIS) in April of 1994, but the system had been under development since 1989. When the new building was authorized, the library director commissioned a feasibility study by Ameritech for development of an ambitious, integrated information service. It was to be based on complete self-sufficiency at a single workstation, point-and-click graphics, availability of multimedia, and accessibility for remote use. Clearly the system was ambitious for its time—pre-Gopher and pre-Web.

The library then undertook a joint application development program with IBM, and began to forge what would become an ongoing relationship with the campus computing service, Integrated Technologies (IT). The IT unit comprises over 200 employees on campus, all administrative and academic computing, responsibility for the information infrastructure of the campus, student labs, all communication and AV services, and more. IT leaders agreed to commit several programmers to the development of the system, under the general guidance of the IBM project leaders and the library systems officer. At this point, the relationship was structured with the library as the client and IBM and IT as producers.

A series of focus group discussions was initiated to dream of a future without limits. Members of faculty departments, students, administrators, and librarians were chosen to participate in the focus groups on the basis of interest or expertise. The fifty-plus hours of group discussion were used to produce a list of functional requirements ranging from specifications of help screens and understandings about accessibility for students with disabilities, to general statements about reliability of performance. The discussions also ensured all interest groups on campus a voice in the eventual product.

All further development proceeded from the functional requirements. The programmers broke out into groups addressing the various components of the system, such as the graphical user interface (GUI), and worked independently, albeit with frequent “touch base” sessions. The initial development of the LIS got under way with Visual BASIC and HyperCard. However, while all of this in-house development was going on, the Internet virtually exploded around us, first with Gopher and then with the introduction of Mosaic, the first popular graphical Web browser. While programmers grappled with developing our own hypertext, software arrived that could easily overcome our obstacles.

As the pressure to build the LIS mounted, the IU–Bloomington parent campus provided additional leadership and resources to the effort. Bloomington IT leaders saw the potential in the new Mosaic browser and the infant Web, and urged consideration of the product. Mosaic was a “mixed bag,” but promising overall. On the plus side:

- Mosaic offered a quick and easy means for information professionals to update, add, or delete material from the system. Giving direct content control to the content experts was much more efficient than having those same individuals take up the programmers’ time for changes to the Visual BASIC code.
- The multimedia capacities of the system suited virtually all of the requirements of the LIS. The software could be enhanced with program add-ons such as an application to launch external software from within the interface. The original icon-based GUI translated nicely, and Mosaic could handle all communication protocols on the Internet.
The navigational system of Mosaic took the hyperlinkages envisioned for the HyperCard-based program a step further, into lateral and Web-like movement options. Of course, that is part of the strength of the entire Web world. The original LIS worked like a visual gopher—very linear and directed, albeit with icons and pictures. Loss of some control over that direction was momentarily unsettling to some, but the robustness of open Web access overcame those doubts quickly.

The Mosaic browser was freely available on all platforms on which the LIS was supposed to function. The costs of further development for such an external software would be borne by others, outside of the University. Of course, that would also mean some loss of control over such development.

On the minus side, the early instability of Mosaic was almost a show stopper. Plans for user authentication upon initial entry had to be discarded. However, this problem was solved by requiring identification of patrons at each point of use for licensed products or restricted services. Also, this was a problem only for users outside the library building. Within the library, the decision was made to provide all services to any user on every LIS station.

The final decision to switch development to Mosaic was made less than two months before the scheduled public release of the LIS. The crunch was on. The IUPUI and Bloomington IT staffs threw tremendous resources into the project. And for the first time, staff librarians joined the team as more than just clients. Now it was up to the librarians to learn hypertext markup language (HTML) and to discover, describe, and organize local and Internet content for the system.¹

After the dust cleared

When the dust had finally settled after the mad dash for the finish line, the LIS looked very much like it does today.² Of course, the system has since moved to Netscape, and resources have increased well beyond the initial offering of approximately 100 Internet links. Certain basic features are striking:

• The use of the image map as the home page, carrying a toolbar of high-demand services to every local guide or help screen. Both the map and the toolbar make use of icons that link


² URL http://www-lib.iupui.edu/
The designers of this system assumed a population with little sophistication about computers, no experience with the Internet, and no human assistance available nearby.

- A wide range of applications available under the Toolbox icon. However, most LIS content consists only of such applications, administrative information about the site and its staff, links to external Internet resources, and bibliographic databases. Since the faculty have developed their own sites without having to come to the library, the unique content contributions of the LIS come from the activities of the Special Collections and Archives department and the Payton Philanthropic Studies Library. The power of the LIS is focused more on integration of resources and access to unique external resources than on the creation of new content.

Since the initial introduction of the LIS, IUPUI has further developed technology for delivery of video and cable broadcasts to selected workstations, and continues to explore developmental partnerships. For example, the library is a test site for Xerox Corporation’s project to deliver reserve readings in full text.

Marketing the LIS

The new information system was unveiled at the formal building dedication amidst great hoopla and publicity. The media were understandably interested in what tax dollars had supported, and all parts of the University community were intently focused on the resources now available. The new library was, of course, featured prominently in student and campus publications.

System orientation programs and building tours were conducted regularly, and the subject-specialist librarians began to incorporate LIS instruction into their course-related presentations. Use of the teaching cluster was particularly important to give patrons an opportunity for hands-on practice. Initial attendance at orientations was low, due to the normal summer drop in enrollment, but this period gave the librarians time to study patron reactions and plan strategy for the fall, and to conduct the general staff training needed to support the new resource. The subject specialists also worked directly with their faculties to demonstrate system capacities and suggest course-related uses.

The computers drew students individually like magnets, even if only for e-mail, games, and word processing. Once patrons were attracted like magnets, even if only for e-mail, games, and word processing. Once patrons were attracted to the Web, everybody got into the act. Savvy departments put up their own servers, IT replaced its Gopher service with a competing campus homepage, and so on.

Contrast: The Jefferson Experience

The environment of Thomas Jefferson University (TJU) presents an almost total contrast to IUPUI. A private school with a long and rich tradition, Jefferson serves fewer than 3,000 students, over half of whom are graduate students in medical or scientific fields. In addition to serving the student body on campus, Jefferson information services are also available to affiliated hospitals in the Philadelphia region, such as Pennsylvania Hospital. The library is esteemed for its strong research collections in print. However, because of
the far-flung placement of its students in clinical settings and affiliated programs, the planners of academic information services depend on the use of electronics to bridge the distance.

Another contrast is that in 1993 Jefferson combined the Library, the Office of Academic Computing, and Medical Media Services administratively to form a single unit: Academic Information Services and Research (AISR). This group is led by the University Librarian, and has provided in its very organization the partnerships and mutual support necessary to press forward with innovative services. Administrative computing and telecommunications are managed within the Department of Information Services. While this department operates the main administrative TJU home page, AISR provides the academic substance. In effect, the partnership structure was already in place before the project was undertaken, and team-based problem solving was already part of AISR’s culture.

TJU is a campus where student e-mail was only introduced in 1993, the library building is twenty-five years old, and the campus is only partially wired for networking. Few open computer labs exist, and the range of equipment spans VT100 terminals to the most current Power Macintoshes. Challenges abound, yet the promise of distance education, the use of electronics to teach and model health situations, and the need for immediate access to information in clinical settings has driven AISR to develop JEFFLINE, its Web-based integrated information service.

JEFFLINE was built steadily, by increments. Prior to 1992 it was essentially an in-house system, providing an automated catalog and a few databases. In 1992, VAX technology and Ethernet access opened the system to remote users and provided Internet access via Telnet. The next year JEFFLINE expanded to provide a Gopher service, which was highly popular on campus. But by 1994 it was clear that the most promising future lay with Web development. In fact, the systems director studied the IUPUI model, among others, when planning the Web version of JEFFLINE. The IUPUI model influenced the design of JEFFLINE substantially.

AISR could draw entirely on its own staff in forming a JEFFLINE production team. Not only were librarians, library systems experts, and academic computing specialists included, but also an educational psychologist and a professional artist. Because models were already available, there was no need to invest in a complete “build from the ground up” approach. JEFFLINE was merely growing from one logical stage to the next.

Unlike IUPUI, which had designed the all-in-one workstation to meet both research and multimedia production needs of researchers on the premises, JEFFLINE was designed from the beginning as a long-distance delivery mechanism for unique content. The academic computing specialists had computer-based learning programs and curriculum support materials to load immediately. As soon as the system was operational, AISR staff went looking for external resources with which to build more content. Grant projects currently under way include a Learning Infrastructure Project, development of a dental hygiene network and knowledge base, and the digitization of archival images. Also, JEFFLINE was able to capitalize on the emerging awareness of departments and University offices in order to offer campuswide services. Some free developmental support is available to all departments; more extensive projects are fee-based.

The visual metaphor

JEFFLINE revolves around the visual metaphor of the digital office. Some of its distinguishing features include:

- The use of logical pictures in context, and with redundant text to reinforce concepts. The categories were chosen on the basis of long-standing Jefferson mission statements and catalog descriptions, so the office organizes their electronic environment in a way that is familiar and inviting.
- The design for a particular audience. The dominant form of remote access to JEFFLINE is via Lynx. While the initial image is large, and sometimes tiresome for graphical users on slow modems, Lynx just ignores the image and goes straight for the text-based menu that follows the image. For graphical users in-house, the image loads very quickly. Note also the design for VGA monitors. Again, AISR developers knew their audience, and chose to design on the basis of “current use plus one year.” Their experience with the expansion and transformation of JEFFLINE over the years provides the security of knowing the resource can grow with its clientele.
- The inclusion of a WAIS-based internal search engine, as well as an alphabetical table of contents. The search option is included in a button bar which appears above the image on the homepage and on every menu screen thereafter.
- The launch of licensed applications via Telnet. While cumbersome, the application is thereby available to any qualified user, local or remote. No special software is required and all applications are available on all platforms.
- The extensive use of forms and “mail-to” functionality for communications.
- The limitation of help screens to those services which require login instructions. This con-
tributes to keeping the system no more than three menu layers deep before reaching actual resources.

**Selling the system**

In tandem with the April 1995 introduction of the new JEFFLINE, AISR promoted the system heavily with educational workshops and events. The Education Services unit undertook a series of workshops with names like “JEFFLINE Overview,” “Internet Overview,” “Internet Tools for the IBM,” and “HTML: Learn to Design World Wide Web Pages.” Librarians, systems staff, and academic computing personnel all participate as teachers in one or more workshops. Some have been merely popular; others have been so oversubscribed that extra sections have had to be added to meet demand. Connections, the AISR newsletter, also features JEFFLINE information regularly.

Building on the popular fever, an “Internet Day” was planned as a sort of fair for all interested faculty and students. Workshops, demonstrations, and special topics presentations lasted all day and into the evening. Response was positive enough to warrant a repeat every semester, while some of the special topical workshops are offered on a more frequent basis.

Use of the system can be measured in a relative way on the basis of numbers of “hits.” The Netscape browser includes this record-keeping capability in a variety of combinations. Of course, one hit on the server only reflects one request for information—not a measure of individual patron sessions. Individual machines can be traced within the building, as well as by machine name. Such measurements, relative though they may be, indicate an increase in the use of machines in the reference area alone by a factor of about six since the introduction of new JEFFLINE and the workshops that promoted it, with obvious implications for reference staffing, equipment support, and space planning.

In fact, the popularity of the resource is now bringing more faculty to AISR for inclusion in the system. In October a monthly interest/discussion group formed to bring together interested faculty, students, and AISR developers on a monthly basis to talk about the future of JEFFLINE. The group also maintains a listserv for announcements and exchange of information. This is a reverse approach to the focus groups that IUPUI used so
heavily. But rather than start from scratch to dream a completely new future, the Jefferson approach was to build steadily on its solid base. Both methods have advantages and disadvantages.

**Shared Management Issues**

The University Library project at IUPUI was clearly visionary in its concept and development. The accident of timing that converted its expression to a Web site by no means reflects change in the intent of the developers. In fact, it points out the flexibility demanded of everyone in the information technology field today. The developers of JEFFLINE also reflected sure-footedness and flexibility in the growth of their site.

However, once the extraordinary effort to build each system was over, the more mundane issues of ongoing maintenance, development, and responsibility took over. Both sites developed similar mechanisms over time. Both opted for a two-pronged approach, using interdepartmental teams, though because IUPUI had started out with the consumer/producer model, it took longer to discover the need for, adopt, and develop teams. At each site, members of the computing service, the systems department, and librarians formed two groups. One group deals with policy and technology issues. The second sponsors the building of content and “collects” new Internet sites.

Both sites grapple with similar issues, often coming to similar solutions. Points to consider in the development of new services include the following. Elaboration of these issues would require a sequel to this article.

- How to maintain links already in place, both in terms of checking hypertext links to resources elsewhere, and in terms of keeping local documentation up to date.
- Whether and how to maintain consistency of “look” and quality across departments, either within the library or across campus, and how to identify and apply university policies regarding publication of sensitive or appropriate materials.
- How to write and apply a collection development policy to electronic acquisitions.
- Whether to lock patrons out of certain activities either completely or in certain physical areas of the building (e.g., e-mail in the reference area), how to write “appropriate use” policies, and how best to allocate use when demand exceeds supply.
- How much help to provide either onscreen or in person. Implied in that are how to measure the needs of clientele, how to train staff, and how to measure staff performance.
- How much developmental support to provide for free to a department that wants to create its own content.
- How to find out how patrons actually use the system, what works best about it for them, and what they like or dislike most.
- What responsibility the library might have when some patrons complain about the public display of obscenities on a workstation that another patron may be viewing.
- How to protect valuable equipment from physical vandalism, theft, and internal sabotage.
- How to integrate various full-text subscription services in a seamless and meaningful way, given the extreme variation in interfaces and delivery methods.
- How to protect original and unique content from abuse of copyright, as well as how to make local clientele aware of the copyright privileges of other sites.
- How to measure true use, rather than relative use, of the overall site and individual components, and how to assess the true value of the product delivered.
- Whether to charge for or limit printing, especially when laser printers are involved. And, related to this one, where to find the money for more paper when the budget runs out.
- What level of resources (mainly human) are needed to adequately maintain and develop the site, and to what degree activities that promote the system can choke both maintenance and development by diverting human resources.
- How far ahead the university can afford to design, without sacrificing low-end users.
- What the obligation of the institution is to its users.
- How best to satisfy the peripheral needs of patrons. They used to ask for pencils and scrap paper; now it’s disks, videotapes, labels, and so on.
- How best to time the introduction of major changes in key images or navigation, and conversely, how to call attention to minor incremental additions.
- How best to plan for space use and expansion in the face of both the delicacy and the cost of fiber.
- And, finally, how much librarians should know about technology and how much technologists should know about library principles and patrons. How do we help each other bridge the gaps?

“... once the extraordinary effort to build each system was over, the more mundane issues of ongoing maintenance, development, and responsibility took over.”

(continued on page 29)
by Bev Actis

In late 1992, Kenyon College had just completed its campus network infrastructure. This new environment provided an institutional “integration” that enabled Kenyon to consider the possibility of a campuswide information system. Kenyon began its planning by investigating many other CWISes on the Internet. In the process, the most important issues to be addressed in launching a successful CWIS were identified. This article discusses those issues and provides a guide to other small schools in getting started.

The following discussion of these issues is meant to provide a general strategy to help other small schools considering a CWIS to take those first steps in getting started.

Do we really need a CWIS?

The first question we asked ourselves was, “Do we really need a CWIS?” With the budget...
restrictions we were facing, would the service a CWIS provided to the campus really be worth the time and work required to develop it? What compensating benefits could it offer?

Since most members of the Kenyon campus were not yet familiar with the concept of a CWIS at that time, we in ICS were almost alone in our enthusiasm for one. We believed that it would fundamentally change the way we shared information with each other and the outside world, and we truly felt that developing a CWIS was an opportunity we could not afford to pass up. The number of CWISes being implemented in institutions across the country was increasing rapidly, confirming that this concept was an idea whose time had come.

Other benefits of a CWIS were that it could provide easy access to a broad range of college information as well as Internet resources. It offered a central location for that information, as a kind of “one-stop shopping” resource and it would be available around the clock from any workstation on campus. A CWIS could save users much time in finding college-related information because of its twenty-four-hour availability and the ease with which it could be browsed. It could also help increase the productivity of anyone providing information to it, since electronic updating and distribution could be accomplished more efficiently.

