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Music Symbols and Online Catalogs: A Survey of Vendors and an Assessment of Retrieval Capabilities

Richard D. Burbank and Barbara Henigman

The symbols for sharp and flat in music notation occur in the uniform title portions of both bibliographic and authority records. These two symbols present special problems for the retrieval of music materials in online catalogs. The authors surveyed vendors of online systems to determine whether vendors consider this problem in systems design and, if so, to what degree.

Symbols used in music notation constitute elements of an alphabet pertaining to sound. These symbols denote specific meaning to all parameters of music: pitch, rhythm, dynamics, and timbre. Two symbols used in pitch vocabulary are the sharp (♯) and flat (♭) symbols. These symbols are commonly known in music terminology as *accidentals*. They occur in music notation in different places: in the key signature of a tonal musical work, denoting major or minor tonality; as an accidental in the course of music notation, denoting a change from or to a previous occurrence of a pitch class in a tonal or nontonal musical composition; and in the generic title of a (usually tonal) music composition, denoting the key of the composition chosen by its composer. (There is another accidental, the natural (♮), that does not commonly occur in the generic title of a musical composition; it is usually found in music notation to indicate the cancellation of a previous sharp or flat accidental.)

From the historical perspective, the appearance of these symbols in the cataloging codes has been evanescent at best. The *ALA Cataloging Rules for Author and Title Entries* (American Library Assn., 1949) contains an example of the flat symbol (p.35). The *Anglo-American Cataloguing Rules* (Chicago: American Library Association, 1967) (*AACR*) has at least one occurrence of the flat symbol (p.308). Surprisingly, there is no instance of either symbol in the *Anglo-American Cataloguing Rules*, second edition (Chicago: American Library Association, 1978) (*AACR2*). The *Anglo-American Cataloguing Rules*, second edition revised (Chicago: American Library Association, 1988) (*AACR2R*) has the flat symbol in two places (p.144, p.529). None of these three cataloging codes includes an occurrence of the sharp symbol or contains any rule pertaining to the use of the symbols.

It is the occurrence of these symbols in the generic titles of music compositions that present special problems for the bibliographic control and online retrieval of music materials. Generic titles, such as *Symphony No. 1 in A♭ Major* or *Sonata No. 3 in F♯ Minor*, are dissected into elements and subfielded during the cataloging process. Chapter twenty-five of *AACR2R* provides the rules for dissection of the generic title and construction of the work's

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```
ARN:   685070                 Rec stat:    c
Entered:    19840822          Replaced:    19860430
Type:      z        Enc lvl:      n        Source:                   Lang:
Roman:              Upd status:   a        Mod rec:                  Name use: a
Govt agn:           Ref status:   a        Subj:        a            Subj use: a
Series:    n        Auth status:  a        Geo subd:  n              Ser use:  b
Ser num:   n        Auth/ref:     a        Name:        a            Rules:    c
   1  010        n  81140254
   2  040        DLC $c DLC $d DLC
   3  100 10     Haydn, Joseph, $d 1732-1809. $t Symphonies, $n H. I, 45, $r F#
minor
   4  400 10     Haydn, Joseph, $d 1732-1809. $t Symphony, $n M. 45, $r F# minor
$w nnaa
   5  400 10     Haydn, Joseph, $d 1732-1809. $t Farewell symphony
   6  400 10     Haydn, Joseph, $d 1732-1809. $t Abschieds-Symphonie
   7  400 10     Haydn, Joseph, $d 1732-1809. $t Proshchal'na͡ia simfoni͡ia
   8  400 10     Haydn, Joseph, $d 1732-1809. $t Abschieds-Sinfonie
   9  400 10     Haydn, Joseph, $d 1732-1809. $t Farewell
  10  400 10     Haydn, Joseph, $d 1732-1809. $t Adieux
```

Figure 1. Sharp Symbol in LC Authority Record.

```
ARN:   663699                 Rec stat:    c
Entered:    19840821          Replaced:    19860711
Type:      z        Enc lvl:      n        Source:                   Lang:
Roman:              Upd status:   a        Mod rec:                  Name use: a
Govt agn:           Ref status:   a        Subj:        a            Subj use: a
Series:    n        Auth status:  a        Geo subd:  n              Ser use:  b
Ser num:   n        Auth/ref:     a        Name:        a            Rules:    c
   1  010        n  81118721
   2  040        DLC $c DLC $d DLC
   3  100 10     Beethoven, Ludwig van, $d 1770-1827. $t Symphonies, $n no. 3,
op. 55, $r E♭ major
   4  400 10     Beethoven, Ludwig van, $d 1770-1827. $t Symphony, $n no. 3, op.
55, $r E♭ major $w nnaa
   5  400 10     Beethoven, Ludwig van, $d 1770-1827. $t Sinfonia eroica
   6  400 10     Beethoven, Ludwig van, $d 1770-1827. $t Eroica symphony
   7  400 10     Beethoven, Ludwig van, $d 1770-1827. $t Geroicheska͡ia
   8  400 10     Beethoven, Ludwig van, $d 1770-1827. $t H´ero¨ique
   9  400 10     Beethoven, Ludwig van, $d 1770-1827. $t Eroica
```

Figure 2. Flat Symbol in LC Authority Record.

uniform title. The MARC formats for music and the *Bibliographic Input Standards*[1] provide the coding, tagging, and subfielding procedures to be used in the cataloging process. The Library of Congress practice is also used as a standard for creating uniform titles. The Library of Congress uses these symbols consistently in the construction of uniform titles (240, 700 $t), and spells out the words *sharp* and *flat* only in the title (245) field if the words are transcribed from the title page. This policy applies to the creation of both bibliographic records and authority records.[2] Figures 1 and 2 provide examples of Library of Congress practice that feature the symbols in authority records.

After the uniform title has been constructed, tagged, and subfielded, the musical key of the work sits in its own subfield: [$a Symphonies, $n no. 1, $r A♭ major], [$a Sonatas, $n no. 3, $r F♯ minor]. Uniform titles for music occur in the 240 and 700 fields of the MARC music formats. These fields were conceived and designed for retrieval purposes.

ACCIDENTALS IN ONLINE CATALOGS

Since the inception of online catalogs, librarians and patrons have discovered that trying to retrieve various manifestations of musical works containing music symbols in their titles can be an extremely frustrating experience. It was noted almost a decade ago that the key of a musical composition can play an important role in retrieval: "Despite the depth of descriptive information or the form of the catalog, retrieval of citations to musical compositions has proven to be a tedious task. The traditional title, author, or subject access for books cannot efficiently apply to musical works. Composers are more prolific than authors, and searching by composer name sends the user thumbing through many entries. Also, titles of musical works tend to be repetitive, with the form of composition and key being the only distinguishing feature."[3] In the middle of the last decade an article on music and online catalogs appeared in the journal of the Music Library Association stating that the key of a musical composition needs to be retrievable when it occurs in the uniform title field.[4]

It would seem that vendors and designers of online systems have created their systems without considering the special needs of music retrieval. In an article on user expectation and system design, systems designers are described as follows: "By nature and training, they are optimistic and self-assured, and above all they expect themselves to be able to execute successfully the design tasks set before them. As with computing developments in a wide variety of application areas, the attitude is that nothing is impossible if it is desired and that the technology available has the power to solve all the problems of information processing, once sufficiently well defined."[5] Nevertheless, online systems frequently do not provide the appropriate means for entering or displaying sharp and flat symbols correctly into both bibliographic and authority records. Walt Crawford, in a 1987 article on bibliographic display, wrote that "design decisions are made in a vacuum. Designers have the tradition of card catalogs and may choose to base online design on those traditions or deliberately reject them. Recent designers have a brief history of online catalogs to look back on, but that history shows extremely wide variation."[6] Still worse is the situation in which a single character may have two different meanings. Examples of this problem include the music cataloger who is forced to use a lower-case *b* in a uniform title because the flat symbol cannot be entered into the system or the user who suddenly discovers that by using the sharp symbol when searching uniform titles he is performing truncation and can neither retrieve a desired bibliographic record nor browse through listings of music materials.

In light of these observations and others gleaned from experimenting with various online systems and exchanging experiences with other music librarians, it is clear that the specific need for retrieval of music uniform titles containing sharp and flat symbols is being ignored by online catalog vendors, despite the fact that all types of libraries (school, public, academic, special) catalog and retrieve music materials. Specifically, online catalogs do not provide retrieval capability for sharp and flat symbols, nor do vendors provide documentation to their clients about the use of these symbols with the system. A survey of these vendors would help to determine the degree to which this problem is taken into consideration during the systems design process.

SURVEY OF VENDORS

A comprehensive list of companies thought to be vendors marketing online catalogs was compiled (see appendix A). Names of vendors were culled from various printed and published sources.[7] The *ALA 1990 Conference Guide* was consulted as a source since many of the vendors exhibit at ALA. Vendors were defined as companies that designed and marketed online catalogs. The final list includes vendors that designed systems for various types and sizes of library collections and different types of data storage facilities (e.g., CD-ROM, mainframe).

A questionnaire was designed that concerned systems design for public access, accommodation of catalog records for music scores and sound recordings, and indexing of uniform titles in MARC. Vendors were queried specifically about the existence of music symbols in the online catalog, the catalog's print and display capabilities, searching and retrieval attributes, and conflicting or same-symbol use for other functions. This information would show how individual vendors dealt with music symbols and would also serve to clarify variations in systems programming that may exist between vendors. Since the authors wanted to create a survey of a specific phenomenon and would need a pool of data that would give an overall picture of how the problem is handled within the context of online systems today, the authors decided not to list or compare individual vendor responses. Vendors were also asked whether or not they provided documentation about these symbols. An area on the questionnaire for additional comments was provided to allow the vendors to elaborate. The questionnaire was mailed with a postpaid return envelope, giving a one-month response window. After the one-month deadline, follow-up telephone calls were made to vendors who had not replied.

A total of 53 questionnaires were mailed. After follow-up telephone calls were made, it was discovered that some of the recipients were either distributors of software products or other types of companies not involved in system design. These responses were eliminated from the total count since they did not meet the requirements. The total number of completed questionnaires received was thirty-three.

RESULTS OF SURVEY

Thirty-two (97%) of the vendors responded that their system was designed for public access. Only one (WLN) responded that it was not so designed; several libraries in the United States have, however, purchased the software and use it as an online public access system. Thirty-one vendors (94%) said they could accommodate catalog records for scores and sound recordings, and two (6%) said they could not. Thirty (91%) have systems that index uniform titles (240 MARC tag/field) in the MARC record, and three (9%) do not. Of the three first questions, an overwhelming number of vendors responded that their system was not only designed for public access but also accommodates bibliographic records for music and indexed music uniform titles.

The next question shifted the tone of the questionnaire from the general to the specific by asking whether the vendor's system accommodates the music sharp and flat symbols. It was assumed that the symbol used for sharp (♯) was the pound sign (#) since the pound sign exists in the ALA character set. (Technically, the music sharp [♯] and pound sign [#] are not equivalent or identical symbols, even though they are used for both purposes in the ALA character set.)

Twenty-four vendors (72%) indicated that their system does indeed accommodate one or both of the symbols in one way or another. Of these (n = 24), most vendors treat both symbols in the same manner (67%). Six vendors (25%) accommodate both symbols, but treat them differently. Two vendors (8%) accommodate only one symbol (one sharp, one flat). Two vendors (8%) indicated that their customer can choose how the symbols would be accommodated.

We asked if the symbols exist as diacritics, special characters, punctuation marks, or fully indexed characters. The replies varied depending on which symbol was in question. In four (17%) of the cases both symbols exist as diacritics. The flat symbol exists more often as a special character (67%), whereas the sharp is more often indexed as itself, i.e., the pound sign (#) (table 1). The sharp symbol exists as a punctuation mark in only one system. It is interesting to note the difference in treatment between the two symbols. Because the pound sign is accepted by the ALA character set as the symbol for the sharp, it is easily indexed as itself. The flat symbol, however, poses special problems. Since it does not have an ASCII value of its own, it must be converted to exist as another type of character. This may make it difficult for systems designers to deal with it easily.

The next group of questions focused on whether the symbols could be displayed on terminal screens and printed to printers. Of the twenty-four systems that accommodate the symbols, eighteen (75%) will display both symbols on a CRT screen if the proper hardware is available, three (13%) will not, and two (8%) replied that they did not know. Here the ALA character set is again a factor. The written report of a 1982 conference on online catalogs included this statement: "An important observation was that the character set used in a system had a very significant impact on the cost of terminals. A terminal that can display the entire ALA character set is two to three times as expensive as one that handles only the ASCII character set."[8] Concerning printing, fifteen vendors (63%) replied that the proper hardware is available, four (17%) replied that it is not, two (8%) replied that they did not know, and two (8%) replied that

Table 1. How Symbols Exist

	Sharp	Flat
As diacritics	4	4
As special characters	10	16
As punctuation marks	1	0
Fully indexed (♯ & ♭)	6	1
Customer can choose	2	2

Table 2. Do Symbols Print/Display?

	CRT	Printer
Yes (both symbols)	18	15
No (both symbols)	3	4
Sharp only	0	2
Unknown	2	2

Table 3. What Happens When Searching?

	Sharp	Flat
Retrievable as themselves (♯ & ♭)	5	1
Eliminated	13	13
Converted into "sharp" and "flat"	2	4
Converted into letter or other	1	3
Customer can choose	2	2

the flat symbol does not print but the sharp symbol does print (see table 2).

Another question asked whether the vendor supplied such hardware as part of its system and provided for responses to be given for both terminals and printers. The responses (n = 33) concerning the terminals were divided: fifteen (46%) replied yes, and seventeen (52%) replied no. Concerning printers, nine (27%) responded that they supply them, and twenty (61%)—a clear majority—replied that they do not.

The next two questions were, perhaps, the most important; they addressed access and retrieval. The first of these questions was "When searching for musical terms such as Concerto in A♭ major, or Sonata in F♯ minor are the symbols retrievable as part of the search string, eliminated from the search string, or converted into other character values (if so, what values?)?"

Of the twenty-four vendors that accommodate the symbols, only eleven (46%) have the capability of allowing the user to retrieve information by using these symbols in the search string (see table 3). One vendor (4%) allows only the flat, not the sharp. Most of these eleven vendors facilitate retrieval by converting these symbols into other values such as the words "sharp" and "flat," the letters *s* and *f*, or in the case of the flat (♭) symbol, a lower-case *b*. Only one vendor (4%) indicated the symbols are retrievable without conversion. Thirteen vendors (54%) completely eliminate both symbols from the search string. Of these thirteen, two (8%) use the pound sign (#) for truncation, further complicating the issue.

It is encouraging that some vendors are attempting to address this problem. The solutions are improvised, however, and require user education. The situation in general, not that just pertaining to the music symbols problem, was clarified in an article on educating online users: "The challenge of educating people to use an online catalog that cannot be substantively changed is formidable. Educators must carefully assess how a particular user population interacts with a particular online catalog and must construct an education program that teaches the library community how to use that online catalog successfully. Since the online catalog cannot be substantially changed, the user must be taught, and taught well."[9] Because most online catalogs cannot be modified, librarians must teach users to key in words or letters in place of the music symbols. Only four of the eleven vendors that provide retrieval capability also provide documentation about these symbols to customers.

