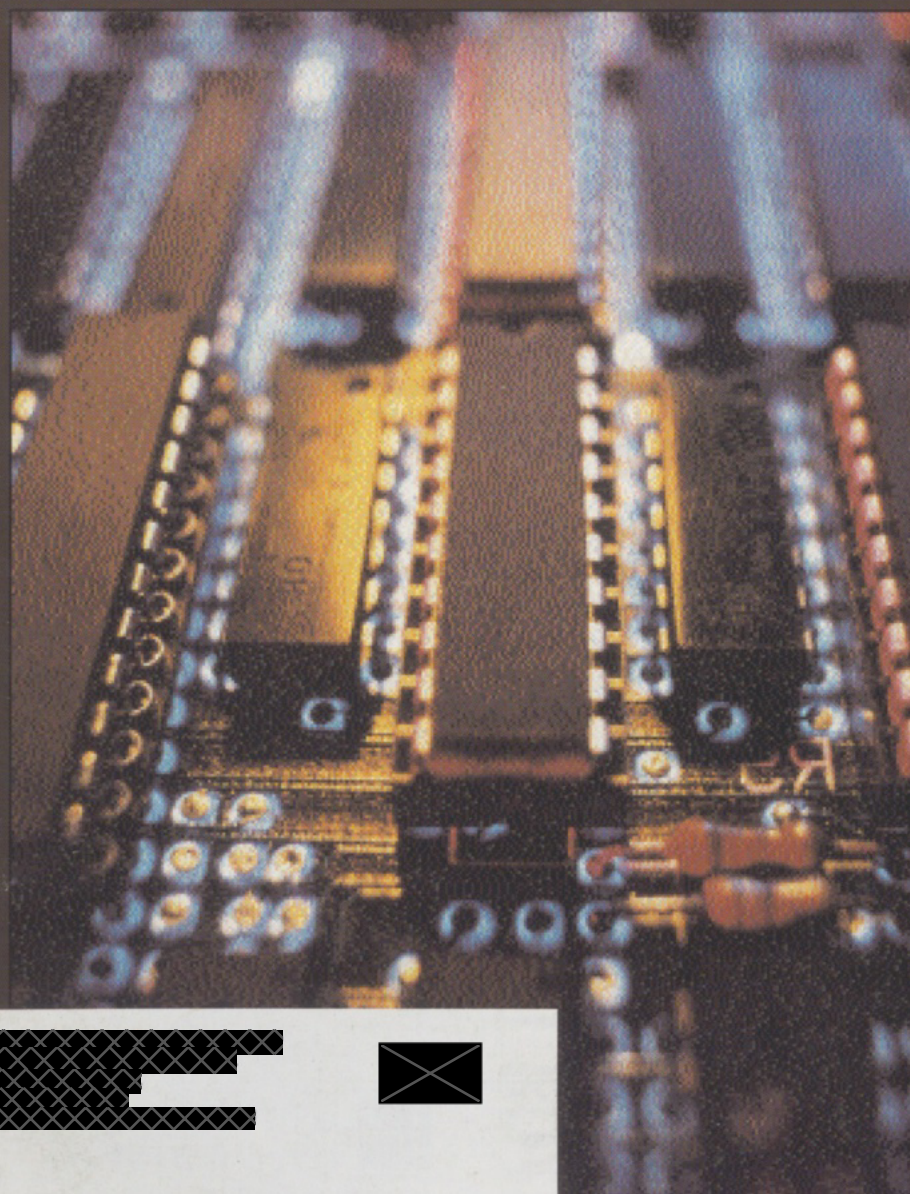


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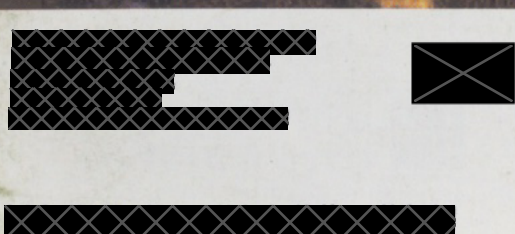
Volume 22 Number 1

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Editorial: When Did the Rules Change?

Dan Marmion

Several years ago, long before I ever thought about being a librarian, I was a graduate history student. History students have to read a lot of journal articles, and back in the day, online full text just wasn't an option. Fortunately, photocopying was an option, and it was a common experience to collect an armload of journals and a pocketful of nickels and tie up a photocopy machine for an hour or more. It was easy to spend five or ten dollars at a time when working on a major paper (and, of course, practically every graduate history class you took had a major paper assigned). The library didn't offer me free photocopying, nor did I expect it to. I was just glad I had access to the journals without having to go through interlibrary loan.

The library at the university I attended didn't have an integrated library system, or any kind of electronic index. My memory may be faulty here, but the first electronic index of any significance that I can remember available for a library to purchase was Infotrac on videodisc, the brainchild of the late Brett Butler, and it didn't come out until after I had become a librarian. We were an early adopter at the library where I had my first professional job as a reference librarian, and I knew it was going to change the world when I saw countless students come into the library far enough to see the sign saying Infotrac was out of order again (the early version did have lots of problems), curse, turn around, and walk out. They would rather come back to the library at another time than use the printed indexes. But I digress . . .

The point I'm making is that there were no computers in the library then, and my options were to use printed sources and take notes or pay for photocopies. Now fast forward to the twenty-first century . . .

At the library where I now work, we recently negotiated a new contract with a photocopy services vendor, and as a result we removed several public-use copy machines from the library. Why? Because over the past few years their use has dropped drastically. Why is that? Simply because we provide access to so much full text

online. They don't have to follow the regimen I did those many years ago, so why should they? Instead of wandering around in the stacks to find a print journal and then taking it to a photocopier, we've given them the ability to stay in one place, locate what they want, and print it right there (save the time of the reader, right?)—for free, no less. Which brings me to what I really want to address.

Just like everybody else, we are looking for ways to save money in these troubled economic times. One of the options we've chosen is to cancel all print serial titles that we have full text access to electronically—not a popular move with some of the teaching faculty (although not all faculty, by a long shot). I was struck by one complaint from a faculty member in the sciences who said that this was a terrible move on our part because students needed not just the black and white text but also the full-color illustrations that accompany many articles. Canceling print was simply unacceptable, this faculty member said, unless the library provide free color printing for the students.

Well, my immediate, flippant reaction was to say, "Sure, we'll provide just as much free color printing as we do free color photocopying—gimme a break." Fortunately I didn't say it to the faculty member. But that's when I started wondering when the rules changed. Why does an intelligent member of the faculty think this is a reasonable expectation? I don't think Ranganathan said to save the money of the reader, did he?

Finally, however, I figured out when the rules changed, and who changed them. To quote Walt Kelly, "We have met the enemy, and he is us." We, the librarians, changed the rules, however unintentionally. We did it when libraries started supplying computers with printers and online capabilities for their users. We said we shouldn't charge for printing a call number or a citation, because somehow that seemed to violate what libraries are all about. So that got us into a mindset that led to us resisting charging for printing, even as we gave our users more and more stuff to print. They got used to it, of course, and now they think it's their due. We can't really blame them, now, can we? Actually, we should provide free photocopies and charge for printing. We would come out way ahead in the long run. Anybody want to buy some used photocopy machines?

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Subject Web Page Management without HTML Coding: Two Approaches

Linda Bills, Rachel J. Cheng,
and Alan J. Nathanson

This article describes two examples using relational databases to streamline the creation and management of active, Web-based subject bibliographies. Before the database approach, library staff expended considerable time and effort compiling subject Web-resource pages to guide users to high-quality resources. The process of producing subject guides was tedious, repetitive, and labor intensive, requiring librarians to become proficient at the intricate task of Web-page creation. Since identical resources, descriptions, and links frequently appear on several different pages, there was considerable duplication of information. Wesleyan University and the Tri-College Consortium each, independently, sought to solve this problem by creating a database of resource information and a process for mapping guide pages. This report compares their different approaches, contrasting in-house versus outsourcing approaches, an independent database versus one built from OPAC, and open source versus proprietary software.

Wesleyan University Library (WUL) in Middletown, Connecticut, and the Tri-College Consortium (TCC) of Bryn Mawr, Haverford, and Swarthmore Colleges near Philadelphia faced a challenge common to many libraries in their need to create subject-specific Web pages for library users. Creation of these pages by appropriate subject specialists required that they either learn to manipulate HTML coding, or to use a Web composition software program. Although the latter option is easier than direct coding, it still requires mastery of a new software application for the sole purpose, in all likelihood, of producing these subject guides. The subject specialist must spend considerable time formatting pages, keying descriptive data about the resources, and troubleshooting unexpected problems with online displays. Not all librarians are equally comfortable with writing Web pages, and individual comfort levels discourage and delay both creation and timely updates of existing pages. A small college library staff is

simply unable to develop and maintain Web research guides in this complicated manner.

Many of the same resources, such as major reference works, indexes, journals, and meta Web sites are duplicated on different subject pages. As the Web resources change their URLs, coverage, or other characteristics, each occurrence of the identical data in different pages needs first to be located, and then appropriately updated. Subject guide pages tend to quickly become outdated. Since several different librarians write the pages, they may even be unaware of updates needed, and of descriptions previously written by their colleagues. This factor contributes to a considerable duplication of effort.

The goal of WUL and TCC was to find efficient ways for librarians to create and update subject research guides. Both institutions addressed this issue independently in 2000, unaware of the other's involvement with it. In January 2001, through a chance discussion, it was discovered that both institutions were working toward similar solutions to the same problem, although with very different approaches.

The Two Approaches

The solutions employed by WUL and TCC are based on the creation of relational databases for tracking resources and building page content to enable the dynamic generation of research guides. The goal is to enable librarians, instead of writing separate and static research guides, to quickly enter or select resources and arrange them on a page through a simple staff interface. Updates of URLs and other resource information can be made once on the database record. Since page displays are created dynamically from the database, the updates take effect immediately on all relevant pages. Outdated resources can be quickly deleted from the database and thus from the pages. It is also possible to compile electronic guides for users on demand by allowing them to search the database itself.

WUL built their solution on an existing database of electronic resources, separate from their library catalog. Librarians enter additional resource data to it as needed for new pages. A set of resource categories was agreed on, so that librarians can create a page for a new subject area by selecting resources from the database to be displayed in each appropriate category, or by leaving that category blank. Records in the database can be updated by another simple interface. WUL built their application using open source software and in-house programming skills.

TCC has a policy of entering records for all online resources, both subscription and free, quality resources, in their shared catalog. They therefore created their resources database by extracting the appropriate records

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and reloading them into a secondary database. New resources and updates are accomplished by adding to or correcting the library catalog and performing regular reloads of the resources database. As with WUL, resource categories were agreed upon, and staff can create a new page by selecting resources from the database and assigning categories. The TCC interface allows more freedom for arranging page structure. This application was built using commercial software (MS SQL and ColdFusion), and by outsourcing the initial development. Ongoing enhancements and maintenance are now done in-house.

A Local, Open Source Solution

The WUL approach was to create a subject database totally independent of the online catalog. For a few years prior to the beginning of the subject guides project, WUL had already begun to maintain Web resources in MySQL with PHP as the scripting language in order to generate Web pages on the fly. Lists of subscribed databases and journals were already available in the MySQL databases. The CTW Library Consortium (Connecticut College, Trinity College, and Wesleyan University) had made a collective decision not to catalog free Internet resources in the CTW online catalog. In addition, the three institutions had not planned to collaborate on the production of library research guides. WUL's solution was to develop a subject Web bibliography as a local database based upon the preexisting data in the MySQL databases.

Before the dynamic subject guides project began, WUL librarians already used a standard template to maintain static subject guides. The creation and maintenance of subject guides was uneven, however, because librarians had other pressing professional responsibilities, and because there was a wide variation in individual librarian's skills in using Web authoring software efficiently. Some of the subject guides were updated in a timely manner while others were not.

WUL chose to maintain the look and feel of the existing static subject pages, and librarians were asked to develop a standardized set of categories and order of presentation in which to list the selected resources. Librarians have the flexibility to list resources using as many or as few of the categories as they think appropriate to their specific subject page. Even when the same database is listed in several subject pages, every librarian also has the freedom to write his or her own descriptive annotations to inform users why a particular resource is valuable for a particular subject.

The WUL subject pages are designed to direct users to significant electronic as well as print resources available in the local reference collection. Links to general research tutorials are included on each subject resource guide page

to remind users of standard research methods (see figure 1). Headers, opening narrative, and links on the right side of each page are also standard to each subject guide. Changes to standard text, such as an announcement of a new service, or changing the URL for a tutorial page, need be executed only once for all subject guides. The lower half of each guide lists, in a standard presentation, the categories of resources available. If users choose to print the guide, they will see the annotated bibliography in a special print format. All WUL subject guides look very similar, but they contain unique descriptions written by a librarian who is a specialist in the respective discipline.

As shown in figure 2, librarians at WUL use a staff interface to construct subject guides. Pull-down lists are available to add, modify, or delete a subscribed Web resource to the guide (see figure 3). Librarians do not enter the URLs since they are included in the master list of subscribed indexes and databases; the existing record already provides the title and URL. This feature allows for the dynamic update of all subject Web pages whenever a URL is changed for a particular resource to which WUL subscribes. As noted above, the librarians may add their own descriptive information appropriate to each

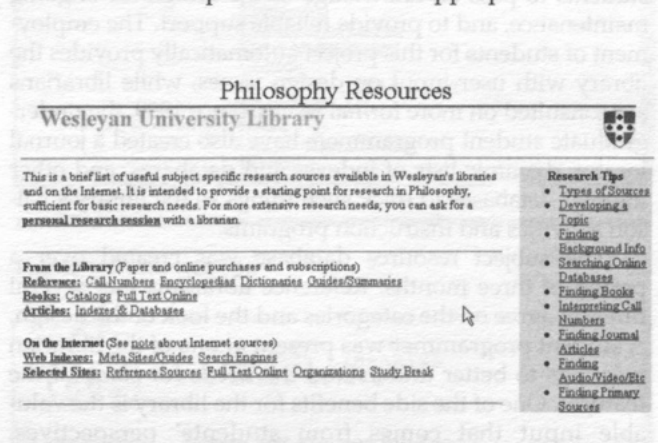


Figure 1. Standard Text for Introduction and Research Tips Wrap around the Resources

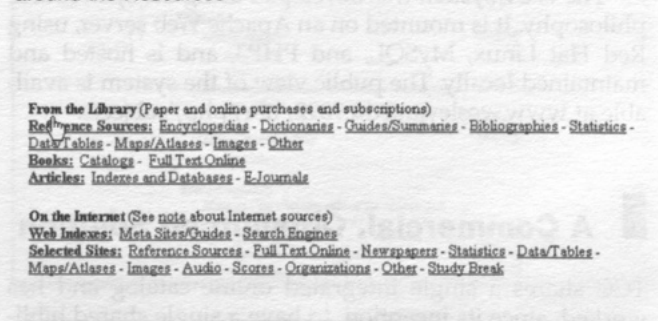


Figure 2. Staff Interface Categories of Resources

guide. Librarians may also assign a priority ranking to each resource through the Display Rank function, which forces the most important resources to the top of a particular listing. Figure 4 shows a separate Web form that is specially formatted to add print resources. The librarian simply types the title and call number of the hardcopy reference item and bypasses the URL field. As with electronic resources, the librarian may decide to add a unique annotation and a display ranking for each source item. The same form, as demonstrated in figure 5, may also be used to add free Web resources, this time using the URL field. The data entered into these forms is stored in a database, and the guide page display for library users is built by retrieval from that database.

The WUL subject resource database was developed and created locally by student programmers whose work was supervised by a permanent staff member. With an annual student budget of \$5,800, at least two undergraduate students are hired each year to create and maintain various database applications in the library. WUL makes a point of hiring one junior to work with a senior who has more experience and who, therefore, can train the new student in the application before graduation. The team approach allows students to pass on knowledge of the design for ongoing maintenance, and to provide reliable support. The employment of students for this project automatically provides the library with user input on design issues, while librarians are consulted on more formal issues. Since 1999, the undergraduate student programmers have also created a journal locator, dynamic lists of indexes and databases, and other internal databases to track such things as the library's liaison activities and instruction programs.

The subject resource database was created over a period of three months. Reference librarians met several times to agree on the categories and the look of the design. A student programmer was present at one of the librarian meetings to better understand the needs for some of the features. One of the side benefits for the library is the valuable input that comes from students' perspectives. Students, on the other hand, have the satisfaction of seeing their creations used by their fellow students.

The WUL system was developed using the open source philosophy. It is mounted on an Apache Web server, using Red Hat Linux, MySQL, and PHP3, and is hosted and maintained locally. The public view of the system is available at www.wesleyan.edu:9092/libr/php/subjects.

A Commercial, Outsourced Solution

TCC shares a single integrated online catalog and has worked, since its inception, to have a single shared bibliographic record for each item in OPAC. When the decision was made to catalog Web resources, the same

Figure 3. Adding/Modifying a Subscribed Web Source

Figure 4. Adding Print Resources

Figure 5. Adding a Free Internet Resource

philosophy was applied—one resource, one shared bibliographic record. TCC OPAC includes cataloging for subscribed Web resources, individual titles of aggregate full-text subscriptions, and selected free Web resources. Catalog records are contributed by the catalogers and reference librarians from the three member institutions. TCC librarians decided that Web publications would be represented in OPAC by separate records, instead of information appended to the records for the printed versions. Two different publishers of the same online title or resource also require two separate bibliographic records. These practices contributed to the overall solution decided upon for the Web guides issue.

Although the TCC libraries' catalog has been merged for more than a decade, Web page design has been unique to each library. Each institution developed its own set of Web information pages for library users, and created its own set of subject, research, and course guides. In 1999

TCC decided to make the development of a single standard for Web resources a high priority because sharing this work offered an excellent opportunity to reduce duplicate effort, share expertise, and better serve the students. TCC intended, at first, to share static Web guides by creating a shared template and a single consortial guide for each subject area. Staff costs for the building and maintenance of the Web guides became an issue, however, as the librarians worked on the shared development project. The need to free subject specialists from tedious, repetitive work, as previously mentioned, and discover ways to update URLs automatically became obvious. An article in *Information Technology and Libraries* brought the active Web pages option to the attention of TCC librarians.¹

Because of its shared OPAC and ongoing commitment to cataloging Web resources, it was natural for TCC to build dynamic Web guides using OPAC as the source for data. The TCC plan, simply stated, was to outsource development of the Web guide publishing system, and to use existing catalog records as the data source. TCC OPAC software has a proprietary data structure so that the bibliographical records could not be accessed directly. The librarians, therefore, made the following decisions:

- standard catalog procedures would be used to create and maintain resource information in OPAC;
- OPAC data would be batch-loaded on a regular basis into an SQL database in which appropriate fields would be selected for use in the guides;
- the SQL database would be used to populate the Web guides; and
- an easy interface would be developed to assist librarians in the selection and arrangement of resources in the guides.

Since TCC librarians decided to share the work of Web guide creation, they made the further decisions that:

- each subject Web guide would include resources available in any of the libraries;
- guides would include all relevant resources, whether online or print; and
- staff from the three colleges could share in the creation and maintenance of any particular guide.