KCInfo could also significantly reduce the use of paper on campus. Although it might not completely replace paper-based documents, they would be printed only at the user’s discretion; thus they would not be wasted on users who had no real need or desire for them. All of these reasons have been proved valid in the ensuing three years, as more and more college information resources have been made accessible electronically through KCInfo.

**Needs and resources: what we want vs. what we have**

Our first task was to determine what resources we had. Kenyon’s all-campus network was our biggest asset, since it provided universal access to computing resources. The network was connected to a cluster of DEC VAXes connected to workstations, half of which were terminals and half microcomputers. With half the campus still using terminals, we realized that the software to run the CWIS would initially have to be software that could run on the VAX mainframe to be accessible to all users.

Using a timeshare environment for our Gopher server was not ideal, since it might put a strain on the VAX cluster when usage became heavy. A separate, dedicated machine would have been preferable but was not possible at the time, so we plunged forward on the VAX to get started. Should system overhead present a problem due to the growth of the CWIS, relatively cheap add-on memory and disk storage could be purchased as needed.

In the future, as we evolved into a system of networked microcomputers, we could migrate our CWIS to a dedicated microcomputer set up as a server.

**Why did we first choose Gopher software?**

In regard to the software required to run a CWIS, we couldn’t afford to allocate staff time for developing our own software because of budget and personnel limitations. Given these limitations, the increasingly popular Gopher software seemed to be the perfect solution for Kenyon at the time, since the software itself was free, and it was easy to maintain. It had become so popular that the University of Minnesota (its creator) and other third parties were continuing to make ongoing improvements to it at a rapid rate.

Gopher had already become a standard on the Internet. Its modular design made it easily expandable, simply by linking up to another module or server, either locally or remotely. It offered a logical, hierarchical menu structure and a minimum of keystrokes for the user to learn. Information retrieval was easy because the location of information was transparent to the user.

Gopher had other important features that made it seem the right choice for Kenyon at the time. It was originally meant to be an Internet “gofer” or navigator, and during its few years of existence, it had acquired the ability to access all kinds of Internet resources, regardless of type or location. These resources included anonymous ftp archives, Telnet sessions, searches through Veronica and WAIS, gateways to online library catalogs, and links to several thousand other Gopher servers around the world.

At the present time, as Kenyon is beginning to develop its World Wide Web server, we will be able to make a smooth transition from our present Gopher environment to the new Web environment. During this transition time, Web browsers will be able to access and display information in KCInfo on our Gopher server until the transfer of that information to the Web server is completed. KCInfo also will remain accessible from the VAX as well as from Kenyon’s Web home page for this period of time. When information providers can be trained to convert their KCInfo documents into HTML format for direct placement onto the Web server, the Gopher version of KCInfo will be discontinued.
Ownership issues: whose CWIS is this, anyway?
In talking to individuals who had implemented CWISes at other campuses, we learned that issues regarding responsibility for information content had posed big problems. It was important to define at the outset who “owns” the information. Because of possible legal implications for Kenyon, it was important to make a clear distinction in roles between the institution and those groups who wanted to sponsor the information in the CWIS.

We viewed KCInfo simply as a vehicle that acted as a “collector and storer” of the information, similar to a library. The role of the sponsor of the information was that of author/editor/publisher. By not editing beforehand the information that was placed in KCInfo, Kenyon would not be responsible for any material that might later be found to be illegal, such as copyright and privacy infringements, libelous or derogatory information, etc.

ICS does, however, regularly spot-check KCInfo documents to ensure that they adhere to certain content standards set up in our KCInfo policy document. Even though we do not edit material before posting, we reserve the right to delete information that is contrary to those standards, if notification to a sponsor about the need for corrections or updating goes unheeded.

As owners of their information, sponsors had full responsibility for its quality and legality. We directed that each sponsoring group (a college department, program, or organization) create its own internal process of review and approval of any documents provided to KCInfo. Sponsors were also charged with selecting a representative to become their information provider, who would be responsible for the editorial management of the sponsor’s documents: formatting, proofreading for grammatical accuracy, posting, updating, and deleting documents.

To identify ownership, every document in KCInfo was required to have a header at its beginning, containing the name of a contact person from the sponsoring group, so that questions and problems could be directed to the proper source. This header also contained the last edit date of the document so that readers could tell how current the information was.

In our current development of Kenyon’s Web server, the question of ownership and responsibility has become even more important, since we have decided to allow not only college groups, but also individuals who are Kenyon affiliates, to become sponsors of a Web page. This includes students, faculty, administrators, alumni, and community members. Individual sponsors will be able to design and maintain their own home page on the Web, once an initial training workshop is completed. Our Web server, however, will contain a specific disclaimer of responsibility at the point of access to personal home pages, so that Kenyon’s role as “collector and storer of information” remains clear to the outside world.

Access and privacy
It is important that sponsors understand the concept of open access before they begin to plan their information. A Gopher-based (and now Web-based) CWIS is available not only to campus users, but to anyone with Internet access. Although it is technically possible to restrict access to certain documents, Kenyon decided that KCInfo was not to be used for restricted information.

In the future, if Kenyon integrates administrative functions within the Web server, there may be good reason for restricting particular information to certain users. For the present, however, information posted in KCInfo is accessible to all browsers on campus or from the Internet.

Regarding the issue of privacy, ICS had to address two concerns: user privacy and data privacy. We had to be careful, in any analysis of usage statistics, that the data would not be used to identify what documents individuals accessed in KCInfo. Libraries have long been aware of the need for user privacy in book checkouts by individuals, and Kenyon had to be sensitive to this in regard to electronic documents.

Data privacy considerations in light of the Family Educational Rights to Privacy Act (FERPA) require that personal information, such as an individual’s home address and phone number, not be made available for public access without allowing that individual the choice of withholding it. This had to be clearly conveyed to sponsors who might inadvertently include inappropriate personal information in their KCInfo documents. Although these privacy issues were not specifically mentioned in our original policy document, they will be in the revision it is currently undergoing.

The preparation of the electronic campus phone directory for KCInfo is a good example of the need to be aware of privacy issues. We had lively discussions about the information that should be made available, since it would be accessible to anyone on the Internet. Our paper-based phone directory contained home addresses of all students and employees (although an individual could elect to withhold that information from the directory).

However, with the electronic version that
would be accessible to the Internet, we decided to limit individual information to the following items: Student listings included only name, year of graduation, Internet address, and dorm phone; faculty or staff listings included the name, position title, department, Internet address, and office phone. Home addresses and phone numbers, as well as campus addresses, were left out. This limited directory has worked satisfactorily thus far. Any individual may also elect to withhold personal information from the KCInfo directory.

**Personnel needs: who's going to do the work?**

The financial climate at Kenyon was such that there was no chance of hiring additional personnel to develop KCInfo, so the time involved in implementing and maintaining it had to be carved out of existing ICS staff time. Therefore, it was imperative that ICS train KCInfo’s information providers to be as self-sufficient as possible. After contacting several other schools about their CWIS personnel needs, we mapped out a tentative personnel “duties” list. (The time actually spent on KCInfo development and maintenance is also included here as well.)

- **System administrator** is responsible for managing the CWIS software and hardware, performing upgrades and migrations and customizing as necessary. Estimated time per week, after the initial installation/test period, is one to two hours; upgrades and any special streamlining “tools” take additional time.
- **Coordinator** is responsible for marketing and public relations work, management of the CWIS menu structure and development, training and support for information providers, and recordkeeping. For the first six months, the coordinator’s duties were off-loaded so that half of her work time could be spent on CWIS development; thereafter, estimated time per week was five to seven hours.
- **Sponsors (college departments, programs, or organizations)** are responsible for information content, i.e., they define and organize information, develop internal review and approval processes, and select information provider(s) to post and maintain their information. After an initial planning process, additional time would be required only as new menus and documents were planned. Individuals, as well as groups, will be able to become sponsors on the new WWW server.
- **Information providers** are responsible for editorial management of documents; they are required to take a training workshop. After an initial learning period, the time needed for preparing documents for KCInfo was not more than required for most paper-based documents. In Kenyon’s WWW environment, individual sponsors will be the information providers as well. [Note: as with any new resource, ways to utilize it keep expanding, so that in the long run, information providers will spend more time preparing many more kinds of documents for electronic publication than they would have attempted on paper.]

**Content: meat and potatoes of the CWIS**

Although it may seem obvious, the selection and organization of the information (content) is the most important consideration if the CWIS is to be well used. It should contain information that is informative and interesting because it has to motivate the user to want to explore it further. The menu structure must be organized intuitively so that the novice user can find the needed information easily.

One of Gopher’s nice features is that the same information can be accessed from multiple locations in the menu structure, thus providing users with more than one logical menu path to follow. In Kenyon’s planned Web environment, the use of links will offer an even greater flexibility in information display.

Defining and organizing information requires time, and it cannot be rushed. Getting sponsors to understand the importance of this planning phase is the key to the success of the CWIS. Information that is unclear or poorly organized will simply not be read, and the CWIS will be bypassed.

By making the sponsors and information providers responsible for all aspects of the content, ICS did not have to spend staff time on proofreading, formatting, or posting the information to KCInfo. As mentioned earlier, each sponsoring department or organization determined its own internal review and approval process for information targeted for KCInfo. Questions about the information were directed to a contact person from the sponsoring department, whose name was identified in the document header. This helped direct questions from readers to the appropriate source, so that they would not take up ICS staff time.

If we had not distributed responsibility for content, ICS would never have had the staff resources to handle the CWIS implementation or its ongoing management. We trained the sponsors and information providers to be as self-sufficient as possible so that we could then concentrate on the system management responsibilities that only ICS could perform.

Early in the project content and formatting standards were established before any information was posted to KCInfo. Although ICS...
does no preliminary editing of the material being posted, it does rely upon regular spot-checking of posted information to ensure that it adheres to those standards.

Some of the standards set for the Kenyon environment at that time were:

- **Appropriateness.** Appropriate information was defined as information that may be of general interest to members of the Kenyon College community. Advocacy, commercial advertising and sales, illegal, derogatory, and confidential information were specifically prohibited in our policy document. Many of these standards were obtained from other Kenyon policies already in effect.
- **Currency.** Information providers were to review and update information regularly; otherwise, the coordinator could delete the out-of-date information if the information provider did not keep it current.
- **Accuracy and quality.** Documents were to be grammatically correct. The quality of workmanship was to be the same as that of paper-based information.
- **Copyright.** Existing copyright and privacy laws were to be honored; sponsors were responsible, if necessary, for obtaining copyright approval from the author.
- **Format.** Instructions were given for converting word-processed documents to ascii or text format, which was required by Gopher; document format standards were established. With the Web development, we are now in the process of searching for tools that will enable our information providers to convert their word-processed documents into HTML format for the Web server.

With the planned transition to our Web server, our information providers will be taught how to convert their documents into HTML format for the WWW server. They will also be trained in handling all the functions of preparing, copying, and maintaining their Web documents, just as they have learned to do regarding KCInfo.

### Policies and policy board:
guide, watchdog, and referee

Other campuses had experienced many problems in setting up their CWISes because they had no clear guidelines to follow and no means of settling the inevitable conflicts that arose because of differing opinions. Examples of these issues were disagreements on the design of the main menu; personnel responsibilities; copyright, privacy, and other legal issues; ownership issues; lack of content standards; access issues; and so forth.

ICS decided that it would be good preventive medicine to set up a policy document and a policy board (drawn from all college divisions) to oversee KCInfo. We set up a committee, with broadly based representation, to write a policy document that would be in place before KCInfo was made available to receive information.

The *KCInfo Policy Document* defined the membership of the policy board, which represented the various college constituencies. This board would oversee the management of KCInfo, define and enforce the policies governing its operation, and settle any conflicts that might arise.

At the present time we are in the process of broadening the policy board’s scope of responsibility, which now includes Kenyon’s WWW server, ftp site, and other networked services. The policy board membership has also been expanded to include a special representative from the library as well as the department of public affairs. The library has already played a significant role in KCInfo’s development, and public affairs staff have been invited to participate in the design of our new Web server’s home page. It is anticipated that both of these departments will take an increasingly visible role in its development.

### Designing the main menu

Before any information could be posted to KCInfo, the ICS task force was faced with the decision of how to design the main menu. The menu topics were critical, because they had to be broad enough in scope to include the wide range of information to be made available to the campus and intuitive enough to allow the reader to find information easily. We investigated many other CWISes to determine which topics were most appropriate for ours. Then we listed all of Kenyon’s departments, programs, and services to see what kinds of information we had to work with and how we might best categorize them.

After we tentatively decided upon a dozen broad topics for our main menu, we set up a prototype menu and made it accessible to campus users to get feedback about the appropriateness of the topics. Were they broad enough, inclusive enough to cover the information to be posted by the many and varied campus groups? The main menu remained flexible during this test phase, but after a limited time, the main menu was “frozen” so that we could get on with the work of developing the menus.
This prototype menu was skeletal, with a limited amount of information in it, but what it had was useful or entertaining enough to draw the reader into browsing through it. The local information that was entered already existed, either on paper or online somewhere else: campus directories, newsletters, calendars of events, computing and library information, announcements, course listings, and so forth. Putting this information into KCInfo made it much easier to find, which served to illustrate its potential as a one-stop information resource.

Since Gopher enables one to browse the Internet, we included several Internet resources as enticements, such as the U.S. Weather Service, White House press releases, the Internet Hunt, and other interesting Gopher sites.

Soon after, the library staff joined forces with ICS by developing an extensive set of menus containing library information. They were instrumental in creating a “Special Electronic Information Resources” menu, which links our Gopher to a wide range of Internet resources, grouped by academic interest. This was instrumental in getting students to use KCInfo, because so many resources used in class work were so easy to access.

KCInfo’s main menu has remained unchanged since it was frozen, with one exception—the addition of a “Comments” topic to encourage reader feedback. With Kenyon’s transition to WWW, we will have the opportunity to rearrange topics, combining some into even broader categories. With the aid of the admissions and public affairs departments, we will be able to put more emphasis on the information needs of the prospective student. Kenyon’s home page will also provide a link to all personal home pages of all Kenyon-affiliated individuals wishing to post information.\(^3\)

The coordinator: cheerleader and trainer

Once the groundwork was laid, we selected a coordinator to manage the day-to-day development of the CWIS. This person had to have excellent organizational skills, since part of the job would be to assist sponsors in organizing their information and selecting an appropriate location for it in KCInfo. One of the ICS staff, a user services specialist, was chosen for the job. Some of her regular work duties were offloaded so that she could devote half of her work day during the first six months to CWIS development, since it would initially require an intense effort on her part.

Another important quality in the coordinator was the ability to envision a fully integrated and operational CWIS and communicate this vision to the campus. The preliminary work involved much marketing and cheerleading, but they were necessary in getting the campus hooked. In the beginning, she spent much time contacting heads of key departments on campus, discussing with them the opportunities that KCInfo offered them in more efficient and cost-saving information distribution.

The coordinator had to develop good record-keeping tools to keep track of the growth of the menu structure and the information providers. Good records were essential in troubleshooting problems effectively, so the coordinator could find the problem areas and correct them. Knowing where menus and files are located was also important in developing tools to streamline the copying and maintenance of files in KCInfo.

The coordinator was also responsible for the training and support of the information providers. This included developing a training workshop, writing a handbook of guidelines, developing ways of streamlining the preparation and maintenance of documents, and phone consulting. Each of these areas required much time for development during the first six months.

Another of the coordinator’s duties was to regularly spot-check the documents that were already posted in KCInfo for adherence to the established content standards. She did not edit the documents, but instead notified information providers about any information that was out of date or wildly inaccurate. It was up to the information provider to make corrections in a timely manner. When information providers first began to post information, they needed reminders to review their documents. The coordinator sent them periodic e-mail reminders, which were also used to request feedback from them about any difficulties they might have encountered in maintaining their documents.

Information providers: the worker bees

As mentioned earlier, information providers were given responsibility for the editorial management of the sponsor’s documents. This included making sure the posted documents were up to date, grammatically accurate, and in proper format for KCInfo display.

All information providers were required to take an initial training workshop to learn how to prepare, post, and maintain their information. There were no exceptions to this rule.\(^3\) Kenyon’s home page can be browsed at http://www.kenyon.edu/
“We are now being prodded by faculty and students to get the Web server up and running because they understand the potential offered by the multimedia Web environment ...”