The penultimate question was whether or not the vendor had plans to address this topic in the future as part of the capabilities of the system. The responses (n = 33) were almost evenly divided, with fourteen (42%) replying affirmatively and sixteen (49%) replying negatively. The remaining three (9%) were divided three ways with one (3%) saying "possibly," another one (3%) saying they had already addressed the topic, and the final respondent (3%) not responding to the question.

The last question of our survey asked whether the vendor's company sends a representative to the annual national meeting of the American Library Association or the Music Library Association, at which there are user groups discussing the advantages for music of different online catalogs. The affirmative responses totalled nineteen (56%); thirteen (39%) said no, and one (3%) did not answer.

The final entry on our questionnaire was an invitation to add additional comments. Exactly half accepted the invitation. These comments ranged from helpful remarks clarifying a respondent's answer to sales pitch commentary asking the authors to consider purchasing hardware or software.

CONCLUSION

The authors found that the results of their survey confirmed their hypothesis that vendors and designers of online systems do not, by and large, consider the special needs of music retrieval. In particular, the sharp symbol was found to possess retrieval capability as it exists in the ALA character set as the pound sign (#). This allows designers of online systems to use a character that is already present in the ALA character set for retrieval purposes. The flat symbol, however, has limited, if any, retrieval capability because it does not have an ASCII value of its own and must be converted in order to exist as another type of character. Although some vendors are attempting to use these symbols as a way to retrieve music uniform titles, most vendors do not seem eager to make solving this problem a priority in their system design process.

It appears that this problem will continue to create difficulty for librarians who wish to retrieve music materials that feature a music symbol in the uniform title portions of a bibliographic or authority record. The data presented in this article can serve to clarify the problem and to reduce its content to a comprehensible, shared concern. Simultaneously, it is hoped that system designers and vendors of online catalogs will consider the needs of music retrieval to a far higher degree as the library automation market enters a decade of refinement and increased programming enhancement.

REFERENCES

1. *Bibliographic Input Standards*, 4th ed. (Dublin, Ohio: Online Computer Library Center, Inc., 1990).
2. Virginia S. Gifford, personal communication, Mar. 1990.
3. Karen Miller and A. Patricia Miller, "Syncopation Automation: An Online Thematic Index," *Information Technology and Libraries* 1, no.3:270–74 (Sept. 1982).
4. Lenore Coral and others, "Automation Requirements for Music Information," *NOTES, Quarterly Journal of the Music Library Association* 43, no.1:14–18 (Sept. 1986).
5. Brian Nielsen, "How Friendly Can an Online Catalog Be? User Expectation and System Design," Paper read at first National Conference of the Library & Information Technology Association (U.S.), Baltimore, 1983, in *Library & Information Technology Association (U.S.), 1st National Conference* (Chicago: American Library Assn., 1984) p.112–16.
6. Walt Crawford, "Testing Bibliographic Displays for Online Catalogs," *Information Technology and Libraries* 6, no.1:20–23 (Mar. 1987).
7. *American Library Association 1990 Conference Guide*; Frank R. Bridge, "Automated System Marketplace 1991. Redefining System Frontiers," *Library Journal* 116, no.6:62 (Apr. 1, 1991); D. Scott Brandt, comp., "Products & Services Software List of Companies Marketing Online Catalogs," *Computers in Libraries* 10, no.7:36–37 (July/Aug. 1990).
8. Davis B. McCarn, ed., *Online Catalogs: Requirements, Characteristics and Costs. Report of a conference sponsored by the Council on Library Resources at the Aspen Institute, Wye Plantation, Queenstown, Maryland, December 14–16, 1982* (Washington, D.C.: Council on Library Resources, Inc., 1983), p.26.
9. Patricia Sullivan and Peggy Seiden, "Educating Online Catalog Users: The Protocol Assessment of Needs," *Library High Tech* 3, no.2:11–19 (1985).

APPENDIX A. COMPANIES SURVEYED

Access Innovations, Inc. (Albuquerque, NM)
Advanced Computer Products, Inc. (Santa Ana, CA)
Ameritech Information Systems (Dublin, OH)
Auto-Graphics, Inc. (Pomona, Ca)
Brodart Automation (Williamsport, PA)
CARL Systems, Inc. (Denver, CO)
CARLYLE Systems, Inc. (Emeryville, CA)
Charles Clark Co., Inc. (Bohemia, NY)
CLSI, Inc. (Newtonville, MA)
COBIT (Columbus, OH)
Columbia Computing Services (Englewood, CO)
Comstow Information Services (Harvard, MA)
Crew-Noble Information Service (Danville, CA)
Cuadra Associates, Inc. (Santa Monica, CA)

Data Research Associates (St. Louis, MO)
Datalib (Reston, VA)
Data Trek, Inc. (Carlsbad, CA)
Dougherty County Public Library (Albany, GA)
Dynix, Inc. (Provo, UT)
The Follett Software Company (McHenry, IL)
Gaylord Information Systems (Syracuse, NY)
GEAC Computers Inc. (Alexandria, VA)
GEAC Computer Corporation, Ltd. (Markham, Ontario)
Grom Hayes Library Systems (Hartford, CT)
Information Resource Consultant (St. Louis, MO)
Inforonics, Inc. (Littleton, MA)
Inlex, Inc. (Monterey, CA)
Inmagic, Inc. (Cambridge, MA)
Innovative Interfaces (Berkeley, CA)
IRVING Network Systems (Boulder, CO)
Library Automation Products (New York, NY)
Library Co-op (Edison, NJ)
Library Corporation (Inwood, WV)
Library Technologies, Inc. (Abington, PA)
Marcive, Inc. (San Antonio, TX)
Meckler Corporation (Westport, CT)
MultiLIS (Washington, DC)
National Computer Systems (Mesa, AZ)
NOTIS Systems (Evanston, IL)
NSC Inc. (Brillion, WI)
Online Computer Systems, Inc. (Germantown, MD)
Pacific Information (Felton, CA)
Readmore, Inc. (New York, NY)
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Right On Programs (Huntington, NY)
RMG Consultants (Chicago, IL)
SIRSI Corporation (Huntsville, AL)
Sociometrics Corporation (Los Altos, CA)
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User Practices in Keyword and Boolean Searching on an Online Public Access Catalog

Pat Ensor

Keyword and Boolean searching modes are now becoming more commonly available on online public access catalogs, and questions have arisen regarding their use by library patrons. How difficult do users perceive these searches to be? Do those who use them tend to rely on them all the time to the exclusion of all other methods? This study attempts to provide answers to these questions in the context of an academic library that uses the Northwestern Online Total Integrated System online catalog.

INTRODUCTION

After keyword/Boolean searching mode was available for awhile on Indiana State Universities (ISU) Libraries' online public access catalog (OPAC), questions began to arise. The percentage of searches done in keyword mode rose steadily from 15.6% in November 1988 to 21.4% in November 1989 before leveling off. How did those who used keyword/Boolean searching use and perceive it? Did they find it difficult? Did they prefer to use it most of the time? Were they satisfied with it?

The author undertook a study of the practices and perceptions of the users of keyword searching on the Northwestern Online Total Integrated System (NOTIS) to answer these questions and others. The two guiding theses of the study were: (1) the use or nonuse of keyword searching on LUIS is related to variables such as age, computer experience, subject area, status, and frequency of searching, and (2) there are certain measures ISU Libraries can take to increase the chance that patrons will use keyword searching and to improve the quality of their keyword searching.

The findings of this study attempt to represent users' early reception of keyword searching; the results should be useful for future comparison to similar data collected about keyword searching and about user reactions to future new OPAC features. (The full project report, submitted to ERIC, and an article published elsewhere also detail other aspects of patron keyword searching.[1])

The University

Indiana State University has approximately 11,000 students, including about 2,000 graduate students. A small number of doctorates are offered are in the fields of education and psychology. Master's degrees are awarded in all schools; they include the College of Arts and Sciences and the Schools of Business, Education, Nursing, Technology, Health, Physical Education, and Recreation. The University has approximately 700 faculty members.

The Library

Indiana State University Libraries include a main library, Cunningham Memorial Library, and a science library, which covers chemistry, biology, and geology. Since March 1985, the ISU Libraries have made the NOTIS online

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catalog, LUIS, available to the public. It lists over 99 percent of the library's holdings, with 1,751,000 bibliographic records. It also includes the holdings of two nearby smaller institutions: Rose-Hulman Institute of Technology, an engineering school, and St. Mary-of-the-Woods College, a liberal arts institution.

Keyword Searching

Indiana State University Libraries made the keyword mode of LUIS searching available in the late spring of 1988, so that it had been available for almost two years when this study was done. Prior to the introduction of keyword/Boolean searching, NOTIS had three modes of searching available: author, done by typing in "a=[author's last name first name]"; title, done by typing in "t=[title of work, omitting initial article]"; and subject, done by typing in "s=[Library of Congress subject heading]." In early 1988, NOTIS introduced the keyword/Boolean search mode, done in its most basic form by entering "k=[word or phrase]." The syntax of this search mode is a very simplified form of the BRS search language.

Library Instruction

Library instruction at ISU Libraries is primarily carried out by the Library Instruction & Orientation Department, which has two librarians. The author and four other librarians participate in instruction when needed. The department offers on-demand instruction sessions at faculty request for classes; most freshmen receive LUIS instruction, including an introduction to keyword/Boolean, in their beginning English class. Advanced instruction in keyword/Boolean searching is offered and publicized once each semester in a workshop that participants sign up for on a voluntary basis; attendance is usually low. Instruction is also available by individual appointment with a librarian.

LITERATURE REVIEW

The most important literature in this area generally falls into three groups: the Council on Library Resources (CLR) online catalog studies in the early eighties, some individual library OPAC user surveys that relate to keyword searching, and some studies of transaction logs for online catalogs. The author could not discover any other similar attempt to question patrons extensively about their use of keyword/Boolean searching on any online catalog, although some of the CLR studies had some questions about keyword/Boolean searching, and some of the transaction log studies have implications in this area. In addition, some research in online and CD-ROM information retrieval is relevant.

Council on Library Resources Studies

In the last half of 1982, a spate of relevant reports began appearing from the CLR-sponsored research projects on online catalog use. A study conducted by the Research Libraries Group included Northwestern University's online catalog, LUIS, which did not provide keyword/Boolean searching at that time. It found that increasing results of a search, finding a correct subject term, and doing a subject heading search were the most commonly cited user problems on LUIS and on the Stanford and Dartmouth systems.[2]

A highly relevant study report appeared in November 1982; Joseph Matthews Associates surveyed users of six computer systems in seven libraries, including an OPAC that provided keyword searching early on Mankato State University's OPAC, PALS (Project for Automated Library Systems). Users of this system had about as much difficulty finding correct subject terms as those of nonkeyword systems (32% vs. 39%), but they reported fewer subject searching problems (17% vs. 28%). Sixty-four percent of Mankato State University users reported using keyword searching versus 48% using subject heading searching. About 45% of the searching on Mankato State University's catalog was keyword searching, as opposed to about 19% subject-heading searching.[3]

A related 1983 study done by the University of California about its MELVYL system, which allows keyword/Boolean searching, indicated that MELVYL system users had greater than average problems increasing a result when too little is received and finding the correct subject term. However, they had fewer than average problems doing a computer search by subject and using logical terms "and," "or," and "not."[4] The problems are similar to those of systems without keyword/Boolean searching, but the greater ease of subject searching bears out Mankato State's results. A related study of the MELVYL system's transaction logs found that in a group of keyword searches, about 27% used a single keyword, and almost 73% used explicit Boolean operators between keywords. The study concluded that in general, search complexity was low, but some users obviously do use Boolean capabilities when a simple search retrieves too much or too little material.[5]

Another interesting study was done of Syracuse University's SULIRS system in 1983. This system has keyword/Boolean capabilities. Analysis of transaction logs showed that many users were apparently unaware of (1) an implicit *and* when they typed in more than one keyword, (2) the fact that the SB command only searched Library of Congress Subject Headings, (3) that they could refine broad searches by combining factors, and (4) that they could get online help. Users tended to type in only one or two keywords, resulting in large lists of results that were seldom completely browsed. When searches were reformulated, it was usually done by changing keywords, not by changing search types.[6]

Joseph Matthews' overall report on the massive twenty-nine-institution CLR OPAC study states that the most common problems patrons reported were increasing the result when too little is retrieved and finding the correct subject term. This result seems to correspond with the findings of the institutions mentioned above with keyword/Boolean search capabilities. Thirty-one percent said that subject searching was difficult. Generally keyword searching was used frequently when available, but it was not usually a requested future enhancement where it was not available. Systems with keyword/Boolean searching received more subject searching and were more successful in known-item searching.[7] Keyword/Boolean searching capabilities did not appear to relate to user satisfaction.[8]

Finally, an online catalog library center focus group study done as part of the CLR research noted that participants remarked that they often find their subject terms to be too specific or too general, they try many different subject terms when finding too little information, and they consult library staff when they cannot find the right terms.[9]

Library-Conducted OPAC User Surveys

In 1983, researchers at Bell Laboratories built two online catalog systems for their library; one was a menu-based system, using a hierarchy based on Dewey Decimal categories, and one allowed keyword searching of author, title, and subject heading terms. The keyword system was overwhelmingly preferred; it was used for 80 percent of all searches. Sixty-five percent of keyword-search users found what they wanted, as opposed to 30 percent of menu searchers. Keyword searchers tended to do simple one- or two-word searches.[10] The users of this system would, of course, have been quite sophisticated technologically.

In a study that surveyed faculty use of subject searching in card and online catalogs at the University of Houston, University Park, Carolyn Frost found that 27.5 percent of the faculty used keyword searching "always" or "frequently." She noted that "the percentage of frequent users of the keyword search was twice as high among humanities/social science faculty as it was among science/engineering faculty." Fifty-two percent of the faculty wanted the enhancement of being able to combine terms in a search added to the catalog.[11]

Transaction Log Studies

The most extensive analysis of user searches on keyword systems was done in the United Kingdom and Australia. A librarian at the University of Hull, which was one of the earliest users of the Geac system in the United Kingdom, studied keyword searches through transaction logs. He found that over a period of eight months, the percentage of one-word keyword searches ranged from 31% to 38%; two-word searches ranged from about 45% to about 50%; searches involving three words or more ranged from about 13% to about 18%; and complex searches (using Boolean operators and/or truncation) ranged from about 6% to about 10%. The one-word searches resulted in the most matches; 36.6% found 100 or more matches, and only 10.4% resulted in zero matches. For the two-word searches, 34.5% found zero matches, and 38.6% found one to nine matches. For the three-word searches, 48.2% found zero matches, and 42% found one to nine. Tom Graham concluded that user comments showed that although learning the system was often difficult, the keyword/Boolean capability was valuable. His study indicated the need for more online help.[12]

In late 1989, a transaction log study appeared with some implications for this project. Thomas Peters of University of Missouri, Kansas City, discusses the relative merits of transaction log studies and surveys. He reports on a transaction log study done on LUMIN, their WLN-based OPAC system. He found that very little Boolean-mode searching was done, and from 50 to 80 percent of the "and" searches done resulted in zero hits. He notes that "many users tend to work with poor, inefficient, high-recall searches rather than attempt to refine their searches and make the results more precise."[13]

Information Retrieval Research

Christine Borgman of the Graduate School of Library and Information Science at the University of California, Los Angeles, has done some invaluable research in this area, but a few others have studied end-user behavior with systems that offer keyword/Boolean searching. Surprisingly, little of the research on end-user searching turned out to be of value in this study, however.