The Public Interface

The public interface to the TCC Web guides emphasizes their consortial nature. Individual library availability is indicated with circled letters that serve as links, and for print resources, in the location statements (see figures 6 and 7). Resources are divided into a set of agreed-upon categories, and may be further divided into subcategories input and organized by the guide creator.

The Staff Interface

The first step in the creation of a new TCC Web guide is to search for relevant resources in the SQL database, as shown in figure 8. This database currently contains approximately 29,000 records. A resource list (figure 9) is retrieved from that search, from which the guide author selects items for inclusion in the subject guide. If a par-

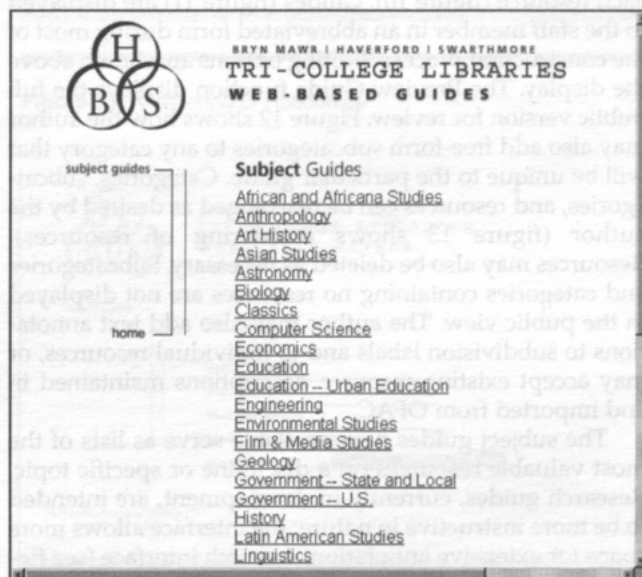


Figure 6. Public Interface

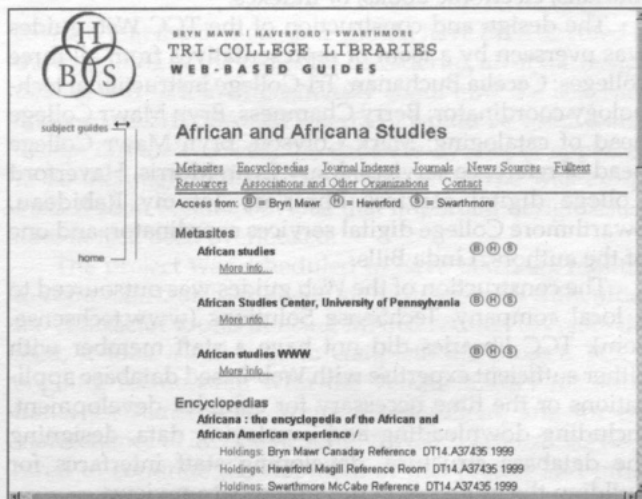


Figure 7. Public Guide Display

ticular resource is not in the database, the author can request that it be loaded in the next weekly batch. The records to be copied from the library catalog to the SQL database are coded; if a record does not exist, it is cataloged. When the record is in the SQL database, the resource can be added to the guide. Although this process is indirect, it has the advantage of making the resource available in OPAC.

Once resources have been selected—a process that can involve several searches—the author assigns a category to each resource (figure 10). Guides (figure 11) are displayed to the staff member in an abbreviated form during most of the construction process. Editing options are shown above the display. The Preview Guide function displays the full public version for review. Figure 12 shows how the author may also add free-form subcategories to any category that will be unique to the particular guide. Categories, subcategories, and resources can be rearranged as desired by the author (figure 13 shows reordering of resources). Resources may also be deleted as necessary. Subcategories and categories containing no resources are not displayed in the public view. The author may also add text annotations to subdivision labels and to individual resources, or may accept existing resource descriptions maintained in and imported from OPAC.

The subject guides now available serve as lists of the most valuable resources on a discipline or specific topic. Research guides, currently in development, are intended to be more instructive in nature; the interface allows more space for extensive annotation. A search interface (see figure 14) is also available that allows users to search the SQL database using either their own terminology, or selecting from a preset list of subject headings. These searches may be limited by format, such as electronic journals, electronic books, or indexes.

The design and construction of the TCC Web guides was overseen by a team of representatives from all three colleges: Cecelia Buchanan, Tri-College instructional technology coordinator; Berry Chamness, Bryn Mawr College head of cataloging; Mark Colvson, Bryn Mawr College head of reference services; Mary Lynn Morris, Haverford College digital services librarian; Tammy Rabideau, Swarthmore College digital services coordinator; and one of the authors, Linda Bills.

The construction of the Web guides was outsourced to a local company, TechSense Solutions (www.techsense.com). TCC libraries did not have a staff member with either sufficient expertise with Web-based database applications or the time necessary for complex development, including downloading and overlaying data, designing the database structure, developing staff interfaces for building the guides, and designing patron views.

Planning was done by a committee of six members, one representing the three computing centers. After deciding on outsourcing, the group interviewed two

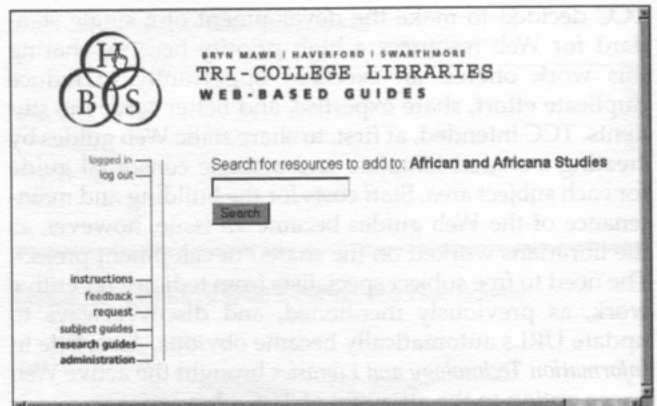


Figure 8. Staff Interface

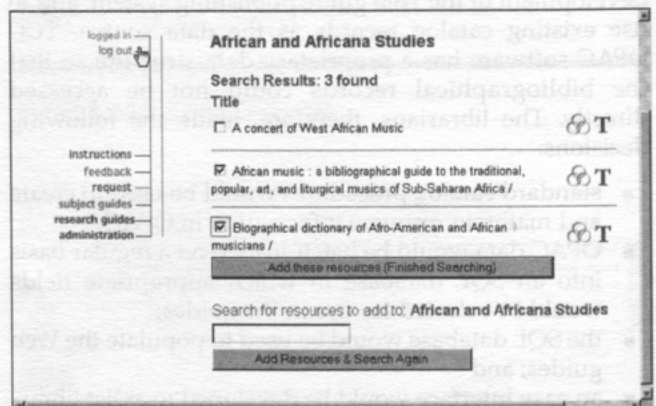


Figure 9. Select Resources for Inclusion in the Subject Guide

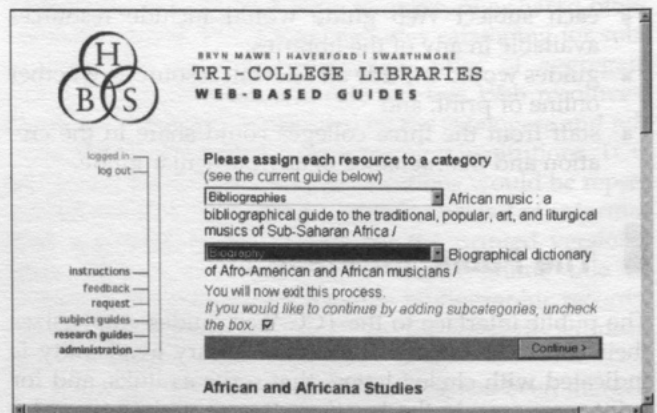


Figure 10. Assigning a Category to Each Resource

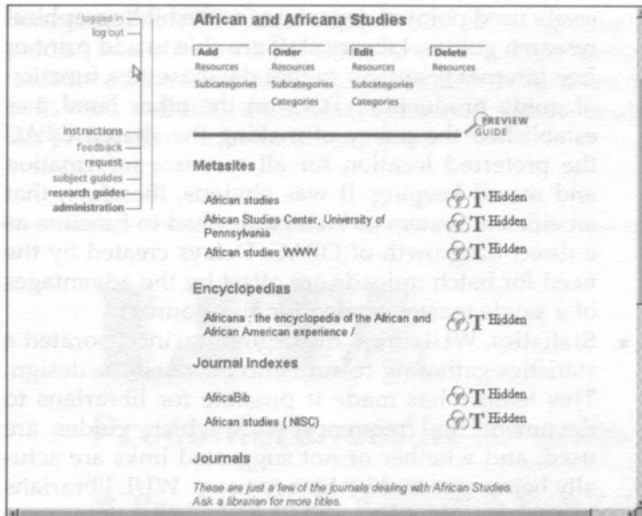


Figure 11. Abbreviated Display of Guide during Construction

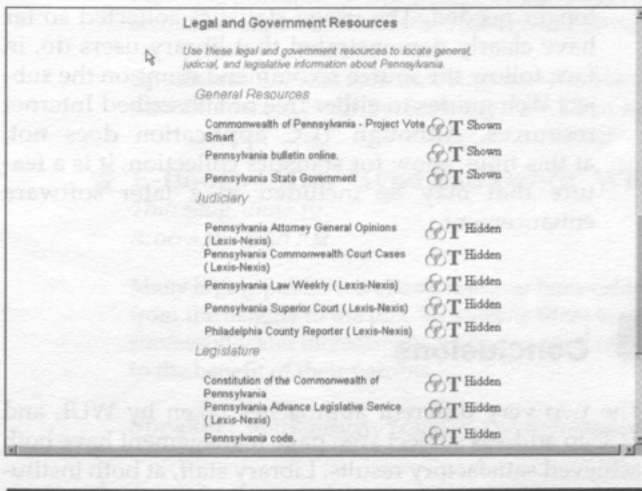


Figure 12. Subcategories by Arrangement (Government Guide)

local companies and selected TechSense. Working with TechSense on the design took two initial meetings, with follow-up examination and redirection as the design emerged. TCC paid TechSense \$26,900 for the product and an additional \$14,400 to train five staff members in ColdFusion and the specific application so that changes and maintenance could be accomplished in-house. These fees were covered as part of a grant from the Mellon Foundation.

The Web-guide project soon became a learning experience in outsourcing development for TCC. The staff dis-

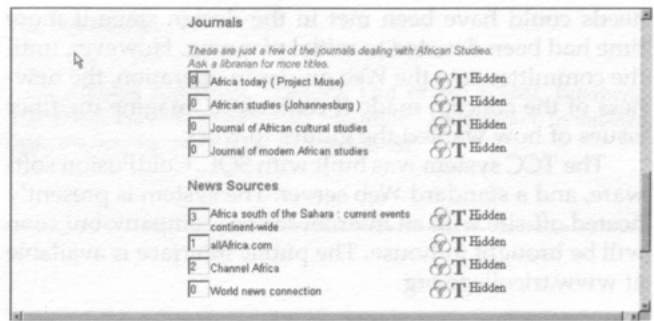


Figure 13. Reordering of Resources

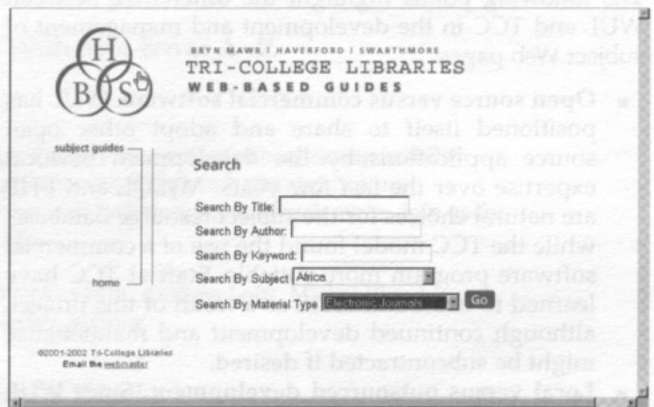


Figure 14. Search Interface for Users

covered that much more time should have been devoted at the beginning of the project to considering all of the design details, and to thinking carefully about how the software, and particularly the staff interface, would be used. Initial design discussions with the database developer appeared to be thorough, but when the first prototype was examined, it soon became obvious that important design issues had, in fact, been overlooked.

The project was scheduled to have taken six months to complete. Due to changes in the design and difficulties the contractor found in using MARC records to create the load, it took a full year to complete the project. TCC's ongoing relationship with the vendor allows for additional assistance with future development, and for the maintenance of off-site hosting. A Web specialist has been hired to continue development of this project and other consortium-wide Web endeavors. This person has spent the majority of his time in the last eight months developing Web guides to meet specific needs of the reference staff. It is the feeling of the committee that many of these

needs could have been met in the design stage if more time had been devoted to initial planning. However, until the committee saw the Web guides in operation, the newness of the concept made it difficult to imagine the finer issues of how wanted the guides to work.

The TCC system was built with SQL, ColdFusion software, and a standard Web server. The system is presently hosted off-site with an Internet service company, but soon will be brought in-house. The public interface is available at www.tricollege.org.

Similar Goals, Different Approaches

The following points highlight the differences between WUL and TCC in the development and management of subject Web pages:

- **Open source versus commercial software.** WUL has positioned itself to share and adopt other open source applications by the development of local expertise over the last few years. MySQL and PHP are natural choices for the subject resource database, while the TCC model found the use of a commercial software program more suitable. Staff at TCC have learned to use ColdFusion as a result of this project, although continued development and maintenance might be subcontracted if desired.
- **Local versus outsourced development.** Since WUL had already developed its local ability to create and manage dynamic Web pages, it was logical for them to create the new subject resource databases locally. TCC, on the other hand, found that the most expedient means to achieve its goals was to outsource its development to a company with both database and ColdFusion expertise. TCC librarians believed that this approach would optimize the design both for functionality and speed. The application was complex; it involved the reformatting of MARC records, overlaying of records, dealing with deleted resources, and creating an interface that was easy to use and which provided the librarians with maximum flexibility. The vendor provided excellent program documentation and training, and will be available when needed in the future. The process was especially valuable in teaching TCC librarians how to manage complex projects with an outside vendor.
- **Database creation.** The WUL decision to create a totally separate database of subject resources instead of one closely allied to the CTW online system was made for a variety of reasons. WUL had never maintained records for free Internet resources in OPAC. Bibliographic records for subscribed databases were already stored in a separate database that became an

easily used point of departure for the bibliographical research guides. Library staff are able to add print or free Internet resources to that database as a function of guide production. TCC, on the other hand, has established the policy of making the shared OPAC the preferred location for all resource information and record keeping. It was obvious, therefore, that an efficient system of Web guides had to function as a direct outgrowth of OPAC. Delays created by the need for batch uploads are offset by the advantages of a single master catalog for all resources.

- **Statistics.** WUL, from the beginning, incorporated a statistics-gathering feature into the database design. This feature has made it possible for librarians to document the frequency with which guides are used, and whether or not suggested links are actually being accessed by library users. WUL librarians had frequently asked whether or not the time spent in the creation and maintenance of Web bibliographies was, indeed, justified by the amount of use they received. By generating and updating subject guides dynamically, the entire operation has become efficient enough that justification is no longer needed. The usage statistics collected so far have clearly demonstrated that library users do, in fact, follow the source recommendations on the subject Web guides to either free or subscribed Internet resources. Although TCC application does not, at this time, allow for statistics collection, it is a feature that may be included in a later software enhancement.

Conclusions

The two very different approaches taken by WUL and TCC to address subject Web page management have both achieved satisfactory results. Library staff, at both institutions, are now able to create structured subject Web guides without the use of complicated, time-consuming Web-authoring software; resource annotations can now quickly be posted, and pages can be updated, corrected, or deleted easily from a single file. Equally important, any addition or modification to commonly used commercial databases can be updated simultaneously across many subject bibliographies.

The uniform templates used by both of these systems have resulted, to some extent, in the loss of individual writing style for the presentation of the library resources. Both systems have circumvented this problem by giving the librarians flexibility to write their own resource annotations, to display the resources in order of importance, and to use as many or as few categories as they believe

necessary. The TCC system has moved from using unique guide formats for the three institutions to a single format used for all the libraries in the consortium. In the cases of both WUL and TCC, the standardization of guide formats has proven beneficial for library users.

Reference

1. Kristin Antelman, "Getting Out of the HTML Business: The Database-Driven Web Site Solution," *Information Technology and Libraries* 18, no. 4 (Dec. 1999): 176-81.



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Speaker: David J. Ives, Chief Information Officer, NELINET, Inc. Dr. Ives has spent over 21 years in the arena of personal computers, with particular interests in data security and recovery. He was the head of the systems team at an ARL library for over 12 years.

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HERMES: The Hopkins Electronic Resource Management System

Mark Cyzyk and
Nathan D. M. Robertson

This article describes a project undertaken by the Johns Hopkins University libraries to develop a systemwide, Web-based application to facilitate the selection, procurement, implementation, and management of electronic resources and their licenses. The authors detail the history of the project, the function of each of its main application modules, and the various security roles required for administration of the application as well as note similar initiatives and other activities within the library profession to streamline and automate the management of electronic resources.

The Johns Hopkins University (JHU) libraries are nearing completion of a university-wide electronic resource management system. This application, the Hopkins Electronic Resource Management System (HERMES), will provide an easy and time-saving means for patrons to identify and access the electronic resources of JHU libraries, as well as facilitate the process of selecting, purchasing, and managing these resources. The scope of resources managed by HERMES will include all electronic resources to which JHU libraries provide access.

Description and Functional Requirements

Early in the project, the following functional requirements were identified:

- provide a full workflow and approvals process to support the selection, procurement, and implementation of e-resources;
- enable dynamic generation of e-resource information for public display;
- provide automatic notification to appropriate staff of changes of status and scope in e-resource ordering and licensing (including such items as when to renew and action required after a certain number of days);
- provide for link management for e-resources, including the automatic updating of URLs in the backend

database, on the campus proxy server, on library Web sites, and so on;

- provide staff with a unified, Web-based means for viewing, updating, reporting, and administering e-resources, including custom report generation;
- document and maintain information about e-resources;
- be accessible to all staff and patrons in JHU libraries with appropriate restrictions for use of administrative modules; and
- be interoperable with existing and future systems, including the integrated library system, the campus proxy server, and Web sites of the various campus libraries.

History of the Project

In the spring of 1999, the electronic resources librarian at JHU's Milton S. Eisenhower Library approached the Web application developer and related her need for an easier way to manage the hundreds of links to both licensed and unlicensed electronic resources on the library's Web site. Her problem is probably familiar to anyone who must manage a significant number of Web pages: if a URL changes somewhere on the Web site, the administrator must then track down and update that URL wherever it appears throughout the entire site. This process was tedious and error-prone.

The creation of a simple database-enabled Web application was proposed that would allow the administrator to create a bibliographic record for a particular e-resource and to subject-index the record using multiple subject headings. The public display for this application would pull data directly from the database and would dynamically generate subject-specific lists of e-resources, along with their corresponding URLs. And because the URL, as part of the bibliographic record, would be stored in a single place, any updates to that URL would automatically appear within each of the individual subject lists on the site. In this way, the need for locating and updating multiple instances of the same URL whenever a change to that URL occurred would be eliminated.