Marketing strategies

For a project of this kind to be successful, the coordinator had to market the idea to several audiences: first, to the ICS staff itself, since they would be responsible for a new resource that required much cooperation and support to get started; second, to the upper management of the college, since their support was necessary to motivate the sponsors to get involved; and third, to the campus in general, so that they could see the value of KCInfo in providing them with readily available, easy-to-find information.

We used the KCInfo Policy Document itself as an important marketing tool. To obtain approval for the document and the proposed KCInfo Policy Board, we had to go before the senior governing board of the college to present our vision of KCInfo, answer their concerns, and ultimately gain their support. The policy document was a symbolic statement that we saw this resource as an invaluable tool for all constituencies of the college and intended it to be developed in a purposeful, responsible manner.

In the beginning it was important to create publicity and interest in whatever ways possible—an initial college-wide e-mail news release with an invitation to attend a KCInfo demonstration, introductory workshops and meetings for potential sponsors and information providers, articles in college newsletters describing KCInfo’s features, monthly e-mail messages about information topics recently added, and personal contacts with key department heads to persuade them to participate, hoping that by doing so they would encourage other departments to do likewise.

In the current development of Kenyon’s WWW server, the marketing effort will not be as pronounced as it was with KCInfo. We are now being prodded by faculty and students to get the Web server up and running because they understand the potential offered by the multimedia Web environment and are eager to share their material with each other and with the world beyond.

Ongoing development: keeping the wagons rolling

KCInfo passed through some distinct phases in its development. In the preliminary or “evangelistic” phase, the coordinator had to work hard to motivate potential sponsors and to interest the campus in seeing the value in KCInfo.

After some initial training workshops were held, there was a very gradual growth during the next six months, as a few of the key departments came on board. But by the end of its first year, the number of documents in KCInfo had grown to nearly 1,000 and the number of connections to it per week increased to nearly 10,000. As more information was added, the usage increased, and as usage increased, more potential sponsors came on board as they began to realize its potential. It became difficult to keep up with the demand for workshops and menus.

It is important to keep in mind that it took about a year for KCInfo to become truly useful, when the point of critical mass was reached. This was the point where people began to consider KCInfo as an integral part of campus life. The pendulum had swung, so to speak. During this phase, good record-keeping became especially critical in order to keep track of the menu growth.

The coordinator has continued to remain tuned in to new developments on the Internet affecting Gopher and WWW. By regularly collecting and organizing information from the University of Minnesota Gopher, the CWIS-L listserv, and other Internet resources, she has been able to incorporate important new features into KCInfo. Some new tools will streamline and automate posting and file maintenance. Some Gopher tools that have been developed at other Gopher sites include automatic expiration of documents, document conversion into ascii format, automated transfer of information into the CWIS, reports on “what’s new” in the CWIS, document access statistics for information providers, programs that identify “dead” links to other servers, and full text and keyword search tools.

In our current phase of integrating KCInfo into Kenyon’s WWW server, we continue to seek tools that will help information providers translate their word-processed documents into HTML format for Web viewing. We must also develop simplified ways of copying, updating, and deleting documents on the Web server so that information providers can continue to function as independently as they have with KCInfo.

Evaluation: looking for feedback in all the right places

As with any new project, it is important to get regular feedback in as many ways as possible. This can be done, of course, with periodic surveys and questionnaires. Patterns of growth can be plotted from Gopher usage logs, which also can provide document access statistics to information providers.
Some of the most valuable feedback is less formal—getting suggestions from users via a “Comments” topic on the main menu, regular follow-up with information providers, and monitoring the CWIS “image” (revealed subtly in references to it in conversation and campus publications). Even complaints are a most valuable form of feedback in providing ideas and impetus for improvement.

**Conclusion**

The explosion of information in our society today requires that we, as information technology experts, find the most efficient tools for accessing that information and presenting it in a meaningful way. KCInfo has become that kind of tool, providing access to a broad range of information at a relatively inexpensive cost to users wherever they are and whenever they may need it.

Although KCInfo was intended as a supplement to other forms of information distribution, it has already replaced some kinds of paper-based communication and has significantly reduced the use of paper over time. Currently many of the college handbooks are in electronic form in KCInfo, thus greatly reducing the need for paper copies, and enabling them to be kept up to date more quickly and easily.

Some faculty have used KCInfo to provide course work resources to their students, although they are still in the minority. However, Kenyon’s Web server, which offers multimedia presentation, has excited many more faculty with the prospects it offers for sharing course work materials and individual research.

One of the biggest benefits of Kenyon’s CWIS is that it has greatly improved access to information for the campus and has increased communication among all groups: students, faculty, staff, alumni, parents, and friends of the college. As it has grown, KCInfo has been instrumental in promoting a greater sense of collegiality on the Kenyon campus, since by informing the community of the many and varied services that each department provides, it fosters a better appreciation of that particular department’s role.

With the current development of our WWW server, Kenyon will open the door to individual contributors, which will offer a new level of communication and information sharing—not only among ourselves as a collegiate community, but also in the context of our global environment.

---

**Two Sites ...**

*(continued from page 21)*

Many of these are the topics of ongoing discussion, on campuses and on listservs. The Web4Lib and PACS-L listservs are particularly good resources for practical library experience.5

**Conclusions**

At the heart of this comparison of two experiences is the operating model. Interdepartmental teamwork, fueled by mutual interests and guided by an intimate knowledge of user needs, proved the effective organizing principle for both sites. A year apart in time and contrasted in so many ways, both IUPUI and Jefferson came to the same conclusions about what was needed both to create the initial product and to maintain it afterwards. This has profound implications for the traditional hierarchies of academic life.

Much has been written in the business and management literature about team building, team processes, and their effects on organizations. Successful implementation is a long-term commitment to the breakdown of organizational barriers, empowerment of individuals, and focus on shared vision rather than protection of turf. Libraries are expanding their scope, becoming publishing houses, entering the education arena in partnership with teaching faculty, and serving as research agents. By stressing teamwork, interdependence, mutual interest, and problem solving on behalf of information consumers, librarians and technologists will come together both personally and organizationally.

---

5 Subscribe to the Web4Lib listserv by sending e-mail to listserv@library.berkeley.edu, containing the message: subscribe web4lib <firstname> <lastname>. Subscription information and basic description for PACS-L are available at URL http://info.lib.uh.edu/pacsl.html

---

*This article was adapted from an article by the author published in CWIS, Volume 12, Issue 2.*
“The architecture provides the blueprint for developing an integrated set of information services, processes, and technologies ... ”

Reshaping the Enterprise through an Information Architecture and Process Reengineering

by Nicholas C. Laudato and Dennis J. DeSantis

This article describes the University of Pittsburgh’s unique approach to designing an enterprise-wide information architecture and a framework for engaging the University community in business process reengineering. That approach included building consensus on a general philosophy for information systems, utilizing pattern-based abstraction techniques, applying data modeling and application prototyping, and tightly coupling the information architecture with efforts to reengineer the workplace.

A team of faculty and staff at the University of Pittsburgh has completed the design of an enterprise-wide information architecture and a framework for engaging the University community in business process reengineering. The architecture provides the blueprint for developing an integrated set of information services, processes, and technologies, enabling significant efficiencies in business and service processes, and facilitating informed decisions concerning information technology expenditures and acquisitions. This article describes the University’s unique approach to this undertaking.

Background

The University of Pittsburgh, founded in 1787, is an independent, nonsectarian, coeducational, public research institution, with a Fall 1994 headcount of 32,519 students at its five campuses. The University’s central-site information system configuration, relying heavily on an IBM 3090-400J mainframe dedicated to administrative computing applications, most of the University’s financial, student, library, and personnel systems run in this environment. The Administrative Information Systems (AIS) group within the Computing and Information Services division is charged with supporting the administrative computing needs of the University. AIS is staffed by approximately 75 personnel skilled in creating and supporting batch and character-based interactive systems developed in COBOL and MANTIS.

Like many other large institutions, the University is permeated with islands of automation in...
the form of thousands of microcomputers and hundreds of local area networks. These systems are considered by the owning units to be an integral part of the information services provided to end users. Many of them support business applications that complement or duplicate some of the functionality of the central systems. This duplication is quite costly in terms of personnel, hardware, and software. But a more critical issue is the timeliness and accuracy of the information on these local systems as compared to the central site systems, and the difficulty of integrating and reconciling data from multiple systems and platforms.

**Project mission and goals**

Like many of its peer institutions, the University finds itself in an economic, social, and political climate that demands the ability to respond to local, regional, national, and international changes in a timely and relevant manner. To accomplish this, University leaders must be able to access and utilize information about all aspects of the enterprise and must change the way its people plan, make decisions, and perform work. In short, the University must transform itself into a modern organization where information is viewed as an asset and used to strategic advantage.

As an initial step in this transformation, the newly-appointed senior vice chancellor for business and finance conceived an approach in August 1992, and selected a senior faculty member from the Department of Information Sciences to design and direct a special project. The project director initiated the Information Architecture and Process Innovation Project in February 1993, with four individuals selected because of their background, knowledge, and experience with varied components of the University. These individuals were relieved of their normal responsibilities for the duration of the project and physically relocated to private office space in the School of Library and Information Science. The project team defined the following mission:

- design an architecture for the University Information System (UIS) that will provide a framework for making decisions about information systems and for improving the UIS in the future;
- establish a methodology for business process reengineering using the UIS; and
- develop a plan for migrating from the current systems to the envisioned UIS.

The architecture provides an overall, high-level design for the UIS, identifying scope, direction, components, relationships, and behaviors. Understanding and intelligently deploying information technology in compliance with the architecture will, in turn, play a crucial role in successfully reengineering the University’s business processes.

**Information architecture philosophy and principles**

The project began with the articulation of a philosophy and set of architectural principles. The creation of a University Information System philosophy statement directly involved over 100 faculty and staff. The statement was debated in three formal focus groups that were specifically configured to represent all constituencies in the University. It was also published in the *University Times* and on several electronic bulletin boards. Through this process, the philosophy statement was refined to reflect the desired goals and directions of the entire University community.

The philosophy and related principles (see sidebar on page 37) have provided a framework for the information architecture by articulating the objectives and quality characteristics that the architecture should follow. These, in turn, are intended to guide the analysis, design, and decisions made relative to all aspects of information systems and processes at the University. They determine the technological approach taken in defining components of the architecture and how they must operate, and are meant to provide a set of guidelines by which information system design decisions can be made.

**Implementation strategy**

The Information Architecture and Process Innovation Project employed a methodology that combined information engineering with business process reengineering. These two components have a symbiotic relationship—the information processing technology empowers users and customers to reengineer business processes, and the reengineered processes determine the need and cost justification for the information technology.

Because of the broad scope of the envisioned University Information System, it became clear that its implementation would have to be phased in over several years. Consequently, when choosing an implementation strategy, the project team eschewed the traditional master plan in favor of a pattern-based approach to building the information architecture. This methodology was inspired by the Oregon Experiment, a highly successful approach used over the past thirty years in designing and building the University of Oregon campus.

(continued on page 36)
The Metropolitan Community Colleges

The Metropolitan Community Colleges (MCC) encompass several campuses in the Kansas City, Missouri, area: Longview Community College, Maple Woods Community College, Penn Valley Community College, and the Blue Springs and Independence campuses. Centralized services for the campuses, as well as leadership for districtwide functions, are provided by the MCC Administrative Center.

Although the MCC district was created by voters in 1964, the present community colleges inherit the long and respected tradition of their predecessor, the Junior College of Kansas City, which was founded in 1915. Today, the Metropolitan Community Colleges offer seventy career or transfer degree programs to 19,000 students, as well as quality, low-cost continuing education courses.

According to Chancellor Wayne Giles, “The district has worked hard at staying on the cutting edge of new technologies, while maintaining a high quality of instruction in traditional, liberal arts disciplines.” More recently, MCC engaged in a strategic planning process that included a focus on expanding technological support for instruction and administration.

The need to better leverage technology

Two years ago, Giles says, “We weren’t using technology as well as we could for delivery of instruction and support of administration. We had the resources to invest in technology because the state has been very supportive of technology—Missouri is enjoying increased revenues from casinos—and the governor is very committed to information technology in education.” But technology at MCC was managed in a very distributed fashion, with little central coordination or district planning.

When Giles became chancellor in 1993, he recommended expanding the academic vice chancellor position he had just vacated to include responsibility for providing leadership for information technology across the district. Thus the position of vice chancellor for educational services and instructional technology was created at the district level. This position, filled in the fall of 1993 by Don Doucette, includes responsibility for curriculum coordination, student services, professional development, research and assessment, distance education and television, and information technology (including instructional and administrative computing and networking), as well as shared responsibility for occupational and continuing education.

While initially there was some concern that adding technology responsibilities to the position might dilute academic advocacy at the district level, that concern has since been alleviated—Doucette says he spends more than 75% of his time on technology-related matters.
percent of his time in the academic officer role. Because of a reorganization and consolidation of technology staffing (see discussion below), Doucette can concentrate on providing strategic planning and policy-level leadership for technology, while the professional IT staff manage operations and provide user support and services.

**Strategic planning and budgeting**

In September of 1994, MCC published the results of a collaborative strategic planning process that had engaged more than 400 individuals from the three colleges and the Administrative Center in the identification of goals, strategies, and priorities for the district. An update to that plan was recently published. One of the major strategic priorities identified in both the plan and update was that “MCC will promote appropriate integration of technology into areas of instruction, student services, and administration.”

The resource allocation processes at MCC are driven by its planning processes; budgets are established based on institutional priorities. In addition, each year the financial plan has included $500,000 earmarked as discretionary funds to support strategic planning initiatives. These funds are awarded based on proposals called “action plans,” generated at the district level as well as by faculty and staff at the colleges. Of the twenty-four plans awarded funding last year, twenty were affiliated with the technology priority identified in the MCC strategic plan.

This year, increases in state funding brought MCC an additional $1.8 million for infrastructure investment, including library acquisitions and access, networking, and academic computing.

**Setting priorities for IT investments**

Since expenditures on technology represent an increasingly significant portion of MCC’s discretionary spending, in the spring of this year, Chancellor Giles charged Doucette with developing a technology plan to guide the allocation of resources in this area, through a process that would ensure districtwide acceptance of the plan. Doucette began working with a technology planning task force during the summer months, engaging more than thirty individuals from throughout the district in the planning process. A draft Information Technology Resources Plan was distributed this fall, outlining principles, assumptions, goals, policies, procedures, and priority applications.

One outcome expected from this process is a set of standards for technology used in offices, classrooms, and labs that will enable “institutional compatibility and efficiency, while allowing for individual differences.” Doucette emphasizes the importance of such standards for network and user services, but believes more freedom is needed with regard to institutional technology to encourage continued use and experimentation by MCC faculty.

A fundamental, underlying philosophy of technology planning at MCC is that “financial, human, and capital resources are finite, requiring MCC to make choices in building a sustainable infrastructure.” Says Doucette, “I can’t think of infrastructure without thinking of support. That phrase ‘sustainable infrastructure’ is really the key here.”

The plan also makes it clear that universal access to information technology resources—giving all students and employees the tools they need—is a primary goal at MCC. First priority is access on campus, providing multipurpose public labs that support a variety of programs and access to campus systems, and perhaps providing less support and investment for highly specialized, discipline-dedicated facilities. Doucette believes that this will help to alleviate the unevenness in access to technology that has existed among the campuses.

MCC has also explicitly adopted the goals of the Missouri Community College Association Information Technology Plan articulated in June of 1995 to guide investment in IT statewide. Those goals included ensuring “that students graduating from Missouri community colleges demonstrate the ability to use basic information technologies, that colleges have faculty and staff necessary to meet the goal of ‘information literacy,’ that each college have a fully networked campus providing convenient access, and that colleges establish networks which share resources and data on a broad and affordable basis.”

MCC’s campuses are presently networked through 56 Kbps lines between locations, with a plan in place to implement T1 lines and fiber in the coming year. In preparation for completion of the high-speed network, the desktop environment is also being upgraded. Currently 90 percent of employees are networked, most with 486-level devices. For the past two years, MCC has funded a program that has put state-of-the-art laptop computers into the hands of more than 60 percent of the teaching faculty, with the stipulation that the recipients complete a 45-hour training course in the use of the technology.