An early study of the behavior of doctors searching Medline yielded some interesting information. Looking at a sample of 400 recorded searches on Medline by these end users, the researchers found that 79.6% of the sessions used the "and" operator, and one to five "ands" were used in 56.8% of the sessions. Truncation was used successfully in 9.8% of the searches. Only 0.6% of the searches used field abbreviations, although 17.4% used the ALL indicator to have Medline do a search not limited to a field. The researchers concluded tentatively that "users tend to learn and use the minimum of techniques with which they can get the job done—being content to do something the long way rather than to try to remember a short one. It also appears that some will look at many references offline to ensure recall, rather than to try a sophisticated strategy to get precision in their searches."[14]

Borgman published several papers in 1986 that focused on individual differences in information retrieval and user mental models. She looked for what factors account for differing rates of success in information retrieval. She has found evidence that indicates that students majoring in science and engineering perform significantly better on a Boolean logic-based search system than social science and humanities majors, even when controlling for previous computer experience. She has also done research that indicates that engineering majors show more of the logical reasoning and problem-solving aptitudes that have been shown to be related to computer programming and information retrieval than English and psychology majors do.[15]

A study of the factors that differentiate between successful and unsuccessful searches by biomedical professionals on Medline from the BRS Colleague system was reported in 1986. Most problems were found to stem from difficulties with search strategy; the more successful searches happened to be for topics where a simple search was adequate. The extent to which the different system search features were used was reported: 77% of the searches used "and," 17% used "or," 38% used truncation, 29% used field qualifiers, and 26% used positional operators.[16]

Finally, in a recent study of CD-ROM users' desire to update CD-ROM searches with online searches, researchers at Texas A&M monitored CD-ROM searches by end users. They found that "the majority of the participants did not understand the basic concepts of searching, such as selection of search terms, use of Boolean operators, truncation, and limiting." They concluded that many, if not most, searchers were searching very inefficiently and "happily printed out hundreds of citations." They also found that searching concepts did not carry over from one CD-ROM system to another.[17]

Summary

The literature to date indicates that users of OPACs tend to use keyword/Boolean capabilities relatively little, and end users of other information retrieval systems find Boolean searching fairly difficult to learn and do. Users tend to do simple searches and make little use of complex features. The main area showing significant individual differences in relation to keyword/Boolean systems has been the area of subject specialization, although evidence here is contradictory.

METHODOLOGY

The Questionnaire

The author decided that the most useful and feasible way to obtain the information desired would be by way of a questionnaire. Although the information obtained is not necessarily an accurate report of what users do, a questionnaire is the only way short of individual interviews and testing to elicit user characteristics

Table 1. Frequency of Keyword Searching

	No.	%
Almost every time I use LUIS	121	30.3
More than half the times I use LUIS	55	13.8
Less than half the times I use LUIS	75	18.8
Almost never	45	11.3
Unusable answers	0	0
Blank	104	26.0

Percentages do not always equal 100% due to rounding.

and subjective opinions. Because the author was working alone and wished to have a large sample size to work with, individual interviews were not feasible.

The final form of the survey had twenty-seven questions, with one question having ten parts. Questions 1 through 16 were aimed at both users and nonusers of keyword/Boolean, and the first ten of them attempted to elicit demographic and other user characteristics. Question 17 was aimed at nonusers of keyword/Boolean searching, and the rest were aimed at users of keyword/Boolean searching. Parts of the questionnaire relevant to these results are given in appendix A.

Questionnaire Administration

The author personally administered the questionnaire from the end of January 1990 to the beginning of April 1990. Users of LUIS at the main terminal cluster on the first floor of the main university library were approached and asked to fill out the survey, primarily during evenings and weekends. Library workers were not approached to answer the questionnaire. An attempt was made to approach anyone using a LUIS terminal during the sampling period, although with only one questionnaire administrator, some users were inevitably missed. Although there is a science library on campus, as mentioned above, questionnaires were not given out there because the collection covers a narrow range of subject areas (chemistry, biology, and geology); as it turned out, approximately 25 percent of the respondents were in a science or technology area anyway.

The only exception to the above procedure was made in an attempt to elicit adequate faculty response. Since few faculty members were to be found doing searches at the main cluster, the author chose approximately sixty faculty members in all disciplines she knew to be LUIS searchers and mailed the questionnaire to them. This effort produced about a 50 percent response rate.

Ultimately, 400 usable questionnaire responses were obtained. Although it proved impossible to keep an exact count of how many questionnaires were distributed, the author estimates the response rate to have been about 35 percent. The data retrieved were processed using the Kwikstat statistical program.

RESULTS

Frequency of Keyword Searching

Reported frequency of keyword searching is given in table 1. Status and age range showed significant variations in frequency of keyword searching. Frequency of keyword searching drops when one goes from undergraduates to graduate students to faculty. Over 65% of all undergraduate students report using keyword searches almost every time or more than half the time they use LUIS; less than 55% of graduate students and less than 36% of faculty members responded similarly.

Difficulty of Learning Keyword Searching

Perceived difficulty of learning keyword searching is reported in table 2. About 60 percent of the respondents felt that keyword searching is very easy or easy to learn. Only about 13 percent circled *3* or *4*.

Respondents who had previously used an OCLC terminal or a computer at school for a computer course perceived keyword searching as easier to learn, whereas those who had not used any other computer system perceived it as more difficult. Only 62.9% of those who had used no other computer system circled numbers on the easy half of the scale, as opposed to 84.4% of those with computer experience. Fully 11.1% of those without

Table 2. Difficulty of Learning Keyword Searching

	No.	%
1 (very easy)	122	30.5
2	117	29.3
3	44	11.0
4 (very difficult)	7	1.8
Unusable answers	1	.3
Blank	109	27.3

Percentages do not always equal 100% due to rounding.

Table 3. Difficulty of Learning Boolean Operators

	No.	%
1 (very easy)	50	12.5
2	90	22.5
3	71	17.8
4 (very difficult)	28	7.0
Unusable answers	0	0
Blank	161	40.3

Percentages do not always equal 100% due to rounding.

computer experience considered learning keyword searching very difficult, versus 1.5% of those with computer experience.

Difficulty of Learning Boolean Operators

On question 20, it is interesting to note the people who did not answer; over 40% of the respondents left this blank (see table 3). Many of them wrote in comments that indicated they did not know what Boolean operators are, and it is likely that some of the respondents who did answer the question did not know much about Boolean operators. There is a widespread lack of familiarity with Boolean operators.

Faculty members were less likely to perceive learning Boolean operators as difficult. ISU upperclassmen and faculty felt Boolean operators were easiest to learn, with over 69% of juniors and seniors and over 79% of faculty circling *1* or *2*, with *1* being very easy. Only 43% of ISU freshmen and sophomores circled *1* or *2*, as did 40.7% of graduate students.

Those with no other computer experience perceived learning Boolean operators as more difficult. Only 62.9% of them circled numbers on the easy half of the scale, as opposed to 84.4% of those with computer experience. Fully 11.1% of those without computer experience considered learning keyword searching very difficult, versus 1.5% of those with computer experience. Those with CD-ROM database experience perceived it as less difficult, as did those with online dial-up database experience, OCLC terminal experience, home computer experience, or work computer experience.

Satisfaction with results of the last keyword search (question 25) falls as perceptions of difficulty with learning Boolean operators rises. Percentages of respondents saying they were very satisfied with the results of their last keyword search drop steadily as their perceived difficulty of learning Boolean operators rises. Over 80% of those who were very satisfied or satisfied (circled *1* or *2*) with the results of their last keyword search perceived Boolean operators to be very easy to learn. This combination is at about the same level for those who circled 2 on the Boolean operator scale, but drops to about 76% for those who circled 3 and drops greatly to about 46% for those who felt learning Boolean operators was very difficult.

Methods Used to Learn Keyword Searching

The bulk of respondents use minimal information to learn keyword searching on their

Table 4. Methods Used to Learn Keyword Searching

Method	No.	%
LUIS welcome screen	169	42.5
LUIS keyword help screens	127	31.8
Trial and error	166	41.5
Library instruction class/workshop	108	27.0
Information desk librarian assistance	34	8.5
Assistance from passing library staff member	22	5.5
Friend or someone at next terminal	52	13.0
Appointment with librarian	2	.5
Library handouts	60	15.0

Table 5. Satisfaction with Results of Last Keyword Search

	No.	%
1 (very satisfied)	57	14.3
2	148	37.0
3	69	15.8
4 (very unsatisfied)	19	4.8
Unusable answers	4	1.0
Blank	109	27.3

Percentages do not always equal 100% due to rounding.

own (see table 4); all the LUIS welcome screen tells them is that to do a keyword search, one types in *k*=[a keyword] and presses the enter key, although a good number of them may actually use the keyword help screens, which have much more information. Most people are evidently not reached by more organized library instruction methods, or they do not want to use them.

Satisfaction with Results of Last Keyword Search

Question 25 is about satisfaction with the results of the respondent's last keyword search. Users were asked to circle a number on a scale of 1 to 4, from very satisfied to very unsatisfied. Results are given in table 5. Over half of all the respondents were very satisfied or satisfied with the results of their last keyword search. Only a little over 20% circled *3* or *4*. Generally, the great majority of people who do keyword searching (71.4%, or 205 of 287) are satisfied with the results of their last keyword search.

Level of satisfaction with results of the last keyword search shows significant variation in attitude toward keyword searching compared with *a*=, *t*=, and *s*= searching. Those who are more satisfied with the results of their last keyword search are more likely to find keyword searching superior or better for topic searching and less likely to consider it a last resort. The "very satisfied" group had the highest percentage of members saying keyword searching is superior (29.6%) and the lowest percentage (11.1%) saying it is a last resort for them. The "very unsatisfied" group had the lowest percentage of members saying keyword searching is superior (5.6%) and the highest (two-thirds) saying it is a last resort. The progression on each attitude statement is fairly clear.

Comparison of Keyword Searching to *A*=, *T*=, and *S*= Searching

The second-to-last question on the survey asks users to compare keyword searching with *a*=, *t*=, and *s*= searching and seeks to elicit general attitude toward keyword searching (see table 6). Do users perceive themselves as using keyword searching just about every time they search, do they use it in moderation under certain circumstances, or do they avoid it if at all possible?

Faculty were more likely than other groups to check the third statement, and less likely to check the first, most positive statement, although this tendency does not quite reach the point of significance when looking at overall response. The response "keyword searching is usually superior to all other methods, and I use it most of the time" was chosen by 19.4% (39 of 201) of undergraduates and 17.6% (6 of 34) of graduate students, but only

Table 6. Comparison of Keyword Searching to A=, T=, and S= Searching

	No.	%
Keyword searching is usually superior to all other methods, and I use it most of the time.	47	11.8
Keyword searching is better when I want to find information on a subject, but I still use a= and t= searching when appropriate.	153	38.3
I only use keyword searching as a last resort when I can't find something using the other search methods.	86	21.5
Unusable answers	3	.8
Blank	111	27.8

Percentages do not always equal 100% due to rounding.

Table 7. Attributions for Failure of Keyword Searches

	No.	%
My topic is too specific.	59	14.8
I'm not finding the right words for my topic.	147	36.8
I don't know enough about how to do a keyword search.	36	9.0
LUIS doesn't list material on my topic.	22	5.5
Unusable answers	27	6.8
Blank	109	27.3

Percentages do not always equal 100% due to rounding.

2.5% (1 of 40) of faculty. The response "keyword searching is better when I want to find information on a subject, but I still use a= and t=searching when appropriate" varied little, with 107 or 53.2% of undergraduates checking it, 19 or 55.9% of graduate students, and 21 or 52.5% of faculty. The final statement, "I only use keyword searching as a last resort when I can't find something using the other search methods," varies again, with 27.4% or 55 undergraduates choosing it, and 26.5% or 9 graduate students, but 45% or 18 faculty selecting it.

Attributions for Failure of Keyword Searches

The final question on the survey asks users to tell the main reason why their keyword searches fail when they are unsuccessful. Four reasons were given, and users were asked to choose the one that most closely applies (see table 7).

DISCUSSION

This look at patron attitudes about keyword/Boolean searching should be of some use to other NOTIS installations and to organizations with other types of OPACs that use a separate mode of searching for keyword/Boolean functions. Information about patrons' impressions about the difficulty of learning keyword searching and Boolean operators, the greater reluctance of faculty to embrace this form of searching, the benefit to patrons of having other computer experience, patrons' preference for learning online, and their attributions for failure at keyword searching may be somewhat generalizable to other situations. It is worthy of research to see if other institutions have the same results.

Contrary to some librarians' beliefs, the great majority of users are not embracing keyword searching wholeheartedly and indiscriminately. At least as far as user self-reporting goes, no one needs to worry that users are using keyword searching exclusively. In fact, in light of the issues raised by searching multiple databases, with multiple vocabularies through the OPAC system, users may well need to be urged to use keyword searching more.

Who seems to take to keyword/Boolean searching more? Not surprisingly, the answer is those with previous computer experience, especially with information-seeking computer experience. This should mean that, as our patrons are becoming more likely to be familiar with computers, they may take to this type of searching more easily. Who seems to take to it less? Faculty members, who probably tend to have less computer experience than students, and who are not as often the target of library instruction efforts. This may point up the need to focus on faculty more when introducing this kind of capability.

Those who found Boolean operators more difficult to learn also were less satisfied with their keyword search results, although one cannot conclude that those who know more about Boolean operators are more satisfied with their keyword search results. For one thing, just because respondents perceive Boolean operators as less difficult to learn does not mean they know more about them. Results on both of these factors may well stem from a general positive attitude and acceptance of keyword searching from a group of respondents. There is interest among librarians, though, in how patrons deal with large search result sets, and those who do not understand Boolean operators may well have more difficulty with this problem.

Patrons were very likely to have learned to do keyword searching through some online method at the terminal, through help screens and the welcome-to-LUIS screen. A library might respond to this by offering more library instruction workshops, but academic libraries have generally had difficulty attracting people to workshops, and it may be more useful to accept that we will never reach all, or probably even a majority, of patrons using a system in a classroom. Librarians tend to hunt diligently for the best way to teach patrons to get around a system's deficiencies, when what we should be doing is insisting that vendors aim for a system that does not need to be explained to such a great extent.

Examining patrons' self-attributions about failure in keyword searching, we note that two of the reasons (having a topic that is too specific and LUIS not listing material on the topic) pin the blame on the system or other factors; the other two reasons (not finding the right words for the topic and not knowing enough about keyword searching) pin the blame on the user. This is a generalization, but the overwhelming majority of respondents to this question gave a reason for failure that implies some lack in their knowledge. Since many of them are probably right, it is encouraging that many users seem to appreciate that they need to know more about the process of keyword searching. Now, however, it is up to the librarians and the system designers to convey that knowledge to them in some useful way.

CONCLUSION

The tendency among users of keyword searching on ISU's OPAC, LUIS, is to use keyword searching more than half the times they use LUIS, to find keyword searching easy or very easy to learn, but to have more problems with Boolean operators. They use means of keyword instruction that are available at the terminal and are independent of library staff. Other parts of the study showed that they are most aware of the keyword help screens, and tend to like them. They generally do not use very organized methods to develop keyword searching terms.