An application was constructed and tested that accomplished this task, and a student was hired to perform data entry to populate the backend database. Just as this project was nearing completion, however, another group in the library began developing specifications for an e-resource license tracking database—in other words, an application that would streamline and control the entire e-resources licensing and procurement process from beginning to end. The fact that most integrated library systems do not adequately provide for the workflow and approval processes surrounding e-resource

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licensing prompted the need for in-house development of such a system. Moreover, there was interest throughout JHU libraries in this project. Most notably, the William H. Welch Medical Library on the JHU East Baltimore campus was interested in participating in the project. With this organizational impetus in place, the earlier project aimed at merely managing links to e-resources was abandoned, and work on an integrated e-resources licensing and management system began.

During the spring 2000 semester, the HERMES committee was formed and several subcommittees were charged with developing specifications for individual modules of the application. These subcommittees were devoted to, among other things, the development of a public display interface, compilation of a list of appropriate subject headings, identification of data elements that should be captured by the backend database, and discussion and preparation of the necessary technical infrastructure. After several months of planning, these subcommittees were dissolved and the results of their work were folded into the work of the central HERMES committee. Planning of the HERMES application, including the design of the backend database and the charting of the entire workflow and approvals process, earnestly began in January 2001. This process required six months of weekly meetings.¹ At the end of six months, coding of the application and its backend database began and lasted approximately six months. The Web application developer spent approximately 66 percent of his time coding the HERMES project during this six-month period.

Special Considerations

JHU is a decentralized organization, and the libraries of the university are administratively independent. Each library may negotiate and manage its own e-resource licenses, and while the libraries negotiate some licenses on behalf of the entire JHU community, others apply only to specific groups of JHU affiliates. In some cases, costs for e-resources are paid for by a single JHU library, and in other cases, costs are shared by participating libraries. In this way, JHU's needs for e-resource management resemble the needs of a consortium.

The Milton S. Eisenhower Library has invested significant time and resources in providing catalog records for e-resources within the library catalog; over seven thousand e-resources are represented in the JHU library catalog. Data elements required for HERMES include bibliographic data already included in the JHU catalog, as well as many other data elements not captured in a traditional integrated library system. To avoid duplication of data entry, HERMES must automatically capture

appropriate data from the JHU library catalog. In order to accommodate the goal of interoperability with existing and future systems, an XML document type definition (DTD) was formulated to serve as HERMES's bibliographic data import format. The current JHU library catalog, a future catalog system, or any other data source with bibliographic metadata about electronic resources may be used to populate HERMES, as long as extracts can be manipulated into the appropriate XML format. HERMES may also be used as a stand-alone system; it allows for manual data entry of all elements if a load from another data source is not available or not feasible.

While it was obviously important for the HERMES system to accommodate the workflow and management needs of the JHU libraries, the developer also sought to make the system useful for other libraries with different approaches to e-resource management. The system is designed to accommodate a variety of approaches to use. With minimal modification of the application code, new workflow steps can be inserted or other similar changes made. Even without code modification, customization for local needs can be accommodated through the specific functional roles available for assignment to users of the system. These functional roles represent individual tasks and responsibilities, such as selection, acquisition, and cataloging. At JHU, most staff will have only one or two roles within HERMES, while at a library with a smaller staff or a more centralized e-resource management workflow, a single staff person might be assigned more roles and granted greater rights and responsibilities.

Brief Description of Main Modules

In order to accommodate each step of the e-resource acquisition and management workflow identified in the planning stages, HERMES was developed as a modular application.

Authentication

This module provides authentication of administrative users against a central lightweight directory access protocol (LDAP) authentication store.² This module merely refers to an externally administered, HERMES-independent LDAP directory to determine whether or not an administrative user truly is who he or she claims to be. If the user is successfully authenticated, this module begins a session based upon the authenticated username. Such information as username/password generation and password resetting are all handled by the outside LDAP service and need not be administered separately by the

HERMES application. This reliance on an external LDAP directory obviously requires that the implementing institution have an LDAP directory available for authentication of staff users.

Authorization

This module checks an authenticated username against an internal authorization table to ensure that the user is authorized for access to the administrative modules of the application. The contents of this internal authorization table provide detailed information with respect to the functions and modules the authenticated user has authorization to access.

Selection

This module allows selectors to initiate and track the selection process. At any time selectors have the ability to view the status of their open items within the overall HERMES workflow—that is, they can quickly determine what stage an item is in with respect to procurement. This offers obvious advantages over a selection process based on paper forms.

Acquisitions

This module governs the acquisitions process for ordering, receiving, renewing, and decommissioning of e-resources. It is the module where license management occurs. Within this module, license terms are defined as actionable elements to allow the system to appropriately allow or deny access to specific user groups. Furthermore, the actual legal license documents may be scanned and uploaded for easy and secure storage and retrieval.

Catalog Interface

This module is perhaps the most complex and sophisticated module in the HERMES application. Since JHU continues to invest effort in traditional cataloging of e-resources, the catalog interface was developed to accommodate automated interaction with the library management system (or any other source with information about e-resource subscriptions). Data in HERMES can be synchronized with data from another resource such that, when a data field in a record in the external resource changes, so too will its value in the corresponding record in the HERMES database. In this way, such things as titles or imprints can be maintained within the external resource, with changes flowing through on a scheduled basis to HERMES. Each HERMES field may be configured to accept changes coming through the catalog interface or to retain existing HERMES data; this allows HERMES to serve as the authoritative source for some

data elements, while the external resource serves as the authoritative source for other fields.

Technically, this process is accomplished through use of XML technologies. An XML DTD was created reflecting the structure of the records held in the HERMES database tables.³ Data need only be extracted from the external resource and formatted in accordance with this DTD. The resulting XML packet is then placed somewhere on the Web in a location accessible in programmatic fashion by the HERMES application. On a scheduled basis, HERMES grabs this XML-formatted extract via HTTP and pulls it into the HERMES database, making required updates to existing records along the way. Thus, select data in HERMES can be synchronized with the contents of the local library catalog or external resource.

Catalog

This module controls the final catalog entries of e-resources. It also provides an authorized staff member the ability to manage the thesaurus of subject terms used to index records in the backend database.⁴ Subject-indexing of e-resources is ultimately performed within this module.

Library Computing Services

This module allows the administration of a lookup table of IP addresses mapped to a standard list of access locations, and a workflow process for implementing e-resources that require special attention from library computing staff (for example, networked CD-ROMs).

Public Display

This module controls the logic and display of what public clients actually see over the Web.⁵ Provision for search and retrieval of data about electronic resources is made here. Specifically, the client has the ability both to browse and search the portion of the collection of e-resources flagged as appropriate for public display from within this module. This module allows participating libraries to dynamically pass in header and footer files resulting in output to the client, resembling, as closely as possible, the look and feel of the local library Web site.

Administrative Search

This module enables authorized administrators to search the entire HERMES database for records matching select criteria.

Report

This module provides reports and statistics for view by authorized staff.

Scheduled Notifications

This module runs on a scheduled basis and automatically notifies the appropriate staff via e-mail of relevant changes in such items as content status and licensing.

Automated Subject Indexing

One of the interesting features of the catalog interface is its ability to automatically subject index records based on their assigned Library of Congress (LC) or MESH subject headings. Catalogers in the HERMES application have the facility to map incoming LC and MESH headings to counterparts in the HERMES subject schema. Once a given LC or MESH mapping has thus been created, any future records entering the HERMES system via the catalog interface will automatically be mapped to the corresponding HERMES subject heading, thereby ensuring that the record is accurately subject-indexed and easily retrievable via the public display interface.

So, for instance, suppose an incoming record has the following LC heading:

Philosophy—Periodicals—Indexes—Periodicals.

The catalog interface determines whether it has previously “seen” this particular subject heading before. If not, it inserts it into a backend lookup table and alerts the appropriate cataloger, informing him or her of the existence of a new LC heading that requires a mapping to the HERMES subject schema. However, if the catalog interface determines that it has indeed seen this LC heading before, and if a cataloger has supplied a mapping into the HERMES subject schema for it, then the incoming record is automatically mapped to the HERMES heading—no intervention on the part of a cataloger is required. And this process will occur for any and all incoming records via the catalog interface that are subject indexed by that same LC heading.

Application Roles and Administrative Groups

During the design phase of the project several administrative roles were identified that would be required for the secure administration of the application. The following are the roles and groups that were identified.

The Public

This group—consisting of faculty, students, researchers, university staff, and the general public—can search,

retrieve, and display datasets from the backend database via the publicly accessible search interface.

Super-Users

Super-Users function as system administrators of the HERMES application. This role has access to all functions, and may add administrative users, assign roles, modify several backend lookup tables, and monitor application errors.

Selectors

This role allows an authorized individual to initiate the resource procurement process on behalf of a participating library and track the item’s workflow progress. Each selector is assigned one or more budget codes that he or she may suggest for use in purchasing selected electronic resources.

Super-Selector

The super-selector flags selected items for approval or disapproval, and thus for passage to the next phase of the procurement process, and decides what will actually be purchased from among the pool of selected items. The super-selector assigns budget codes to selectors. There must be at least one super-selector per participating library, and the super-selector has control over the selections proposed for that particular library.

Acquisitions Administrators

Acquisitions administrators are responsible for procuring items and for tracking them throughout the procurement process. This role also administers and maintains license data, including scanning and upload of digital copies of the licenses themselves. Finally, acquisitions administrators maintain the table of budget codes that super-selectors may assign to selectors.

Catalog Administrators

This role is responsible for properly cataloging items in HERMES, including assignment of subject headings. If bibliographic data for e-resources is imported from another source such as the library’s catalog, catalog administrators are responsible for completing records with HERMES-specific data and for administering the automatic subject-indexing module.

Library Computing Services Administrators

This role is responsible for approving the purchase of electronic resources with special computing requirements—for example, CD-ROMs and other standalone databases.

Public Display Administrators

This role is responsible for deciding, out of the domain of purchased and cataloged items, which ones appear on the publicly accessible search interface. This role can alter the bibliographic record of an item at any point, ensuring that the record for the item is sufficiently complete and fit for public viewing.

Administrative Query

Certain members of the library staff who might not otherwise fit into any of the other administrative roles can log on to HERMES and query the database for licensing information. Staff assigned this role include members of interlibrary loan and reserves departments. This role can only query and view records in the database—it has no insert, update, or delete privileges on any of the data.

Technical Details

As of this writing, the HERMES application is comprised of thirty-six database tables and 130 files containing 12,007 lines of program code. The backend database is currently Microsoft SQL Server 7.0, but the application was written in such a way that any relational database management system (RDBMS) supporting transactions and subselects could be used instead. Due to its simplicity, power, scalability, and value as a Web application development platform, Macromedia's ColdFusion was chosen as the middleware platform.⁶ The ColdFusion developer community is large and very open with its custom libraries (in ColdFusion-speak, "tags"), hence a handful of custom libraries were also incorporated into the HERMES application.⁷ Due to the unacceptable performance of existing XML parsers, a portion of the catalog interface was written in Python, a scripting language capable of extremely fast text manipulation.

Similar Projects and Related Initiatives

Many other libraries have recognized the need for organizing the e-resource management process, and several libraries have developed automated systems similar to HERMES. A small group of librarians interested in the problems and issues with e-resource management met at the 2001 American Library Association (ALA) Annual Conference in San Francisco. The group organized a larger meeting at the 2002 ALA Midwinter Meeting in New Orleans; HERMES committee member Nathan

Robertson was among several meeting participants who gave presentations on locally developed e-resource management systems.⁸

Many attendees at the 2002 ALA Midwinter Meeting expressed interest in developing a metadata standard for e-resources to facilitate their management; this standard would include not only descriptive metadata, but also metadata to accommodate licensing details, access restrictions, and administrative management. In May 2002 NISO hosted a workshop in conjunction with the DLF Forum in Chicago for a group of librarians and vendors to explore issues and ideas regarding e-resource management and e-resource metadata. A follow-up meeting at the 2002 ALA Annual Conference in Atlanta was well attended.⁹

In September 2002 the Digital Library Federation took on official sponsorship of the Electronic Resource Management Initiative project.¹⁰ There is clearly growing interest from the library community in the issues of streamlining e-resource management.

Post-Coding History and Current Status

As of this writing, the HERMES application is undergoing intensive testing, and bugs are being resolved. Once testing is complete, the backend database will be populated, initially with an XML-formatted extract from the local library catalog. However, because the initial data dump will only be comprised of bibliographic rather than licensing data, a long period of manually entering licensing data and fleshing out the bibliographic records will necessarily follow. Then, with complete bibliographic and license records in place, they will have to be mapped, one to the other—that is to say, each bibliographic resource record must be mapped to its corresponding license. Only once this process is complete will HERMES be ready to go live. It is hoped this can be accomplished sometime during the spring 2003 semester. Once live, all requests for new e-resources and all e-resources licensing will use HERMES as the primary tool for managing these complex processes.

After the current testing and debugging of HERMES is complete, the Sheridan Libraries of the Johns Hopkins University plan to release HERMES as an open source software product for other libraries to customize and use.

Acknowledgments

The authors wish to express their sincere thanks to everyone at JHU involved in the HERMES project, particularly

the regular members of the HERMES committee: Lori Foulke, Rebecca Graham, Dawn Hale, David James, Pat Lovett, Ginny Massey-Burzio, David Reynolds, Mary Ann Urka, and Sue Woodson.

References and Notes

1. This planning was strongly influenced by several examples of similar, ongoing projects across North America. Adam Chandler (Cornell) and Tim Jewell (University of Washington) maintain a useful Web site listing these efforts. Accessed Dec. 13, 2002, www.library.cornell.edu/cts/elicensestudy.

2. For more information about LDAP, see www.ldapzone.com, accessed Dec. 13, 2002.

3. The HERMES DTD is as follows:

```
<?xml version="1.0" encoding="UTF-8"?>
<!ELEMENT alternatetitle (#PCDATA)>
<!ELEMENT catalogid (#PCDATA)>
<!ELEMENT collectioncode (#PCDATA)>
  <!ELEMENT contributors (#PCDATA)>
<!ELEMENT coverage (url?, collectioncode)>
<!ELEMENT coverageurl (coverage+)>
<!ELEMENT edition (#PCDATA)>
<!ELEMENT eissn (#PCDATA)>
<!ELEMENT formertitle (#PCDATA)>
<!ELEMENT imprint (#PCDATA)>
<!ELEMENT isbn (#PCDATA)>
<!ELEMENT issn (#PCDATA)>
<!ELEMENT language (#PCDATA)>
<!ELEMENT lcmeshheading (#PCDATA | lcmeshheadingflag)*>
<!ELEMENT lcmeshheadingflag (#PCDATA)>
<!ELEMENT libraryid (#PCDATA)>
<!ELEMENT newtitle (#PCDATA)>
<!ELEMENT printequivalent (#PCDATA)>
<!ELEMENT record (catalogid, title?, contributors?, alternatetitle?,
```

```
contributors?, imprint?, edition?, issn?, formertitle?, printequivalent?, eissn?, formertitle?, specialviewinginstructions?, newtitle?, specialviewinginstructions?, formertitle?, printequivalent?, isbn?, newtitle?, issn?, formertitle?, printequivalent?, specialviewinginstructions?, language?, subjectheadings?, libraryid?, typeofresourceid?, coverageurl)>
```

```
<!ELEMENT recordset (record+)>
```

```
<!ELEMENT specialviewinginstructions (#PCDATA)>
```

```
<!ELEMENT subjectheadings (lcmeshheading+)>
```

```
<!ELEMENT title (#PCDATA)>
```

```
<!ELEMENT typeofresourceid (#PCDATA)>
```

```
<!ELEMENT url (#PCDATA)>
```

4. Mark Cyzyk, "Recursive Custom Tags," *ColdFusion Developer's Journal* 2, no. 10 (Oct. 2000). The heart of the backend portion of the subject module consists of a single table representing a linked-list data structure of subject terms as well as program code that recursively interacts with the data in this table.

5. The look and feel of the search interface used in this module as well as the overall logic of how searches are done in this module were based upon the HERMES Public Display Subcommittee's long, hard scrutiny of the very fine example provided by the California Digital Library. Accessed Dec. 13, 2002, www.cdlib.org.

6. Mark Cyzyk, "Script Junkie: ColdFusion Markup Language," *Web Techniques* 5, no. 8 (Aug. 2000). See for discussion and examples of why ColdFusion is superior in many respects to other Web application platforms. Accessed Dec. 13, 2002, www.webtechniques.com/archives/2000/08/junk.

7. Specifically, `cf_TwoSelectsRelated` by Nate Weiss and `cf_ListRemoveDup` by Joshua Spangler.

8. A report on this meeting is posted to www.library.cornell.edu/cts/elicensestudy/alamidwinter2002.htm, accessed Dec. 13, 2002.

9. A report on this meeting is posted to www.library.cornell.edu/cts/elicensestudy/alaannual2002/home.htm, accessed Dec. 13, 2002.

10. This initiative is outlined at www.diglib.org/standards/dlf-erm02.htm, accessed Jan. 9, 2003.

The Impact of Information Technology on Job Requirements and Qualifications for Catalogers

Zahiruddin Khurshid

Information technology (IT) encompassing an integrated library system, computer hardware and software, CD-ROM, Internet, and other domains, including MARC 21 formats, CORC, and metadata standards (Dublin Core, TEI, XML, RDF) has produced far-reaching changes in the job functions of catalogers. Libraries are now coming up with a new set of recruiting requirements for these positions. This paper aims to review job advertisements published in American Libraries (AL) and College and Research Libraries News (C&RL NEWS) to assess the impact of the use of IT in libraries on job requirements and qualifications for catalogers.

Three major developments in library automation and IT have brought sweeping changes in cataloging during the last four decades. The first was the development of the MARC format by the Library of Congress (LC) in the early 1960s. It formed the basis of library automation systems and led to the creation of bibliographic utilities in the 1970s, the use of which not only freed catalogers from clerical aspects of their duties, but also increased cataloging productivity. Professional catalogers were then able to concentrate on original cataloging and even took up difficult materials, such as theses and dissertations, technical reports, and nonbook materials, which they were unable to catalog before. The effect of bibliographic utilities on cataloging became evident in job advertisements in which experience with utility was either required or desired.

Phrases like "experience with OCLC operations" and "familiarity with RLIN or similar systems" are listed as qualifications for catalogers and managers alike, revealing the impact of the new technology on practice and workflow from top to bottom.¹

The second important development, which took place in the early to mid 1980s was the introduction of micro-computer and optical disc technologies. Bibliographic utilities and vendors of MARC records started distributing records on CD-ROM, thus allowing even smaller libraries, which cannot afford expensive online access to OCLC and other utilities, to install CD-ROM-based bibliographic databases on local area networks for copy cataloging. The success of these CD-ROM databases encouraged the LC and other agencies responsible for developing and distributing various cataloging tools to

issue them on CD-ROM. Catalogers found CDMARC (discontinued in 1997), CatCD, Classification Plus, Dewey for Windows, Cataloger's Desktop, and others easier to store and more up-to-date than the print version. However, to install and use these products effectively required catalogers to have knowledge of such topics as computing, desktop applications, and network-based tools. The job advertisements, therefore, required computer skills for catalog librarians, including knowledge of PC-based applications and bibliographic utilities as well as CD-ROM experience.