**Restructuring for effective technology management**

The creation of a vice chancellor position with technology responsibilities prompted a reorganization of computing services at the district level, and eventually throughout the campuses. The data processing center (primarily administrative computing), which was reporting to the vice chancellor of administrative services, was brought into Doucette’s line organization, and a new area was created, Network and User Services, to provide a central coordinative and leadership function for distributed computing and districtwide networking. Under the direction of Kathy Kamp, this new area now also encompasses voice communications (which formerly reported to the marketing department) and district-level library technical support services.

The spring following this restructuring, to address staffing needs districtwide, recommendations were made to establish new technology support positions at each college:

- a coordinator of networks and user services (essentially a college network administrator who would coor-
coordinate the development of the college’s network infrastructure and network-based applications in cooperation with the district’s Director of Network and User Services.

- a coordinator of instructional support to assist faculty in the use of technology for instructional purposes
- computer laboratory managers responsible for the college’s instructional computer labs
- computer support specialists to install and maintain hardware and software in labs and offices
- multimedia and media technicians to provide support for the use of traditional media and emerging multimedia applications

According to Mike West, dean of instruction at Maple Woods Community College, “We had begun to identify systematically our technology staffing needs. Basically, we believed we needed decentralized support in two areas—instructional support and technical support. Centrally, we knew we would need to establish a help desk/training function, recognizing that when we put technology into the hands of our faculty and staff, we must be sure they are trained to use it.”

After more than a year’s experience with these staffing positions, it became clear that additional changes were needed to ensure a broader distribution of services and better use of resources. This was effected primarily through changing the reporting line of the college coordinators of networks and user services. Rather than continuing to report to the dean or associate dean of instruction at their campuses, as of July 1995 these coordinators began to report to Kamp at the district level.

A significant benefit of the new arrangement is that college coordinators are now able to function clearly as members of a districtwide team, working with a coordinated set of priorities to benefit not only the college where they are located but MCC as a whole. Each coordinator will now be able to become a specialist in certain areas, so he won’t have to be skilled in and responsible for all technologies, and all campuses will have better expertise available to them.

Kamp has assigned these new “team” members areas of specialization, such as LANs, wide area network, wiring, Internet, PC hardware and operating systems, remote access, video transmission, and e-mail/groupware and document imaging. According to Kamp, “We’re doing four times more than we were able to do before. The new structure hasn’t diminished campus support, and there’s still local oversight over how things are done. Everyone is benefiting.”

Aldo Leker, president of Longview (an MCC college known for being on the forefront of technology), believes it is helpful to have a central focus on technology “to address the larger problems that are not always evident to those in the colleges, who can be parochial in their views. We are beginning to see that the central planning and coordination is getting us more than what we gave up—that is, some of our autonomy.”

The instructional support coordinator positions have retained their campus-based autonomy. Instructional support by its nature deals more with faculty relationships and disciplines and needs to be close to those who are being supported. Chip Dube describes his instructional support coordinator role as primarily being an educational consultant to the faculty, with heavy emphasis on incorporation of technology while advising on pedagogical concerns—in short, a learning systems approach. “The best person to sell a faculty member on using technology,” he says, “is another faculty member.”

**Administrative systems development partnership**

When Doucette arrived at MCC, he found the district had been investigating new administrative information systems for several years and had come to the conclusion, after developing specifications, issuing an RFP, and narrowing the selection to three vendors, that no product on the market could meet the colleges’ requirements. Completely rebuilding the current legacy systems was out of the question—there simply were not enough staff resources to take on an internal development project. The solution to this quandary was entering into a partnership with The Robinson Group (TRG) to add functional modules to the existing student information for immediate benefits, while designing and developing a new integrated system over the next three years. This development would take place not only with TRG, but also in conjunction with a consortium of institutions participating in designing the system.

With this decision, MCC established a clear technology direction—distributed, network-based computing with centralized support—and placed a priority on the development of information systems that focus on student-centered applications that provide students with increased access to the information they need to support student learning. Until the new student system is up and running in 1997, three TRG products have been implemented to add functionality to existing systems: MetroTouch, a telephone registration system; INSIGHT, a student tracking system; and InfoTouch, an information kiosk system that allows students to access their records and transcripts.

The eleven institutions participating...
in the TRG consortium (including not only other community colleges but also several private universities and two California State University campuses) are working to develop a student system called SAN—Student Access Network. Many of the participating institutions, including MSS, are also working toward developing a Financial Access Network (FAN) system. Business process evaluation at each campus has played a significant part in the joint design process.

According to MCC Director of Student Services Malcolm Wilson, “The real value of the SAN project is that it is based on a collaborative effort. What we get will be much closer to what we need, and much better than what’s on the market. The process looks at what we do, then at what would be a better way to do it.”

Vice Chancellor of Administrative Services Ron Greathouse agrees: “We’ve done a thorough business process evaluation at MCC over the past year, mostly through continuous quality improvement initiatives. The partnership emphasizes that the business systems must satisfy the needs of the people who will use it, not just the financial personnel. So division chairs will sign off on the design before we proceed.”

MCC has bought a low-end ES9000 to provide continued support for the legacy systems until the SAN and FAN systems are implemented in 1997. The new systems are expected to run on the RS-6000 machines the district has been installing for moving to a client/server configuration.

Teaching, learning, and technology

MCC has been broadcasting telecourses since the summer of 1992 through its Distance Education Network. This network is part of KC-Ednet, a consortium of five two-year and four-year colleges which provides televised instruction to work sites and homes within a 40-mile radius of the city. This fall the district began experiments in two-way video.

Faculty at the Metropolitan Community Colleges have welcomed the infusion of technology funding and support in recent years. Doucette describes what he found upon arriving at MCC as “pent-up demand”—faculty were more than ready to use technology but many had been without resources to help make that happen. The recent widespread provision of desktop computing and ubiquitous access to the Internet have opened many opportunities for faculty to incorporate technology into the teaching and learning process.

Longview faculty member Priscilla Jackson-Evans says that one of the best things that happened as a result of MCC’s strategic planning was the setting aside of monies to fund action plans proposed by faculty. Longview’s Faculty Resource Center was one such funded proposal that has had a major impact. The Center, she says, “is not just a physical place where you find multimedia tools, but a nexus for faculty interest and expertise. It’s both a location and a state of mind—a virtual place where you are free to try new things.” What has made it so successful was its grassroots origin: “It wasn’t imposed, but evolved from individual faculty members who felt the need to investigate using technology to teach.” At the same time, others at the college were conceiving a similar idea, from faculty in the social sciences and humanities, to the college librarian, to a task force on excellence in teaching.

Throughout the district, libraries and learning resource centers are playing an important role in paving the way for incorporating technology and information resources into instruction. Electronic resources are steadily being added to existing collections, and MCC’s participation in a consortium of libraries (known as KACEY), including the Kansas City public library, has enabled access to a rich set of online resources that would not have been possible had the district chosen to develop stand-alone systems.

Denise Zortman, director of the Learning Resource Center at Penn Valley, describes the MCC libraries as a “community resource.” Participation in the consortium has enabled the libraries to be a part of the ARIEL project, which will facilitate interlibrary loan via the network. An infusion of state monies last year allowed a significant investment in library equipment purchases that will help the library to move to a digital environment.

At Penn Valley the Learning Resource Center has become an effective facilitator of technology support for teaching and learning. The LRC building houses not only the library, but also an academic computing lab and a learning assistance center, with plans for adding media services in the future. Physically locating these components under the same roof helps to make the services more interconnected and is providing a model for other campuses in the district. Maple Woods is taking a similar approach, combining a learning center, multimedia lab, and the library into a shared “learning resources” environment. All of the libraries in the district plan to network their CD-ROM collections district-wide once the fiber and T1 lines are implemented.

This sharing approach is certainly not new to the library community, and in fact extends beyond the campuses to the district level. While there is no single individual who coordinates all library activity throughout the district, library leaders from each campus work closely with each other and with Doucette’s organization, functioning as a leadership “team” to manage the district’s information resources. “Academic libraries have always been underfunded,” says Zortman, “so we learned long ago to collaborate and share resources.” She views the recent development of a library technical support function in Kamp’s Network and User Services department as especially helpful to the college libraries as they prepare for the emerging networked information environment.

What does the future hold for the Metropolitan Community Colleges? Chancellor Giles knows that changes are on the horizon, and acknowledges the role that technology will play in enabling them: “We have to get away from our traditional fall, winter, and spring offering system, and change how, when, and where we offer instruction. Students want something different, so we will need to do things differently. We will need to change business processes and systems to accommodate the way students want to do business. All of this will be enabled by technology, and in fact using technology is probably the only way we’ll be able to make those changes.”
“In a pattern-based approach, the architecture is documented in a set of patterns, or information processing principles.”
tation to allow the user to select the exact object to be viewed. A viewer displays the object. The viewer is typically segmented into pages or scrolling sections to allow all attributes associated with the object to be viewed without invoking additional transactions. Viewers also provide "hot button" links to other associated viewers and functions. Finally, a view-before-update pattern specifies that you must view the attributes associated with an object before entering a mode that allows you to modify them.

One of the premises of the architecture is that these patterns, among many others, would repeat over and over again in different applications, with only the specific data elements changing from application to application. For example, a finder will always look familiar and behave consistently, regardless of whether it is designed to find a student record, course section, purchase order, or research account. If all of the University's business applications were constructed from such recurring patterns, it would be easier for users to master the interface and seamlessly move from one application to another.

The finder/browser/viewer paradigm designed in the first prototype was replicated in a series of six smaller prototypes developed by Information Science graduate students. These student prototypes involved a wide variety of topics, including a classroom scheduling package, a car dealership program, a real estate program, and a purchasing system. This set of prototypes helped verify the team's assertion that the patterns being developed were flexible and generalizable.

Based on the experience of advising the graduate students in using the patterns to create additional prototypes consistent with the architecture, the team developed a second major prototype, the Application Builder Prototype. Twelve of the fifteen code modules created for the first prototype were generalized so they could be completely driven by metadata (instead of hardcoding the association between a database field and its display field in a window, the application used metadata, stored in a relational table, to link all display fields to the database). The remaining three modules could then be tailored to create a unique application with a finder, browser, and viewer. This allows a programmer to generate a new application simply by creating the metadata and laying out fields on the viewer window. The Application Builder Prototype thus illustrates the possibility of creating an application software library containing reusable software components that embodied the identified patterns.

The final two prototypes demonstrated the feasibility of developing applications using the client/server paradigm and of retrofitting a legacy application into the envisioned architecture. The last of these, the Registration/Advisement Prototype, evolved into a production application that is currently deployed on approximately ninety desktops across the University.

**Architectural view**

To its users, the UIS will appear as a single set of applications automating the information processing activities the user performs. All activities will involve a familiar set of information processing tasks, each with a standard interface. The system will create the illusion that all data are stored and processed at the user's location.

The UIS architecture will be distributed and layered (see Table 1). Eventually, all applications will be constructed and integrated using foundation software, including a data management system, common utilities, a user interface library, and network services. Each will conform with
emerging industry standards for distributed information systems. Such standards facilitate the use of common tools such as spreadsheets and statistical packages, facilitate electronic data interchange with organizations outside the University, and promote independence from individual vendors.

Until the architecture is fully implemented, existing systems and commercial packages will be evaluated on their ability to meet functional needs, their compatibility with UIS data management and network standards, and the ease of integrating them with the UIS interface library and common utilities.

Process view

The University’s work activities are currently organized around functional units, and the organization can be viewed as a series of vertical organizational structures. All activities are based upon this set of vertical compartments. Current information systems are also organized in this manner, as is all the information technology used to support the work of the University. This traditional organizational structure is not unlike organizational structures found in industry. Work activities organized around such functional organizational structures are commonly characterized by inflexibility, unresponsiveness, the absence of customer focus, an obsession with activity rather than result, bureaucratic paralysis, lack of innovation, and high overhead.

Current processes, such as the campus procurement process, are long, convoluted assembly lines that are plagued by inefficiencies, delays, excessive paper, multiple levels of authorizations, errors, lack of access to information, and customer dissatisfaction. Personnel are specialized, lack adequate access to electronic information, and spend too much of their time on work flow and paper flow issues. Processes are badly in need of significant reductions to the costs of delivering services and radical improvements to the quality of the services delivered.

One of the ways to begin addressing these characteristics is by viewing the organization as a set of processes instead of individual functions. Once natural processes are identified, the focus can shift to how well all activities in the process support the process outcome and how well the process outcome helps the University to achieve its goals and objectives. Morris and Brandon state that processes can be viewed as the essence of business. Not only is most work accomplished through processes, but a great deal of what differentiates organizations from each other is inherent in their individual work processes. This seems perfectly reasonable, since the same raw materials and human capital are available to every organization. Process is therefore one of the most important factors contributing to competitive advantage. However, despite the importance of process, it seems to have been largely ignored by management theorists and managers themselves.

A process is a logical and finite set of observable, interrelated (or hierarchical), work activities utilizing input, that when performed in a pre-defined series produce output(s). Processes have internal and external customers, and are independent of an organization’s functional boundaries. Output is generated by a transformation of the input(s). As displayed in Figure 1, activities are limited by the resources available to work activities, and the constraints imposed by mandates (policy, laws, and regulations).

The Information Architecture and Process Innovation Project identified four general clusters of processes (shown in Figure 2) and defined the processes and components related to each

Table 1: Architectural layers

<table>
<thead>
<tr>
<th>Philosophy and Principles</th>
<th>Organizational Structure and Responsibility Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESKTOP/CLIENT INTERFACE LAYER</td>
<td>The desktop/client interface layer allows applications to obtain interactive input and present interactive output through routines in the user-interface library, standardizing the look and feel across UIS applications.</td>
</tr>
<tr>
<td>APPLICATION LAYER</td>
<td>The application layer provides a set of common utilities for use by all UIS applications, standardizing the way users perceive and perform activities, and reducing the effort required to create and integrate applications.</td>
</tr>
<tr>
<td>DATA AND DOCUMENT MANAGEMENT LAYER</td>
<td>The data and document management layer standardizes the description, storage, and retrieval of all UIS data and documents. All applications will access data through services provided by this system.</td>
</tr>
<tr>
<td>SYSTEM AND NETWORK MANAGEMENT LAYER</td>
<td>The system and network management layer facilitates the management of the configuration of computer processors, networks, software, access devices, data storage devices, and other devices, like any other assets within the University.</td>
</tr>
<tr>
<td>PLATFORM LAYER</td>
<td>The platform layer addresses the hardware, system software, and networking components of the architecture that support applications and user access to information system resources.</td>
</tr>
</tbody>
</table>

cluster. The flow through a process represents the data and documents that enter into and exit from the activities of a process. Each of the processes have many sub-processes that act as threads of inter-related activities. These process clusters represent the flow of the University and the services provided by administrative systems to support the mission of the University. The focal point of these processes is the set of customers that the process is intended to support. The data and document processing required to provide service to customers must be supported by the information architecture.

In their seminal work, Hammer and Champy define reengineering as “the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service and speed.” In order to make dramatic and meaningful improvements, an organization must identify and take a fresh look at natural “beginning-to-end” processes. Reengineering means starting over and asking why we do what we do. The purpose of process reengineering is to make the processes as streamlined as possible and provide a high level of service to customers. Part of the streamlining requires the use of information technology to permit sharing of data, parallel activities, increased responsiveness and improved quality.

Based on its research into business process reengineering literature, and on discussions with representatives from corporations who had successfully deployed BPR projects (Bell Atlantic, DEC, IBM, Xerox, and Deloitte & Touche), the project team developed a BPR methodology and proceeded to select a pilot BPR effort to test the newly developed methodology. The team first identified all business processes in the enterprise. Using their knowledge of the structure, policies, procedures, and processes, the team performed a “process dump,” then analyzed and organized the resultant activities and processes into categories. These categories were reviewed with individual end users and further refined. The team then selected one of the high-level processes that was in a state of disrepair, the procurement process, for a pilot reengineering effort.

The project team commissioned a core reengineering team, composed of a representative cross section of faculty, staff, and others, including vendor representatives from IBM, Xerox, and DEC. This team, facilitated by two members of the original project team and led by the director of purchasing (the designated process owner), was supplemented by a standing resource team and by several other individual users and administrators throughout the University. The team investigated, but rejected, the use of specialized software packages to assist the reengineering effort, deciding instead to use general flowcharting software to map existing and envisioned process chains. After eight months of deliberation, the reengineering team completed and documented its new procurement process.