Keyword searchers generally find no more than some of their keyword searching results useful, but they report themselves very satisfied or satisfied with their results. They take a moderate view of keyword searching, finding it better for subject searching, but still using *a*= and *t*= searching when appropriate. They are most likely to feel that when their keyword searches fail, it is because they cannot find the right words for their topic. More studies like this one may point the way toward understanding more about users' perceptions of keyword searching methods, especially in light of the growing practice of loading periodical databases locally. They will make keyword searching even more important to users.

REFERENCES AND NOTES

1. *Keyword/Boolean Searching on an Online Public Access Catalog: Patrons and Their Perceptions* has been published as ERIC document ED 33 7163; "User Characteristics of Keyword Searching in an OPAC," *College & Research Libraries* 53:72–80 (Jan. 1992).
2. Douglas Ferguson and others, *Public Online Catalog and Research Libraries* (Stanford,

Calif.: Research Libraries Group, 1982), (ED 229 014).

3. Joseph R. Matthews, *A Study of Six Online Public Access Catalogs: A Review of Findings*, final report for the Council on Library Resources (Washington, D.C.: Council on Library Resources, 1982), (ED 231 389).
4. University of California, Berkeley, Systemwide Administration, Library Studies and Research Division, *University of California Users Look at MELVYL: Results of a Survey of Users of the University of California Prototype Online Union Catalog, Part 1*, final report for the Council on Library Resources (Washington, D.C.: Council on Library Resources, 1983), (ED 231 400).
5. Ray R. Larson, *Users Look at Online Catalogs, Part 2: Interacting with Online Catalogs*, final report for the Council on Library Resources (Washington, D.C.: Council on Library Resources, 1983), (ED 231 401).
6. Thomas H. Martin and John C. Wyman, *Feedback and Exploratory Mechanisms for Assisting Library Staff Improve On-Line Catalog Searching*, final report for the Council on Library Resources (Washington, D.C.: Council on Library Resources, 1983), (ED 258 577).
7. Gary S. Lawrence and Joseph R. Matthews, *Detailed Data Analysis of the CLR Online Catalog Project*, final report for the Council on Library Resources (Washington, D.C.: Council on Library Resources, 1984), (ED 242 332).
8. Joseph R. Matthews and others, eds., *Using Online Catalogs: A Nationwide Survey* (New York: Neal-Schuman Publishers, 1983); Robert N. Broadus, "Online Catalogs and Their Users," *College & Research Libraries* 44:458–67 (Nov. 1983).
9. Karen Markey, "Thus Spake the OPAC User," *Information Technology and Libraries* 2:381–87 (Dec. 1983).
10. Valerie Geller and Michael Lesk, "An On-Line Library Catalog Offering Menu and Keyword User Interfaces," in *Fourth National Online Meeting Proceedings* (Medford, N.J.: Learned Information, 1984), p.159–65.
11. Carolyn O. Frost, "Faculty Use of Subject Searching in Card and Online Catalogs," *Journal of Academic Librarianship* 13:86–92 (May 1987).
12. Tom Graham, "The Free Language Approach to Online Catalogues: The User," in *Keyword Catalogues and the Free Language Approach*, ed. Philip Bryant (Bath, England: Bath University Library, 1985), p.21–30.
13. Thomas A. Peters, "When Smart People Fail: An Analysis of the Transaction Log of an Online Public Access Catalog," *Journal of Academic Librarianship* 15:267–73 (November 1989).
14. Winifred Sewell and Sandra Teitelbaum, "Preliminary Observations of Nonmediated Search Behavior of Pathologists and Pharmacists," in *Proceedings of the ASIS Annual Meeting*, v.19 (Washington, D.C.: American Society for Information Science, 1982), p.276–78.
15. Christine L. Borgman, "Individual Differences in the Use of Information Retrieval Systems: A Pilot Study," in *Proceedings of the ASIS Annual Meeting*, v.23 (Washington, D.C.: American Society for Information Science, 1986), p.20–31.
16. Martha Kirby and Naomi Miller, "Medline Searching on Colleague: Reasons for Failure or Success of Untrained End Users," *Medical Reference Services Quarterly* 5:17–34 (Fall 1986).
17. Susan K. Charles and Katharine E. Clark, "Enhancing CD-ROM Searches with Online Updates: An Examination of End-User Needs, Strategies, and Problems," *College & Research Libraries* 51:321–28 (July 1990).

Browsing through Public Access Catalogs

Jamshid Beheshti

Browsing is an important aspect of the information-seeking activities of library users and is primarily visual. Second-generation OPACs lack the necessary visual characteristics for browsing. These characteristics may be best implemented through simulation of images of books and library shelves on the computer monitors. To mimic users' mental models of the real world may be costly, however, unless new interfaces can tap into existing sources of information. A possible solution may be found in using the information embedded in the MARC record pertaining to the physical description of a book. Public Access Catalog Extension (PACE) is designed as an alternative interface based on mental images of users and MARC records.

In the 1960s MARC was introduced to the library world; in the 1970s automated cataloging systems were developed; and in the 1980s came the introduction of online public access catalogs (OPACs). As each decade passed, sophisticated systems were produced and implemented to automate library functions and to provide end users with more efficient and effective services. Today, automated systems are used extensively in different information environments and online catalogs have had overwhelming acceptance by the public, replacing the more traditional card catalogs.[1]

OPACs have evolved from the first to the second generation, enabling users to search through keywords in a variety of fields using Boolean logic, truncation, and proximity operators. In addition, many second-generation systems enable end users to have access to two or more search modes, such as menus and commands, and several display options. These OPACs, however, are different from commercial databases available through systems such as DIALOG and BRS in several respects. They are primarily designed for end users. They do not have extensive descriptors, abstracts, or many other accessible fields as traditional online bibliographical databases do. Furthermore, they cover a variety of subjects and are not confined to a particular discipline.[2]

Traditionally, OPACs have involved mini or mainframe computers in a multi-user environment. With the introduction of CD-ROMs, a new generation of online catalogs, sometimes referred to as PACs (public access catalogs), has emerged in the market. PACs have been associated with single-user computing, but some may be used in a network environment. The distinction between the two categories of online catalogs has become blurry; one CD-ROM vendor reports that its largest system serves over 250 stations and includes two million records.[3] Using the microcomputer's graphic capabilities, user interfaces of CD-ROM PACs are generally more "friendly" than OPACs, with such features as help windows and pull-down menus.

Despite their sophisticated retrieval engines, research shows users have a number of

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problems in interacting with OPACs. An in-depth analysis of these problems may be found in a recent article by Martha M. Yee, who has reviewed over 150 studies in this area.[4] Yee summarizes the obstacles facing users of OPACs as: finding appropriate subject terms, large number of hits and failure to reduce the retrieval sets, zero hits and failure to increase the retrieval sets, failure to understand cataloging rules, and spelling and typographical errors. In addition, lack of understanding of the indexes, files, and the basic database structure has led to the use of articles, stop words, inputting author's first name before the last name, and hyphenation problems. Interfaces and retrieval systems have caused a few problems of their own—namely, complex interfaces and the need for training and relearning when used infrequently, incomprehensible error messages, problems associated with displays both for brief records and for complete cataloging information, incomprehensible HELP messages, and predicaments of Boolean logic. These problems have prompted one researcher to state that the second-generation OPACs, like many other online retrieval systems, are "powerful and efficient but are dumb, passive systems which require resourceful, active, intelligent human searchers to produce acceptable results."[5]

Researchers are currently investigating different options and models to remove some of the obstacles facing end users in retrieving information from online catalogs. These options consist of enhancing the content of MARC records by including additional subject headings and classification schedules, and redesigning user interfaces. Because enhancing millions of MARC records can be extremely costly, creating new interfaces may provide a more realistic solution to the existing problems. Marcia Bates has suggested a model for improving online searching called "berrypicking." This models is based on the premise that the nature of a user's information query is dynamic, and therefore "it follows a berrypicking pattern, instead of leading to a single best retrieved set."[6] Bates has arrived at this model by examining search patterns of end users. Users have various search techniques to fulfill their information needs, including obtaining information from footnotes and references in journals and books, identifying core journals in a discipline and following them through, searching for known authors and subjects, and "browsing the materials that are physically collocated with materials located earlier in a search." This last technique plays an important role in the information-seeking activities of users.

BROWSING

Franklin P. Adams once said, "I find that a great part of the information I have was acquired by looking up something and finding something else on the way."[7] Browsing is an important and integral part of the information-seeking activities of library patrons. Although, Apted, Herner, Hyman, and Lancaster have suggested different categories for browsing, in general, it may fall into two broad classes: random and systematic.[8-11] The former represents the nonpurposive, general type of browsing that may occur in public libraries and is mainly for interest and leisurely reading. Systematic browsing may have a specific purpose—to alleviate the user's information anomaly. At this stage, as Pejtersen states, the "user may have a need which is so ambiguous that no search specification is possible. Instead, the bookshelves or database are scanned in order to explore possible matches between the intuitive current need and the available items."[12] This type of browsing, also referred to as "semi-directed" or "semi-structured searching," is the first phase of more specific information seeking. Marchionin suggests that people browse for three reasons: the search objective cannot be defined clearly, the cognitive burden is less than the structured formalized searching, or perhaps the retrieval system "encourages" browsing.[13] While some investigators view browsing to be nothing more than "casual, don't-know-what-I-want behavior,"[14] others advise novice users to actively browse through the shelves because "when you have learned to read shelves as well as books, you have made a significant advance along the road to intellectual maturity."[15] Morse, a leading researcher in the field of operations research, suggests that the browser "does not allocate his search effort purely at random; he goes to that section of the library that he estimates has the highest probability of containing a book or books his immediate interests would find to be worth borrowing."[16]

Browsing in the online environment has been a viable searching alternative for some time. The present OPACs have two modes of searching: querying and browsing. Querying involves exact keyword or phrase matching by using Boolean logic, proximity and other operators, the result of which is "all or nothing."[17] This mode of searching is generally used for known-item searches and high precision. Browsing consists of scanning lists of index terms, subject headings, shelflists, or brief bibliographic records. It is most effective and practical when the search aim is not specific, and the precise subject headings or descriptors are unknown.[18] Many systems offer both modes of searching to end users, but information retrieval problems continue. A study of the MELVYL system (University of California's online union catalog) shows that 44 percent of searches result in zero hits in the "Lookup" mode. Those users who conducted successful searches retrieved sets with an average of 98.2 records, constituting a relatively large set to browse through.[19]

Research shows that browsing and classification schemes in online catalogs are linked—the former is a prerequisite for searching by class numbers. Browsing the shelflist by using the class numbers has been demonstrated to be an effective search strategy.[20] Some systems, such as General Research Corporation LaserGuide, Library Corporation Bibliofile Catalog, and Intelligent Catalog, offer shelf browsing by adjacent call numbers.[21] LaserGuide provides two additional features to help users search and locate desired books. The MAP key displays a diagram of the library with approximate location of the catalog in relation to library shelves. The SHELF key accommodates shelf browsing by allowing the user to move to either side of the present location, left or right of the selected title. Another example of browsing capability of an OPAC is Minnesota State University System OPAC (PALS) shelflist browse feature, which enables the user to scan sections of the shelflist by entering truncated call numbers. Data presented through this type of display do not provide for realistic shelf browsing and limit the user to single line displays.[22]

Even though many OPACs are gradually incorporating browsing capabilities, including shelf browsing, one study indicates that library patrons browse the shelves even after consulting the online catalog.[23] The data from Hancock-Beaulieu's study show that between 30 and 45 percent of all the searches that start from the online catalog, regardless of type of search, are concluded with browsing at the shelves.[24]

ELECTRONIC BROWSING THROUGH MARC

Browsing is primarily visual and is dependent on patterns and shapes that are presented on the screen.[25] Direct manipulation of objects on the screen conforms to existing syntactic and semantic models. These models are based on the notion that when objects are displayed on the computer monitors, the need for learning and using complex commands, the syntax of which might create more obstacles for users, are substantially eliminated. Each direct manipulation would immediately result in a visible reaction from the system and therefore reduce cognitive burdens. Hence, "the task semantics dominate the users' concerns, and the distraction of dealing with the computer semantics and the syntax is reduced."[26] In general, end users find spatial presentation to be an effective channel of communicating and organizing information.

Many existing MARC records contain the physical description of the monographs. The number of pages or leaves, preliminary pages, illustrations, and the size of a monograph are all contained in the field tag 3xx of MARC records. This description is usually presented in the OPACs as part of the full record but not the brief records that are displayed for browsing purposes. Ironically, however, very few users would notice this rich source of information. As one study has reported, users "appear to scan the documentation for the information desired. Having located such information, they may fail to note the presence of related information unless it is in close (perceptual) proximity."[27] Physical descriptions are usually concealed between the information-rich fields, title and subject headings. Even if OPAC users do notice the physical descriptions, they have to use the complex mental process of decoding the written language, i.e., number of pages and size of the book, and encoding this information into mental images.

Why is the physical description so important? Ted Nelson, the founder of Project Xanadu, states:

> One of the greatest [problems] is how to make the reader feel comfortable and oriented. In books and magazines there are lots of ways the reader

can see where he is (and recognize what he has read before): *the thickness of a book*, the recalled position of a paragraph on the left or right page, and whether it was at the bottom or top. These *incidental cues* are important to knowing what you are doing. New ones must be created to take their place. How these will relate to the visuals of tomorrow's hot screens is anybody's guess, but it is imperative to create now a system on which they may be built[28] [my italics].

In the above passage, Nelson is referring to the use of hypermedia and the associative disorientation problems. Yet the *incidental cues* that he mentions may be important stimuli in an OPAC. The visual clues, along with auditory and tactile ones, are crucial factors in human information processing which have been ignored in information retrieval systems.[29] Creation of the image of a book on the screen, based on the MARC record, conforms with the mental models used in Human-Computer Interaction research. These models imply that people learn through analogy and comparison to an existing familiar mental model.[30] By simulating books and book shelves on the screen, users are presented with familiar images that they have had contact with since childhood. Users interpret images through a process that involves the "activation of knowledge structures developed from previous use of other 'analogous' systems or other portions of the same system. It also includes the use of general world knowledge and inferential techniques."[31] In addition, younger-generation library patrons may expect to use graphical user interfaces (GUIs), 3-D graphics, and direct manipulation of objects on computer monitors as they become the norm rather than the exception in many software packages in the marketplace.[32] Second-generation OPACs do not use any of these new technological developments.