The emergence of Internet technologies in the 1990s, markup languages, and non-MARC standards are the third group of developments that have impacted cataloging jobs. As a result, some cataloging positions now require proficiency with computer applications (Internet, integrated library system [ILS], e-mail, and PC software packages), knowledge of markup languages (HTML, SGML, and XML), and experience or familiarity with emerging metadata schemes and tools (Dublin Core, CORC, EAD, TEI, RDF).

This paper aims to trace the impact of all these developments in library automation and IT on position titles, degree requirements, and required skills of catalogers by analyzing job advertisements published in *C&RL News* and *AL* over a two-year period (2000 and 2001).

Literature Review

Several articles have appeared during the last ten years or more discussing the changing and evolving roles of catalogers and the impact of automation on job requirements and qualifications for catalogers. Furuta's study revealed that bibliographic utilities in the 1970s produced far-reaching changes in cataloging departments by allowing the bulk of the material to be processed more quickly and cost effectively by nonprofessionals. In turn, that change caused professionals' duties to shift to more difficult items.² Xu traces the impact of automation on job requirements and qualifications of catalogers and reference librarians in academic libraries by analyzing job advertisements from 1971 to 1990. He concludes that, with the development of automation in libraries, the requirements of previous work experience for catalog and reference librarians are becoming more similar. Increasing needs for computer skills can be found in both categories, although the skills requested are quite different.³ Buttler and Garcha surveyed 271 catalogers in academic libraries to determine if and how their job functions have changed over the past ten years. The result showed a change from print to electronic formats, involvement of nonprofessionals in higher levels of cataloging, a trend toward outsourcing, and more cataloging of specialized items,

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audiovisual materials, and digital documents by professional librarians.⁴ Copeland finds in her study a broadened role of the serials cataloger with developments in automation and national standards.⁵ Towsey claims that employers are still looking predominantly for traditional cataloging skills, such as knowledge of AACR and MARC, foreign language cataloging ability, and subject work skills, typically within an online environment. Some employers are also looking to use catalogers for less traditional work, such as cataloging electronic and computer materials, metadata cataloging, and use of the Internet.⁶ Palmer uses a technique to help entering students of his introductory cataloging classes understand the practical value of cataloging skills and to motivate them to devote more time and energy to developing them, especially those abilities that potential employers seem to prize. He asks his students to look at job advertisements in issues of *AL* to note the number and kinds of jobs that request cataloging skills, and the specific kinds of skills that the advertisements request.⁷

The previous studies have focused more on analyzing the impact of automation on changing roles of catalogers and determining the current job functions performed by catalogers and how these functions have changed over the past ten years. The present study aims to assess the impact of IT encompassing an ILS, computer hardware and software, CD-ROM, Internet, and other domains, including MARC 21 formats, CORC, and metadata standards on job requirements and qualifications for catalogers. The results of this study should provide information significant to those library administrators recruiting catalogers, to library and information science educators preparing catalogers, and to library students considering a career in cataloging. Emphasis will be on analyzing the impact of emerging technologies as reflected in job advertisements of the last two years.

Method

Over a two-year period (2000 and 2001), 151 job advertisements were selected for this study. The sources for these advertisements are *C&RL News* and *AL*, recognized in the library field as two major sources of position announcements for libraries. Some announcements were also selected from AUTOCAT, a discussion list on cataloging, which is a source of the most recent announcements. Any duplicate advertisements were discarded.

The study is based on the assumption that announcements will include the necessary requirements for catalogers, including the qualifications, knowledge, skills, and experience generally sought by the employers. The most recent two years were selected for the reason of analyzing current priorities and the desires of employers.

Position Titles

The data gathered for this study show that position titles of catalogers vary. Seventy-three different position titles were found in the 151 announcements examined. Table 1 lists a selection of these titles under two categories—traditional titles and emerging titles.

Of the traditional titles, the most common is catalog librarian, used in nineteen of the announcements. Serials cataloger is the second most frequent, occurring sixteen times; cataloger occurs fourteen times; head, cataloging department, eleven times; cataloging librarian, nine times; and cataloging services librarian and cataloger (monographs), five times each. Other titles are used less than five times and most of them are unique. Several announcements included old position titles even though they required newer skills and knowledge of emerging technologies. It is expected that traditional position titles will gradually give way to more innovative titles reflecting the changing role of catalogers in the electronic or digital library environment. Table 1 includes a list of emerging titles, some of which do not include generic

Table 1. Position Titles (N = 151)

Position Titles	Frequency	%
Traditional Titles		
Catalog Librarian	19	12.58
Serials Cataloger	16	10.59
Cataloger	14	9.27
Head, Cataloging Department	11	7.28
Cataloging Librarian	9	5.96
Cataloging Services Librarian	5	3.31
Cataloger (Monographs)	5	3.31
Emerging Titles		
Electronic/Digital Resources Librarian	10	6.62
Metadata Librarian	5	3.31
Cataloger/Systems Librarian	3	1.98
Cataloger, Print and Digital	2	1.32
Cataloging and Metadata Department Head	1	0.66
Metadata Analyst	1	0.66
MARC Database Manager	1	0.66
Knowledge Manager (Cataloging Section)	1	0.66
Information Architect/Cataloger	1	0.66

terms like cataloger or cataloging. One may find it difficult to comprehend that metadata analyst, metadata librarian, knowledge manager, information architect, and others are, in fact, cataloging positions.

Degree Requirements

Of the 151 position announcements examined here, 123 (81.45 percent) require that catalogers hold an MLS degree. In twenty-one announcements (13.9 percent), the American Library Association (ALA)-accredited MLS or an equivalent graduate degree, such as master's degree in computer science, is required. Of these announcements, six (28.5 percent) are for positions like metadata librarian, metadata analyst, knowledge librarian, and electronic resources cataloging librarian. Five announcements (3.31 percent) make no mention of a degree and two (1.32 percent) ask for a bachelor's degree in a relevant field. Seventeen announcements (11.25 percent) also require an additional subject master's degree.

These figures show that the ALA-accredited MLS is still the preferred degree for cataloging positions. As a matter of fact, the professional degree accredited by the ALA is required for all library jobs. Lynch and Smith have reported in their study that "over 80 percent of all jobs advertised between 1973 and 1998 required a degree from an ALA-accredited program."⁸ However, the trend is also towards a second graduate degree in another discipline, which can be very helpful, especially in subject cataloging.

Required Skills

The skills required for catalogers are given in table 2, and are categorized into two groups. Group 1 skills are those which are basic and have remained relatively unchanged for many years. They include knowledge of standard cataloging tools (Anglo-American Cataloguing Rules, LC Subject Headings, LC or Dewey Decimal Classification, and MARC formats since the 1970s), communication and interpersonal skills, and knowledge of a foreign language. The most critical among this group is the knowledge of cataloging tools, occurring in 91 percent of the announcements. Nine percent of the announcements did not mention this requirement, but it was implied in the statements, such as "previous cataloging experience," "demonstrated knowledge of cataloging principles and procedures," and "familiarity with cataloging tools."

Group 2 skills are directly related to the developments in IT. Most common among this group is the experience with an ILS (80 percent). Thirty percent of the announce-

ments required experience with specific library systems, including Innovative Interfaces, DRA, Endeavor, Sirsi, and others. Libraries seem to prefer the candidates who have familiarity or experience with the system currently in use to those who have familiarity with other systems. Equally important is the experience with one or more bibliographic utilities. OCLC is mentioned more than any other utility for the obvious reason that it is the largest, with approximately 50 million records.

The amount of Internet resources has grown tremendously since the early 1990s. Realizing the importance of these resources to users, the library cataloging community began to attempt to catalog them in 1992. Catalogers used the MARC field, 856, *Electronic Location and Access*, to provide a link between a bibliographic record and a remote electronic resource. However, digital librarians did not find the MARC format suitable for providing descriptions of electronic resources, and began to develop new systems for encoding electronic texts. A number of schemes known as metadata or non-MARC standards, such as Dublin Core, TEI, XML, RDF, and others have emerged during the last five to seven years. University libraries of Columbia, Cornell, Penn State, Alberta, Iowa, and Missouri, known for large electronic collections, are seeking catalogers with experience or familiarity with these emerging metadata schemes and tools. As electronic collections of other libraries continue to grow, the demand for catalogers or metadata librarians with knowledge of non-MARC standards will also increase.

Proficiency with basic computer applications (Windows, word processing software, spreadsheets, and so on) and ITs ranks lower (29.13 percent) in terms of the required skills. However, this is probably due to the assumption that the person who has experience with an integrated system, one or more bibliographic utilities, and emerging metadata schemes and tools would also be conversant with computer applications in general. Xu's division of computer skills for catalog librarians into "the following groups: computer applications, automated cataloging, OCLC, RLIN, and other bibliographic utilities . . ." supports this argument.⁹

Catalogers in several libraries are also assigned the task of Web-site development. For example, one of the catalogers at the King Fahd University of Petroleum and Minerals Library in Dhahran, Saudi Arabia is also the library webmaster. He divides his time between cataloging and Web-site development jobs. Of the 151 announcements examined, six libraries have sought catalogers with Web-site development or Web-authoring skills. This number may increase in the future as catalogers get more engaged in developing Web sites of their own departments or libraries.

Having reviewed the impact of IT on position titles, qualifications, and required skills of catalogers in detail, it seems appropriate to present here a job advertisement for

Table 2. Required Skills for Catalogers (N = 151)

Position Titles	Frequency	%
Group 1		
Knowledge of Standard Cataloging Tools	137	90.72
Communication Skills	99	65.56
Knowledge of Foreign Language	75	49.66
Interpersonal Skills	50	33.11
Group 2		
Experience with an ILS	121	80.13
Experience with One or More Bibliographic Utilities	120	79.47
Experience or Familiarity with Emerging Metadata Schemes and Tools	58	38.41
Proficiency with Computer Applications	44	29.13
Web Site Development/Web Authoring Skills	6	3.97

metadata librarian at Columbia University as an indicator of changing trends toward job requirements for catalogers.

Requirements: Master's degree in library/information science, computer science, or relevant field, or subject master's degree with library experience; knowledge of concepts and applications of standards and practices for organizing information; ability to work in a team environment with diverse group of library staff; ability to plan, coordinate, and implement projects; excellent written and oral communication skills; good organizational skills; and aptitude for complex, analytical, and detailed work.

Highly desirable qualifications: Working knowledge of cataloging principles and procedures including AACR2R, LC Subject Headings and Classification, and MARC 21 formats; working knowledge of standard bibliographic and other reference tools; working knowledge in one or more foreign languages; experience with non-MARC metadata schemes (e.g., Dublin Core, CORC, TEI, etc. and associated technologies (e.g., XML, etc.); familiarity with relational databases; and an understanding of network architecture.¹⁰

Conclusion

Content analysis of job advertisements indicates that the developments in IT have impacted everything from position titles to skills of catalogers. Innovative position titles are emerging. Although the preferred qualification is a

master's degree in library and information science, some libraries are asking for a master's degree in computer science or relevant field, or a subject master's degree with library experience. However, major changes are occurring in the skills area. In addition to knowledge of cataloging principles and procedures, the requirements also include familiarity and experience with an ILS, one or more bibliographic utilities, computer applications, and emerging metadata schemes and tools. According to Buttler and Garcha, more and more catalogers are involved in activities formerly in the domain of systems and automation librarians; St. Clair's thesis is that "digital catalogers will have different tasks from those of paper library catalogers."¹¹ Preparing catalogers for the changing environment would, therefore, require both library educators and library administrators to revamp their cataloging courses and training programs. The present study is expected to help them in identifying the areas for change.

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Remote Observation Strategies for Usability Testing

Susan M. Thompson

Observation is the cornerstone of usability testing and an important strategy in evaluating library Web sites. Traditionally, test administrators have directly observed test users as they interact with the Web site interface. Remote observation offers an alternative that may facilitate the testing process and offer additional capabilities. Usability testing during the California State University San Marcos (CSUSM) Library Web site redesign used a simple remote observation strategy to view the test user's screen on another computer removed from the test location. The library investigated Timbuktu, NetMeeting, and Camtasia as potential software tools to assist in remote observation.

Usability testing has become an important component of Web site development for many libraries. Libraries are user-centered organizations. They provide an entire service—reference—just to help users find information. It is important that their Web sites also meet their patrons' information needs in a user-friendly fashion. The best way to improve a library Web site's usability is to observe users interacting with it and then incorporate their feedback into the site's design.

Norlin and Winters state, "the objective of usability testing is to evaluate the Web site from the user's perspective."¹ Usability testing uses a variety of methods to evaluate a Web site. Battleson, Booth, and Weintrop divide usability testing into three categories: (1) inquiry, which includes focus groups and questionnaires; (2) inspection, which includes heuristic evaluation (comparison of site elements with a list of usability design principles); and (3) formal usability testing, also known as formal observation.² Of the various usability testing techniques commonly used to evaluate Web interfaces, only a few, such as heuristic evaluation, solely depend on the Web developer's expertise. Most usability tests directly involve users in evaluating the interface. For example, card sorting asks users how they would organize the site; matching tests check if users can correctly associate the intended meanings with their icons; and questionnaires and focus groups solicit feedback on users' needs.³

The best-known usability test is the formal observation of the user interacting with the product to be tested. It is the classic usability test. It is so central that the term "usability test" is often synonymous with user observa-

tion. It is so important that organizations are willing to hire full-time usability experts and build special laboratory environments to facilitate the observation process. Most usability experts value the feedback from observation more highly than that of other usability tests—so highly that they are willing to cut corners just to make sure it is done. Krug expresses it most passionately: "Testing one user is 100 percent better than testing none. Testing always works. Even the worst test with the wrong user will show you things you can do that will improve your site."⁴

Libraries do not have special observation rooms or full-time experts, so they must make do with existing facilities and personnel to conduct usability observations. Doing usability testing on a budget has been a theme in the usability community since Nielsen's 1989 paper, "Usability Engineering at a Discount."⁵ With the proliferation of networking technology and the advent of the Web, new ways of conducting usability observations have become possible. Just because most libraries' usability efforts are on a budget does not mean they don't have access to powerful tools to facilitate and enhance user observations.

This paper reviews the direct observation process typically used in library usability studies and introduces an alternative method—remote observation. How the California State University San Marcos (CSUSM) Library applied remote observation to usability testing is described, along with examined software tools. The strengths and weaknesses of the three software packages as remote observation tools are compared against each other and more traditional tools such as video. Finally, several new capabilities made possible by remote observation are discussed.

Direct Observation

In formal usability observation, test users are observed interacting with the Web interface as they perform specific tasks. The tasks should represent real life situations. Hackos and Redish state that it is desirable "to observe users performing a task they ordinarily work on."⁶ The tasks should indicate the specific results users should achieve and should be small enough to fit within the testing time frame. Nielsen suggests that the test should start with a simple task to increase test users' confidence and end with a task that produces a tangible result so users feels they have accomplished something.⁷

Generally, it is considered important that the test subjects represent real users of the finished site. In cases where the site has several distinct audiences, Nielsen recommends testing additional users.⁸ Norlin and Winters suggest identifying a target group that represents the site's primary users.⁹ Krug, on the other hand, believes "it

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doesn't much matter who you test."¹⁰ While it is desirable to find users representative of the target audience, he feels most site problems will be found by anyone with basic Web knowledge.

Many evaluators recommend testing only a small number of users, often referring to Nielsen's 2000 Alertbox article in which he explains that five users find 85 percent of the problems in a site.¹¹ Krug and Hackos and Redish suggest two or three users may be sufficient.¹² Spool, who had originally also endorsed a low number of test subjects, has recently challenged the idea that five users are sufficient, suggesting that it may take many more to find the majority of problems in a site.¹³ One of the benefits of testing fewer users is the ability to create a more nimble, affordable process that can encourage iterative design phases and multiple usability tests.

It is important to conduct tests involving users in an ethical fashion. While usability testing is not physically dangerous, it can be distressing to users. It is the test administrator's job to minimize the psychological risk.¹⁴ In addition to making sure the user feels as comfortable as possible during the test, the test administrator should also ensure the confidentiality of information obtained from the test. The principle of confidentiality and privacy is particularly important in libraries, which abide by the American Library Association's Code of Ethics.¹⁵ Informed consent is a mechanism to provide information about the test to the user along with an explanation of their rights. In academic and research settings, a formal process is usually established which lays out the rules and procedures for conducting tests involving human subjects.¹⁶

Typically, in a formal usability observation the test administrators include a facilitator and one or more observers. The facilitator gives the test participant instructions and assists the user through the test without actually directing them. She usually debriefs the user at the end of the test using a questionnaire or structured interview. Chisman, Diller, and Walbridge found that debriefing can be particularly helpful at getting at intangible interpretations of what constituted success for the user. One of the key roles of the facilitator is to provide reassurance and encouragement to the user. A common theme throughout the literature is the importance of reassuring the user that it is the Web interface that is being tested, not their skill in using the Web.¹⁷ The other key role of the facilitator is to encourage the user to think aloud in order to "to get at users' inferences, intuitions, and mental models as well as their reasons for the specific steps they take and decisions they make while doing the task."¹⁸

The role of the observer is to take notes on the user's interaction with the interface. It can be very difficult for the facilitator to take notes and interact with the user at the same time. Observers can record significant remarks from the facilitator as well as the user's comments, on-

screen actions, path through the site, and time to complete the tasks, leaving the facilitator free to interact with the user. Hackos and Redish recommend the observer "overdo the note taking" on the theory you can't have too much information.¹⁹ Most studies used one observer in addition to the facilitator, but there can be as many observers as the room will hold. Krug and others advocate inviting stakeholders—decision makers and people involved in the development of the site—to observe.²⁰ Seeing how users actually interact with the Web site can be a powerful way to convince stakeholders and Web designers to make changes needed to meet users' needs.

The observer tries to stay out of the user's sight and be as unobtrusive as possible. Being observed can be intimidating to users, particularly when several people are watching them, and their performance and behavior may be affected. The tendency of users to change their behavior when they are aware their performance is being monitored is known as the Hawthorne effect.²¹ Nielsen recommends conducting usability observations with as few observers as possible.²² The observation process also has pitfalls for facilitators and observers. It is tempting to offer advice during the test or to get caught up in the drama and forget to take notes. Other methods of observation may provide more detachment for the observer and intrude less on the test user.

Some organizations have built special laboratories in which to conduct usability tests. The laboratories usually have a separate observation room with a one-way window overlooking the user test area. Video cameras transmit information on the test screen to observers in a special observation room. The separate room helps promote objectivity and allows multiple observers to freely discuss the test as it is happening.