Transforming the University of Pittsburgh
The project team proposed that three organizational units should play a prominent role in the implementation of the proposed architecture and process innovation initiatives: (1) an advisory committee to provide overall guidance, direction, and priority setting; (2) an advanced technology group to investigate and implement emerging technologies, as well as to develop the technical capabilities for staff in Administrative Information Systems (AIS); and (3) AIS, through the Information Architecture and Process Innovation Project, to ensure that the architecture evolves and grows with changing technology and that the process reengineering efforts are related and refined.

Advisory committee role
The basic organizational structure proposed for policy formation and implementation of the information architecture centers around the creation of the University Information System Advisory Committee (UISAC). The UISAC, formed in September 1995, is composed of senior administrators and faculty members and will be chaired on a rotating basis by the senior vice chancellor for business and finance and the provost. The UISAC is composed of representatives from the University community, including academic units, administrative units, and the regional campuses.

The UISAC has been given responsibility for creating an enterprise-wide business and information system strategy, and for making policy
and funding recommendations for information system and reengineering projects proposed by academic and administrative unit design teams and by AIS. The rationale behind the formation of the UISAC is the strongly felt need for a consistent and coordinated approach to (1) the University's administrative information systems and information technology infrastructure, (2) the policies, tools, and techniques required for development, and (3) the implementation of the information architecture and business process reengineering initiatives. The focus must be on technology supporting business and its customers. The UISAC will be a major agent of change and, as such, needs to create an environment of trust and demonstrate effective planning and committed leadership.

**Advanced technology group**

One of the critical elements for any information systems organization in this age of rapid technological development is to develop and retain a staff trained in the use of new and productive technologies and techniques. The recommended approach to this issue is to form an advanced technology group whose function is to develop applications using the newest technologies and techniques available on a prototype scale. This group could attract faculty and advanced students to work with AIS personnel on projects that are developmental in nature but have a potential payoff for the University. Such a group could also begin to attract external funding as well as become a beta site for hardware and software vendors.

**Project approach**

The information architecture will be implemented through a project approach. Projects will be proposed by project design teams that are formed within the administrative and educational units of the University. The design teams for projects may be reengineering teams, or they may be smaller incremental improvement project teams. The teams will propose projects in accordance with detailed guidelines that ensure they will be aligned with the information architecture. This project approach is preferred over a master plan approach in order to avoid the problem of plan obsolescence typically associated with large master plan implementations.

The project design teams will present their project proposals to the UISAC, which will review the proposed projects and recommend revisions as necessary. Project proposals submitted for funding will be described using a pattern language and will contain an environment section, a functional section, a performance section, and a budgetary section.

All proposals must indicate what University and other standards are being utilized as part of the project. If proprietary products are being proposed that do not adhere to an open systems architecture, then a rationale must be provided. The decision to fund projects will be based largely on their adherence to the architectural patterns.

To date, six major projects have been proposed by business units and four have been approved by the UISAC:

- Following up on the successful business process reengineering pilot for procurement, the University issued an RFP for a procurement system, and ultimately selected Oracle Financials. Because of their close relationships, the general ledger and accounts payable components are also being implemented. The phased implementation will begin in 1996 and proceed through 1998.
• To begin building the infrastructure necessary to support the other projects, AIS initiated an ad hoc committee to evaluate and select database management systems. In addition, AIS formed a set of ten working groups, patterned after those proposed in the architecture statement, to advise the procurement project team on the technical issues related to hardware and software selection and acquisition. This activity culminated in the purchase of a site license for Oracle database and development tools.

• Based on the success of the fourth application prototype, the Registration/Advisement Prototype, a registration project was initiated to investigate ways to improve the registration process. This project followed the University’s BPR methodology, except for one fundamental point—it did not start from scratch, but rather assumed that the legacy student system would not be significantly changed. The project plan calls for further deployment of the Registration/Advisement Prototype, as well as the creation of new capabilities for the related processes of course scheduling and academic advisement. Implementation will be phased in over three years, culminating in student self-registration via client/server technology and telephone.

• A second major BPR effort was initiated in the human resources area.

Roles and responsibilities defined
A need was identified to define the roles and responsibilities of AIS personnel, IS owners and IS coordinators, local unit technical personnel, end users, and management. For example:

• Managers have the responsibility to assemble design teams for projects and to provide release time for design team members to work on the information system projects being proposed.

• End users have the responsibility to make requirements for information system services, products, and features known to the design team in a timely manner and in a form and format that is understandable to them.

• Local unit technical personnel, IS owners, and IS coordinators act as information system design team members, local system implementors, local system managers, local application developers, and local end user consultants and trainers.

• AIS personnel act as technical consultants and design team members for implementing information system projects. AIS may also act as application developers for both the client and server sides, as well as act as IS suppliers and IS operators.

Project work documented
The work of the project team has been documented in a series of internal publications. First, a forty-page summary document, written for the average user, explains the fundamentals of the architecture. A more detailed 200-page document explains the background, philosophy, architectural layers, and recommended organizational changes. This document is supported by a 300-page technical supplement that provides...
details on the architectural layers, the prototypes, and the process reengineering efforts. This work was reviewed and approved, first by the senior vice chancellor's executive staff, and subsequently by a sixteen-member committee of academic and administrative leaders.

Summary

The Information Architecture and Process Innovation Project determined that the current University administrative process environment can benefit from drastic improvements in quality and efficiency by employing the methods available through process reengineering. The project also determined that modern information processing technologies and systems are required to support the flexibility, rapid response time, and information access requirements needed by end users to perform their work, deliver quality services, and make informed decisions.

The implementation strategy is being driven by business process reengineering projects, but, at the same time, these new system implementation projects must be balanced with projects to improve access to information using the current systems. The implementation strategy is based upon process owners, system owners, and end user initiatives for projects that follow the architectural principles and the natural relationships between activities of a process and the interrelationships between and among processes.

"... these new system implementation projects must be balanced with projects to improve access to information using the current systems."

---

NACUBO/CAUSE Workshop

Financial Information Systems: Critical Success Factors

Program Highlights:

Importance of creating an information architecture and an information technology strategy • Why so many institutions are considering new financial information systems • The importance of an institution-wide perspective, plus institution-wide buy in • Developing an RFP for vendors and potential partners • Emphasis on critical success factors (as well as pitfalls) at various stages in the process.

Faculty:

Kenneth Blythe, Director, Office of Administrative Systems, Pennsylvania State University
David Bosserman, Associate Vice President, Controller, Secretary, Treasurer, Oklahoma State University
Janet Gordon, Executive Director of the Office of the Executive Vice President, University of Pennsylvania
Richard Katz, Director of Business Planning and Practices, University of California System
Margaret Plympton, Director of Administrative Services and Planning, Yale University
Edwin Rennie, Director of Information Systems and Services, Sinclair Community College
Barry Walsh, Associate Director of Financial Management Support, Indiana University

Who should attend?

VPs for Business and Finance Controllers
Presidents/Chancellors
Chief Information Technology/Systems Officers
Chief Budget Managers
Internal Auditors
Academic Provosts

NACUBO/CAUSE Workshop

Member Fees: $495 first registrant
$445 additional registrants

February 5-6, 1996
The Ritz-Carlton, Houston, Texas

For more information, contact NACUBO
202-861-2520  kwlassiter@nacubo.nche.edu
Lessons from a Successful Data Warehouse Implementation

by John D. Porter and John J. Rome

A data warehouse is often the first client/server application an organization attempts. This was the case at Arizona State University (ASU), where such a project brought together student, financial, and human resources data in an integrated data warehouse. This article discusses the project’s history and architecture, issues faced, and lessons learned after three years of work.

To remain competitive in today’s business climate, an organization needs a foundation of quality data. Organizations of higher education need this capability as much as Fortune 500 companies. To ensure quality data for tactical and strategic decision-making, many colleges and universities are creating a “data warehouse.”¹ A data warehouse is a separate store of data extracted from one or more production databases to produce an authoritative source for decision support. Some critics believe data warehousing contributes to an organization’s information problem by adding yet another source of data. However, the success that organizations are experiencing with data warehousing proves it is a solid business strategy for the 1990s.

Building a data warehouse is extremely complex and takes commitment from both the information technology department and the business analysts of the organization. It takes planning, hard work, dedication, and time to create a relational database that delivers the right data to the right user. Arizona State University’s data warehouse is not a panacea for every data problem, but it is a very good start toward a permanent solution.

Data Warehousing—Popular, But Not New

Data warehousing is not new. In fact, it is reminiscent of an old mainframe concept from the mid-1970s: take data out of production databases, clean them up a bit, and load them into an end-user database. International Business Machines Corporation (IBM) first coined the phrase “information warehouse” in 1991. IBM’s original concept was met with skepticism because accessing non-relational data stores (such as IDMS®, IMS® or VSAM®) was too complex and degraded operational system performance. Based on these

experiences, experts now agree that a warehouse needs to be a separate data store built with a relational database management system (RDBMS). Names such as “information factory” or “data refinery” surfaced initially, but “data warehouse” is now the generally accepted terminology.

**Warehouse definition**

The most widely recognized definition of a data warehouse is, “a subject-oriented, integrated, time variant, non-volatile collection of data in support of management’s decision-making process.” Subject-oriented means the data warehouse focuses on the high-level entities of the business, such as students, courses, accounts, and employees. This is in contrast to operational systems, which deal with processes such as student registration or payment of an invoice. Integrated means the data are stored in consistent formats (e.g., consistent naming conventions, domain constraints, physical attributes, and measurements). ASU’s operational systems have four unique coding schemes for ethnicity. In the data warehouse, there is only one coding scheme. Time variant means the data are associated with a point in time (e.g., semester, fiscal year, and pay period). Finally, non-volatile means the data do not change once they are entered into the warehouse.

**Use increasing**

In higher education, glimpses of data warehousing exist in the file extracts that institutional research departments receive or the user reporting databases that the information technology department creates. Consequently, data warehousing is really an old concept with a new name and better technology. The data warehouse is likely to become the cornerstone of client/server activity in the immediate future. So popular is the notion that a recent META Group report indicates 90 percent of their clients are undertaking warehouse initiatives, up from less than 10 percent just a year ago. Judging from the number of inquiries about ASU’s data warehouse, similar trends are occurring in many higher education organizations. In the business market, analysts estimate the industry will grow to $2.1 billion by 1998. Some of the major players vying for this money include IBM, Hewlett-Packard Company, Oracle Corporation, AT&T GIS, Sybase, Inc., and SAS Institute, Inc., as well as vendors already established in this market such as Prism Solutions, Inc. and Red Brick Systems.

**ASU’s Warehouse Development**

Development of ASU’s data warehouse started in the summer of 1992 as a client/server “proof of concept” project. Negotiations with RDBMS and UNIX workstation vendors resulted in a one-year lease of a server for the cost of the annual maintenance contract. While getting the warehouse server in place, over twenty companies agreed to provide complimentary copies of their data access software for evaluation. Although many of the access tools were in their adolescence at the time, accessing data was much easier with these graphical user interface (GUI) tools than with the fourth-generation tools then in use.

ASU formed a development team of twelve individuals from the data administration and information technology departments to build the data warehouse. The team selected a representative group of business analysts to serve as pilot users to test the warehouse and access software. During the next few months, the team built a “student” warehouse model based on over 200 questions, which the pilot users considered difficult or critical to answer using current information resources. During 1993, many of the original data warehouse team members shifted back to their regular duties, leaving a core of about five full-time equivalent employees working on the project. That core has remained intact, receiving additional help from ASU’s institutional research office and many of the business analysts who are regular users of the warehouse. Also, the data administration department initiated a formal program to train users on the warehouse. To date, there are over 400 trained warehouse users, with two to three classes being taught each month.

---

2 Ibid.
The goal is to train 1,000 employees, approximately 20 percent of ASU’s full-time work force.

**Warehouse architecture**

ASU’s data warehouse resides in a client/server environment. As seen in Figure 1, ASU extracts data from the mainframe and loads it into a UNIX server running an RDBMS. ASU’s warehouse server is a Sun® Sparc 630™ with 512 megabytes of memory and two processors, running the Sun Solaris 2.3™ operating system. The RDBMS is Sybase SQLServer release 10.x. Users connect through Ethernet to the warehouse over ASU’s network backbone via Transmission Control Protocol/Internet Protocol (TCP/IP). The suggested GUI data access tool is BrioQuery™ from Brio Technology, Inc., which runs identically in both the Macintosh and Windows environments. Microsoft Access® is another tool used.

The process of using GUI tools to build structured query language (SQL) requests and bring the results back to a client machine is much different from the 3270 protocols in a mainframe environment. With client/server architecture, once the data are in the workstation, users “own” the data, cutting and pasting at will into their favorite software (e.g., spreadsheet, word processor, graphic tools).

**Modeling and design**

As business requirements and database technologies become more sophisticated, the need for data modeling and design increases. ASU uses an “upper” computer-aided software engineering (CASE) tool to design the warehouse. However, the entity/relationship (E/R) diagramming function and the object repository are the only features of the CASE tool used. The E/R diagramming tool creates a graphical representation of the data in the data warehouse and automates the creation of data definition language (DDL), the technical language used to create the warehouse’s tables, views, and indexes. The object repository ensures consistent definitions and characteristics of fields in the data warehouse. While an upper CASE tool is not imperative in building a data warehouse, it does help automate the development process and the E/R diagrams produce “road maps” to the data.

Designing a data warehouse is different from designing an operational system (see warehouse design, Figure 2). The warehouse wants data with a high value for decision-making, whereas the data content of an operational system is more requirements driven. ASU’s data warehouse contains four primary databases: student, finance, human resource, and course. These databases are updated weekly, biweekly, monthly, and yearly, depending on the data. They also contain “official” data, which are captured on the census date and never changed. Over time, this results in an official and end-of-period look to the historical data in the warehouse. For example, by the end of the semester, the student database provides users official and end-of-semester enrollment data. ASU found that some data in the warehouse need more frequent updating. These data are the valid occurrences of data contained in the code tables and the names and addresses of ASU’s customers. These records are updated daily.

There are four basic types of tables in ASU’s data warehouse: data tables, lookup tables, virtual tables, and summarized tables. Data tables contain raw data, extracted at the unit record level from the operational system. Lookup tables are code tables, defining the cryptic coding schemes that exist in the operational data. Lookup tables save space, improve flexibility, and allow the description of a code value to change while retaining its meaning. Virtual tables are views into the warehouse data. Views simplify the user’s perception of a data warehouse, presenting data in a different way or restricting access to certain data (e.g., class roster appears as a single table, but the data reside physically on multiple tables). Last, summarized...
nodes contain summarized data. These tables improve response time to frequently queried data and will become the foundation for ASU’s online analytical processing systems (OLAP) and executive information systems (EIS).

Database design is a creative process. In fact, given the same set of requirements, two designers usually produce different but acceptable solutions. Often, in database design, it is easier to just do it than to explain exactly what you did. ASU’s warehouse team follows the design guidelines listed in the sidebar below.

ASU’s Ongoing Warehouse Data Issues

ASU addressed a number of data issues in the process of building its data warehouse over the past three years, including determining what data to collect, how often to update the data, how to achieve “officialness,” and how to resolve data security and privacy issues. ASU’s experience is that with a data warehouse, these issues are never completely resolved.

What data to collect

A data warehouse must deliver the right data to the right people. However, the data warehouse cannot deliver all the data people want. People are always asking new questions, so predicting what data they need is difficult. ASU started by asking users what data they wanted or what reports they used. Another good starting point is to look at the data going to the institutional research department. ASU’s experience is that once the data warehouse is implemented, users quickly let the development team know what data they want.

Update frequency

A data warehouse must deliver the right data at the right time, but what is the right time? The answer is, “it depends.” In ASU’s data warehouse, data are entered yearly, by census date, monthly, bi-weekly, weekly, and daily. By rule, the more often a table is updated, the more operational the nature of the data. For example, ASU’s data warehouse updates daily the addresses of students. Many warehouse users create labels for student mailings and need current address information. Updates to code tables occur daily, too. However, ASU tries to limit the number of data elements updated daily, since there is a cost associated with loading the warehouse. In the future, daily updates to ASU’s data warehouse will “replicate” data in operational systems. Replication is an economical industry solution of copying data and making them available to users on a server.