A NEW GENERATION OF PUBLIC CATALOGS

To address the needs of end users and alleviate some of the mentioned difficulties, particularly with subject access, many researchers have studied the use of OPACs and conducted experiments to enhance and improve these retrieval tools. In a large-scale joint study by the Council on Library Resources (CLR), Forest Press, and OCLC, a research team headed by Karen Markey conducted the Dewey Decimal Classification (DDC) project between 1983 and 1986. The objective of the project was to study the effectiveness of DDC as a subject-access, browsing, and display agent.[33] The DDC project involved enhancing the online catalog with the inclusion of DDC Schedules and Relative Index. The results of the study show that enhancements are very beneficial to the users. Subsequently, Markey and Calhoun found that by using the 5xx MARC fields, specifically 520 MARC tag containing "summary" and 505 MARC tag consisting of "contents," an average of 15.5 new terms may be added to each record, hence extending the accessibility.[34] More recently, Markey Drabenstott and Vizine-Goetz used the concept of "search trees" in an experimental setting to augment the online catalogs. They used the machine-readable *Library of Congress Subject Headings* (*LCSH*-mr) with the ultimate objective of determining "the most sensible subject searching approach for the wide variety of user queries entered into online catalogs."[35]

Cochrane, Markey Drabenstott, Chan, Pejtersen, Lawrence, and other researchers have demonstrated the value of enhancing the online catalog with DDC, Library of Congress Classification, other classifications schemes, and their combination with other fields.[36-40]

One of the longest-running experiments in the field is the Online Keyword Access to Public Information (OKAPI) project, which uses color-coded keys and on-screen menus.[41] The main objective of the OKAPI project, which started in 1982, is to build an OPAC that does not require any user training utilizing advanced retrieval techniques, such as ranking of documents, weighting index terms, and automatic spell checking. An experiment at Carnegie Mellon University consists of enhancing a selected number of records in different subjects by adding valuable references in the table of contents.[42] Similar projects have been conducted in other institutions.[43,44]

Despite these enhancement efforts, only a few researchers have been conducting experiments with object-oriented displays for the bibliographic retrieval systems. Duncan and McAleese, in an experiment in using graphical user interfaces for an OPAC (Knowledge and Information Mapping; KIM), suggest that the *visual* impact of a graphical thesaurus has inherent cognitive and psychological advantages.[45] A first attempt at applying direct interfaces to public catalogs was made by Benest et al.[46] The icons in this system represent indexes, and users flick through pages visually. The icons are also used to manipulate the books physically with the idea that the reader will reach an overall impression of its contents. The system is based on the notion that "spatial awareness is seen as providing recognition clues."[47] Unfortunately, retrieval in this system is only possible through phrase access of the index entries, and it is not enhanced through other subject or classification schemes. An experimental interface for use by children is also based on the concept of simulating bookshelves on the screen; however, it is not based on existing information embedded in MARC records, nor does it have extensive subject-access capabilities.[48]

Many other innovative and visionary solutions have been conceived and implemented by researchers. The Library and Information Science Research Laboratory (LIBLAB) of Linkoping University in Sweden has been experimenting with the hypertext system to enhance their online catalog. HYPERCATalog, which is produced by LIBLAB, uses an object-oriented graphical interface to support the interaction between the library patron and the catalog.[49] A new development in interface design based on a hypertext system was recently reported in the literature. The interface loads MARC records into Apple computer's HyperCard software to use its excellent graphical environment.[50] The results are a more user-friendly presentation of the MARC content.

Perhaps one of the most innovative catalog enhancement efforts to date is the BOOK HOUSE project. Designed at the Riso National Laboratory in Denmark, BOOK HOUSE is a prototype graphical database system containing the works of fiction for novice users. The purpose of the project is to use the users' mental images of a library to design and construct an "electronic library." This is accomplished by direct manipulation of the objects on the screen through use of icons.[51] Another innovative interface is based on a more sophisticated multimedia environment, referred to as the Multimedia Visualizer.[52] This system uses two- and three-dimensional graphs and animation to guide library patrons through an electronic library. Patrons can search the library database through the traditional access points (author, title, and subject) by choosing the appropriate card catalog. They also can listen to sound recordings by using the image of a tape recorder on the computer monitor, or ask questions from a librarian that is an animated image. Bookshelves are also depicted on the screen, but the physical characteristics of individual books are not represented.

These and other similar projects are paving the way for the third generation of OPACs, the essential characteristics of which may be the use of graphical user interfaces, enhanced subject access through the addition of classification schedules, automatic spell checking of the search terms, the addendum of table of contents, and the creation of links among the subject headings.[53] As one researcher has observed: "In any system implementation, all of the options should be available because there are many factors which determine which of these a particular user will choose in any given situation."[54] Any enhancement to the catalog is bound to be beneficial to the end user, but at a cost—a cost to the information center or the library for designing and/or implementing the system and a cost to the user for learning a new interface. The enhancement efforts thus far have been exorbitant since data are not readily available in the present MARC records.[55] Cost reduction for the development and execution and shortening the learning curve for end users are challenges that the third-generation OPAC designers have to confront.

AN ALTERNATIVE

Some recently developed OPACs are using concepts that move them closer to direct manipulation or object-oriented interfaces. Hildreth states that in these OPACS the "objects desired (e.g., book records—How nice table of contents would be here!) are manipulated in a direct, more intuitive manner, avoiding previous layers of mental encoding/decoding and indirect representation searchers are usually required to pass through."[56] To produce an alternative front end for the online catalog, the information contained in MARC tag 3xx, the physical description of a book, is manipulated to create a new interface called Public Access Catalog Extension (PACE) (see figure 1). A subject search under the Library of Congress subject heading "Catalogs, on-line," from OCLC CAT CD450 catalog is conducted to obtain data for designing a prototype PACE. An image of each book based on the dimension and number of pages has been created to simulate library shelves. Number of pages is used to determine the relative thickness of the book, while the dimension presented in MARC is used to calculate the relative height. The imaged spine of each book contains the call number, title, and other information, such as author's name. In addition, since color may play an important role in spatial arrangement, each book is color coded to distinguish it from its neighbors.[57] For the purposes of illustration, only a few shelves have been created, but in the future many more features will be added to the interface. Each screen will hold approximately fifteen to twenty items, the same number available through many OPACs in their browse modes. Users may search the database by call numbers and browse the shelves. They may choose to "zoom in" on a specific item, and if interested, they would have the option to "pick" it from the shelf through a "hot spot" on the screen to be manipulated by a pointing device such as a mouse. Once the book has been chosen, it may be opened to see a simulated title page containing the name of the author, full title and subtitle, publication year, publisher, and place of publication. On the "verso" (i.e., the next page), the full MARC record information will appear. If the book is chosen permanently (i.e., it is not replaced on the shelf), a dotted line will fill the outline of the image of the book on the shelf. This technique will enable the user to follow his or her search and browsing path in the stacks and avoid disorientation. Once the user chooses a particular book from the shelves and opens it, the table of contents will appear after the title pages. All the movements through the stacks will be directed by a mouse and the use of a fixed menu (icons) at the bottom of the screen. Users will be able to move one shelf-column at a time or jump ahead or back several shelves at any time. A "home" selection on the menu will enable the user to go back to the opening screen. PACE is not fully operational yet, but initial user responses have been very promising.

CONCLUSION

Many systems have been designed to enhance the second-generation OPACs and to accommodate end users, but they do not meet the browsing requirements of most clients. Browsing plays an important role in information seeking and is primarily visual and object

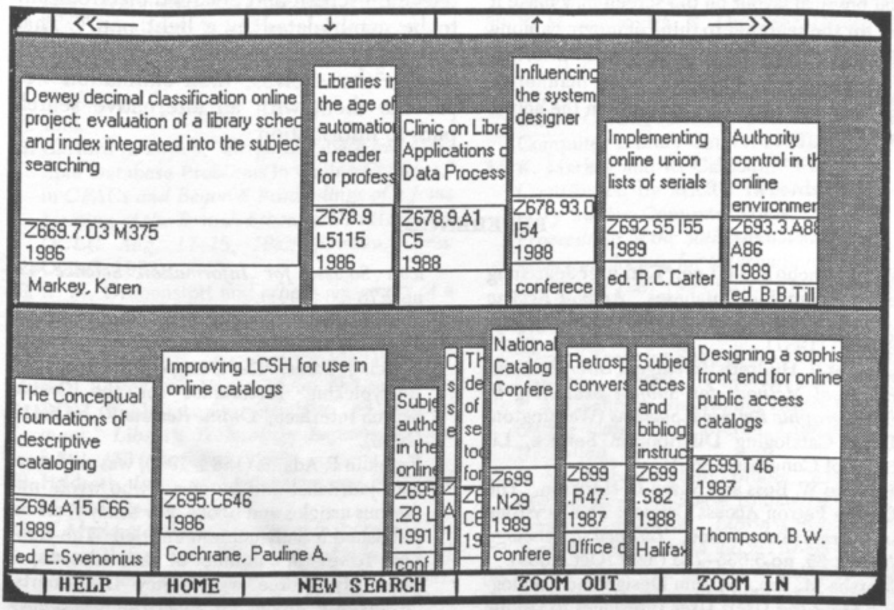

Figure 1. PACE Interface.

oriented. It can be best accomplished through simulation of images of books and library shelves on the screen. To mimic users' mental models of the real world, however, may be costly unless new interfaces can tap into existing sources of information. A possible solution may be found by using the information embedded in MARC records pertaining to physical descriptions of books.

Until recently, none of the graphical user interface or object-oriented enhancement efforts had been based on the MARC record. For each research project, small databases were constructed at an additional cost. With millions of MARC records available to library and information centers, the "issue is not how to improve the information on the record but how best to use information already present."[58] Massicotte suggests that "we may begin to examine how the existing MARC record structure could be combined with better system design to provide the user with a mental 'picture' of the database."[59] The familiar "mental picture" is the key to designing a new generation of OPACs. Bates states:

> It is the actual physical layout of a library that people are most familiar with, rather than the complex intellectual relationships we develop among catalog entries, books, . . . Creating a virtual physical layout on the screen may make it easier for the searcher to think of moving among familiar categories of resources in an information retrieval system, in the same manner in which they move among resources in the actual library.[60]

An alternative object-oriented, enhanced interface based on the mental image of the user is proposed in this article. PACE does not compete with the existing interfaces; rather, it is designed to enhance them. PACE may be expanded to include indexes and eventually the entire text (which may already be in machine-readable form). Users may take a leisurely PACE through the simulated library stacks, randomly or systematically choose a number of books, and examine their contents. Whether books are physically in the library or are charged out will not affect the user. Physical impairments will not deter patrons from using the library, as PACE will enable them to browse through the electronic collection without leaving their homes. Younger-generation library users having had considerable experience with direct manipulation of objects on computer monitors will be at ease with PACE.

Today's technological advances enable us to design and implement a system that simulates libraries on computer monitors. Such a system based on the existing information embedded in MARC would create images of books and shelves on the screen. Some twenty years ago, Miller speculated that since people prefer to locate information spatially, pictures of real bookshelves should be stored on a television screen and enlarged electronically to be manipulated by a light pen.[61] That vision may be realized now. If users need to browse the shelves, then simulation will provide them with an alternative search path to information.

REFERENCES

1. W. H. Mischo and J. Lee, "End-user Searching of Bibliographic Databases," *Annual Review of Information Science and Technology* 22, 227–63 (1987).
2. Charles R. Hildreth, *Intelligent Interfaces and Retrieval Methods for Subject Searching in Bibliographic Retrieval Systems* (Washington, D.C.: Cataloging Distribution Service, Library of Congress, 1989).
3. Richard W. Boss and Susan B. Harrison, "The Online Patron Access Catalog: The Keystone in Library Automation," *Library Technology Report* 25, no.5:635–723 (Sept./Oct. 1989).
4. Martha M. Yee, "System Design and Cataloging Meet the User: User Interfaces to Online Public Access Catalogs," *Journal of the American Society for Information Science* 42, no.2:78–98 (1991).
5. Hildreth, *Intelligent Interfaces and Retrieval Methods*, p.2.
6. Marcia J. Bates, "The Design of Browsing and Berrypicking Techniques for the Online Search Interface," *Online Review* 13, no.5:411 (1989).
7. Franklin P. Adams (1881–1960) was an American journalist and humorist who wrote numerous articles and books. For thirty years he published a daily column entitled "The Conning Tower" in a number of national newspapers. My source was Nancy L. Roberts, "Franklin P. Adams," in *American Newspaper Journalists Dictionary of Literary Biography,*

v.29 (Ann Arbor, Mich.: Gale, 1984), p.18.
8. S. M. Apted, "General Purposive Browsing," *Library Association Record* 73:228–30 (1971).
9. S. Herner, "Browsing," *Encyclopedia of Library and Information Science* 3:408–15 (1970).
10. R. J. Hyman, "Access to Library Collections: Summary of a Documentary and Opinion Survey on the Direct Shelf Approach and Browsing," *Library Resources and Technical Services* 15:479–91 (1971).
11. F. W. Lancaster, *Information Retrieval Systems: Characteristics, Testing, and Evaluation* (New York: Wiley, 1968), p.181–82.
12. Annelise Mark Pejtersen, "A Library System for Information Retrieval Based on a Cognitive Task Analysis and Support by an Icon-Based Interface," in *ACM SIGIR Conference Proceedings* (Boston, 1989), (New York: Association for Computing Machinery, 1989), p.41.
13. G. Marchionin, "An Invitation to Browse: Designing Full-text Systems for Novice Users," *Canadian Journal of Information Science* 12, nos.3/4:69–79 (1987).
14. Bates, "The Design of Browsing and Berrypicking Techniques," p.414.
15. D. Gore, *Bibliography for Beginners*, 2d ed. (New York: Appleton-Century-Crotts, 1973), p.76–77.
16. P. M. Morse, "Browsing and Search Theory," cited in C. Hildreth, "The Concept and Mechanics of Browsing in an Online Library Catalog," *National Online Meeting Proceedings 1982* (Medford, N.J.: Learned Information, 1982), p.182.
17. Hildreth, *Intelligent Interfaces and Retrieval Methods*, p.9 .
18. Ibid.
19. Clifford A. Lynch, "Large Database and Multiple Database Problems in Online Catalogs," in *OPACs and Beyond: Proceedings of a Joint Meeting of the British Library, DBMIST, and OCLC Aug. 17–18, 1988* (Dublin, Ohio: OCLC, 1988).
20. K. M. Drabenstott and others, "Analysis of a Bibliographic Database Enhanced with a Library Classification," *Library Resources and Technical Services* 34, no.2:179–98 (1990).
21. Karl Beiser and Nancy Melin Nelson, "CD-ROM Public Access Catalogs: An Assessment," *Library Technology Reports* 25, no. 3:281–453 (May–June 1989).
22. Hildreth, *Intelligent Interfaces and Retrieval Methods*, p.32.
23. K. Markey, *Subject Searching in Library Catalogs: Before and After the Introduction of Online Catalogs* (Dublin, Ohio: OCLC, 1984).
24. M. Hancock-Beaulieu and others, *Evaluation of Online Catalogues: An Assessment of Methods*, British Library Research Paper 78 (London: British Library Research and Development Department, 1990).
25. J. F. Cove and B.C. Walsh, "Online Text Retrieval via Browsing," *Information Processing & Management* 24, no.1:31–7 (1988).
26. B. Shneiderman, *Designing the User Interface: Strategies for Effective Human-Computer Interaction* (Don Mills, Ont.: Addison-Wesley, 1987), p.202.
27. B. Janosky and others, "Online Library Catalog Systems: An Analysis of User Errors," *International Journal of Man-Machine Studies* 25:587 (1986).
28. T. H. Nelson, *Literary machines*, cited in R. Hjerppe, "HYPERCAT at LIBLAB in Sweden: A Progress Report," in *The Online Catalogue Developments and Directions*, ed. Charles R. Hildreth (London: The Library Association, 1989), p.205.
29. M. E. Rorvig, "Psychometric Measurement and Information Retrieval," *Annual Review of Information Science and Technology* 23:157–89 (1988).
30. R. M. Schumacher and D. Gentner, "Transfer of Training as Analogical Mapping," *IEEE Transactions on Systems, Man, and Cybernetics* 18, no.4:592–99 (1988).
31. Janosky and others, "Online Library Catalog Systems," p.574.
32. Derek Greenwood, "OPAC Research in the United Kingdom," in *OPACs and Beyond: Proceedings of a Joint Meeting of the British Library, DBMIST, and OCLC, Aug. 17–18, 1988* (Dublin, Ohio: OCLC, 1988), p.1–16.