Traditionally, usability observation studies use video cameras to record the test, whether or not a usability lab is available. One video camera tapes the screen while a second camera may be used to monitor the user's facial expressions and record comments. An advantage of videotaping is that it allows in-depth observation to be made later in a controlled setting, without the user present. The observer can review a particular behavior several times or share information with colleagues.

Libraries do not usually have access to a special usability laboratory or even necessarily video equipment. None of the library sites in the literature reviewed used a laboratory, although several appropriated a classroom or conference room for their testing. Only two of the twelve library case studies reviewed used video cameras.²³ Many libraries do not have ready access to this type of equipment, nor do they tend to have testing situations that easily accommodate setting up video equipment. In addition, the equipment itself can be intrusive and intimidating to the user. While acknowledging the advantages

of laboratories and video equipment, Nielsen does not consider either essential for conducting practical usability tests.²⁴

Remote Observation

In usability studies users typically are observed directly by the test administrators. However, observing users remotely is a viable alternative that is being explored. Ivory and Hearst describe remote testing as methods that allow you to test users in a different location.²⁵ The evaluator doesn't observe the user directly, but rather observes or gathers data over the network. Hartson et al. define remote usability testing more specifically to be "usability evaluation wherein the evaluator, performing observation and analysis, is separated in space and/or time from the user."²⁶

Same-time/different-place testing means the test administrator observes the user at the same time they are performing the test but from a remote location, usually by observing the user's screen over the network using such specialized software as PC Anywhere. The test administrator can communicate with and listen to the user via speakerphone or, in the networked environment, a computer microphone. This type of live viewing of a remote site is what remote testing most commonly means. Different-time/different-place testing means the test administrator observes the user's actions later, usually from some kind of recorded medium. Different-time/different-place testing may rely on the user activating special software on a computer and sending the results to the test administrator. The test administrator cannot directly observe and interact with users in different-time/different-place testing.

Remote observation offers several potential benefits over direct observation. A primary benefit is the ability to reach more users in more locations than traditional methods allow. In particular, it can make it easier to gain access to and schedule users, particularly in certain groups such as busy administrators or faculty.²⁷ Certain types of remote observation may also be less intrusive to test users; possibly reducing the Hawthorne effect. The network offers alternative methods to administer usability tests. Hammontree, Weiler, and Nayak state, "usability evaluators can now view computer networks and modem connections as frameworks upon which distributed usability labs can be constructed and all network or modem accessible machines as potential windows into remote test sites."²⁸

Hartson et al. describe seven types of remote evaluation:

- **Portable evaluation** involves taking a testing laboratory (basically such equipment as video cameras) to the user's location.

- **Local evaluation** at a remote site requires the test administrator to send the prototypes and interface to be tested to the user, who then evaluates them and sends the results back to the test administrators. Sometimes local evaluation takes the form of subcontracting with a local expert to do formal usability testing with a group of users and having the results sent back.
- **Remote questionnaire/survey** embeds a questionnaire in the application itself so that feedback is requested at appropriate places as the user works with the application.
- **Remote control evaluation** controls a local computer from another computer at a remote site. Software such as Timbuktu or PC Anywhere establishes the connection over the network. Audio capture can be made via phone or computer microphone.
- **Video conferencing** uses a computer-to-computer teleconferencing connection over the network to capture input from a video camera at the user's site.
- **Instrumented remote evaluation**, similar to remote questionnaire, embeds code in the application to be tested and logs significant events or actions by the user.
- **Semi-instrumented remote evaluations** require the user identify significant events affecting their performance and trigger the logging mechanism.²⁹

Many of the researchers in remote usability testing are searching for ways to automate and thereby simplify data collection and, possibly, usability information analysis. A number of usability analytic tools have been developed. For example, WebSAT checks HTML code against a set of usability guidelines, and NetRaker helps create online surveys that gather feedback as users interact with the site. While some tools have been developed to facilitate gathering and analyzing data from usability observations, they are not particularly useful for remote observation.³⁰

The most useful remote observation tools have actually been developed for other purposes. Preston lists nine tools that assist in remote observation over a network that are equivalent to Hartson's remote control type of evaluation.³¹ These tools come from a variety of software backgrounds, including remote control, support desk and customer service, telecommuting, system administration, and video chat. Hammontree, Weiler, and Nayak recommend tools developed for cooperative computer-support work as being particularly well suited for remote usability testing.³² They define these tools as being able to provide three capabilities: sharing window applications between two or more computers in real-time; sharing a common whiteboard to write on and paste screen shots; and displaying live video of the remote person on the screen. Hammontree's definition expands on the video-conference type of remote evaluation that Hartson

describes.³³ CSUSM found that the most basic capability needed for remote observation was a screen viewer. Many of the tools Preston lists provide this capability in one form or another, particularly as part of remote control, support desk, and application sharing functions.³⁴

Remote observation over the network, particularly same-time/different-place testing, is vulnerable to technical difficulties. Not only must the test administrator ensure the Web site and underlying Internet technology is functioning, but also that the additional observation software layered over the top is working. Before using remote observation software over the Internet, it is important to test it ahead of time outside the local network to check for problems with firewalls. Most non-Web-based software will not work with all operating systems. If the remote computer is a Macintosh, it may not be controllable by PC-based software. The Web is also not completely uniform in technology. Different browsers and different browser versions can cause unpredictable results when you test outside of a controlled environment. A final issue in working with remote test users that Hong et al. mentions is the need to install software on the user's local computer, and, in some testing situations, to return data from the user's machine to the test administrator.³⁵

CSUSM Remote Usability Observation

In spring 1999 we initiated a project to redesign the CSUSM library Web site. The primary mission of the redesign was to address concerns from users and librarians on finding material on the site. Several evaluation strategies were used to guide redesign efforts. Early in the project, we conducted an informal observation of the old site to identify specific problems, particularly relating to navigation. We held focus groups and distributed questionnaires to better understand students' library Web needs and their opinions on Web site improvements. Finally, we examined logs of Web site activity to identify high-use areas of the existing Web site. We used this information to build the site navigation structure and develop the look and feel of the site.

Near the end of the project, we conducted a formal usability observation to evaluate the prototype of the new site. The goal of the observation was to determine how successful users were in navigating our new interface. We studied five volunteer users selected from student employees of the library. Three sets of questions were developed for the test. A questionnaire at the beginning of the test session gathered demographic information. The formal observation test consisted of eight typical student research tasks. At the end of the test, the facilitator was joined by the observer to debrief

the user with a series of questions on their overall opinion of the site.

The test administrators consisted of a facilitator and an observer. The facilitator was the user's advocate and responsible for all interaction with the user. The facilitator established the initial contact with the user, explained the basic purpose of the test, and scheduled the test session. During the test, the facilitator gave users their tasks, waiting until one was completed before providing the next task. She encouraged users to think aloud, provided reassurance, and prompted users to keep them moving or to find out their thoughts. The facilitator was responsible for recording significant user comments and observations of the users' attitudes and behavior.

CSUSM developed a remote observation strategy. Rather than having the observer in the same room with the user, directly viewing the test screen, or using a video camera to record the screen for later evaluation, we used a screen viewer to allow remote observation. The screen viewer enabled the observer to sit in a separate room and view the user's interaction with the Web site interface on his or her own computer screen. Using Hartson's criteria, we conducted a same-time/different-place remote observation using a remote control evaluation tool to view the user's screen.³⁶

We chose to observe from a remote location to improve both the user's comfort and our concentration. We felt a silent observer behind the user's shoulder would be intimidating, unlike the facilitator, who could establish a friendly, interactive relationship with the user. Informal observations at the beginning of the development process indicated that it was easy for the observer to become caught up in the action and lose focus. In our formal observation, we wanted to provide the observer with a more detached, objective environment to facilitate focused observation and detailed recording. We accomplished this by using remote observation.

The observer was introduced to the user at the start of the test and participated in debriefing the user at the end. Otherwise, the observer adjourned to a separate room. In our case, the room was close enough for the observer to hear the conversation between the interviewer and the user, which helped to put the user's actions into context. We used Timbuktu computer support software as our screen viewer. We selected Timbuktu because it was already installed on our computers as part of the campus computer center's remote support efforts.

The role of the observer was to watch the user's interaction with the interface. The observer recorded users' selections, including button clicks and input in boxes, and noted their paths through the site. She also recorded less obvious cues such as hovers over buttons and dithering between areas of the page. We felt that a great deal could be learned about a user's thought process by his or her mouse behaviors before actually making a selection. This

also helped compensate for not being able to see and perhaps hear the user. The observer found hovering could indicate confusion or indecision over the meaning of the button label. Dithering back and forth between different buttons seemed to indicate confusion as to which of two or more choices was the correct one. The facilitator's recorded observations of the user's behavior at these points, as well as overheard comments, helped confirm the observer's interpretation of the mouse behaviors on the screen.

Usability testing showed that students were indeed more successful in navigating the new site. One problem observed with the old site was that students would select the Site Search button as a first choice for conducting their subject search. No one made that mistake with the new Site Contents label. The Research Hub secondary navigation page significantly reduced confusion about where various resources were located within the site. In looking for books and journal articles, users were fairly evenly split on whether they used the site's menu structure or the quick link buttons that led directly to the heavily used library catalog and online indexes. Since users didn't clearly prefer one navigation structure over the other, we felt justified in offering both types of navigation. All of the students tested indicated a clear preference for the look and navigation structure on the new site.

Usability observation revealed that the most serious problems with the new library Web site concerned terminology. The librarians worked together to develop labels for the site but had a lot of difficulty identifying clear terms for some resources. For example, "online indexes" was a compromise that substituted library jargon, "indexes," for computer jargon, "databases," and used the generic "online" rather than "journals" because the sources included other types of materials. In recognition of the confusing nature of some labels, the final site included explanatory roll-overs on the Research Hub secondary navigation page where the resources were listed. The users tested made extensive use of these explanations. Their eyes caught such descriptive terms as "book," "journal articles," and "media," which contributed to their success in selecting the right resource to use. During the debriefing, several users were enthusiastic about the explanations and suggested the use of even more roll-overs, especially on the home page. As a result, supplementary explanations were added to all selections on the homepage, secondary navigation pages, and navigation elements on the content pages. Most of these additional explanations simply used ALT tags, which proved to be beneficial when we revised the site for ADA accessibility. While roll-over and ALT tag explanations helped compensate for inadequate terminology, creating more intuitive labels will be a major focus of the next Web site redesign.

Terminology also caused problems with navigating our basic menu. We designed the site to separate infor-

mation about library services from the electronic resources, which we called the Research Hub. The idea was to create an area where users would be able to see all their research choices in one place. Once in the Research Hub navigation screen, we found that users were very successful in identifying the various resources available to answer their questions. Testing, however, showed several of the users had trouble getting to that page in the first place—they were selecting "Library Services" and ignoring the Research Hub button. We quickly determined the solution was to bring the Research Hub menu choices up to the main homepage. Unfortunately, by conducting a usability test at the end of the project, we had run out of time and resources to make such a major change to the site before it was released. If we had conducted our usability observation tests early in the site-development process it would have been much easier to incorporate the results in the final design.

Remote Observation Tools

CSUSM has tried three different types of software for remote observation: Timbuktu, Microsoft NetMeeting, and Camtasia. We used Timbuktu as our screen viewer for the usability test because it was already installed on our computers. Shortly after our testing was completed, the campus stopped using Timbuktu. As a result, we experimented with Microsoft's NetMeeting, which was readily available as part of Microsoft Windows on our newer machines. Although designed to facilitate meetings, the software includes the ability to view a screen on a remote computer. Both Timbuktu and NetMeeting are same-time/different-place screen viewers based on network technology. A third product, Camtasia, is a free-standing screen recorder. After seeing a colleague's transcript of an information literacy session recorded with Camtasia, it became apparent that it would be an ideal method for recording usability observation tests.

Timbuktu Pro for Windows

Timbuktu by Netopia is a remote control technical support program.³⁷ The software is used by computer support personnel to remotely troubleshoot and maintain end-user computers. It can transfer files, load programs, run remote programs, or control the user's computer from the help desk. The program also allows you to simply observe the user's actions. Timbuktu must be installed on both the test user's computer and the observer's computer. To establish an observation session, the observer selects the Observe option and then contacts the user's computer using either the computer name or IP address. The software sends a message to

the user's computer asking for permission to make the connection. As soon as the user accepts the connection, their screen appears on the observer's monitor. The observer can adjust the viewing area but cannot control anything on the user's computer. Figure 1 shows the Timbuktu connection window open on the observer's computer with the test user's screen visible in the Remote window with the black background. Timbuktu is one of the few products with versions for Macintosh computers. Timbuktu Pro for Windows costs about \$170 for a twin-pack; Timbuktu for Mac OS twin-pack is about \$190.

Windows NetMeeting

Microsoft's Windows NetMeeting is designed around a conference call metaphor and enables two or more people to communicate or meet online.³⁸ A session is started by calling another user's computer using the computer's name, IP address, or the user's network name. The called computer, as in Timbuktu, must accept the call in order to participate. The computers that are connected are participants. Upon acceptance, you have a connection to the computer and can talk if the microphone is enabled, but you must take further steps to see the user's desktop. The observed or remote computer must share their desktop. The Share function allows another computer to run programs on the remote computer. To simply observe, the Share function is activated with only the desktop specified. Figure 2 shows the NetMeeting connection window with the Share window open as it appears on the test user's screen.

Like Timbuktu, users can chat, transfer files, and run remote programs, but with NetMeeting they also have a whiteboard collaboration tool and options to simplify hosting meetings. One of the most significant differences is that NetMeeting allows you to activate the computer's microphone so that you can listen and even talk to the user. You can also add a video capture card and video camera to see the user and enable video conferencing. Windows NetMeeting 3 is included in Windows 2000 and XP and available as a free download for other Windows PCs.

Camtasia 3.0

TechSmith's Camtasia operates under a different principle than the two screen viewers, Timbuktu and NetMeeting. It is not intended to facilitate live interaction between two computers or two users. It is, instead, a screen recorder.³⁹ It records all the action that takes place on the screen with the expectation that it will be played back at a later time. As the name implies, Camtasia mimics the actions of a video camera. As a result, it shares many of the benefits of videotaping while avoiding some of the pitfalls. Camtasia

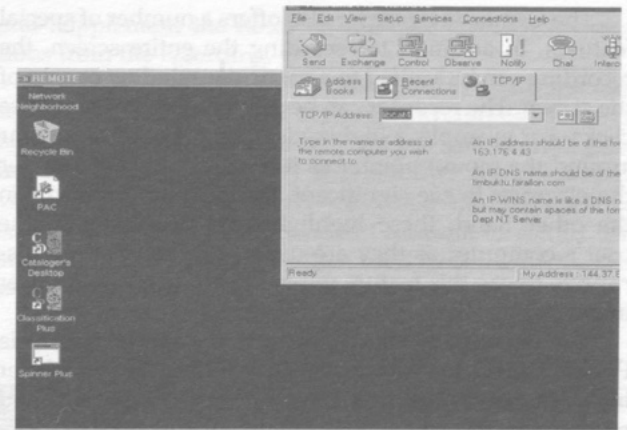


Figure 1: Connecting Timbuktu to a Remote Computer

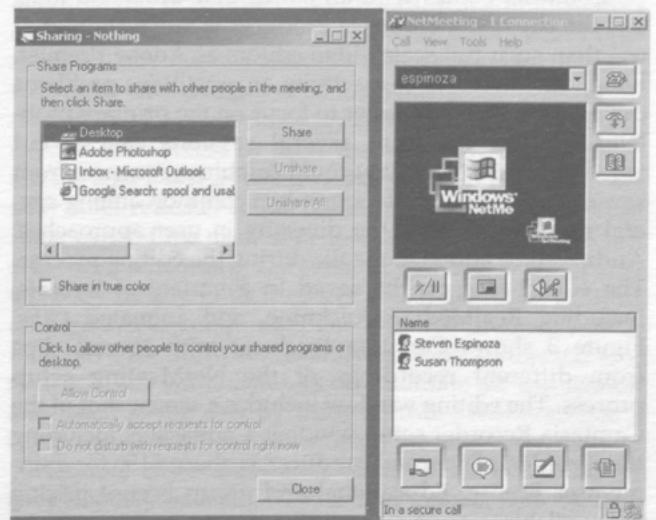


Figure 2: Sharing the Test User's Desktop Using NetMeeting

is best used for different-location/different-time remote observation.

Camtasia consists of three pieces of software: the Camtasia Recorder, the Camtasia Player, and the Camtasia Producer. The Camtasia Recorder must be installed on the computer to be observed. Before the test begins, a test administrator sets the software to record. From that time forward, until it is stopped, Camtasia records all the action on the screen. Recordings are saved in the industry standard .avi file format. Sound can also be recorded using the computer microphone.

The Camtasia Recorder also offers a number of special features. In addition to recording the entire screen, the recording can be limited to a particular window or area of the screen. The recorder can be set to highlight the mouse clicks. For example, a highly visible red circle can appear around the mouse pointer as it clicks, making it easy for the observer to see significant actions on the screen. On the other hand, these highlights are occurring on the user's computer as they are using it. It may be too disruptive to use this feature while attempting to test a user in a natural setting.

The recorded file is viewed with the special Camtasia Player. The capture plays back in real-time, but the player includes standard controls to pause, fast forward, and rewind the recording. The quality of the playback can vary depending on how well the recording software was configured for the machine it was installed on. Without any configuration, the recorded image can be somewhat degraded and the cursor movements jumpy. After configuration, the quality becomes quite acceptable.

Camtasia comes with an editor that trims and joins .avi file clips. The Camtasia Producer is much simpler to use than such full-scale video editors as Adobe Premier. Long, dull stretches of inactivity or repetitious problems can be cut out so it is easier to focus on the primary problems. Recordings from several sessions can be cut together. For instance, you could combine sequences from several tests to illustrate a problem common among several users or to show the diversity in user approaches. Audio can be added to the file during the editing process. The edited files can be saved in a variety of formats, including RealMedia, Quicktime, and animated GIFs. Figure 3 shows Camtasia Producer with several clips from different recordings of the NetMeeting setup process. The editing window includes a screen shot of the Camtasia Recorder setup window. Camtasia 3, including the recorder, player, and producer, is about \$150 for a single-user license. Educational and group license pricing are available.

Comparison of Remote Observation Tools

Screen viewer software allows the test administrator to observe the test user's screen from a remote location. Screen viewers such as Timbuktu and NetMeeting do not require any special equipment or testing room. In a way, screen viewer software gives the test administrators the option to mimic the usability lab's one-way mirror observation room environment using their normal facilities. The software provides an excellent quality image of the user's screen, better than that provided by most video recordings. Software with screen viewing capability is



Figure 3: Camtasia Producer Editing a Recording of an Observation Setup

readily available and relatively inexpensive. On the other hand, screen viewing software needs to be installed on the test user's computer. This is not a problem when the computer is under the test administrator's control. However, if the test is run on the user's own computer, the test administrators must arrange for the user to acquire and install the appropriate software, making sure the viewer works with the particular operating system on the test machines. An advantage of NetMeeting is that it is already installed on Windows 2000 and later operating systems. Finally, screen viewers may encounter firewall issues trying to access other locations over the Internet.