Official vs. current

Making official numbers available in a data warehouse brings consistency and credibility. ASU adds official “numbers” to the warehouse to limit how much users need to understand the impact of timing on the data. To achieve “officialness,” an organization selects census or “cut-off” dates for measuring data. With census dates, there is a distinct period of measurement, making historical trends much easier and allowing integration across systems. For some requests, official numbers are better to use (e.g., historical trends), while at other times (e.g., for financial decisions) the most current data are best. At ASU, both numbers are available from the data warehouse. However, to simplify user queries, official and current values appear in separate databases.

Delivering “officialness” in the data warehouse is not as easy as it sounds. The programs that extract and transform the data from the legacy databases must produce numbers that

ASU’s Warehouse Design Guidelines

- Identify major subjects or topics as tables in the warehouse
- Add an element of time to the tables—semester, fiscal year, etc.
- Appropriately name fields in the tables or views
- Add derived fields when necessary—calculated age, GPA, etc.
- Duplicate data to decrease the number of tables that must be joined
- Exclude extraneous fields found in operational files—“flags,” etc.
- Create logical tables or views for ease of use—class roster, etc.
- Consider security and privacy during design
- Make sure the data model answers the critical business questions
balance with the official numbers released by ASU. Since different algorithms and extract programs exist, there are often differences between the warehouse and official University reports. The problem multiplies because of ten years of data in the warehouse. Creating and validating ten years of official data was difficult. ASU found that going forward in time when building the data warehouse was easier than reconstructing and validating history.

**Security and privacy**

Security and safeguarding privacy are major concerns when building a data warehouse. Security in a database means protecting data against unauthorized disclosure, alteration, or destruction. Granting select (authorization to read only) access to tables or views achieves a certain level of security in a warehouse. At ASU, read-only access to the data warehouse is at the database level. This procedure follows an open access policy for employees approved by ASU's administration in 1993. This policy is based on the notion that giving employees access to data and holding them accountable is better for the organization than withholding the data.

Although many RDBMSs support column-level security, ASU has not implemented this feature, primarily due to the high cost of administering user access. In traditional operating systems, tasks or screens control access, meaning users only have access to a single record or instance of data (e.g., verifying admission status of a student). In a data warehouse, users have access to a table or set of tables in a subject area, which means access goes beyond retrieving single records to retrieving groups of records.

At ASU, the registrar's office is the trustee of the student database, the human resources director is trustee of the human resources database, and so forth. In these databases, read-only access excludes access to name and address. To obtain name and address information, the data trustee grants access to the person database. The user's business need determines whether access is granted. Given the large number of records in ASU's data warehouse, placing name and address in a separate database achieves a certain level of privacy. Additionally, training classes emphasize the Family Educational Rights and Privacy Act (FERPA), and users must sign a document stating they will follow these policies. In addition, users receive training on the appropriate and fair use of information.

**ASU's Lessons Learned**

ASU's data warehouse development improved access to and the integrity of administrative data, increased organizational awareness of data administration, and improved the quality of decision-making. However, "like a good marriage, a data warehouse is not created instantly; it develops only over time, with thoughtful goal setting to build a strong foundation. And like a nasty divorce, a bad warehouse can extract a lot of money, time, and energy from the parties involved." ASU has high hopes for its marriage. But as with any computing project, ASU learned many lessons along the development path and hopes other organizations will learn from its experience.

**Develop an enterprise strategy**

A successful data warehouse requires an enterprise strategy; otherwise the data warehouse may fail. The first step in establishing this strategy is adopting policies promoting sound data management. A data warehouse is easier to build and more useful to the organization when strong data management practices are in place. Before opening the data warehouse, ASU adopted an enterprise data access policy, determining who received access and what type of access a user received.

Policies making the data administration department responsible for data integrity and integration of the data warehouse and enterprise operational systems also were implemented. ASU found these policies essential to navigate the warehouse project around everyone's data "turf." Also, good enterprise thinking must penetrate development culture. Users, business analysts, and the information technology, institutional research, and data administration departments must work together. At ASU, strong collaborative working relationships exist among all these areas. This culture contributed significantly to the success of ASU's warehouse implementation.

---

Identify a project champion

All computing projects need a champion. ASU’s data warehouse champion is the data administration department. Data administration follows the evolution of the data warehouse according to Bill Inmon. Inmon says the data administrator's role has changed dramatically from managing the data dictionary to designing and constructing the data warehouse. ASU’s data warehouse put the office of data administration on the map and brings a new awareness of enterprise data to the organization. Users do not believe how bad their data are until they see them. For example, one college uses the data warehouse to verify professional program information and correct mistakes on ASU's operational systems. However, a data warehouse is a double-edged sword for the data administration department. Once users access the warehouse, a “never-ending” list of enhancements quickly appears. At this point, organizations will need to commit additional resources for warehouse development and support, or other data administration functions suffer.

Avoid cost justification

If possible, avoid the traditional cost/benefit analysis in justifying a data warehouse project. Since a data warehouse benefits the entire organization, ascertaining the full benefits is difficult, if not impossible. Fortunately, at ASU, a limited demonstration of the warehouse concept was enough to sell the project. If a more complete cost/benefit analysis were required, the project might never have started. In other words, don’t spend too much time justifying the benefits of a warehouse; just start building one!

A data warehouse may be inevitable for most organizations, since there is little chance that a technical breakthrough will make access to legacy data easier or cheaper. The Gartner Group says, “Organizations employing a data warehouse architecture will reduce user-driven access to operational data stores by 75 percent, enhance overall data availability, increase effectiveness and timeliness of business decisions, and decrease resources required by IS to build and maintain reports.” But how can all these benefits be quantified?

Be ready for technology shortfalls

Client/server technology is less reliable, secure, and timely than its mainframe predecessor. Data access tools are just beginning to mature. Networks add new layers of complexity, and monitoring performance and tuning of servers is imperfect. The results are gaps in available technology and software, leaving users frustrated and their needs unmet. One such example is matching a cohort on a desktop machine with the data warehouse. Most query and retrieval tools do not support this type of function (joining a local table with server table). If the tool allows this function, joining data is slow, making the match process prohibitive for large databases. Allowing users to create tables containing the ID’s of records being tracked on the server solves this problem. However, this solution defeats the benefits of client/server technology, moving emphasis back to the host machine. ASU’s experience is that when problems occur with client/server technology, no one, including the vendor, knows how to solve the problem in a timely manner.

Make users aware of costs up front

The information technology department and technology infusion funding traditionally absorbed much of the cost of new technology at ASU. With the data warehouse and client/server computing, the cost of upgrading hardware and buying software for enterprise systems has shifted to the individual or department. Employees seeking access to the warehouse need to know the cost of connecting. At ASU, a “connection checklist” is available, detailing all the steps necessary for access. The checklist includes information on these items: how to obtain a data warehouse account and receive access, what PC or Mac and printer to buy, how to connect to the network, what software to buy, and how to register for training. ASU finds this checklist very helpful.

Find ways to capture metadata

One of the more difficult tasks is providing users and application developers a good data dictionary and source for metadata. Metadata are
data about the data, including format, encoding/decoding algorithms, domain constraints, and definitions of the data. There are thousands of data elements, and capturing metadata is an endless task. Although this process is time consuming, the dividends are significant. ASU learned developers are more concerned about metadata, while users want data definitions. The problem is exacerbated by the fact that good metadata and data dictionary tools do not exist in client/server technology. ASU found no good tools to help solve the metadata problem. This is a problem that needs to be solved by the client/server industry.

Build integrity and integration capabilities

Integrity and integration are important characteristics of a data warehouse, and the characteristic lacking in most operational systems. These features give the data warehouse credibility, consistency, and real power. When designing these capabilities into ASU’s data warehouse, the development team recognized that the integrity of the data varied. In some cases, the development team “scrubbed” the data; in other cases, it was simply too difficult. ASU’s experience is that making the data available through the warehouse improves data accuracy in all systems. Knowing the data are observable in the warehouse is an incentive for those inputting data into the operational systems to be accurate.

The data warehouse also requires data that integrate. These are the data that span the high-level subject areas of the warehouse. At ASU, these high-level subject areas are students, financial information, human resources, and courses. Examples of data that integrate or crosswalk the high-level subjects are fiscal year, semester or term, department, course, a person’s unique ID, and account number. Data elements that integrate are the very fabric of an operational system. If these elements differ in format, domain, or values between systems, integrating the data in the warehouse is difficult or impossible. When data successfully span high-level subject areas, building a data warehouse is easier and less expensive. ASU’s experience is that most integration problems need to be solved in the organization’s operating systems before attempting to integrate data on the warehouse.

Let the data warehouse fill operational gaps

Many users tend to look at the data warehouse as another administrative system. This phenomenon happens since the data warehouse is in relational format. While the warehouse can address some of the data shortfalls that operational users experience (“data gaps”), this is not the warehouse’s primary role. To help our users understand the difference between the data warehouse and their administrative system, we developed a slide that compares a data warehouse to an administrative operational system on a variety of dimensions (see sidebar above). Every talk or presentation on the data warehouse includes this slide underscoring the differences between the two. ASU reiterates these differences frequently to discourage users from making unreasonable requests of the warehouse. However, the truth is that ASU’s data warehouse plays a powerful role in bringing inexpensive, temporary solutions to some operational computing shortfalls.

Invest in training

Training data warehouse users is critical and pays good dividends. In most computing projects, management recognizes the need for training, but does not always fund training. This is true of ASU’s data warehouse. With every new database there is a need for another training course, complete with reference materials. Every enhancement or change to the warehouse must be documented and communicated to warehouse users. At ASU, the data administration department assumed responsibility for training
and documentation of the data warehouse. While training users is essential, it distracts from future warehouse development unless new resources are allocated.

Initial training at ASU focuses on the tool, the logic, and the data. While a data warehouse supports many different access tools, training with one tool reduces a trainee’s learning curve. After an extensive review of data access tools, ASU chose a tool that works in both the Macintosh and Windows environment. Logic training is important also (e.g., SQL operators, Cartesian join, etc.). While this functionality is inherent in most access tools, training on query logic avoids many questions down the road. Finally, ASU’s training concentrates on the data, which is usually what users understand the least. ASU spends up to 60 percent of class time training on data, and hopes to increase this percentage as users become more familiar with access tools and query logic.

Make sure a support structure is in place

While training reduces the number of data warehouse questions, a support infrastructure is key to handling other support needs.

At ASU, there is an e-mail address where users can send their questions or problems. Experts on warehouse data, networking, and data access tools receive these messages and respond within 24 hours. ASU logs responses in a searchable database for users to reference in the future. Also, users can telephone a central help line that will send an e-mail message for them.

Second, there is a file transfer protocol (FTP) site available for warehouse users. This site stores PostScript copies of all documents associated with the data warehouse and copies of the data models. This is also a site for sharing common queries built by users or the warehouse team.

Last, there is a Warehouse Users Group. The WUG meets monthly to share findings, educate members about the data warehouse, and provide feedback to the warehouse team. Currently, over seventy-five people attend the monthly meeting. The WUG also gives warehouse users an opportunity to find a “warehouse buddy,” so they don’t feel alone in ASU’s world of data.

Conclusion

After three years of experience, the future of ASU’s data warehouse is becoming more clear. Initially, the warehouse served as a resource for accessing information from legacy systems. Eventually, the warehouse will serve as a telescope into ASU’s distributed data stores. Some of these data will reside in the data warehouse, while other elements will be “viewed” from the RDBMSs where the data reside. ASU foresees a time when the telescope extends beyond ASU to other organizations with common goals, such as the neighboring Maricopa County Community College District. The real power of the warehouse will be actualized in years to come.

The data warehouse fills an important data administration role in a client/server environment. As distributed application developers move further away from the central computing core, the data elements in the warehouse ensure the integrity of the organization’s enterprise data. The definitions and coding standards in the warehouse are what distributed developers follow. The warehouse is the “glue” holding enterprise data stores together until a mature repository comes along.

The most important contribution of ASU’s data warehouse is the new focus on data integration. While attempting to achieve integration in the warehouse, ASU conceived a new data model which integrates not only the warehouse, but also the administrative systems. By integrating the warehouse, ASU obtains more powerful data. By integrating the operational systems, ASU gains strategic new levels of customer service.

The bottom line is that data warehousing is here to stay. Warehousing gives organizations the opportunity to “get their feet wet” in client/server technology, distributed solutions, and RDBMS. This is essential for any future mission-critical application, making the data warehouse a low-risk, high-return investment. The question is not simply whether to build a warehouse, but when.
Building Virtual— and Spatial— Libraries for Distance Learning

by Richard J. Bazillion and Connie L. Braun

Colleges and universities that once concentrated on campus-based teaching are now seeking wider markets for their services. Distance learning is becoming a growth sector in higher education, one in which course distribution poses one set of issues and academic support services quite another. New library buildings can be designed to bring information technology to off-campus students in ways that enhance their educational experience.

So important is the issue of distance education that new library buildings should be planned with its needs in mind. Since planning for library space rarely occurs at “extended campus locations,” librarians “must determine what services and collections are needed and find affordable alternative methods for delivering them.” The goal is to create a building capable of serving as a teaching instrument, one that is accessible to students, both on- and off-campus, “unencumbered by the familiar constraints of time and place.”

A key principle of modern library design is to emphasize information technology: build around the technology, don’t just add it on. Make the investment in technology the first claim against the project budget so that everyone realizes that the new library has a teaching mission to fulfill. No longer simply storehouses for printed materials, academic libraries can become active participants in the institution’s teaching activities. Assisting distance learners is one aspect of that evolving mandate. Only within the last decade, spurred on by the advancing digital revolution, has this new purpose come into focus.

Virtual libraries won’t eliminate buildings

Before discussing the design implications of new technologies that libraries may use in support of distance education, a defense of new buildings themselves may be in order. Librarians have lived to regret the catchword “virtual library,” which some university administrators construe as “no need to invest in a new building.” It matters not that the old facility may be a relic of the earlier days, added to haphazardly, burdened with antiquated technologies, and essentially renovation-proof. Whenever new construction is proposed, the same questions arise. If print is about to be vanquished by digitized data flows, why are library buildings needed? Aren’t their paper contents going to disintegrate in a few years? Just wire up faculty offices and dormitories, give everyone access to the Internet, and the space problem is solved. The vision is an enticing one, but false. Libraries as institutions—ascendant places on campus—have a lot of life in them still. Information technology strengthens the library’s position rather than weakens it. There are two reasons why this is so.

First, prophecies that paper-based collections will disappear are wrong. Books will survive, even if journals migrate to electronic media. No one, least of all the authors of hypertext documents, has discovered a better, more convenient means of presenting a narrative or a linear argument. Thus books will continue to be published and libraries will go on collecting them. Collections of journals and government publications may demand less space in the future, as their contents are digitized. But the space saved in this manner will have to be devoted to other activities, mainly of a teaching and service nature. Instruction will be offered in the libraries by librarians who know how to use a variety of electronic research tools, notably the Internet.

Second, those who believe that the virtual library represents function without a solid form neglect the library’s role as a teaching institution. As information technology pervades college and university campuses, the need for non-classroom learning opportunities grows. Internet navigation and the creation of electronic documents are skills best learned with expert guidance; libraries that offer Netscape courses attract a steady clientele. Librarians familiar with the Internet since its inception are the professionals best qualified to teach electronic research skills, either of a general nature or in the context of specific disci-
plines. These skills are indispensable to college and university students and faculty, and especially to those who study at a distance. Without them, there is little hope of prospering in the modern academic world or in the so-called “information society” now struggling toward maturity. Library buildings planned during the final decade of this millennium must be able to perform a teaching function if they are to be useful for many years into the next.

What are the space needs in new library buildings?

Two kinds of space belong in new library buildings: (1) a large classroom equipped for the teaching of electronic research skills, in addition to Internet navigation; and (2) an information “arcade” or “commons,” similar to those found at the universities of Iowa and Southern California, where students may create new documents from electronic sources.

In the “commons” area there should be at least two dozen multimedia stations capable of accessing a variety of electronic sources on CD-ROM, optical disk, laser disk, or the Internet. This equipment should be selected as late in the building process as possible so as to ensure that everything is state of the art. Space devoted to the commons is between 3,000 and 5,000 square feet, depending on the size of the institution. The total area should include staff offices, a workroom, a service desk, and a large classroom.