33. K. Markey and A. N. Demeyer, *Dewey Decimal Classification Online Project: Evaluation of a Library Schedule and Index Integrated into the Subject Searching Capabilities of an Online Catalog* (Dublin, Ohio: OCLC Online Computer Library Center, 1986).
34. K. Markey and K. Calhoun, "Unique Words Contributed by MARC Records with Summary and/or Contents Notes," in *ASIS 87: Proceedings of the 50th Annual Meeting of the American Society for Information Science October 4–8, 1987* (Medford, N.J.: Learned Information, 1987), p.153–62.
35. K. M. Drabenstott and D. Vizine-Goetz. "Search Trees for Subject Searching in Online Catalogs," *Library Hi Tech* 8, no.3:10 (1990).
36. P. A. Cochrane, *Improving LCSH for Use in Online Catalogs* (Littleton, Colo.: Libraries Unlimited, 1986).
37. K. M. Drabenstott and others, "Analysis of a Bibliographic Database Enhanced with a Library Classification," *Library Resources and Technical Services* 34, no.2:179–98 (1990).
38. L. M. Chan, "The Library of Congress Classification System in an Online Environment," *Cataloguing & Classification Quarterly* 11, no.1:7–25 (1990).

39. Pejtersen, "A Library System for Information Retrieval."
40. G. S. Lawrence, "System Features for Subject Access in the Online Catalog," *Library Resources & Technical Services* 29, no.1:16–33 (1985).
41. D. Greenwood, "OPAC Research in the United Kingdom," in OPACs and Beyond: *Proceedings of a Joint Meeting of the British Library, DBMIST, and OCLC, Aug. 17–18, 1988* (Dublin, Ohio: OCLC, 1988), p.1–16.
42. T. J. Michalak, "An Experiment in Enhancing Catalog Records at Carnegie Mellon University," *Library Hi Tech* 8, no.3:33–41 (1990).
43. E. D. Posey and C. A. Erdmann, "An Online UNIX-based Engineering Library Catalog: Purdue University Engineering Library," *Science and Technology Libraries* 6, no.4:31–43 (1986).
44. A. Byrne and M. Micco, "Improving OPAC Subject Access: The ADFA Experiment," *College & Research Libraries* 49, no.5:432–41 (Sept. 1988).
45. E. B. Duncan and R. MaAleese, "Intelligent Access to Databases Using a Thesaurus in Graphical Form," in *Proceedings of the 11th International Online Information Meeting, December 10–13, 1987* (London: 1987) (Medford, N.J.: Learned Information, Inc., 1987), p.377–387.
46. I. D. Benest, G. Morgan and M. D. Smithurst, "A Humanised Interface to an Electronic Library," in *Interact '87: Proceedings of IFIP 1987 International Conference on Human Computer Interaction*, ed. H.J. Bullinger and B.Shackel (New York: Elsevier, 1987), p.905–10.
47. N. N. Mitev, "Ease of Interaction and Retrieval in Online Catalogues: Contributions of Human-Computer Interaction," in *The Online Catalogue Development and Directions*, ed. C.R. Hildreth (London: The Library Association, 1989), p.152.
48. Christine L. Borgman and others, "Children's Use of an Interactive Science Library: Exploratory Research," *School Library Media Quarterly* 18, no.2:108–11 (1990).
49. R. Hjerppe, "HYPERCAT at LIBLAB in Sweden: A Progress Report," in *The Online Catalogue Developments and Directions*, ed. Charles R. Hildreth (London: The Library Association, 1989).
50. Jason B. Rosenberg and Christine L. Borgman, "A Report on the Loading of MARC Format Bibliographic Records into HyperCard," *Information Technology and Libraries* 10, no.4:292–97 (Dec. 1991).
51. A. M. Pejtersen, *The Book House: Modelling User's Needs and Search Strategies as a Basis for System Design* (Roskilde, Denmark: Riso National Laboratory, 1989).
52. Newton S. Lee, "Multimedia Visualizer: An Animated Object-based OPAC," *Information Technology and Libraries* 10, no.4:297–310 (Dec. 1991).
53. Charles R. Hildreth, "Beyond Boolean: Designing the Next Generation of Online Catalogs," *Library Trends* 35, no.4:647–67 (Spring 1987).
54. Pejtersen, "A Library System for Information Retrieval," p.41.
55. C. A. Mandel, "Enriching the Library Catalog Record for Subject Access," *Library Resources and Technical Services* 29, no.1:5–15 (1985).
56. Charles R. Hildreth, *Intelligent Interfaces and Retrieval Methods*, p.93.
57. R. H. Veith, "Using Form, Color and Spatial Dimensions in Information Retrieval Systems," in *Proceedings of the 5th National Online Meeting, April 10–12, 1984* (New York: 1984) (Medford, N.J.: Learned Information, Inc., 1984), p.413–18.
58. F. W. Lancaster and others, "Subject Analysis," *Annual Review of Information Science and Technology* 24:52 (1989).
59. Mia Massicotte, "Improved Browsable Displays for Online Subject Access," *Information Technology and Libraries* 7, no.4:375 (1988).
60. Bates, "The Design of Browsing and Berrypicking Techniques," p.419.
61. G. A. Miller, "Psychology and Information," *American Documentation* 19, no.3:286–87 (1968). ■■

An Examination of Unfilled OCLC Lending and Photocopy Requests

Scott Seaman

Interlibrary Loan Offices can supply documents for only a fraction of the lending requests received (i.e., requests for the loan of a book or photocopy of an article received from another library), despite sophisticated electronic verification/locating systems. Lending fill rates of 50 percent are common. As a consequence, an interlibrary loan request must be referred to several different libraries before being satisfied. This inefficiency significantly lengthens the time required to deliver a document to a patron. This study analyzes 7,587 failed OCLC interlibrary loan and copy requests to determine why the requests could not be supplied. It was found that loan requests most often fail because local policies prevent loan or the items were in use. Copy requests most often failed due to the requested volume of a serial not being owned.

Although significant technological improvements have been made to the interlibrary loan (ILL) process to speed receipt of requested materials, at least one study has observed that turnaround time for ILL transactions has varied little since 1979.[1] One reason cited for long turnaround times is the inability of a requesting library to locate potential lenders of materials accurately. Despite sophisticated electronic verification and locating systems, ILL offices can often fill only 50 percent of the lending requests received. Each of these unfilled requests must be referred again and again until satisfied. This inefficiency is a source of considerable delay in the ILL process.

Each time a request is referred, the total turnaround time of the request is measurably increased. Because multiple referrals add significantly to turnaround, one strategy to speed turnaround time is to request from as few institutions as possible. Identifying why libraries must refer 50 percent of their lending requests has been the subject of only a handful of recent research studies. Furthermore, previous studies have focused on failed book requests without examining the reasons serial requests fail. By identifying the reasons ILL and photocopy or copy requests are not filled, it may prove possible to reduce the probability of failure and, consequently, improve the turnaround time.

Several earlier studies have shown that ILL success rates (the proportion of all ILL borrowing requests successfully completed) are between 80 and 90 percent.[2] Each of these studies based success on the final transaction, ignoring the number of referrals a request may have required. This is particularly true of libraries using the OCLC ILL Subsystem as a primary means for sending requests. However, when success is limited to that of being the first library in the OCLC lender string, Dodson et al. found that only 57.1% of requests were completed.[3] Nearly 43% were not filled and were referred to the next potential lender. Gorin and Kanen found similar results: 52.6% for the first library, 21.4% for the second, and 16.4% for the third.[4]

Explanations as to why such a large proportion of OCLC requests must be referred, despite having accurate location information,

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are elusive. Robert B. Winger examined the book-lending requests of the University of Chicago's Joseph Regenstein Library.[5] Of approximately 8,061 book requests received, 55.5% (approximately 4,471) were not filled. Winger analyzed and grouped a sample of 347 of the unfilled book requests into five categories: not owned, 29.14% (volume or edition not owned, not owned as cited), no longer in collection, 14.28% (missing, lost, discarded, transferred), unavailable for lending, 49.43% (in use, at bindery, noncirculating), miscellaneous/policy, 6.27% (lent before to same reader, duplicate request, request cancelled), and no reason given, 0.50%.

A 1986 study of the Illinois Library and Information Network (ILLINET) examined failed ILL book borrowing (not lending) requests to determine reason for nonsupply. Again, copy requests were excluded from the study. The authors classified the unfilled book requests into four broad categories: (1) no lenders identified (51%); (2) located, but noncirculating (12%); (3) located, but in use (26%); and (4) canceled without search (8%).[6]

In characterizing the failed requests, the authors found that almost half were for items published between 1970 and 1984. Special formats, such as audiovisual items, microforms, documents and technical reports, theses, annual reports, and conference proceedings accounted for an unusually large portion of the failed requests. ILLINET includes academic, special, public, and school libraries. The authors found that 85 percent of failed requests originated from public libraries. Over 60 percent of the failed requests used OCLC and local or statewide tools to identify potential lenders.

A 1989 New Zealand study of borrowing failure cited three primary reasons for nonsupply of books through ILL: no locations (32%), not held (15.4%), and in requests for use (10.7%). In contrast to the Illinois study, requests for adult nonfiction published since 1985 was the area of greatest failure.[7]

The purpose of this study, then, is to examine ILL transactions in a large academic library to determine: (1) the ratio of unfilled to filled loan and copy requests, and more significantly, (2) why the unfilled requests could not be satisfied. Identifying why lending requests fail is an important step in improving turnaround time of ILL requests.

OHIO STATE UNIVERSITY INTERLIBRARY LOAN OFFICE

The Ohio State University (OSU) Libraries collection holds 4.3 million volumes and serves a population of 55,000 students, 4,500 faculty, and 16,500 staff.

Interlibrary loan at OSU is centralized in the university libraries system. Borrowing, book lending, and photocopy services are managed from a single office. Materials are retrieved by the ILL office from a central graduate library and twenty-six department libraries. Over 60 percent of university libraries' holdings are in the department libraries. Moreover, some department libraries are more than one mile from the central library. The health sciences and law libraries are administered separately and operate their own ILL services for their patrons.

More than 30,000 borrowing and lending requests were processed in OSU's ILL office during 1988–89. Slightly over 15,000 lending and photocopy requests were processed during 1988–89 from institutions in the United States and overseas. Requests were received from a broad range of institutions, including other academic libraries, public libraries, special libraries, private industries, and government. A $10 fee was assessed for most loan and photocopy requests that were filled.

Eighty percent of lending requests received were through OCLC; 20 percent came through U.S. mail, telefacsimile, or electronic mail. Virtually all OCLC loan requests were verified for location using OCLC as the source. Those received via ALA forms, electronic mail, or fax used a variety of sources, including OCLC, the *National Union Catalog* (*NUC*) or *Union List of Serials in the United States and Canada* (*ULS*) as a source for location verification.

LIMITATIONS AND DEFINITIONS

For the purposes of this study, *interlibrary loan* is defined as "a transaction in which library material, or a copy of the material, is made available by one library to another upon request."[8] The transfer of materials within the OSU libraries system is not considered ILL.

An "OCLC loan request" is a request initiated by another library through the OCLC ILL Subsystem for the delivery of the original document (either paper, film, fiche, or card). Loan requests are most often for books. Volumes of serials are only rarely requested. Similarly, an "OCLC copy request" is a request initiated by another library through the OCLC ILL Subsystem for a reproduction of the original document (paper, fiche-to-fiche, fiche-to-paper, etc.). Copy requests are overwhelmingly for journal articles. Occasionally, however, chapters of books are requested for copy. An "OCLC not filled copy request" and "OCLC not filled loan request" are those loan and copy requests that could not be supplied.

The data were limited to requests received through the OCLC ILL Subsystem between May 1, 1990, and November 30, 1990. The results were based solely on lending statistics maintained during this period. Requests received via U.S. mail, telefacsimile, or electronic mail were not included. Subject and requestor information was not maintained on the requests. Requests not filled were sorted daily by reason not filled and tallied by staff members coordinating the lending or copying. This information was cumulated into monthly statistics.

Statistics were maintained to identify reasons for nonsupply in four broad areas: not owned, not available for ILL, policy prohibits ILL, and other. Within each area, detailed statistics were maintained for several categories.

Not Owned

"Title not owned" covered any request, with what seems to be verified bibliographic information, for an item that was not owned or was no longer owned by OSU Libraries. This category includes requests for specific editions or printings that were not held by OSU Libraries.

"Volume not owned" covered requests for a title that was owned, but the volume or part needed was not. This did not include volumes or issues temporarily missing from shelves because of binding, circulating, etc.

Not Available for ILL

"In use" covered any book or serial volume charged to a patron or temporary library location code (binding, repair, etc.).

"Not on shelf" was used for items that the local online system showed as available for loan but could not be located in the stacks. This category also included noncirculating materials (such as journal volumes) temporarily missing from the shelves.

"Too fragile" covered items believed too delicate to survive the rigors of packing and shipping.

Policy Prohibits ILL

"Cost" covered instances in which the requesting institution refused the item because of the $10 fee OSU charges. Some institutions requested items unaware of this policy. When informed (via the Lending Message field of the OCLC request), they choose to obtain the item from another supplier.

"Noncirculating" covered any item that could not be supplied because of a predetermined policy restricting its use to an OSU libraries facility.

Other

"Bad citation" meant the request had a critical part of the bibliographic information incorrect or missing. Consequently, the request could not be located.

"Lost on OCLC" covered OCLC requests not responded to within the four-day limit imposed by the OCLC ILL Subsystem. The OSU libraries system is dispersed over an unusually large campus. Consequently, it is not always possible to retrieve the item, process it, and update OCLC within the time provided.

"Other" covered miscellaneous reasons for nonsupply, including cancelled requests, OCLC conditional messages not answered, and requests for copies in formats (such as microfilm) that OSU libraries could not supply.

RESULTS

Loan Requests Not Filled

Data were collected over a seven-month period from May 1, 1990, through November 30, 1990. A total of 15,147 requests were received through OCLC; 7,560 (49.9%) were filled while 7,587 (50.1%) were not filled. Of the requests received, 7,846 (51.8%) were requests for copies, and 7,301 (48.2%) were loan requests.

The requests not filled were divided almost evenly between loans not filled and copies not filled. Not filled loans represented 3,697 (50.6%) of the total requests not filled, whereas not filled copy requests represent 3,890 (49.6%) of the total requests not filled. Table 1 (OCLC Lending Requests) profiles the requests OSU received and those not filled.

Table 1. OSU Interlibrary Loan Office OCLC Lending Requests May 1, 1990–Nov. 30, 1990

	No.	%
Total OCLC requests received	15,147	100
Copy requests received	7,846	51.8
Loan requests received	7,301	48.2
Total OCLC requests not filled	7,587	100
Copy requests not filled	3,890	51.3
Loan requests not filled	3,697	48.7

Statistics were maintained daily, classifying why each of the 7,587 book and copy requests were not filled. Figure 1 (OCLC Loan and Copy Requests Not Filled) organizes results into four areas: not owned, not available for loan, policy prohibits loan, and other.

The most significant reasons loan requests were not filled were because local policy prohibited loan (44%) or the item was not available for loan (38%). Only 12% of loan requests failed because they were not owned, whereas 60% of the copy requests failed because they were not owned. "Not available" accounted for 22% of not filled copy requests.

