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).
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250,000-square-foot library, equipped with over 1,700 fully networked work sites. Delivery via both fiber optics and twisted pair cabling is duplicated for backup. Both raw power and conditioned power are provided to each station as well. The building may contain only twenty-eight linear miles of book shelving, but it has over 125 miles of fiber optic wiring. The work sites include clusters in the middle of the print stacks, private carrels around the periphery, individual sites in group study rooms, and clusters in Reference, in a teaching classroom, and in the media library.

Only the clusters are actually populated with machines (over seventy-five in the fall of 1995). The other sites are available to students who may bring their own portable equipment or check out one of the library’s laptops. Such personal equipment is common on campus—some IUPUI programs even require that students buy particular products for the sake of compatibility.

The platforms chosen for the initial implementation were IBM 486 stations running Windows and Macintosh Quadra 440AVs. All use 17” SVGA NEC monitors, and share laser printers (four workstations to one printer). Headphones attached to each station channel some of the noise away from passersby. Video production and scanning equipment is located in special areas of the building. Of course, as new stock is added, a mix of machines has been introduced, making for interesting maintenance issues. No significant down time is allowed in the public areas. In-house storage and repair facilities allow staff to “swap” components immediately.

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/
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- The availability of an alternate linemode version for remote users, tailored for those whose equipment cannot handle graphics, or who don’t have the patience to wait for their modem to haul the image across the wires.
- Instructions to the user on the greeting screen to “click on the service desired,” followed by layers of help screens with both description and instruction for use of each service. All local and Internet sites have been given such help screens. Other applications, such as bibliographic databases and word processors, load automatically (for specified IP ranges) but provide context-sensitive help within the application. The designers of this system assumed a population with little sophistication about computers, no experience with the Internet, and no human assistance available nearby. For example, all menus are kept to a single screen (measured on a standard in-house monitor at default settings), so patrons who don’t know how to scroll won’t miss information.
- Topical screens that organize information primarily for library-related topics. The campus information icon was originally designed to lead to campuswide resources, as the LIS was once expected to be the campuswide information system. However, as happens often with 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.
- Access to personal storage space under the Bookbag icon. Students automatically get 5MB, but may increase it as needed. This feature was added in early 1995.
- Lack of an internal search engine. Internal search engines were not available during the developmental period, so an alphabetical title list of resources complements the subject classification under the Electronic Collections icon. Addition of a search tool is high on the IUPUI agenda for future enhancements.
- 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 for common uses, the other parts of the system sold themselves. Welcoming documentation, signage, and roving attendants were all used to capture attention and suggest paths for exploration.

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.3 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.4 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 proves 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-

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4 URL http://aisr.lib.tju.edu/
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 over-subscribed 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.”
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 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.

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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