A suitably equipped classroom might comprise between 1,200 and 1,600 square feet, with room for twenty-four to thirty student stations. Equipment selected depends on technical specifications current at time of purchase, but each station should offer a networked PC and the classroom should provide an instructor’s station with a Power PC-level machine to which is attached a laser disk player, a VCR, a removable storage drive, and a read/write optical storage drive. Other essential equipment in the classroom includes a projection system and an LCD data-display pad with overhead projector. Interactive TV (ITV) capability is indispensable.

ITV has applications for teaching and delivering information resources

Faculty and librarians can use interactive TV to teach electronic research skills simultaneously to classes at several remote sites. Instruction benefits from “the immediacy of video interaction, and from the power of computer simulation.” ITV is a technology that is also finding applications outside classroom teaching or conferencing. “The distribution of multimedia through interactive TV,” according to one consultant, “will supersede multimedia CD-ROM products, which are the latest technology in many libraries.” Information services may be delivered directly to the home, once ITV becomes universally accessible. In the meantime, regional consortia representing every level of education can play a leading role.

States may provide grant support to create ITV nodes in local schools. Colleges and universities then may offer degree programs or individual courses in late afternoons or evening hours for the convenience of adult learners. Broadband communications open the door to quality distance education in which student access to research materials supports each ITV course. Librarians also can develop electronic research skills more effectively by exploiting the flexible audio/video capabilities of ITV.

Visual demonstrations are superior to verbal or written explanations alone; to put it another way, “having a friend teach you to ride a bike is more effective than is watching a videotape on the topic.” A video link between a librarian, who is able to “show” the off-campus students how to use a print-based resource or how to search the online catalog or the Internet, is possible by means of ITV. If this technology is available, students receive good reference service and, at the same time, learn electronic research skills.

Everything depends on students having easy access to proper equipment at their end, either at home or in an ITV classroom at the remote location. A commitment to providing top-notch equipment will pay dividends, both in the quality of students enrolling in distance education programs and in the quality of the education they receive.

Libraries actively support distance learners

Distance education enjoys a potentially limitless market. The library’s role will be to evaluate and broker information sources offered by private vendors and, especially, to educate researchers in their use. That is why new library buildings must provide ITV links through which to offer both products and teaching programs. The two are bound together by the users’ constant need to convert “information” into knowledge—an intellectual exercise that involves researcher and librarian together in the process of sifting and selection. Just as one would not buy an expensive or complicated appliance without advice, it would be a mistake to ignore a skilled navigator when searching the ether for electronic sources.

Although such technologies as satellite broadcast (used, for example, by the National Technological University), interactive television, and two-way audio/video conferencing enable
instructors to reach widely-dispersed student audiences, library-resource support to distance learners is often spotty. Either students find it difficult to locate information sources remotely or else they lack reliable means of obtaining the materials they need. Reference assistance from a professional librarian also may be hard to come by. Efficient document delivery often is frustrated by financial constraints that prevent timely receipt of library materials.

Such obstacles tend to deter faculty from assigning substantial research papers. As a result, distance education students may find their experience less satisfying than do their on-campus counterparts, even though they expect the same quality of teaching and library support. Technology, where it is available and utilized, is improving contact between student and professor. Multimedia communications "will transform networks of desktop machines into distributed workplaces ideally suited to collaborative projects," thus drawing distance learners into the campus mainstream. Even then, much work will remain to be done in developing the electronic research skills of all students.

Distance learning, then, imposes certain demands on library service, especially in two main areas: (1) user training, and (2) reference assistance. Although new teaching technologies, such as ITV, can enhance the learning experience, course-related research assignments often pose a serious challenge. Students who must rely on a faraway library to meet their information needs require encouragement and assistance. These students generally are older and bring considerable life experience to their studies, and a commitment to specific academic goals often motivates them to learn. On the other hand, they may have limited knowledge of computers and of libraries. Their cognitive processing styles, shaped by on-the-job experience, demand instructional strategies that are unique and interesting. Curiosity and persistence are mental attributes of successful distance learners, whose receptivity helps them to make effective use of information technology.

**Intermediated services need to be supported—especially for distance learners**

Users need the ability to contact a professional librarian for advice in locating research materials. Having compiled a bibliography, they then must obtain the items themselves. This may be difficult unless there is an efficient overnight interlibrary courier service, like the one in Minnesota and the Dakotas operated by MINITEX.

From the standpoint of library design, however, the goal is to simplify contact between librarian and distance learner. This can be done by providing e-mail and computer-conferencing links to the library's information/reference desk. Situated near the main entrance for the convenience of local patrons, this desk also will serve as a communications center for distance learners in search of assistance. Electronic reference service will provide off-campus patrons with the means to confirm a citation, obtain a historical fact, or locate biographical data on a person currently in the news. While quick-reference inquiries are easily handled by e-mail, reference interviews are best conducted by telephone or video conference. The library's reference desk, therefore, will need to be equipped with video-conferencing units, a flatbed scanner, and an ITV camera, in order to transmit images of printed materials such as maps and photographs.

A remote link to the library's catalogs and databases, and other electronic information sources, is essential, but not sufficient. Librarians can reduce the frustration that even dedicated students suffer by guiding them via e-mail messages to essential information sources in their various fields. Many professional journals now feature articles on Internet resources in almost every academic discipline. A compilation of such guides, made available online, will go a long way toward assisting both on- and off-campus library users in locating relevant information.

"For the most part," according to Lange and Farr, "direct electronic access is a replacement for physical access that is not available to the off-campus student. It is the means by which students can learn library and literacy skills at a distance and obtain the needed resources to enhance their educational experience." Reasonable electronic access demands that up-to-date computer and communications technology be available in the off-campus locations. Research in fiber optics is contributing to a convergence of telephone, television, photocopy, printer, and computer. Electronically available information, therefore, is improving in quality and accessibility. A minimal communications equipment array includes 19,200 baud (or higher speed) modems connected to T1 or T3 data lines, communications software, Internet navigation software such as Mosaic or Netscape, a robust laser printer, and a computer-mounted video camera. Desktop video-conferencing adds a new dimension to reference service at a distance.

**Outreach, accessibility, and openness are key**

If properly introduced, electronic communication systems will allow libraries to reach a much wider clientele and thus more effectively

---


"From the standpoint of library design, ... the goal is to simplify contact between librarian and distance learner."
support distance education offered by the home campus. As “the boundaries of place and distance become less important,” libraries will have to make themselves more accessible to a scattered community of learners with their own time constraints. That is why new buildings have to be designed as teaching instruments through which librarians can reach off-campus students wherever they are, whenever library services are needed. If new buildings are created with the needs of distance education in mind, they will better serve all of the institution’s students, not just the group that lives close to the campus.

A library’s electronic infrastructure opens it to a dialog with its users, in which librarians are guides and intermediaries rather than guardians of paper collections. Academic libraries today play a dual role: as custodians of locally-owned materials and as gateways to an unlimited universe of information waiting to be converted into knowledge. Library design should strive to create a seamless connection between the building itself and its link to the outside world, the Internet. Library architecture itself can reflect the commitment to outreach embodied in distance education. Greater use of windows, for example, softens the building’s exterior and makes it seem less fortress-like. Modern glass technology features “low-e” coatings (low “emissivity” or radiation) that significantly reduce heat loss, as do the thermal-insulation qualities of the window units themselves. Ultraviolet filtering shields library materials from the damaging effects of natural daylight. As long as collections do not receive direct sunlight, they are in little danger. Generous fenestration contributes to a more congenial working environment within the building. Windows also proclaim an openness and accessibility missing in libraries designed to serve primarily as warehouses.

The library’s day as a passive repository for paper-based collections ended when electronic research tools became indispensable. Architecturally, the library building of the future should reflect the new reality: libraries are active participants in the teaching missions of their universities.
Library and IT Collaboration Projects: Nine Challenges

by Marilyn J. Sharrow

The University of California Davis has for some time sponsored a number of collaborative efforts between the General Libraries and the Information Technology Office. These have included a jointly maintained demonstration site for new hardware and software; work on image protocol standardization, the campus Gopher, and CWIS; and regular coordinated teaching and publication projects.

Although the history of such cooperation at UC Davis has been remarkable for its successes rather than its failures, our collaborations have not been without a number of specific challenges that we think may be common to most library/IT collaborations. Being alert to these potential challenges can better position a campus to reap the many benefits that come with the move from fragmentation to collaboration in the management and use of information resources.

Based on our experiences, we have identified nine primary challenges to library/IT collaboration.

Priority setting. The first challenge facing collaborative efforts of any nature is the need to agree on priorities, for both joint and independent development. Information technologists and librarians alike agree that we are witnessing a revolution as we become an increasingly electronically oriented society. While more paper-copy books and journals are being published now than ever before, at the same time more information—including images—is becoming available in computerized databases and full-text electronic books and journals. The need to provide access in parallel to both types of information resources is pressing. Also pressing, then, is the need to set—and reset—priorities. In the best of collaborative efforts, each group brings to the committee table a list of priorities. These priorities are negotiated and agreed upon by the team, funding sources are earmarked, and plans for implementation are designed. Within this framework of priority setting, the ability to remain flexible, to change plans rapidly and effectively, is essential.

Funding. The second challenge, funding, creates some tension by its very nature. There are already too few dollars to be divided among too many groups for too many worthwhile projects. It is important that the library and IT units avoid making claims that one group’s work is more valuable than the other’s. It is my contention that the IT/library team prospers as a team—that it does better when the units work together than when the units work separately. Both partners on this team share a common goal: to network and deliver information for the whole campus. Both partners can advance this goal by calling upon collaboration as an effective tool for grantsmanship, oversight of general funds, and application for fleeting opportunity money.

Staffing. The capabilities and expertise of the library and IT units are different; therefore, the potential for conflict is increased. The library is mandated to select content and work directly with the users. IT is responsible for delivering that content on the information highway. Although staff may at times seem to be focused in different directions, collaboration affords both organizations the opportunity to learn and appreciate true differences in approach, while reinforcing many complementary interests and goals.

Areas of responsibility, or turf. Similarly problematic is the issue of turf, although individual campus hierarchies vary widely, and conflicts between areas of responsibility can vary accordingly. At UC Davis the university librarian and the associate vice chancellor for IT exist in a peer environment. We both report to the executive vice chancellor and provost, and common committees bring us together often and effectively. In our case, the campus structure itself promotes equality in collaborative efforts, but this is not always so. The placement of library and IT administrators within the college or university hierarchy can often be a potential source of power conflict. Collaboration in such an environment requires extra care and attention.

Awareness of effort. Critical to the effectiveness of any collaborative program is the recognition of effort of activity. We know how easy it is to pursue our own projects without first considering their impact on other campus units. To minimize this risk, the library/IT team must pay attention to communication: it must focus on both the...
communication process and the structure of that process. At UC Davis we meet frequently, on many levels, thereby managing to keep abreast of each other’s projects and activities. Nevertheless, we still feel the need to design more secure ways by which we can keep both partners informed as to how each is proceeding on various automated projects—this without killing the entrepreneurial and spontaneous efforts of our talented staffs!

Levels of authority. Another significant challenge to collaborative projects is posed by the problem of authority. Simply stated, someone must be in charge. Everything our teams do ultimately ends up in a committee or task force format, creating the risk that the final responsibility will slide. We have learned that we need to determine, and make clear, responsibility. To the extent possible, the opportunity to take undue credit or cast blame must be eliminated. During these early days of the electronic revolution, many of our projects are simply tests or experiments. At UC Davis we have accordingly agreed that we are still in the learning stage, and that the value of a project extends beyond a simple win or loss on the technology scoreboard.

Communication. It should by now be apparent, from my examples, that constant, constructive communication is key to any successful collaboration. This communication must occur in many forms and at many levels. In this respect, effective communication becomes a tool in responding to the other challenges that face collaborative projects.

Personalities, trust, and respect. Unfortunately, it only takes one or two bad experiences to create an environment of distrust. At UC Davis, librarians and information technologists are peers—friends, colleagues, and true partners. We recognize the bottom line, that any collaborative relationship will be only as good as the people who are involved in it, and we feel fortunate to have the opportunity to work with such talented and dedicated individuals.

Campus politics and climate. Finally, and usually beyond the control of an individual unit, the campus environment itself can sometimes dictate outcomes of a collaborative project—unless the individual units are sensitive to that climate. Historical precedent, prejudices about computer hardware and software companies, funding models, reliance on certain protocols—all can hamper effective cooperation. It is a fact of life for all support units that work must proceed among the campus mine fields! Awareness of the political climate of the college or university can do much to protect team members from unnecessary setbacks.

Both library and IT professionals have significant roles to play in the administration and delivery of higher education. As an important part of the education and training process, librarians are logical teachers and mediators of the electronic information transformation. As specialists who know how to acquire information and how to provide it on the network, information technologists are excellent gatekeepers and facilitators. Each group needs to acknowledge the expertise of the other. This is critical in building overall trust, by the entire academic community, in our new electronic world.

The motivation for creating all of this electronic access is the fact that without it one cannot be an active player within, or beyond, the campus of today. Without the appropriate functionality, researchers cannot acquire information available on automated databases. Students cannot register for classes. Staff cannot prepare payroll. In this regard, the use of IT has become a condition, not a choice. Yet there is no finite technology—we cannot wait until everything is in place and then assess our success. The long-term good of society depends in large part on how well colleges and universities educate our citizens. We cannot settle for mediocrity.

Both librarians and information technologists want to deliver the appropriate information in the appropriate ways and at the appropriate time. By working together and avoiding the pitfalls, our units—and our customers—have everything to gain. At UC Davis we have faced many challenges and the road hasn’t always been easy. Nevertheless, we have achieved a full, productive, and enthusiastic partnership between the library and IT. While this achievement is personally satisfying to the staffs of both organizations, its true value obviously lies in the services we are now able to provide to our users.
What Information Resources Managers Need to Understand about the Higher Education Enterprise

by Ronald Bleed and Polley Ann McClure

Last summer, the two of us spent three weeks in the Institute for Educational Management (IEM), sponsored by the Harvard Institutes for Higher Education of the Harvard University Graduate School of Education.1 With our 98 fellow students whose areas of responsibility ranged from president to “other” (that included us!), coming from institutions of all sizes, types, and regions, we tackled the tough issues facing higher education today. We learned from our instructors, from over 2,500 pages of reading, and, most of all, from each other.

The purpose of this article is to share what we learned about the higher education issues that we and our staffs need to be aware of, to suggest some necessary skills and expertise that can be learned and practiced, and to encourage you to participate in IEM or similar programs to become a more effective information resources leader on your campus. The areas highlighted below are based on the IEM program content, designed to help us better understand the higher education enterprise in which we work.

Educational leadership. To lead in any environment, educational or other, requires a full understanding of the environment’s culture. Institutional missions, like those of our information technology and information resources departments, are changing, evolving, evaluating, questioning—sometimes remaining committed to goals set by earlier generations, sometimes redefining goals and mission with the changing times. As information resources managers, we need to be as familiar with the overall institutional culture as we are with our own organizational culture, and appreciate the importance of existing culture in determining the success or failure of change initiatives—especially those we may find ourselves facilitating and supporting.

External leadership. Similarly, it is as important to build networks of people and organizations as it is to build our more familiar networks of LANs. Colleges and universities have often enjoyed the luxury of focusing internally and managing with campus and departmental autonomy. The new reality is that in 1995 we must now manage many external factors. Effective leadership requires working with outside individuals and institutions for political and economic support. Our attitudes must be adjusted in the face of diminishing resources, increasing criticisms, and growing competition. “Politics” is not a dirty word. Understanding the political consequences of our actions is undeniably valuable because it can lead us to discover what we need to do to get resources and authority for our decisions.

Leadership within organizations. As organizations, colleges and universities are both complex and unique. Getting things done right requires not only knowledge (what is the right thing to do), but also ability (how to convince other people that this is the right thing to do, how to assemble resources and engage staff). In their book, Reframing Organizations, Lee Bolman and Terrence Deal identify four frames of reference or vantage points which can be used to assess situations and define leadership actions: the structural frame, the human resource frame, the political frame, and the symbolic frame.2 The different frames focus on different factors: formal rules and policies, motivating people, resource limits and power, or the elaboration of meaning. Like many administrators in higher education, information resources professionals generally function in the first, or structural frame. By understanding the other three frames of reference, we enhance our understanding of campus organizational dynamics. The true leader determines which frame to emphasize given a specific situation or challenge, and thereby manages the environment most effectively.