Table 2 (OCLC Loan Requests Not Filled) provides detailed analysis for each category of loan requests. Within the category of "policy prohibits loan," "noncirculating" is the major component and the single most significant factor affecting the failure of loan requests. Within the "policy prohibits loan" component, "cost" represents instances where the $10 loan fee caused failure. This appears to be an insignificant factor of loan failure. However, a significant number of transactions are made on a free reciprocal basis. This activity tends to deflate the impact of those refusing loans due to cost.

The other significant component of loan failure, "not available," represents items "in use," items "not on shelf," or items "too fragile" to ship. Although "in use" items represent the largest portion of the category, "not on shelf" does represent a substantial portion of the total.

The combination of "other" and "not owned" comprise only 19 percent of the total loan requests not filled. This suggests that OCLC accurately reflects library book holdings. Particularly encouraging is that "bad citations" represent a very small portion of the total. Most loan requests are verified for accuracy and location using OCLC. If correctly processed there is little chance of error. However, it is possible to send ILL requests via OCLC without verifying the accuracy of the citation or location of the item. Such requests are difficult for the lender to interpret and often cannot be located for loan. These statistics suggest that such requests are rare.

Copy Requests Not Filled

The overwhelming reason copy requests were not filled was "not owned." Table 3 (OCLC Copy Requests Not Filled) details the statistics on each category of copy requests not filled. Virtually all of the "not owned" statistics were generated because a particular volume of a serial was not owned. OCLC describes serial locations only at the title level and not at the volume level. Therefore, a library sending an OCLC request for a journal article cannot determine from the OCLC bibliographic record which library owns the needed volume. Consequently, potential lenders' symbols are input into the loan request without knowledge of specific holdings the libraries may have. The data depicted in figure 1 and table 3 suggest that this limitation results in a very high proportion of copy requests not being filled. Such requests must be referred again and again until an institution is found with the correct volume available to photocopy.

The OSU libraries do not currently participate in an OCLC Online Union List of Serials. These data suggest that participation could significantly impact ILL success rate.

"Not available" represents 22 percent of the OCLC copy requests not filled. That category is dominated by "not on shelf." In most cases, these failures represent serial volumes owned but temporarily missing from the shelf, probably because patrons are using them or they are waiting to be reshelved.

The number of "bad citations" is considerably higher for copy requests than for loan requests. Copy requests are nearly all for articles in journals. The information that the patron copies onto the ILL request form for copies is easier to mistake than that for loan requests. Consequently, "bad citations" represent 8.9 percent of copy requests but only 1.9 percent of loan requests.

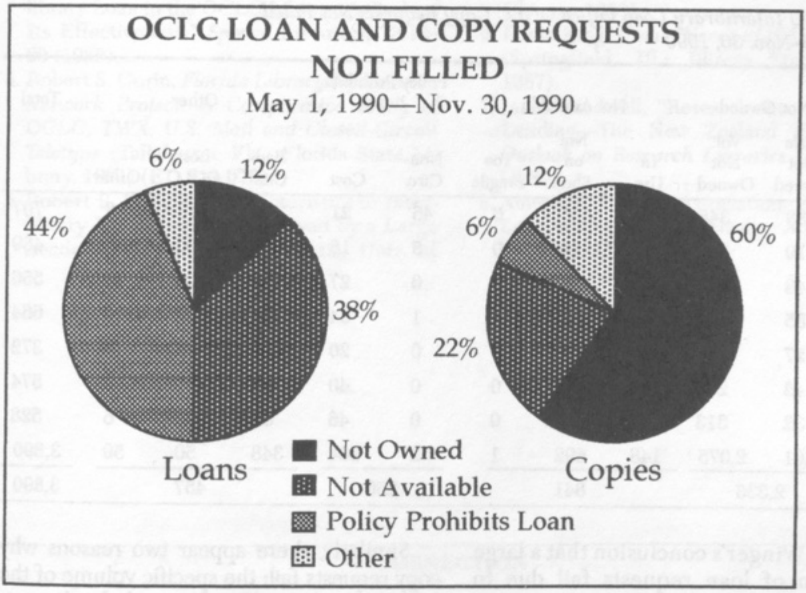

Figure 1. OCLC Loan and Copy Requests Not Filled.

Table 2. OSU Interlibrary Loan Office OCLC Loan Requests Not Filled May 1, 1990–Nov. 30, 1990

	Not Owned		Not Available			Policy Prohibits Loan		Other			
	Title Not Owned	Vol. Not Owned	In Use	Not on Shelf	Too Fragile	Non-Circ.	Cost	Bad Cite	Lost OCLC	Other	Total
May	25	13	104	59	3	126	21	9	1	13	374
June	34	25	129	79	5	191	39	11	2	27	542
July	46	19	113	58	8	176	26	5	1	11	463
Aug.	41	25	120	67	12	199	33	7	0	16	520
Sept.	46	37	108	48	1	167	40	10	0	20	477
Oct.	66	23	156	77	5	268	57	13	0	29	694
Nov.	43	28	141	78	13	211	60	15	1	37	627
Total	301	170	871	466	47	1,338	276	70	5	153	3,697
	471		1,384			1,614		228			3,697

CONCLUSIONS

It appears from these data that more detailed holdings information could significantly decrease ILL loan referrals and consequently improve turnaround time. For loans, more specific information on the availability for ILL is needed. For copies, more specific information on specific volume holdings is needed.

There appear to be two primary reasons OCLC loan requests fail. Either the item is considered noncirculating or it is already in use. Although the data do not lend themselves to direct comparisons, these findings

Table 3. OSU Interlibrary Loan Office OCLC Copy Requests Not Filled May 1, 1990–Nov. 30, 1990

	Not Owned		Not Available			Policy Prohibits Loan		Other			Total
	Title Not Owned	Vol. Not Owned	In Use	Not on Shelf	Too Fragile	Non-Circ.	Cost	Bad Cite	Lost OCLC	Other	
May	38	346	66	125	0	46	21	44	13	8	707
June	19	263	13	98	0	5	16	47	20	8	489
July	48	322	10	89	1	0	27	49	2	8	556
Aug.	55	329	24	125	0	1	34	80	2	14	664
Sept.	27	205	14	58	0	0	20	40	2	6	372
Oct.	42	297	10	117	0	0	40	52	7	9	574
Nov.	32	313	11	80	0	0	46	36	4	6	528
Total	261	2,075	148	692	1	52	204	348	50	59	3,890
	2,336			841		256			457		3,890

do reflect Winger's conclusion that a large proportion of loan requests fail due to being noncirculating, at the bindery, or in use.

In each of these instances, the requesting library may resubmit the request for materials that do not circulate, or are at the bindery, or are in use. The request may be referred innumerable times before a library is found that can supply the item. This is particularly true with noncirculating items, since an item that is noncirculating in one library tends to be noncirculating in another. Perhaps response time could be improved if availability for ILL were indicated on a title-by-title basis. If libraries could identify potential lenders more accurately before initiating the request, referrals could be reduced and consequently, turnaround time improved. While such an indicator is probably not practical for items temporarily charged to patrons, it may be for those items permanently designated as noncirculating.

Similarly, there appear two reasons why copy requests fail: the specific volume of the serial is not owned or the needed volume is not on the shelf. Participation in an online union list could minimize the impact of the former. That bad citations are more prominent with copy requests than loan requests is not surprising. The numerical information leading to a journal article is easily miscopied.

Inevitably, more research is needed. Although the primary reasons for ILL request failure have been identified, the assumption that minimizing referrals improves turnaround time has not been tested. Testing copy failures at an institution participating in the OCLC Union List Subsystem may provide insight into the impact of precise location holdings and if such information affects turnaround. Finally, it is generally recognized that ILL characteristics vary between academic, public, and special libraries. Duplicating such studies may identify other reasons for nonsupply.

REFERENCES

1. John Budd, "Interlibrary Loan Service: A Study of Turnaround Time," *RQ* 26:75–80 (Fall 1986).
2. King Research Inc., *Libraries, Publishing and Photocopying*, final report for the United States Copyright Office (Rockville, Md.: King Research, 1982); Vernon E. Palmour and others, *A Study of Characteristics, Costs and Magnitude of Interlibrary Loan in Academic Libraries* (Westport, Conn.: Greenwood, 1982); D. M. Boals, "Interlibrary Loan Networks, Practical Obstacles on the Road to Utopia," *Public Libraries* 19:124–25 (Winter 1980); Izabella Taler, "Automated and Manual ILL: Time Effectiveness and Success Rate," *Information Technology and Libraries* 1:277–80 (1982).
3. Ann T. Dodson and others, "Electronic Inter-

library Loan in the OCLC Library: A Study of Its Effectiveness," *Special Libraries*, 73:12–20 (1982).
4. Robert S. Gorin, *Florida Library Information Network Project: A Comparative Study of OCLC, TWX, U.S. Mail and Closed-Circuit Teletype* (Tallahassee Fla.: Florida State Library, 1981) (ED 211 076).
5. Robert B. Winger, "Characteristics of Interlibrary Loan Requests Received by a Large Academic Library" (M.A. thesis, Univ. of Chicago, 1983).
6. David King, *Unmet Needs of ILLINET Users* (Springfield, Ill.: Illinois State Library, 1987).
7. Janet Caudwell, "Research into Interlibrary Lending—The New Zealand Experience," *Outlook on Research Libraries* 11, no.4:4–6 (1989).
8. American Library Association, *Interlibrary Loan Codes, 1980* (Chicago: American Library Assn.,1981), p.9.

CORRECTION

Please note that the title of Rebecca Guenther's article (p. 120–31 in the June 1992 issue of *ITAL*) was incorrectly listed on the cover and title page. It should have read "Development and Implementation of the USMARC Format for Classification Data." Also, figure 3 (p. 124) was published incomplete. The complete figure is given below.

We regret the distress these errors may have caused Ms. Guenther and our readers.—*The Editor*

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Communications

The Intelligent Reference Information System Project: A Merger of CD-ROM LAN and Expert System Technologies

Charles W. Bailey, Jr.

The University Libraries of the University of Houston created an experimental Intelligent Reference Information System (IRIS) over a two-year period. A ten-workstation CD-ROM LAN was implemented that provided access to nineteen citation, full-text, graphic, and numeric databases. An expert system, Reference Expert, was developed to assist users in selecting appropriate printed and electronic reference sources. This expert system was made available on both network and stand-alone workstations. Three research studies were conducted.

INTRODUCTION

From October 1989 to September 1991, the University Libraries of the University of Houston developed a prototype Intelligent Reference Information System (IRIS) that integrated CD-ROM LAN and expert system technologies. The IRIS Project was partially funded by a $99,852 Research and Demonstration Grant from the U.S. Department of Education's College Library Technology and Cooperation Grants Program.

The principal goals of the IRIS Project were to: (1) implement a CD-ROM LAN that would provide access to citation, full-text, graphic, and numeric databases; and (2) develop an expert system that would recommend appropriate CD-ROM and print reference sources.

Three research studies were conducted: (1) a CD-ROM LAN performance benchmark; (2) a survey of user perceptions of the CD-ROM LAN; and (3) a survey of user perceptions of the expert system.

The IRIS project was intended to assist all members of the university community, plus the numerous Houston citizens who use the services of the University of Houston Libraries. This user population is ethnically diverse and multilingual.

The IRIS Project evolved from two earlier projects: (1) the Intelligent Reference Systems project, which developed an expert system for indexes and abstracts (Index Expert)[1,2]; and (2) the Electronic Publications Center project, which established a CD-ROM service that employed stand-alone workstations.[3]

EDUCOM's Educational Uses of Information Technology (EUIT) Program acknowledged the accomplishments of the IRIS Project when it named the project one of its Joe Wyatt Challenge Success Stories. The Joe Wyatt Challenge was intended to identify 100 successful applications of information technology in U.S. and Canadian colleges and universities; 101 projects were actually chosen.

PROJECT STAFFING

The IRIS Project involved staff from many parts of the library. The staff identified in the original grant proposal were mainly involved in expert system development and CD-ROM LAN technical support. As the project evolved, it became clear that additional project staff were required to plan and implement major new electronic information services, provide end-user support services, and conduct project research.

The IRIS Project Director was Robin N. Downes, director of the University Libraries. Reporting to Downes, the Project Management Group supervised the efforts of the Electronic Publications Instruction Group (bibliographic instruction and user documentation), the Knowledge Engineering Group (expert system development), and the Research and Evaluation Group (CD-ROM LAN performance benchmark and user

Charles W. Bailey, Jr., is Assistant Director, Systems, University Libraries, University of Houston.

studies). The final project structure was as follows:

Project Director
Robin N. Downes, Director of the University Libraries

Project Management Group
Charles W. Bailey, Jr., Project Manager and Assistant Director for Systems (Chair)
Cherie Colbert, Coordinator of Library Instruction and Information Literacy
Kathleen Gunning, Assistant Director for Public Services and Collection Development
Donna Hitchings, Head of Information Services
Judy Myers, Assistant to the Director
Thomas Wilson, Head of Systems

Electronic Publications Instruction Group
Cherie Colbert, Chair
Ivan Calimano, Information Services Librarian
Carolyn Meanley, Coordinator of Government Documents
Derral Parkin, Head of Branch Libraries

Knowledge Engineering Group
Judy Myers, Chair
Charles Bailey
Jeff Fadell, Information Services Librarian
Jill Hackenberg, Coordinator of Electronic Services
Thomas Wilson

Research and Evaluation Group
Kathleen Gunning, Chair
Donna Hitchings
Kimberly Spyers-Duran, Information Services Librarian

MAJOR ACTIVITIES OF THE IRIS PROJECT

There were four major activities of the IRIS Project: (1) selection of CD-ROM databases and negotiation of network licenses for these databases; (2) selection of the hardware and software components of the CD-ROM network, installation of these components, and network implementation; (3) development of the expert system; and (4) evaluation of the performance of the CD-ROM LAN and assessment of user reactions to the CD-ROM LAN and expert system.

CD-ROM Database Selection

In order to explore the full potential of electronic information resources, the IRIS Project wanted to provide users with access to a mix of citation, full-text, graphic, and numeric CD-ROM databases. The project also wanted to select databases that supported the major disciplines taught at the University of Houston. When the project began, some CD-ROM vendors were hesitant to consider network licenses, and this limited the databases that the project could consider.

Since CD-ROM vendors were uncertain about how to price network licenses to CD-ROM products, negotiations with vendors were lengthy and there was little similarity in the obtained license agreements.[4] Initially, vendors restricted access to their products in various ways, such as the number of overall network workstations, the number of simultaneous users per database, and the workstation location. When the licenses were renewed, many vendors focused on the number of simultaneous users as the primary way of contractually limiting database access.

The nineteen networked CD-ROM databases used in the IRIS Project were:

- ABI/INFORM Ondisc
- Art Index
- Biological and Agricultural Index
- Business Dateline Ondisc
- Compact Disclosure
- Compendex Plus
- Computer Select
- General Science Index
- Humanities Index
- Microsoft Bookshelf
- The New Grolier Electronic Encyclopedia
- Ondisc ERIC
- Periodical Abstracts Ondisc
- PsycLIT
- Social Sciences Index
- sociofile
- Software Toolworks World Atlas
- Statistical Masterfile
- SUPERMAP

CD-ROM LAN

In order to provide optimal performance and maximum system design flexibility, the University Libraries decided to purchase the various components of the CD-ROM network and integrate them itself, rather than buy a "turnkey" system. This required technical expertise and a significant investment of time, especially since the University Libraries had to purchase many "plug-compatible" hardware components on state contract.