Removing the observer from the vicinity of the user can create issues that need to be addressed. It is difficult to facilitate the user's test experience if all test administrators are remote from the user. The role of the facilitator is very important, particularly in reassuring the user and prompting them to think aloud. Voice technology such as speakerphones or software such as NetMeeting can help compensate for separation between test subjects and administrators.

Recording technology captures the user's screen actions as they occur. Videotape is the primary recording medium referred to in most studies; however, you can

also record with audio tape and software like Camtasia. The primary advantage of recording is the ability to view the test session at a later time. The problem with same-time observation, whether direct or using a remote screen viewer, is that the observer has a single pass at data collection. The observer has to make decisions about what is important to record and can't review alternative data later. With a recording, the observer can control the session, pausing it to take notes or to repeat a section to enhance understanding. The recorded observation can be shared with colleagues for additional input or to show stakeholders why certain features do not work.⁴⁰

Video recording offers several other advantages over screen viewers. Audio is always available as part of the recording, although it is not interactive. It is possible to capture the user's face showing their reactions as well as the screen activity itself. Finally, video taping does not require control of the user's computer, no software needs to be installed or configured. On the other hand, video recording equipment can be as intrusive as the presence of human observers in the room with the users. The room itself needs to facilitate placement of the video equipment. The library may need to acquire or borrow equipment, such as video cameras, tripods, and VCRs. The image can roll because of the difference in frames per second between the camera and the monitor, resulting in poor playback quality of the videotaped computer screen. A scan converter can correct this problem but adds another piece of equipment to be acquired and setup. Evaluation can take much longer when writing observations from videotape—up to ten times the duration of the original user test, according to some estimates. In many cases, no one bothers to view the tape at a later time—it is never used.⁴¹

Camtasia shares many of the benefits of video cameras while escaping some of the problems. Since no equipment is involved, it is as unobtrusive to the user as the screen viewers and even allows unattended recording. It is much easier and quicker to scan a Camtasia file than a video tape, which may also increase the likelihood that the recording will be viewed later. The file is easy to edit, and image quality is better than videotape. Since Camtasia is only on the user's machine, there are no issues with firewalls and communication over networks. The completed file can be sent to the test administrator in a variety of ways. Disadvantages of Camtasia include the fact the software must be purchased and installed on the test user's machine just like screen viewers. Unlike video cameras, Camtasia only records the action on the screen; it can't provide a view of the user's face.

Camtasia can assist single test administrators. Trying to facilitate the test, observe users' behavior, and take meaningful and extensive observation notes at the same time is difficult. Camtasia allows a single test administrator to focus on facilitation without worrying about equipment or extensive note taking. Later he or she can go back

and supplement the notes on the user's screen interactions from the recording.

Of course, libraries are not restricted to using just one remote observation tool. It is possible to combine them to benefit from various features. Camtasia can record a testing session that is remotely observed live using a screen viewer. For instance, when we tested the NetMeeting screen viewer, we also activated Camtasia to record the session. The recording was then used to demonstrate the use of NetMeeting in remote observation.⁴²

Other Possibilities for Remote Observation

Remote observation opens up new possibilities in library usability evaluation. Test users do not have to be physically proximate to the test administrator. In fact, test users do not even have to be aware that they are being observed, although this may raise ethical issues. Test administrators can more easily show developers and stakeholders how users actually interact with the Web site, making it easier to explain why changes need to be made.

Screen viewing technology allows usability experts to expand their access to users for testing. It is possible to see the user's screen whether they are next door or in the next state. Whether or not the library wants to geographically expand the users they test, remote observation can also make scheduling test sessions easier. It is possible to test busy faculty in their offices and students off-campus on their home computers. The only requirement is that they have the software installed and are connected to a network. Test administrators can facilitate the test session and listen to the user by using software that activates a computer microphone or by using the telephone.

Remote observation tools open up the possibility of anonymously watching users as they interact with the Web site in a natural setting. For instance, a screen viewer—or better yet, a screen recorder installed on a public reference machine—allows the usability expert to watch how walk-up users in the library behave during spontaneous searches. The advantage of anonymous observation is the ability to see completely natural search behaviors that are not influenced by the testing situation. However, the uncontrolled nature of the observation can make it difficult to interpret the results. Preece points out that the reason for the observation influences the method used.⁴³ If the test administrator needs feedback on specific tasks, same-time observation with controlled questions provides better results. On the other hand, if the test administrator wants to see how users utilize technology in general, observation in the natural environment may be more suitable.

A number of usability experts point out the best way to convince a programmer or other stakeholder to change

is to show them how successfully, or unsuccessfully, users interact with their site. Traditionally, the easiest way to show user interaction to a programmer or decision maker was to invite them to observe the testing from the observation booth in a usability lab. Libraries often do not have the option of using a special lab, but it is possible to setup a screen viewer on a computer away from the testing situation, either in an observation room or in the stakeholder's own office. Recording the test session allows you to share the information with others after the test has been completed. However, most stakeholders that are peripherally involved with the project may not be willing to sit through hours of tapes. Camtasia's Producer makes it possible to easily edit test recordings into a highlights version that points out the most significant issues.

Remote observation opens up some additional questions on the ethical testing of users. For instance, when remotely observing the screen of a public machine, the user's identity is anonymous to the test administrator. Is it a violation of the user's privacy to observe their actions without permission if their identity is unknown? If we don't know who the user is, can we then assume confidentiality is assured? Is confidentiality a problem if the user is required to login to the computer or a record is kept of individuals who sign up to use the library computers? Do rules regarding informed consent and human subject research apply when the user is never directly engaged in the research? How are the user's rights and confidentiality maintained if people other than the test administrators are allowed to view the test session or a recording of it?

Conclusion

Web sites are no longer just the public relations face of the library. With the advent of Web-based catalogs and journal indexes, access to most library resources depends on the library's Web site. The dependency is tightened as libraries add actual content online, such as full-text articles and e-books. Users have come to expect to use these resources without the help of a librarian. A well-designed Web site has become essential for serving users.

The usability experts reviewed all agree that observation is the most informative usability test for effective Web interface design. Remote observation tools can facilitate the observation process and enable libraries to accomplish more with their limited resources. Screen viewers can help compensate for ad hoc testing facilities by allowing observation to take place in another room, which also makes the observation process less intrusive to the test user. Software enables recording test sessions without acquiring additional equipment, which may be obtrusive to the test user, and helps solo test administrators conduct a more thorough usability test. Remote

viewing and recording technologies can also expand a library's usability testing efforts by reaching users they might otherwise not be able to test, observing users searching in their natural environment, and sharing the results with stakeholders persuasively.

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Communications

TECHXNY June 2002 and Implications for Libraries

Judith Gelernter

If the morning weather report predicted rain, would you carry an umbrella? The annual Technology Exchange Week (TECHXNY) conference predicts gales and calms in the information technology (IT) industry, and we in library IT who share the climate should listen. Whether you choose to carry an umbrella is up to you—and your patrons.

TECHXNY, with its emphasis on innovative business-related technology, commands a position to suggest IT trends. TECHXNY suggests what's hot, what's in, and what's on its way out.

How might knowledge of IT trends help in the library? It might prevent us from planning—or worse, investing in—products that are too new or too old. Ironically, it is fortunate that library budgets do not in general allow us to sit at technology's cutting edge where we might be more likely to take a costly electronic risk. Our library missteps are perhaps more likely to lead us down the path of purchasing obsolescent equipment or omitting security features we ought not be without. Presented are some industry trends extracted from exhibitions, talks, trade publications, and promotional literature that flowed freely at the TECHXNY conference. These trends can, in turn, help set the agenda for the library. It is hoped that this essay can help guide library IT strategy and assist in prioritizing purchases, suggesting what may be eliminated

and helping focus on present and upcoming essentials.

TECHXNY, in its twentieth season, welcomes thousands of attendees annually. This year, exhibitors from over three hundred of the world's leading IT companies participated, including Compaq, HP, IBM, Intel, Iomega, Microsoft, Palm, Samsung, Sony, ViewSonic, and Xerox, to name a few. Microsoft, IBM, and others provided keynote speakers. Special sessions were held on topics such as Win2000, Linux, start-ups, security, storage and high availability, and IT infrastructure.

Discussed following are a few of the conference themes that have particular bearing in a library setting: hardware (such as physical objects), telecommunications (for example, communication over a distance), and IT in the organization (that is, overall functioning of the system). The relevance of each theme is considered first for the industry in general and then specifically for a library setting. These observations are less recommendations than what are intended to be taken as provocative ideas.¹

Hardware at TECHXNY

In a departure from conventional usage, the exposition publicity proclaims that "PC" now stands for "Pervasive Computing," in that the desktop system is no longer the sole platform for productivity. Instances of pervasive computing represented at the conference included laptops, notebooks, and PDAs as well as desktop computers. Other products shown were digital video creators, speech-enabled server appliances, credit-card-sized digital cameras, color print/scan/fax copiers, and 3D-Album photo presentation software, to name a few.

One of today's prime IT marketing conceits is to describe a product as a solution. In point of fact, many of the latest solutions have yet to settle on problems significant enough to war-

rant purchase of the gadget. It is difficult to arrive at any conclusions about the range of devices represented because a conference presence of some gadget does not necessarily reflect its acceptance or share in the market. Take DVD, for instance. The Digital Video Expo was described in the conference program as "the largest professional video event on the East Coast focused exclusively on digital video tools and technology," and the extensive DVD sessions were open to all conference attendees free of charge. Representation of DVD at the conference, however, does not reflect its use at large. Show director Christina Condos mentioned to me that the CMP DV Media Group had paid for this promotion. Not represented at the conference was holographic storage technology that may soon compete with DVD. InPhase Technology has developed a prototype device called Tapestry for holographic video storage that can hold up to 100 GB (the equivalent of about twenty compressed feature films) on a single disc. It is predicted that the device will ship in 2004.²

In prime keynote position (first speaker, first conference day), Microsoft's group vice president of productivity and business services, Jeff Raikes, introduced us to Office II, scheduled for release in July 2003. Microsoft is developing the new version of Office to allow us to "reach into the information . . . and take what we need," said Raikes. This strikes a chord for those in our profession. But search features are not the inspiration for technological development—the trend is toward the all-in-one: small devices that act like notebooks, schedulers, e-books, and telephones with Internet access. Microsoft appears to be developing software for such all-in-one devices. A selection of gadgets produced by Microsoft Partners was exhibited, including laptops with horizontal and vertical screens, PDAs with a stylus that writes like a pen, and cell phones with Internet access. Applause at the

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display of these breathtaking innovations interrupted his talk twice.

Pen-and-paper note takers may be amused at the thought of audience excitement over the ability to use a stylus to touch a screen ruled with loose leaf paper-like blue lines, but Microsoft believes that it is offering us what we are familiar with and want, albeit in a physically heavier form with components that break and a warranty that expires. In the final analysis, the pen-and-paper note takers challenged by reading their own handwriting may envy the digitally equipped.

Telecommunications at TECHXNY

Gadgets, sessions, and keynotes converged on the telecommunication topics of how the hardware is connected (wired or wireless technologies) and what resources these connected machines should provide.

In a preconference survey, 89 percent of conference attendees rated wireless technologies "hot." While wires transmit current over metal or glass, wireless technologies send electro-magnetic signals through the air, in forms such as infrared, cellular, wireless fidelity, and Bluetooth.³ TECHXNY publicity for the session titled "Wireless LANs, WANs, and Security" stated that "no next generation wireless data technology is more hyped—or hoped for—than high-speed, wide-area wireless networking." Despite sizzling expectations, insufficient registration forced the Mobile Wireless presenters to cancel their session. Cancellation may be attributable ultimately to the fact that many conference attendees know that at present, performance of most wireless transmission is generally comparable to wired transmission at speeds of only eleven Mbps (megabits per second), and that security is an even more daunting problem when wires are bypassed.

Even tied to wires, the Internet is accessible now on more devices more of the time than ever before, and speed remains a priority. An exhibit hall nicety sponsored by AMD was an Internet café offering a number of Internet-enabled public computers. By mid-afternoon, there was a long line of people waiting for virtual service. But the ideal Internet does not make people wait. Overcoming bandwidth limitations will continue to challenge the industry and guide development for the foreseeable future. The striving for greater bandwidth capability was cited as a top technology trend at the January 2002 meeting of LITA, and the trend continues.

The maturing Internet is more than a series of static sites for users to navigate—it is itself a stream. A major thread of the conference was devoted to Web services that can be provided along the stream. One of the clearer definitions describes Web services as a series of present and evolving standards designed by the World Wide Web Consortium (W3C) to promote cross-platform program-to-program communications. W3C has specified a template (Web Services Description Language—WSDL) and a procedure call protocol (Simple Object Access Protocol—SOAP) as official standards. Web services allow programs that do not ordinarily work together to communicate and share resources.⁴

IBM's senior vice president of technology and manufacturing, Nicholas Donofrio, gave an overview of Web services in his keynote address. He prophesied computing-on-demand that will allow users to tap into a stream of services and pay only for what they use. Linux Virtual Services, introduced by IBM this summer, is an example of computing-on-demand that allows companies to access particular Linux applications on an as-needed basis. The goal of developing Web services to their full potential, Donofrio pointed out, is beyond the capability of any single company and must be shared by the entire industry.

Glowing forecasts of various Web services appeared regularly in spring and summer 2002 IT journals. Here's a typical claim from such an article: "Today's technology is able—better than ever before—to map systems to systems, applications to applications, and applications to people in some very powerful ways. . . ."⁵ It has been reported that Amazon.com and Google plan to introduce Web services late this summer. Such services are available with the help of Microsoft's .NET or Sun Microsystem's Java2 Enterprise Edition J2EE.⁶

IT in the Organization according to TECHXNY

Iterated in many forms during the course of the conference was the fact that hardware and telecommunication systems are of limited value without people to set up and maintain the systems, and without security that retains system integrity.

IBM's Donofrio acknowledged that, while the goal of IT research continues to be smaller—faster—cheaper, IBM's larger aim is to design a system that is simple and easy to maintain. (As if to underscore the soundness of that objective, on day one of this tech guru conference, two rows of self-registration terminals crashed. Wouldn't a simpler system have been more reliable?) IBM plans to develop a system that will configure and regulate itself.⁷

Suppose that a system, for the moment, is running optimally. How to keep it safe from break-in in today's cyber-terrible society? The Internet security firm Riptech reports that cyber attacks against public and private organizations increased 28 percent from January to June 2002. Traditional firewalls and intrusion defense systems are rapidly becoming obsolete in the wake of viruses that use a blend of baneful techniques.⁸ One track of TECHXNY was system security, and these sessions

were well attended. As one example, an hour presentation on patch management reviewed how to identify and plug holes in a timely fashion.

Software and strategies are not fully effective in stanching the spread of cyber plagues. A July 2002 *eWeek* editorial declares that it is time for programmers to “abandon insecure languages” and preference languages that prize safety over efficiency.⁹ Another writer in the same issue suggests that “maybe it is time for government to step in and help clean things up” because the current situation is deteriorating.¹⁰ At the same time, a *PC Magazine* editorial looked toward the government for help.¹¹ This is despite the government’s National Infrastructure Protection Center (www.nipc.gov) established in 1998 to forewarn and respond early to threats. Cyber territory has become prey to the kind of anarchy that happens only when the punishment for cyber crimes is insufficient deterrent, criminals crack anonymously, and authorities are weak.

Implications for Libraries

Despite the bewildering array of gadgets continually coming onto the market, it might be better for your library if you were to admire most new devices at a distance. Satisfy your curiosity by reading about them in tech journals such as *PC Magazine*, *PC World*, or *TECH Edge* (formerly *Computer Buyer’s Guide and Handbook*), or at a conference such as TECHXNY. It is often wiser to refrain from altering or updating a component of a present system until it becomes necessary. Even when devices are compatible, changes made to a system might compromise its stability.

When you do make a purchase for your system, try to avoid peripherals and instead acquire machines with built-in components. Follow the convergence trend. For example, find

monitors with built-in speakers, CPU with memory enough to bathe in, and computers with CD-R/RW drives installed. Fewer peripherals will lessen the risk of a new gadget growing legs, and will lessen the potential for later incompatibility and upgrade problems.

Whether or not a library should invest in wireless transmission stations depends on user demand and budget, among other things. Laptop docking and wireless stations are especially popular within the academic community.¹² Marshall Breeding evaluates wireless technologies in the library setting and finds that, slow performance and security aside, “libraries will find it necessary to extend their commitment to wireless networking.”¹³ Setting up such a network can be straightforward and affordable at a few hundred dollars per access point and about a hundred dollars for a wireless network card.

A library might use Web services to link otherwise disjointed resources. Once you decide what service your library needs, you can check the Universal Description, Discovery, and Integration Business Registry (<http://uddi.com/find.html>) to determine which company is offering the service you require. The National Library of the Netherlands currently is using Web services. Their Alta Vista indexed catalog uses XML records from diverse sources—electronic objects as well as book records. Their programmer has used the Search and Retrieve via URL (SRU) standard to standardize the interface with additional Web applications.¹⁴ In another Web services application with the Portuguese National Library, the library asks its catalog vendor BookMARC to send ISBN numbers via SOAP message to its catalog vendor and to receive a UNIMARC record in return.¹⁵

Finally, be prepared to defend, and if possible, increase your library budget in defense of system security. Michael Erbschloe, vice president of research at Computer Economics and author of *Information Warfare: How to*

Survive Cyber Attacks, advises that we must absolutely anticipate that more frequent and more intense cyber attacks are coming.¹⁶ The National Cyber Security Alliance sponsors Stay Safe Online (www.staysafeonline.info) with tips for maintaining tighter security on personal computers.

In conclusion, please allow IT problems to precede IT solutions. It is inadvisable as well as expensive to brandish technology for the sake of the show. If you feel that offering wireless docking or Web services would help your patrons or staff substantially, or would allow you to widen your patron base, then by all means, proceed.¹⁷ New services, however, rarely bring on a library budget windfall. If the cost of new services exceeds your annual budget, consider charging to cover costs. The library photocopy machine is not the only tech tool that performs a useful service. Besides, have you noticed that people tend to appreciate services more when they must pay for them?

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Digital Divide in India: Need for Correcting Urban Bias

N. Parvathamma

A digital library is a capital- and technology-intensive project. It is a great challenge to develop digital libraries in countries like India in light of the problems of shrinking budget; high initial and recurring expenditure; and social and economic problems of illiteracy, population growth, poor health conditions, inadequacy of resources for development programs, and weak infrastructure. While access to digital information is possible in more than two hundred cities in India, "voice telephony" is still a major medium of information transfer in villages. This paper discusses the social and economic issues that need to be considered to bridge this digital divide between rural and urban populations in order to ensure sustainable development of the country.

The digital revolution has altered the way society functions at global, local, and personal levels. It has led to changes in the collection, storage, processing, and transmission of information, changes that have resulted in the

evolution of libraries into digital libraries. Many definitions of digital libraries have been put forth, and terms such as digital libraries, electronic libraries, and virtual libraries are being widely used. While digital libraries and electronic libraries contain digitized information along with print-based publications, and may not necessarily be networked, virtual libraries are often defined as "libraries without walls," spread across the globe through communication networks.