Academic administration. As information resources leaders, we also need to understand the fundamental issues related to academic adminis-
"Most visions that succeed are compatible with the organization’s capacity to support the vision, both because they involved people in the process and because they accommodated the power structure."

Financial management. Sound financial management is essential to determine and assess organizational health, whether within our own organizational units or within the larger framework of our colleges and universities. We need to understand the financial indicators, or ratios, that can be used in assessments, the financial systems for managing staff and faculty compensation, tuition costing and pricing, deferred maintenance, and the value of participative budgeting. Financial management issues can be exceedingly difficult to work with because there are so many inherently conflicting issues. The issue of deferred maintenance, however, is one that can be transparently relevant to our profession: some of the arguments and techniques for budgeting preventive maintenance for buildings could be very usefully applied to the all too familiar case of departmental IT maintenance and replacement costs. Likewise, participative budgeting techniques are valuable for any top executive, especially under conditions of declining funds (a scenario increasingly familiar to information resources professionals).

Strategic planning. Two strategic planning concepts we learned about that are particularly useful to information resources managers are “gaps” and “supply chains.” Strategic planning to transform an organization—whether the information resources organization or the entire campus—must be done in the gap between the resources of an organization and the goals of its manager. This gap “stretches” the organization forward in more competitive ways. The vehicles used include cross-functional teams, fast development cycles, focus on core competencies, alliances with suppliers and affinity organizations, arrangements with competitors, and programs of employee involvement. What holds many organizations back is not a surfeit of resources but a scarcity of ambition! And we need to remember to focus on strategic planning for the entire supply chain, not just for our own organizational unit.

Vision. Vision is a picture of the future that we seek to create. It should be a set of compelling words that show where we want to go and what we want to look like when we get there. As information resources leaders, we should strive to design systems with a shared vision in which people in every part of the institution can speak from the heart about what really matters to them. By listening to individual voices, a community of cohesive voices can be built, all committed to finding the deeper purpose of our organizations. Some visions fail because of poor implementation strategies. Most visions that succeed are compatible with the organization’s capacity to support the vision, both because they involved people in the process and because they accommodated the power structure.

We are repeatedly told by the popular press and management consultants that the successful leaders in our profession will be those who best understand the business in which we are employed. Higher education is our business; to build and support information infrastructure and systems that are aligned to the mission of our colleges and universities, we need to take the time—to make the time—to learn about the challenges and key issues facing this business.
Are you feeling “caught in the middle”? That is, are you feeling caught between, on the one hand, the expectations of upper management for productivity gains, reduced expenditures, and continuous quality improvement and, on the other hand, a front-line staff that is tired of the “flavor of the day” productivity process and demanding credibility from you? If this describes your situation, then Caught in the Middle: A Leadership Guide for Partnership in the Workplace may be for you.

Rick Maurer has written a very basic guide to help the middle manager begin the journey toward creating an empowered work force. In Maurer’s model, there are two parts to the process of improving quality and involvement: the partnership between management and front-line staff, and the methods used for improving and measuring quality. He focuses solely on realistic steps a manager can take to begin building a partnership with the front-line staff. In addition to describing these steps and listing many books that provide the theoretical foundation for his practical suggestions (and that serve as resources for the reader), the author gives readers some important assessment tools.

These tools can help a manager decide whether he or she is ready for the transformation, can help a team discuss the forces aiding or hindering the employee involvement process, and can help a manager create a staff development profile. Maurer includes a diagnostic check for teams, to help a team to clarify its goals and the roles and responsibilities of team members. It also highlights the ways in which a team will approach problem solving and its relationships with other teams.

One of the most helpful chapters in the book is called “Pulling It All Together.” Maurer suggests using force field analysis to sort out the positive and the negative issues, or forces, that arise from the organizational- and self-assessment tools, and gives a concrete example of the use of force field analysis. It is very important that the manager and his or her front-line staff have a realistic view of their chances of success in changing the work environment. Redefining the goal in light of the forces for and against it, and developing strategies for working on the forces you can control, will both be critical factors in your success.

Too often as middle managers we feel uneasy about moving forward and wonder where we can start. Caught in the Middle provides an effective road map for creating a partnership between middle management and front-line staff.

Reviewer Cheryl Munn-Fremon is Director, Information Technology Division, Academic, Research and Administrative Partnerships at the University of Michigan in Ann Arbor. She is responsible for building partnerships between the central technology organization and the academic and administrative units of the University. (cmfremon@umich.edu)


Reviewed by Anne Woodsworth

For those who want to understand what constitutes “fair use” in today’s mercurial electronic climate, this slim volume will be useful for all sectors of education. What’s Fair? A Report on the Proceedings of the National Conference on Educational Fair Access and the New Media, American University, Washington, DC, June 15-17, 1994, presents the issues, and points toward possible solutions, through the eyes of copyright experts, representatives of educational institutions, and producers of copyrighted materials. The papers presented at the conference, sponsored by the Consortium of College and University Media Centers (CCUMC) and the Agency for Instructional Technology (AIT), are augmented here with relevant sections of the 1976 Copyright Law, and fair-use guidelines for books, music, and off-air videotaping, as well as a short list of further readings. Efforts of various groups to define and clarify fair use peppers the volume—from the AAU/ARL report to a working group of the National Information Infrastructure Task Force, as well as the practical examples of how the Association of American Publishers is working on pilot projects, experiments, and models to accommodate the needs of multimedia users and developers.

While work on guidelines has progressed since the conference took place, the report still provides a useful summary of how U.S. Copyright Law is being and might be explicated for
new media. The views from users, publishers, copyright experts, and educators give the report both balance and tension. The limitations of the report are that it provides a snapshot of a work in progress—work on the interpretation and application of a law that was devised at a time when education, publishing, computing, and telecommunications were clear and distinctive domains and their interests did not intersect as partners and collaborators.

In sum, I recommend this to anyone with skimpy knowledge of fair use. It is a useful summary and short reference guide to complicated issues—barring final resolution of how fair use gets defined for twenty-first century multimedia.

Reviewer Anne Woodsworth is Dean of the Palmer School of Library and Information Science, Long Island University. She has served twice on the CAUSE Current Issues Committee and is author of CAUSE Professional Paper #11, Reinvesting in the Information Job Family. (woodswor@aurora.liunet.edu)

---

**Handbook for Personal Productivity**

by Henry E. Liebling


Reviewed by Jan Baltzer

If you are the type of individual who is attracted to books on 101 ways to improve employee morale, 200 ways to improve your management style, or fifty-two timely tips for improving productivity, you may very well enjoy the *Handbook for Personal Productivity* written by Henry E. Liebling and published by Productivity Press. This pocket-sized handbook gives concise suggestions on how to: improve your personal productivity, get more productivity from teams, achieve quality customer service, deal with personal health issues, and gain the most from workshops and seminars.

In the area of personal productivity, the focus is on the importance of good self esteem, the need to ban negative thinking, setting goals and objectives, visualizing yourself as an achiever, and time management. Each section begins with a motivational look at the topic and a well developed list of “Things to Do” and “Challenge Exercises.” The sections on team productivity, quality service, health, and workshops/seminars mirror this approach.

The information presented in the *Handbook for Personal Productivity* is nothing new to managers who have done much reading on the area of personal productivity. It certainly does not have the content or depth that would be required by someone who was seriously trying to research and understand the dilemmas that managers face today. However, it is nicely condensed and excellent as a refresher on the do’s and don’ts of managing yourself and your time.

Reviewer Jan Baltzer is Vice President and Chief Information Officer of The Apollo Group, Inc., parent company of The University of Phoenix and the Institute for Professional Development.
The California State University is nearing the end of a five-year study to reclassify all information resources positions. The existing personnel classification system for IR jobs is severely outdated (1978) and does not reflect the skills needed for today’s fast-changing technology environment. In addition, the new classification series will attempt to introduce the concepts of pay for performance and skills-based compensation to information resources positions. The proposed classification series is currently being negotiated with the California State Employees Association. It is anticipated that negotiations will be successfully concluded and training for managers in the application and implementation of the new classification series can begin in first quarter, 1996.1

Patricia M. Cuocco (patricia@calstate.edu)
Director, IT Policy and Analysis

The University of New Mexico is currently involved in a multi-year project to review and reclassify all positions, including Information Resource positions.

This project is a direct result of a comprehensive review of the University’s Human Resource policies and procedures and our current classification and compensation system. That review identified several opportunities for improvement which we hope to seize with our staff classification and compensation study.

Bill Adkins (bdakins@unm.edu)
Director, Applications and Communications Support, CIRT

The University of Maryland at Baltimore, in conjunction with other University of Maryland System institutions, has been working on a long-term project to rewrite job specifications for the entire system. Library and information technology jobs are part of this project. The primary reason for the rewrite was to update descriptions for the total University, since our current descriptions are very old, and to design a pay structure that was more closely aligned to market. The new non-exempt phase will be implemented July 1, 1996.

Paul Petroski (papetrosk@umabnet.ab.umd.edu)
Director, Information Services

At Tuskegee University, we are planning a complete review of our administrative computing positions between now and the next budget submission in the spring. We are running a new hardware/software system on a Digital Alpha vs. an IBM 4381 mainframe. This, plus changes in user expectations, requires at least a rewrite of the position descriptions, moving away from traditional “programming” and “operations” toward report design, training, and consultation, and database administration. We have already reduced staffing in Operations. We don’t know yet how many people will be required in Administrative Computing. We expect the salary structure and organization to look about the same, but responsibilities will change.

Donald C. Fuhr (fuhr@acd.tuske.edu)
Director of Computer Services

Stephen F. Austin State University (SFASU) is a state-supported campus of 12,000 students in East Texas. The current organization for centralized computing support consists of Administrative Computing (which includes Telecommunications and Networking) and Academic Computing as separate departments reporting through separate divisions within the University. Support responsibilities have been difficult to define, with duplication of effort in some areas and other needs not being adequately addressed. Levels of service have not been entirely satisfactory.

In addition, much of the academic demand for technology support now relates to specialized needs for instruction, including production and use of multimedia resources (including World Wide Web), planning for integrated departmental and college technology environments, and development of distance education programs. The $150 million/year “supercard” for technology created in Texas by HB2128 indicates an opportunity for SFASU to further implement instructional technologies for collaborative programs with other universities, public schools, and healthcare providers, as well as with government and industry.

To address these issues, a realignment of information technology services is being implemented on campus, with centralized support provided through University Information Systems and through the Office of Instructional Technology. University Information Systems retains responsibility for administrative data processing systems, networking and telecommunications, and computer user services. The Office of Instructional Technology facilitates integration of new technologies into instruction and research through direct faculty support functions and coordination of on- and off-campus technology programs. It is important to note that Instructional Technology services are integrated with information resource technology programs originating in and supported by Steen Library.

R. Lee Rayburn (lrayburn@sfasu.edu)
Director, Instructional Technology
Mike Jennings (mjennings@sfasu.edu)
Director, University Information Systems

The University of Minnesota (Twin Cities), in anticipation of significant changes in how organizations define the positions and skills of those who are responsible for keeping the organization informed of all relevant external information, is looking seriously at creating a new post-baccalaureate degree in Information Access and Assessment.

CAUSE/EFFECT
Winter 1995

Question:
Has your library or IT organization reclassified jobs and/or redefined positions and, if so, why? Is this activity part of a broader organizational restructuring?

Giunta, CAUSE/EFFECT, by Elsa Swan and Celeste Giunta, CAUSE/EFFECT, Summer 1994, pp. 36-44.
The new system reduces the number of computing classifications from over 130 to six... and reduces the number of computing pay ranges from seventeen to four."

The hypotheses are: (1) that skill in accessing and assessing information external to the organization itself is increasingly required in most contemporary settings, and (2) that the explosion of information sources, technologies, and retrieval methods calls for an individual who can think in a highly analytical manner as well as perform specific information-seeking and assessment tasks.

Program participants would consider concepts such as: how information is created, and the implications of that creation process; the nature of knowledge production; the scientific method of inquiry as it relates to information access and assessment; the organization and retrieval of information in various contexts; issues regarding information quality and policy; and information technology and society. Technical skills would be offered as appropriate for various student programs.

This degree is in the early stages of its design. If approved, it may begin as early as the fall of 1996.

David Shupe (dshupe@mail.cee.umn.edu)
Program Director

In response to a request from the vice president for human resources, a group of computing and human resources professionals at The Ohio State University developed a new classification structure for computing positions. This structure is also intended to be a model for redeveloping all staff classifications at the University.

The general approach is an adaptation of broadbanding that has fewer, more general classifications with very broad pay bands. The new system reduces the number of computing classifications from over 130 to six: system specialist, system engineer, and director, and reduces the number of computing pay ranges from seventeen to four.

The new simplified model enables unit flexibility in defining positions, in determining entry-level and continuing salaries, and in more effectively compensating for important skills and high performance. It removes human resources barriers for recruiting, developing, and retaining excellent staff.

The new classification system is only one component of a newly defined integrated Career Management approach, combining classification, compensation, and performance management to build a high-performance and adaptive organization to meet the needs of the next century.

Implementation began in autumn of 1995 and will be completed by April of 1996.

Charles R. Morrow-Jones (mjones+@osu.edu)
Associate Director
University Technology Services

DePaul University has regularly reclassified jobs and positions in the IT area. The reasons are as follows:

Restructuring. As part of the original reorganization of four separate IT units into one structure, a number of positions were reclassified or redefined. Central to these activities was the creation of a larger networking staff, and the redeployment of graphic designer positions into instructional technology and courseware support positions. The division went through a second restructuring that combined one department with two others. All positions, including a managerial position, were reclassified to fit with the new structure.

Responding to the market. The rapid increase in the demands for some skills sets, particularly UNIX programming and administrative skills and client/server experience, has required the reclassification of position to respond to the need for increased salaries. Given our limited budget, the increases in one area were balanced with reclassifications downwards in other areas. Flexibility has been the key to maintaining competitiveness.

Turnover. Staff turnover has also resulted in the need to redefine and reclassify positions. Vacant senior-level positions have at times been redeployed into entry-level positions, allowing for the promotion of current staff members. In addition, vacant positions have regularly been transferred between departments to meet the varying demands for services. As the University’s priorities change, the ability to move vacant positions (and at times current staff) from one department to another is crucial to meeting expectations, especially when the overall number of staff positions has remained stable.

John Burton (jburton@wppost.depaul.edu)
Director of Management Support

Spring 1996 Readers Respond Question

Has your institution created any policies or procedures with respect to your World Wide Web site? Is any one department considered responsible for coordinating the site and, if so, where is that primary locus of responsibility?

Please send your response, along with your name, title, e-mail address, phone and fax numbers by electronic mail to: eharris@cause.colorado.edu; by fax to 303-440-0461, or by regular mail to Elizabeth Harris, CAUSE/EFFECT Managing Editor, CAUSE, Suite 302E, 4840 Pearl East Circle, Boulder, CO 80301.
Feature Articles

Jacobson, Carl. “Internet Tools Access Administrative Data at the University of Delaware.” Fall, pp. 7-12.
MacKnight, Carol B. “Managing Technological Change in Academe.” Spring, pp. 29-31, 35-39.


CNI Report

———. “Is There a Picture in Our Networked Information Future?” Summer, pp. 3-4.
———. “Sharing the Challenge of Networked Information.” Winter, p. 3.

Current Issues

Hersey, Karen. “Coping with Copyright and Beyond: New Challenges as the Library Goes Digital.” Winter, pp. 4-6.
Plice, Samuel J. “Why Your Campus Should Consider Adopting OSI’s DCE Standards.” Spring, pp. 5-7.

Campus Profile

The Metropolitan Community Colleges. Winter, pp. 32-35.
The Pennsylvania State University. Fall, pp. 28-31.
Seattle Pacific University. Spring, pp. 32-34.
University of Idaho. Summer, pp. 30-33.

Viewpoints

Quinn, Christine A. “From Grass Roots to Corporate Image—The Maturation of the Web.” Fall, pp. 49-51.
Tannenbaum, Robert S. “Teaching, Learning, and Technology at Research I Universities.” Fall, p. 52.

Good Ideas