India has a population of 1.02 billion (as of March 2001), with an average literacy rate of 65.38 percent. However, the literacy rate varies from 47.53 percent in Bihar State to 96.92 percent in Kerala State.¹ On average, at present, 18.2 percent of rural and 36.9 percent of urban populations have completed at least ten years of schooling, are able to read and write English, and hence, are capable of using information and communication technologies, including digital libraries.²

While 36 percent of the world population has access to the Internet, 2.3 million Indian users, or a mere 0.37 percent of Internet users, accessed the Internet in 2000.³ The majority of these users were professionals from the corporate segment (43 percent) and students (38 percent).⁴ The National Association of Software and Service Companies (NASSCOM) estimates that Internet users in India would increase to 23 million by 2003. This, of course, is provided the projections are transformed into reality by extending Internet coverage from its almost urban, English-centric setting to rural and Indian-language-speaking populations; improvement in bandwidth; and penetration of the Internet

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through the use of personal computers and cable television.⁵ Most villagers still depend upon personal interaction to share information within their community.⁶ This disparity in the use of digital information can be bridged to ensure sustainable development of India by addressing the social and economic issues discussed in this paper. If these inequalities are not dealt with at their roots, then technological access and use will be limited to urban areas and the computer literates, further marginalizing the rural population. This digital divide can be narrowed through digital literacy and training, content development in local languages, development of multimedia products that even those who are illiterate can understand, and utilization of digital technology at the community level. Hence, the objectives of a digital library in the Indian context should be:

- bringing the benefits of IT-based services to people;
- making available the latest information communication technologies (ICTs) to both the business and non-business populations;
- creating awareness in the underserved populations about their basic value;
- offering services which are beneficial to them; and
- making these services and facilities self-sustaining in the long run.⁷

Advantages and Disadvantages of Digital Libraries

The advantages of developing and using digital libraries in India are:

1. Digital libraries can handle multimedia data, which can communicate information more effectively than print media, and can be easily accessed and understood even by those who are illiterate.

2. A large amount of information is freely available on the Internet. The delay in downloading multimedia data from the Internet due to limited bandwidth can be reduced by using high-end modems, ISDN, cable modem, DSL, and Satellite technologies.
3. Digital libraries have enabled the transfer of information at global, national, and local levels.

The disadvantages faced in developing and using digital libraries in India are:

1. Developing countries like India cannot afford to adapt information technology (IT) to its fullest extent due to certain problems such as unreliable power supply, lack of funds for the development and maintenance of digital data, insecure political regimes, and poorly developed communication services.⁸
2. Initial investment in digital libraries is high. Faster development in technology requires continuous updating of hardware and software. Networking access consists of initial costs and recurring expenses.
3. Subscription to information from developed countries may not always be beneficial. For example, a bibliographic database available on CD can be accessed as long as the subscription is valid. If it is discontinued for financial reasons, subscribers will be left without information.
4. Content developed in English may not be relevant in a local context, especially in the rural areas.
5. Lack of standardization is a major problem in the digitization of information in Indian languages.
6. Information freely available on the Internet is still being underutilized due to: (1) low level of research and development and other activities; (2) users not being fully aware of its availabil-

ity; or (3) inability to use latest technologies.

India, however, cannot afford to ignore the advantages of adopting new ITs and digitization of information. There is need for a harmonious integration of existing information systems and services with new technologies. In regard to this, a number of experiments are already under way, such as the Information Village Experiment in Pondicherry. These projects have demonstrated that it is possible to bridge the rural-urban divide by using IT with minimum investment. They have also demonstrated that "things should be done in a small sample, make it work, and then just copy that," rather than starting at a national level, as the benefits of such projects may not trickle down to grass roots at all.⁹

Economic Issues

Some economic issues influencing the use of digital information in India are:

1. Even though the cost of computers and Internet access has been reduced considerably, the cost is still high for an average Indian citizen. Only one million people in India own personal computers. The high cost of computers and Internet access, together with the lack of basic telephone lines, has divided the community into the information rich and the information poor. The problem is further aggravated by illiteracy; for people who cannot read, digital literacy is out of reach.
2. In science and technology, much of the information required by researchers in India is acquired from more advanced countries. Acquisition of such information sources, databases, or access to them requires a substantial amount of hard currency and foreign exchange.

3. Allocation of resources by the government for storing, processing, distributing, and accessing information varies for different types of information.
4. Charging for information also contributes to widen the gap between the information rich and poor. Specialized information may be charged. But a large amount of information is available on CDs and mass media at minimal cost. Such information can be popularized.

Social Issues

Social issues to be addressed for the effective utilization of digital information are:

1. Collaboration among local social workers and other active players, such as government and nongovernmental organizations, is essential to popularize digital information.
2. Local representatives, including women, should be involved along with computer experts in decision-making for the issues related to technological applications. This would help in changing the way people perceive technology and the social practices surrounding it.
3. Digital information can be employed in more useful ways if the local community can correspond in its own language. For example, Tamil has become the first Indian language to have a universally accepted keyboard and encoding scheme for use. Chennai-based private firm Lastech System has launched its e-mail software Indomail, which facilitates sending e-mail in twelve Indian languages. This would let people send and read their mail in their own languages.¹⁰ The Center for Development of Advanced Computing (C-DAC) has launched Internet- and e-mail-ready multilingual

Indian-language processing software called I-LEAP.¹¹

4. Rural communities must be encouraged to share their knowledge, and this knowledge needs to be properly recorded and accessed digitally in local languages. For example, a multimedia, multi-language HoneyBee Network database developed by the Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI) has demonstrated that the local communities and individual innovators are able to learn from each other across large spatial distances, languages, and cultures, being illiterate.¹²
5. IT-enabled activities should be promoted to create employment opportunities among educated rural youth. For example, they can be trained to create databases of local importance and to offer IT services at nominal charges to the rural population. Existing subscribers trunk dialing/international subscribers dialing (STD/ISD) centers can be upgraded to serve as ISPs in rural areas. Gradually, these centers can evolve to support database development, maintenance of hardware, software development, printing, and information services.

Measures for Correcting the Bias

The gap between information rich and information poor, and literate and illiterate can be reduced by setting up community information centers. These centers are to be equipped with multimedia PCs and relevant software to enable even those who are illiterate to use computers using icons and the mouse. For example, by accessing a relevant multimedia-based program, someone who is illiterate should be able to learn how to nurse a malaria patient.

There is need for public-private sector partnership in providing the required infrastructure—such as telephones—in rural areas. Non-governmental organizations can be involved in the popularization of digital information. Value-addition to generic information is essential to make it locale-specific.

Educated and unemployed youth in rural areas should be imparted skills in the use of software such as Microsoft Office and I-LEAP, and in the use of HTML and accessing Internet resources. They should be provided with loans to start multi-functional ICT centers. Indian software developers need to concentrate on developing the indigenous software to suit local requirements. Information professionals, health workers, and social workers needs to be trained in developing databases and multimedia kits on agricultural and health practices, reproductive health, and so on. In addition, academic and research institutions should create specialized databases on subjects of local interest and innovations at local levels in the local language.

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Establishing Our Presence in Courseware: Adding Library Services to the Virtual Classroom

John D. Shank and Nancy H. Dewald

Course management systems and software (courseware) are increasingly being used to enhance traditional college courses, yet library resources and services are noticeably missing from this venue. Libraries risk being bypassed by this technology and los-

ing relevance to students and faculty if they do not establish their presence in courseware. Librarians need to be proactive in inserting links to resources and to library assistance within the courseware domain in order to retain visibility, increase relevance with students, and strengthen relationships with faculty.

Courseware such as Blackboard, WebCT, and others are increasingly being used by college and university faculty across the country to augment their traditional classroom courses.¹ According to the 2001 National Survey of Information Technology in U.S. Higher Education, nearly one out of every five college courses now makes use of courseware. Also, approximately 70 percent of private universities and 80 percent of public four-year colleges participating in the survey responded that their institution has purchased courseware.² Cohen notes that "Though course-management software is generally considered in connection with Web courses and distributed education, such software is actually used most often in traditional courses, to make them Web-assisted."³

For the most part, unfortunately, academic libraries have been all too absent in the design, development, and implementation of courseware.⁴ As a result, faculty do not think of integrating library resources directly into their courseware-enhanced courses. It is possible that faculty (who increasingly make course-related resources—reading and research assignments—available to students through courseware) and students (who use courseware in conjunction with the Web to search for and obtain their course-related materials) may not see the library as the first or even a relevant place to obtain the scholarly resources needed for their courses. Librarians may well find themselves and their services being ignored in a world where library services and resources are not included in the courseware domain.

Academic libraries across the country are becoming increasingly aware that they must be included in the courseware domain in order to further assist faculty and students in locating and accessing appropriate library resources.⁵ Long asserts that librarians ". . . need to think hard about what services they wish to deliver to online environments and clearly articulate how they might be accessed from courseware systems."⁶ Currently, there is little consensus on how to fit the library into courseware.

In this article, several methods will be outlined by which libraries and librarians can insert themselves into the courseware domain. The focus will exclusively be on courseware used to enhance traditional classes. One broadly defined method, titled Macro-Level Library Courseware Involvement (MaLLCI), entails working with the developers and programmers of courseware to integrate a generic, global library presence into the software. Another method, titled Micro-Level Library Courseware Involvement (MiLLCI), involves individual librarians teaming up with faculty as consultants to participate in developing a customized library instruction and resource component for the courseware-enhanced courses.

Benefits of Courseware

It is important to understand some of the tools and benefits that courseware offers to the faculty and students who use it. This will enable a better understanding of the methods by which libraries can insert their presence and services into the courseware domain. There are many different types of course-management software systems available. However, most courseware share a certain core set of basic features, including powerful resource sharing, communication, and assessment tools. Dabbage, Bannan-Ritland, and Silc assert that the "use of these features can promote collaborative

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learning, enhance critical thinking skills, and give every student an equal opportunity to participate in classroom discussions."⁷

Resource Sharing Tools

At a bare minimum, courseware resource sharing tools allow students and instructors to upload and make available various types of files (such as word processing, spreadsheet, and database), create hypertext links to internal and external Web pages, and easily create simple Web pages. One of the advantages that this offers students is the ability to access much of their course content from one Web location completely independent of, and agreeable to, both their physical location and schedules. Also, students are able to electronically submit their assignments to their instructors, who can then grade and return the work along with comments for the students to read. The advantages that this offers the instructor include both the ability to extend the classroom (independent of time and location) and the ability to collect and archive class assignments, activities, and resources.

Communication Tools

Courseware communication tools allow students and instructors to e-mail directly from their courseware domain, create asynchronous threaded message boards/discussions lists, and create synchronous real-time chat forums. One of the advantages that this offers the students is the ability to communicate with their peers and instructor independent of both time and location from any computer connected to the Internet. Advantages to the instructor are the ability to further class discussions by allowing shy students to contribute more, as well as to allow discussions to continue outside of the physical space and time limit of the

classroom. Additionally, students and instructors can mutually benefit from such courseware features as the threaded message boards and discussions lists, which allow one student to ask a question and the entire class to view the archived question and its answer, thus allowing the instructor to provide one answer for the entire class.

Assessment Tools

Courseware assessment tools allow instructors to create simple, auto-marked Web quizzes and tests, create auto-marked Web surveys, and monitor their students' progress and interaction with the courseware-enhanced quizzes, materials, and communication features. One of the advantages that this offers students is the ability to take practice quizzes and get immediate feedback with their results, allowing them to monitor their progress in learning the concepts they are instructed to learn. The advantage that auto-marked Web quizzes and tests offers instructors is that, by reducing the grading time, they can increase the time to monitor and direct the students' learning progress. Accordingly, instructors can utilize Web quizzes to quickly assess and identify areas or topics where students need further reinforcement.

Librarians can make use of these tools and the benefits they offer in differing degrees to establish a presence for both library resources and services, using the MaLLCI and the MiLLCI.

MaLLCI

As previously stated, MaLLCI entails librarians at an institutional level working with the designers, developers, and programmers of courseware to integrate a generic library presence into the course management software. This means that preexisting library

Web information, resources, and services would be integrated uniformly so that all courseware-enhanced classes would have direct access to them. There are varying ways in which the library and its services could be integrated and made accessible in courseware. Some possible options for enhancing courseware:

1. Virtual reference-desk services.

Virtual reference-desk services offered by many university and college libraries could be integrated into courseware, thereby allowing students to ask reference questions while they are logged in to their courseware course page. It is also possible, for libraries that have not invested in virtual reference-desk software, to utilize courseware's chat functions to provide the needed environment to create a basic virtual reference-desk service.

2. OPAC and database links.

The library can establish direct links in the courseware domain so that students can search their campus library's online catalog and the proprietary databases the library subscribes to in the courseware environment. The advantage in creating these links between the library's resources (catalogs, indexes, and databases) and the courseware is that students have straightforward and direct access to the electronic materials offered by their campus library from their own personalized or customized courseware course pages. Cohen also suggests that software that searches the library's catalog, indexes, and databases to create customized bibliographies based on the students' needs could be integrated into courseware.⁸ This would greatly benefit students by enabling them to have a relevant bibliography of print and electronic resources they can use in their coursework and writing assignments. This electronic bibliography could also provide direct

links to full-text Web-based resources so that instructors and students alike could have immediate access to them, saving both instructor and student time and energy.

- 3. Global pathfinders and help sheets.** The library, by providing links to broad-based pathfinders and help sheets that librarians have previously created, can assist students in searching OPAC and various online databases.
- 4. Document delivery services.** The library can integrate electronic-reserves software, interlibrary-loan, and document delivery systems into courseware so that "... students could benefit from the scanning, check-in and check-out, and copyright management functions. ..."

Benefits and Drawbacks of MaLLCI

There are several benefits of implementing this model. The first two benefits of integration of the library's resources and services into the courseware domain are the increased visibility of the library's resources and services, and the increased ease of access for both faculty and students. By integrating and linking the library's catalog and online databases into the courseware environment, students and faculty are only a click away from accessing many of the information resources relevant to their course assignments from within courseware.

A third benefit is the scalability of library services. Linking to the preexisting library systems serves both a large university as well as a small college. Just as libraries designed and developed their Web sites so that students can access library resources and services independent of both time and location, by linking these same resources to courseware, the library makes them directly available to all students using courseware. Since the information is directly

linked, by updating the library's Web site the information is automatically updated in the courseware, saving library staff both time and energy. A fourth benefit is that it does not require faculty to commit time and energy to making these resources available; rather, they are automatically integrated directly into their courseware-enhanced pages.

The MaLLCI model does have some shortcomings. One of the biggest, (similar to preexisting library Web sites), is the lack of direct human contact. Students using courseware would not likely develop familiarity with any librarians in this model. Rather, they would be able to get many of the resources and services they needed right from their desktop computer. In essence, students would become virtual library users when accessing online full-text databases, catalog, pathfinders, and other helpful resources from courseware. Consequently, they may not be able to develop their search skills and utilize the full power of the databases to locate the most appropriate resources for their class assignments.

Another shortcoming is the lack of personalized and customized resources for both students and faculty. Because this model focuses on integrating the broadest and highest level of library services, it would not be possible to customize specific resources for specific class assignments. In order to accomplish this, a librarian would have to work directly with a faculty member.

MiLLCI

We have discussed MaLLCI as the library at an institutional level making broad-based links between library resources and courseware. In contrast, MiLLCI is individual librarians working with individual faculty members to provide more customized library research assistance within courseware. This option is probably best seen as a supplement

to the in-class library instruction rather than a replacement, although it may also be a way of getting a toe in the door of classes for which there was not previously any library instruction.¹⁰

The level of individualized courseware use by librarians can range from minimum to maximum, with a great deal of flexibility in between. At a minimum, if there are already library Web pages appropriate to a course, such as pathfinders, bibliographies or Webliographies, or guides to the literature of a field, or if the librarian is already planning on making a Web page of some sort for the class, the librarian simply asks the faculty member to link to it from the courseware page. At a maximum, course-integrated library instruction involves the faculty member and the librarian collaborating in planning and delivering the course, with equal access to the courseware pages. The librarian adds many customized links, leads some chat-room discussions, and monitors a message board of research-related questions throughout the semester. In between are many options, depending on how much effort the librarian wishes to expend. Options for enhancing courseware include:

- 1. Library instruction outline.** This outline is the basis for a class presentation that later can be accessed as a reference by the students. It can include various sources appropriate to the class assignment, such as selected databases, the online catalog, selected Web-page links, and print and online reference sources.
- 2. Pathfinders, bibliographies, and Webliographies.** These may be general guides created to aid research in a discipline or customized guides created for a particular class.
- 3. Recommended databases for the assignment.** Databases appropriate for class assignments may be listed in order from basic to more

complex, with optional annotations by the librarian to help students understand what they will find in each database. Direct links can be made from within the courseware. Alternatively, instructions for getting to the database from the library Web pages could be provided.

If the library has produced help sheets on the databases, these can be put in PDF format and linked to the course page for interested students to print out at any time. Even when a librarian is not available, they have access to this basic help online.

4. MLA, APA, or other style sheets.

One of the most common reference questions is "How do I make a bibliography?" If the class will be doing this as part of their assignment, it is helpful to have a link to information in the style selected for the course (or multiple styles if desired). Numerous institutions of higher education have Web pages on several of the commonly used bibliographic styles. If the library has handouts on these, they can be included in PDF format for students to print out. The call numbers of the MLA handbook, APA handbook, and others can also be listed.

5. Reference service. A basic e-mail link to the librarian, as well as a phone number and office address, provide a necessary help line for students. Another option is a link to real-time chat reference service, if that is available at the institution. Wheeler and Fournier note that it is beneficial for the librarian, in face-to-face meetings with students, to strongly encourage them to contact him or her with research questions, noting that "student anxiety levels seem to be greatly reduced" with this encouragement. They add that the subsequent e-mail communication allows the librarian to "continue building the relationships" begun in class.¹¹

A third option is a link to a message board, which the librarian monitors periodically, for discussing research difficulties. The advantage of the message board is that all can see questions that have application to a number of students. Dickstein and McBride report on a course collaboratively taught by a faculty member and librarian, in which the librarian gave in-class library instruction three times during the semester, and at specified times monitored a message board on which students discussed their research in groups. The librarian was then able to jump in with help or suggestions when students expressed difficulties with their research.¹² If a faculty member plans to have students discuss their research on a message board, the librarian can offer to monitor these discussions at specified times in order to provide assistance. In the experience of Wheeler and Fournier, students preferred to e-mail questions privately to the librarian. If a question seemed to have general application, the librarian requested permission to post it (with identifying information removed) to the message board, and students did not refuse this request.¹³

6. Tutorials. Web-based library tutorials may be assigned as part of the course, and these can be linked to the courseware pages. If possible, it is preferable not to make online tutorials a substitute for meeting with the class, but they can be used as a supplement either before or after the class meeting.

7. Quizzes. If the tutorial does not include quizzes, the courseware has a facility for creating quizzes, and the librarian can create these as part of a library assignment to follow in-class instruction, tutorial use, or both. Grassian and Kaplowitz suggest a pretest, taken before the in-

class library instruction, and a post-test, taken one month after the in-class library instruction to assess the effectiveness of the instruction, be placed on course Web sites.¹⁴ The librarian should discuss this with the faculty member to be sure he or she agrees to assign the tests to the students.

8. Questionnaire for students.

Following in-class instruction, the librarian can seek student feedback online if desired. Again, the courseware's quizzing facility can be used for creating a questionnaire.

Benefits and Drawbacks of MiLLCI

The primary advantage of MiLLCI is the strategic positioning of library resources and services. For a number of years many libraries have had Web pages that guide students to appropriate resources in a discipline or topic. Students must somehow navigate their way to these pages, assuming they think to explore the library Web site. The instruction librarian may mention the pages during a course-related library instruction class, but the students still must make the effort to find the separate library pages. When faculty have a course Web page or use courseware, students are very likely to be accessing these pages as a course requirement. Having a link within those pages to the library information provides one-stop-shopping for students. The closer the link between course assignments and library resources to help with those assignments, the greater likelihood that students will access library information. As Getty et al. points out, in this way the library offerings also gain the legitimacy of the course itself.¹⁵

Another technology with a library-use parallel to courseware is My Library software. Ghaphery and Ream of Virginia Commonwealth

University report that the use of My Library was mainly popular as a teaching tool, where instruction librarians created custom pages with databases and Web sites appropriate for particular class assignments, and used these pages during the in-class library instruction. The authors report that students and faculty were enthusiastic in their appreciation of this as a tool for researching assignments; the pages had "heavy usage" and "classes like coming back to a single page to find all the relevant resources for their research assignments."¹⁶ Placing customized library links within faculty courseware pages will provide this same convenience for students.

Another advantage of library involvement with courseware that benefits students is enhanced collaboration between librarians and faculty members. The librarian will have an opportunity to discuss any difficulties and assignment details with the faculty member, improving both assignments and library assistance for students. The faculty member will perhaps see the librarian as a consultant, improving information access and students' information literacy skills both within the course and beyond it.

A third advantage is that librarians have more contact with students and can provide more research information to them without requiring faculty members to give up more class time. In addition, the information is strategically placed to coincide with the times students are ready to receive that information—when they are working on their research. If students have questions, an e-mail link, phone number, chat reference, or a message board are available from within the course pages to seek help from the librarian.

The drawback to MiLLCI is, of course, the amount of time and effort required of the librarian. As stated above, this can be as little or as much as the librarian wishes to give. If the librarian chooses to become involved at the level of course-integrated

library instruction, then an online component such as message boards and chats will demand increasing amounts of time. Librarians can select from the list of possibilities presented here and consider the time they have to give. Use of MaLLCI features will also help in providing library resources within courseware while not adding to the day-to-day demands on the librarian.

The lack of faculty's willingness to be involved in the process is another possible drawback. They need to see the librarian as a consultant in courseware, and some faculty members may not be willing to do that. Likewise, faculty may have difficulty sharing control of their courseware-enhanced course. This will require establishing a relationship of mutual trust in which the faculty member feels comfortable sharing editorial control of the courseware content. Librarians will need to work with diplomacy and aplomb. Eventually, working with the willing members of the faculty will perhaps one day provide enough positive examples of courseware collaborations to convince those who are less enthused.

Conclusion

If the current trend of universities and colleges adopting courseware to enhance their traditional courses continues, most, if not all, of these courses will be augmented in some manner by courseware in the coming decade. Libraries must find a way to enter the courseware domain in order not to be left out of this important educational advance and not lose the opportunity to make a significant contribution to the development of courseware. If university and college libraries do not find a means by which to establish their presence in courseware, they could face the frightening prospect of faculty and students alike viewing the library as an insignificant place to obtain the

scholarly resources needed for their courses. Rather, commercial information distributors, who have already gained a foothold in some courseware environments, may successfully eclipse the library as the primary information provider.¹⁷

When establishing a presence in courseware, it is valuable to implement, at some level, both types of library courseware involvement, since both models have different strengths and weaknesses. Accordingly, if libraries successfully establish a presence in courseware, the gain will be an increased relevance with students, and strengthened relationships and collaborative ties with faculty. Within the courseware domain, the library will once again be viewed as the first and most relevant place to obtain the scholarly resources and information literacy skills that are needed in today's world.

References and Notes

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CORC

New Tools and Possibilities for Cooperative Electronic Resource Description

Karen Calhoun, John J. Riemer, eds. New York: Haworth, 2001. 184p. (ISBN 0-7890-1304-5).

It is noteworthy that the week I submitted this review for publication was the same week that the OCLC's Cooperative Online Resource Catalog (CORC) service came to an end—not because of its failure, but because of its success. After more than three years of ongoing, extensive upgrades, CORC has evolved into OCLC's new Web-based Connexion interface. This could not have come about without the commitment, time, energy, and expertise of the early pioneers, a group well represented by the authors of this volume, who worked in CORC from the time of its experimental infancy. CORC began as an experimental cooperative project in early 1999 and became a full OCLC production service in July 2000. CORC was both a database of metadata records for online resources and an experimental interface for creating those records, along with sharable pathfinders. But, as this volume makes clear, CORC was also much more than that for those who participated in it.

This book consists of fourteen separate articles written by individuals or groups of coauthors, published simultaneously in this book and in the *Journal of Internet Cataloging*, volume 4, number 1/2, 2001. The book also includes a preface by Jay Jordan, president of OCLC, and an introduction by the two coeditors, Karen Calhoun of Cornell University and John J. Riemer of the University of Georgia. All fourteen articles center around the writers' early experiences with the OCLC CORC service, but contain widely different perspectives. The subtitle of the volume conveys the theme that ties these diverse

articles together: "new tools and possibilities for cooperative electronic resource description." The new tools explored here are those that developed within the CORC service, opening up new possibilities for cooperation in creating metadata for electronic resources, especially the burgeoning number of resources available on the Web. The types of cooperation covered include cooperation between OCLC and CORC participants, cooperation among participating institutions, and cooperation within institutions among technical services, public services, and collection development staff.

The articles in this volume were written when CORC was still an experimental project and its records had not yet been integrated into WorldCat. Given the rapid changes in the world of metadata and in the CORC service itself, some of the information in these articles is already out of date. But on the whole the book remains remarkably relevant for recent users of CORC, and now of Connexion, with regard to cooperative description of online resources. Especially useful, perhaps, are the articles that describe the development of local workflows and the application of Dublin Core (DC), MARC, and CORC functionality to their institutional processes. The volume still has much to offer institutions that are already engaged in creating metadata for online resources, but is especially helpful for those who have yet to begin. Readers will find a wealth of theoretical and practical information in this book, and they will discover blueprints and models to consider when planning their own institutions' workflows.

The first two groups of articles in the volume look at CORC from a theoretical perspective, the first three offering a big-picture view of CORC. First off, Thomas B. Hickey of OCLC writes about collaboration in CORC, providing a good overview of the CORC project. He emphasizes the ways in which the project continues

and expands the long tradition of cooperation and collaboration developed between libraries and OCLC, especially in the areas of systems and standards, and manifest in both the CORC Resource Catalog and CORC Pathfinders. Hickey stresses standards as the mainstay of library cooperation.

In their article on CORC and the future of libraries, authors Charlene Hurt and William Gray Potter share the perspectives of two library administrators. They suggest that CORC may offer the hope of being "the universal bibliography," containing both local and universal records, and controlling collections previously not well controlled by libraries, such as special collections, manuscripts, archives, media, along with Web sites, e-journals, and other new e-resources. This vision rests, I assume, on the potential of CORC to eventually include records in multiple metadata formats in addition to AACR/MARC and Dublin Core. Concluding the first group of articles, John J. Riemer writes about the rationale and possibilities for a relationship between CORC and the Program for Cooperative Cataloging (PCC). He includes some interesting comments about the dynamic tension that exists between the DC and MARC standards and how PCC members can monitor and help establish core-level record equivalents in other metadata schemes.

The second grouping of articles represents a research and development view of CORC. The four articles in this section discuss ways in which OCLC is investigating methods for letting computers automate and simplify the resource-description process, allowing human beings to concentrate on the more intellectually-demanding tasks that computers cannot do (at least not yet, if ever). One such area of exploration concerns ways to simplify the use of subject terminology in metadata records. Lois Mai Chan, Eric Childress, Rebecca Dean, Edward T. O'Neill, and Diane Vizine-Goetz

write about the development of Faceted Application of Subject Terminology (FAST). FAST provides a new approach to subject vocabulary for Dublin Core based on Library of Congress Subject Headings (LCSH), but applied with a simpler syntax. The core idea of FAST is the separation of LC subject terminology into four complementary facets: topical, geographic, form, and time period, and the use of computerized metadata systems for post-coordination instead of precoordination of subject strings based on users' search criteria. FAST is not intended to replace fully developed LCSH strings in AACR content records, but to allow for a simpler form of resource description by those not well-versed in the complexities of LCSH. This would still allow for subject searches of far greater richness than simple uncontrolled keyword searching.

Authors Carol Jean Godby and Ray Reighart offer a summary of the WordSmith research project's contribution to CORC. The primary goal of this project is to automatically identify significant subject terminology in machine-readable text so as to harvest and automatically generate subject terms in records for electronic resources. These terms may be accepted by resource describers in whole or in part as uncontrolled subject keywords, or they may serve as a starting point for development of controlled vocabulary terms within a metadata record.

In her article "Dewey in CORC: Classification in Metadata and Pathfinders," Vizine-Goetz discusses OCLC's efforts to map the vocabulary of LCSH to Dewey Decimal Classification (DDC) and to experiment with automated DDC classification for e-resources in CORC at the time of record creation. This type of automated classification remains an area of active research at OCLC today and into the future.

Childress, one of the leaders within the CORC project at OCLC, writes about "Crosswalking Metadata

in the OCLC CORC Service." From its first release, CORC offered support for both the DC Metadata Element Set (DCMES) and OCLC-MARC as available views of all resource records. The key to supporting this capability has been a behind-the-scenes "crosswalk," based on a metadata-to-metadata conversion specification. Childress points out that OCLC plans to develop additional crosswalking capabilities for other major metadata standards in the future.

This crosswalking between DC and MARC is one of the great achievements of the CORC project, but it also exhibits, in the opinion of some CORC users not represented in this volume, the potential for significant confusion among library catalogers and other resource describers, and can result in compromising the integrity of both AACR/MARC and DC metadata created according to their own unique standards. But this is not to diminish the value of CORC's role in developing an actual working crosswalk, extremely important for general metadata interoperability, nor the fact that this capability within CORC proved central to several libraries' cross-divisional workflows for online resource description, as recounted in later articles in this book.

The third and fourth groupings of articles are written by implementers of local metadata projects using CORC. The third group deals with CORC implementation within cataloging departments and within cross-functional institutional teams. Jeff Edmunds and Roger Brisson (Pennsylvania State University) stress that, at the time of their writing, CORC was very much a work in progress. They note that CORC included both important innovations but also significant drawbacks, as well as many automated capabilities still in their infancy or yet to be realized as useful in practice, such as metadata harvesting and automated DDC generation. In the section of their article titled "CORC As a Testbed for Innovation," the authors point out that many previous

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technologies and many years of work of the OCLC Office of Research went into CORC, and that during the early time of beta testing there was a great deal of ongoing, continuous revision of the CORC interface, much of it in direct response to feedback from the early users of CORC based on their hands-on experience. The authors see the CORC project as enabling a melding of two cultures: those of cataloging specialists and of computing and Internet specialists.

Norm Medeiros, Robert F. McDonald, and Paul Wrynn write about utilizing CORC to develop and maintain access to biomedical Web sites at New York University School of Medicine. As part of their move from subject-specific biomedical Web pages to using CORC pathfinders, they developed an excellent list of resource types to be considered for selection and those to be eliminated from consideration. Like many of the other authors in this work, they selected DC as a standard that allowed a broader group of staff to create metadata in CORC. Rather than using the library OPAC, their Web team used a subject-based approach within the library's Web site as the locus for patrons to access these resources. "In this approach, users select their subject interest, and have the option to view e-journals, e-texts (when available), Web sites, online catalog (MEDCat) resources, and recent Medline citations on that particular subject" (120).

The next two articles discuss CORC as the basis for collaboration across internal library divisions. Ann Caldwell, Dominique Coulombe, Ronald Fark, and Michael Jackson write about collaboration between catalogers and reference librarians in the OCLC CORC project at Brown University. They provide a good deal of practical information, including a list of expected outcomes, implementation strategy and training schedule, local guidelines for selection of no-fee Web resources for cataloging, and a list of results of the project.

Calhoun describes how the CORC at Cornell project allowed principal functional groups which typically worked independently—technical services, collection development, and public services—to work together collaboratively. The project initiated an experimental workflow for Internet resources, differing in three ways from their existing workflow: (a) selectors prepared the preliminary records in CORC, using the DC standard; (b) reference librarians as well as selectors identified, chose, and created preliminary records for Internet resources; and (c) later, catalogers used CORC to finish the records in MARC format, exported the metadata to the local catalog database, and to the Library Gateway. Using systems analysis theory to model and discuss the processes of describing Internet resources, Calhoun finds that "distributed description is both feasible and beneficial" (138). She states that being able to flip back and forth between DC and MARC views of a record was the keystone of their workflow.

The fourth and final grouping of articles deals with the use of CORC and DC for special categories of material, namely, serials, digital art, and digital images of maps. Wayne Jones concludes that the DC Element Set can work well for describing serials, except for two areas: dates and volume/date designation. He recommends defining the DC Coverage element for the volume/date designation and prescribing a four-digit date in all cases for a single year, with unknown digits indicated by a "u" or some other method. Also necessary would be the use of a qualifier with the DC Date element, such as Date.Issued.

Ann Hanlon and Ann Copeland recount the results of an investigation of using DC and CORC for describing collections of digital art, that is, works created originally in digital form, not reproductions of tangible works, for the @art gallery, an online gallery of digital art, exclusively for the Web environment. They found

that DC could work relatively well if, and only if, multiple local qualifiers were added. For example, they needed to be able to identify the specific role of multiple creators in a digital art project and to connect specific names with specific titles within a collection-level record. After experimenting with using DC in CORC, they chose not to use CORC for their resource description, largely because of the limited use of qualifiers as well as the DC-to-MARC and MARC-to-DC mapping problems, which, among other things, were not able to maintain the connection between multiple artists and titles.

Finally, David Yehling Allen shares his experiences with using the DC in CORC to catalog digital images of maps. Although he feels that creating bibliographic records for digital maps in the CORC database seems to be the best available solution to the problem of bibliographic control of the thousands of digitized maps available on the Web, he recounts the many problems that he encountered in doing this. Among many other interesting comments, he states:

In theory, it should be much easier for novice catalogers to work with the DC rather than MARC, but in practice I encountered many difficulties. Most of the problems arise from the newness of both the DC and CORC, and from the lack of established standards and documentation for working with them. . . . Ironically, one source of confusion has been the very simplicity of DC cataloging (165).

These comments will resonate with many who take DC seriously and have attempted to use it. Allen stresses the importance of developing best-practice guides for the application of DC to describing cartographic materials as the best solution to these problems.

Looking at the volume as a whole, the majority of authors are quite positive about the CORC project,

whether it be CORC's theoretical possibilities, OCLC's ongoing research and development efforts, or what CORC allowed the authors to accomplish practically within their institutions and for their end-users. For example, the ability to use DC and map it into MARC allowed reference librarians and other non-catalogers to create simple records without MARC tagging and for catalogers to then upgrade those records to full AACR-MARC standards when chosen for inclusion in their library OPAC. The ever-developing technical capabilities of the CORC system, now evolved into the Connexion interface, such as dynamic, hyperlinked authority control and setting local "holdings," are also regarded as major positives of the system.

But several of the authors noted problems centering on the quantity and quality of the records included in CORC, the application of standards for resource description, and the results of mapping between DC and MARC. For example, Edmunds and Brisson remark on the fact that the majority of records in CORC were those seeded from the experimental InterCat and NetFirst projects, the latter especially containing low-quality, sub-standard records, and many describing resources of popular interest or trivial Web sites of low value to

most libraries. The authors comment that the problems with the quantity and quality of records in the CORC database are (at the time of their writing) the result of a lack of rigid selection and cataloging standards. They raise additional significant issues entailed in the co-existence of CORC records created according to both DC and MARC cataloging standards. Calhoun in her article also writes: "While we agreed that even a skeletal DC record enables better indexing and retrieval, we found the present heterogeneous mixture of DC practices encoded in CORC records less than optimal" (141). And Hanlon and Copeland recounted in their article on using DC for digital art that "We were disappointed . . . with the restrictions placed on us by the implementation of DC in CORC and, to some extent, with the way the DC/MARC crosswalk maps data between the two views" (155). Knowing that these comments were written before CORC records were merged into WorldCat, it would be very interesting to know what these authors think today about the implications of this merger for record-sharing in WorldCat, predicated as it has been on careful adherence to commonly-held national standards, upon which OCLC members have relied as the mainstay of cooperative cataloging.

The above problems notwithstanding, this book reminds us of what marvelous work OCLC has done in encouraging and enabling the description of Internet resources by catalogers and other librarians through the initial CORC project. The book demonstrates how OCLC and librarians have greatly benefited each other by working collaboratively on the CORC project and how the project also enabled librarians to work collaboratively with each other in innovative ways, across internal institutional divisions, bringing non-catalogers into the resource description process. This book reflects the fact that the development of the current Web-based cataloging interface, with hyperlinked authority control and many other technical innovations, has been a phenomenal advance for the library and cataloging communities, all rooted in the once experimental CORC project. These authors are among the pioneers who made possible these features, now embodied in CORC's successor, and their words give us not only a window on the recent past but also remain on the whole remarkably relevant for the cooperative description of electronic resources today.—*Steven Jack Miller, University of Wisconsin-Milwaukee Libraries*

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XML AND LIBRARIES

Ron Gilmour, presenter

Library webmasters, systems librarians, and anyone who is interested in web technology, data representation, or who wants to know what XML is all about, plan to attend this Institute. Learn the structure and utility of Extensible Markup Language (XML) with an emphasis on the relevance of XML to libraries. Discuss the role XML plays in diverse applications such as web design, content management, and descriptive metadata. Points covered include: History of XML, Why librarians should care about XML, Using XML on the Web (including stylesheets), Using XML for data interchange, Using XML for metadata.

LITA and MLNC are co-sponsors of this event on Friday, May 9, 2003 at Washington University West Campus in St. Louis.

Atlanta, Georgia

PROXY WEB SERVERS AND AUTHENTICATION

Peter Murray, presenter

Systems librarians and computer professionals with a background in providing web services register now for this Institute. Library administrators who are seeking an introduction to proxy servers have also found this Regional Institute useful. Put web proxy servers to use for you: bandwidth conservation, gathering statistics, filtering, and authentication. This program is a combination of instruction on the theory of proxy servers, their use in library situations, and practical examples of implementations.

LITA and Solinet are co-sponsoring this Institute on Friday, May 30, 2003 at the Renaissance Hotel in Atlanta.



Register now at 1-800-545-2433 x4269 or www.lita.org/institut



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