The IRIS Project designed and installed a ten-workstation CD-ROM LAN. The workstations were 16 MHz 80386SX microcomputers with 1 MB of RAM, 40 MB hard discs, and EGA monitors. The project used an IBM Token-Ring LAN that ran under Novell Advanced NetWare 2.15 Revision B. Two Meridian Data CD Net 314 CD-ROM servers were employed. A 20 MHz 80386 server was used to support NetWare and centrally provided software. The Meridian servers and the network workstations used the Meridian CD Net, NetBIOS, and NetWare DOS Client programs. The Microsoft CD-ROM Extensions software was used on workstations. The Saber LAN Administration Pack was used to provide menu-driven access to CD-ROM resources, log CD-ROM sessions in a dBASE-compatible file, control access to CD-ROM resources to comply with license agreements, and provide enhanced network security. From eight public workstations, library patrons were easily able to access any desired CD-ROM database. Library staff used two additional workstations: (1) the Information Services desk workstation was employed for ready reference searching; and (2) the computer room workstation was used to manage the CD-ROM LAN. During most of the project period, there were also four stand-alone CD-ROM workstations in the Electronic Publications Center that provided access to five checkout databases (there were three workstations in use after Reference Expert was implemented).

The CD-ROM LAN implementation process was challenging.[5] The purchase of "plug-compatible" Token-Ring boards resulted in compatibility problems with the Meridian CD-ROM server software that needed to be resolved. Some network cables were defective and had to be replaced. It was apparent that few CD-ROM vendors had designed their searching software to operate on a network, and the process of getting a CD-ROM database up and running on the network was often far more complex than it should have been. Some CD-ROM searching software would run from the Novell NetWare server; some would not. Workstation memory was another problem area; the AboveLAN software was required to free up conventional memory in order to run some CD-ROM searching software. (At a later date, migration to MS-DOS 5.0 made it unnecessary to continue using the AboveLAN program.)

The CD-ROM LAN was made public in August 1990. It has been heavily used by the patrons of the University of Houston Libraries, and it has significantly increased user access to electronic information. In the first year of the grant (October 1989 to September 1990), CD-ROM databases were used 25,264 times (7,628 network uses in the two months that the network was available). In the second year of the grant (October 1990 to September 1991), CD-ROM use skyrocketed to 77,031 database uses (68,784 network uses), which reflects the fact that the network was available during the entire year. The highest number of CD-ROM database uses in a single month of the grant period occurred in April 1991, with 9,678 uses (8,581 network uses).

Effective management of the IRIS CD-ROM LAN required several policy decisions.[6] In order to provide equitable access to the popular CD-ROM LAN, workstations were scheduled in one-half-hour blocks during peak use periods. To provide the widest breadth of resources, very few CD-ROM back files were mounted on the CD-ROM servers; the majority of back files were made available on a checkout basis. Staffing was significantly increased in the Electronic Publications Center to provide more user assistance.

To support the effective use of the IRIS CD-ROM network, the University Libraries developed new user documentation and expanded its instructional efforts. It created a Quick Reference Card for each CD-ROM database that provided brief instructions for using the database.[7] The Quick Reference Card was available as a handout. It was also included in a three-ring notebook that provided users with more in-depth information about the CD-ROM database, including an Advanced Search Tips guide and, for citation databases, a list of indexed journals. Staff also modified existing publications, course-related workshops, and ongoing library tours to include coverage of IRIS resources. Special hour-long classes about generic CD-ROM searching techniques were initiated.

The CD-ROM LAN has been highly reliable. There is a scheduled weekly maintenance period for the installation of new CD-ROM releases, hardware and software upgrades, minor workstation repairs, and other purposes.

Reference Expert

The development of the expert system was a complex process.[8,9] Three prototypes were developed using KnowledgePro (expert system shell with built-in programming language), VP-Expert (expert system shell), and PDC Prolog (logic programming language) prior to the development of the production system, which was written in PDC Prolog. Library staff informally evaluated the Reference Expert prototypes during the system development process. By using expert system shells, the developers could quickly create working mock-ups of the desired system. Programming in PDC Prolog required significantly more effort; however, it gave the developers a higher level of performance and much greater control over the workings of the system than an expert system shell would. The expert system was designed so that the knowledge base was contained in ASCII files, which nonprogrammer library staff could modify using word processing software. This strategy also enhanced the transportability of the system, because other libraries could customize the knowledge base for local use. To improve transportability further, a window on the first screen of the system was designed to display introductory text that was contained in an ASCII file. The system was menu driven, simplifying its use for the diverse user population of the University of Houston Libraries.

Much of the expert system design process focused on questions about what user, information need, and reference resource characteristics were important and how these characteristics were related to each other. The Knowledge Engineering Group (KEG) identified numerous potentially useful characteristics, but determining how they related to each other was very difficult. Those relationships that were deemed to be important had to be embodied in a menu-driven user interface.

After lengthy analysis of the reference process, KEG determined that the central variables in Reference Expert would be three reference resource characteristics: content type (e.g., addresses, citations, and definitions), format (i.e., CD-ROM or print), and subject coverage.[10] It was a significant breakthrough when KEG decided that the traditional category that a reference work was placed in (e.g., dictionary, directory, or index) was not important. Reference works in the same category could be quite different (e.g., an engineering handbook and a psychology handbook). The key to describing reference works effectively was to identify the kinds of information that they contained—their content types. This simple idea was a powerful tool for classifying specific reference works.

The Knowledge Engineering Group developed a frame-based knowledge representation scheme to describe reference materials. Frames are a compact and flexible way of organizing knowledge in a hierarchical structure.[11]

To build the knowledge base, KEG selected 340 printed and CD-ROM reference sources, and it coded these reference sources using the knowledge representation scheme. This effort focused on the most heavily used reference sources in the collection. KEG recorded title and location information for each reference source, and the committee assigned appropriate subject headings and content types to the work. Comments about the proper use of the reference source were added as needed, and information about the coverage (i.e., selective or comprehensive) of indexes was optionally included for those sources. KEG recorded the relationship between each subject heading and its content types, which required that the committee identify what content types had been assigned to the sources classified under the subject heading. KEG also added descriptions for major subject headings to the knowledge base. The resultant knowledge base was fairly large, containing over 230,000 bytes of information.

The subject heading scheme used in Reference Expert was adopted from an earlier one used in the Index Expert system. The content type scheme was created from scratch. Both were refined in an iterative fashion, with changes being made as new sources were examined.

PDC Prolog, a logic programming language, proved be a good tool for developing Reference Expert's inference engine. An inference engine is the expert system component that emulates the human reasoning process. The program was designed so that the entire knowledge base was loaded into memory from a disc file. The inference engine then used the information in the knowledge base to recommend reference sources. The knowledge base was near its maximum size for network workstations, which had less free memory than stand-alone workstations.

Unfortunately, PDC Prolog was a difficult tool to use for interface design tasks that would be relatively simple with a procedural language like C. The backtracking mechanism used in PDC Prolog, which searches the knowledge base for additional information when the inference engine reaches a dead end in its reasoning process, gives the language great power and flexibility; however, it also makes it difficult to program the parts of the system that require a predictable sequence of activity. Backtracking can be selectively disabled, and this was done, but this is a rather arcane art. A considerable amount of energy was devoted to making the user interface visually attractive and easy to use.

Given the significant differences between logic and procedural programming languages, a novice logic language programmer faces unknown territory, where his or her prior procedural language programming experience may be more of a hinderance than a help. The fact that the University Libraries had previously developed the Index Expert system using both Turbo and PDC Prolog made the programming effort go more quickly than it would have otherwise.

Although PDC Prolog made more effective use of conventional memory (first 640 KB of memory) and ran faster than the expert system shells that were employed in the project, the size of the knowledge base severely degraded system performance until a method of reducing system load was devised. Since this solution required that portions of the knowledge base be deleted from memory during program execution, the knowledge base had to be reloaded each time the program ran. System performance was now speedy, but there was a startup delay each time the system began a new session. It was decided that this was an acceptable tradeoff. It would have been possible to store the knowledge base in a B+ tree disc file; however, this would have made the program considerably more complex. Subsequent testing on an 33 MHz 80386 workstation revealed that this platform provided very good system performance.

Many expert systems developed by libraries use low-cost expert system shells, and they often have a fairly limited scope. For example, a recent survey of Association of Research Libraries members found that four out of the six identified expert system development projects were using expert system shells.[12] Expert system shells can be effective for small-scale systems, but may not be adequate for larger, more complex systems.[13] The experience of the IRIS Project shows that expert system development with a logic programming language also can push the limits of affordable microcomputer technology.

Originally, we had intended to connect users to recommended CD-ROM LAN databases from within the expert system. It was decided that, given the ease of CD-ROM access from the LAN menu system, this linkage was unnecessary. Since many libraries who might be interested in using Reference Expert may not have CD-ROM LANs, omitting this feature also improved the transportability of the expert system.

Reference Expert was made public in June 1991. The system was available on the ten CD-ROM LAN workstations, on three stand-alone CD-ROM workstations, and on a dedicated workstation at the entrance of the library. Preliminary data indicate that it will be a popular service. From the time the system became public to the close of the grant period (June 1991 to Sept. 1991), Reference Expert was used 3,571 times. There was a steady increase in use of the system: 229 uses in June, 656 uses in July, 937 uses in August, and 1,749 uses in September. (These figures exclude use on a staff workstation used to manage the network.)

The system works as follows. After viewing an introductory screen, the user is presented with a subject menu. Each subject is described in more detail in a window at the bottom of the screen. If the user selects a subject that has lower-level headings in the subject hierarchy, the user can either choose the current subject heading or pick a lower-level heading. The user is shown the lower-level subject headings in a window at the bottom of the screen. After a subject is selected, the system determines whether there are content types associated with the subject (e.g., addresses, brief biographies, or definitions), and if so, it displays a content type menu. Content types may be qualified by language, such as "Translations of words (English, French)," location, such as "Addresses (Houston)," and other criteria. Once the user selects a content type, the system determines if both print and CD-ROM resources exist for the chosen subject and content type, and if so, it displays a format selection menu. Finally, the system retrieves reference sources that match the selected subject, content type, and format criteria. After reading the list of sources, the user can print it. The current date, selected subject, and selected content type are automatically recorded in an ASCII log file, which is designed so that it can be easily imported into a dBASE-compatible system.

Two versions of the system are used in the University Libraries: (1) the version used on LAN workstations that executes once, returning the user to the LAN menu; and (2) the version used on the stand-alone workstation that automatically reloads after executing.

Reference Expert is available at no charge.[14] Recipients are licensed to use the program for noncommercial, educational purposes. As of July 1992, over 400 copies of the program have been distributed to libraries, library schools, computer centers, and other users. A 16 mHz 80386SX computer with an EGA or VGA monitor, 1 MB of RAM, and a hard disc is the minimum recommended hardware configuration needed to run the system.

Research Studies

Three formal system evaluations were conducted during the IRIS Project: (1) a CD-ROM LAN performance benchmark; (2) an assessment of user reactions to the CD-ROM LAN; and (3) an assessment of user reactions to the expert system. Selected highlights of these studies are presented here. The detailed results of these studies will be presented in future papers by members of the IRIS Research and Evaluation Group.

The performance benchmark showed that response time increased substantially as the number of simultaneous users of a CD-ROM LAN database increased. For example, the average increase in response time between one user and nine users for three of the CD-ROM databases (ERIC, Humanities Index, and PsycLIT) was 59.09 seconds. The benchmark also revealed that the degree of performance degradation under load varied considerably by CD-ROM product. With nine simultaneous users, there was a 65.08 second difference between the fastest and slowest response time for the three previously mentioned databases. The results of the performance benchmark reflect the specific hardware, software, and CD-ROM databases used by the IRIS Project and the particular testing methodology employed. Given the benchmark results, we currently plan to limit access to a maximum of ten simultaneous users per CD-ROM database.

The CD-ROM LAN survey indicated that the majority of users reacted very favorably to CD-ROM databases, saying that they found information more quickly (89.4%) and more easily (84.2%) than in printed sources. Most users (85.1%) believed that they found more helpful information in CD-ROM databases than in print sources. An overwhelming majority of users (97.5%) agreed that it was valuable having CD-ROM databases in the library.

The Reference Expert survey revealed that the majority of users preferred to use Reference Expert than to use printed guides (62.9%) or to ask library staff for assistance (56.3%). Most users said that they would consult the sources recommended by Reference Expert (72.5%) and use the system in the future to find reference sources (74%).

CONCLUSION

Given the state-of-the-art of the underlying technologies, CD-ROM LANs and expert systems still suffer from performance and other technical limitations; however, the Intelligent Reference Information System Project demonstrated that they can be used very effectively in libraries. The IRIS Project required a fairly high-level of technical support and the participation of a wide variety of library staff. Other libraries that want to develop systems of similar scope and complexity may have comparable staffing needs.

Given the success of the IRIS Project, the University Libraries are planning to expand the CD-ROM network significantly, increasing both the number of workstations and the number of networked CD-ROM databases.

The University Libraries have established the Reference Expert Task Force to continue the development of the expert system. This group will design and program a prototype of the next version of the system using Visual Basic in a Microsoft Windows environment. The University Libraries are interested in adding significant depth to the decision making process in Reference Expert by taking into account more reference resource characteristics and adding both user and information need characteristics. The University Libraries are also interested in exploring the use of an object-oriented programming language like C++ for producing the production version of the new Reference Expert system. This should reduce the complexity of interface design and increase the overall capacity and performance of the system.

REFERENCES AND NOTES

1. Charles W. Bailey, Jr., "Building Knowledge-Based Systems for Public Use: The Intelligent Reference Systems Project at the University of Houston Libraries," in *Convergence: Proceedings of the Second National Conference of the Library and Information Technology Association, October 2–6, 1988*, ed. Michael Gorman (Chicago: American Library Assn., 1990), p.190–94.
2. Charles W. Bailey, Jr., and others, "The Index Expert System: A Knowledge-Based System to Assist Users in Index Selection," *Reference Services Review* 17, no.4:19–28 (1989).
3. Charles W. Bailey, Jr., and Kathleen Gunning, "The Intelligent Reference Information System," *CD-ROM Librarian* 5:14,16 (Sept. 1990).
4. Thomas C. Wilson, "Zen and the Art of CD-ROM Network License Negotiation," *The Public-Access Computer Systems Review* 1, no.2:4–14 (1990). To retrieve this article from the University of Houston's list server, send the e-mail message GET WILSON PRV1N2 F=MAIL to LISTSERV@UHUPVM1 (BITNET) or LISTSERV@UHUPVM1.UH. EDU (Internet).
5. Thomas C. Wilson and Charles W. Bailey, Jr., "The Intelligent Reference Information System CD-ROM Network," in *Library LANs: Case Studies in Practice and Application*, ed. Marshall Breeding (Westport, Conn.: Meckler, 1992), p.157–71.
6. Kathleen Gunning, "The Intelligent Reference Information System: The Effect on Public Services of Implementing a CD-ROM LAN and Expert System," *Library Administration & Management* 6:146–53 (Summer 1992).
7. The Quick Reference Cards developed by the IRIS Project are available from: LOEX Clearinghouse, University Library, Eastern Michigan University, Ypsilanti, MI 48197.
8. The reader unfamiliar with expert system technology may want to consult the following introductory works for further information: Ralph Alberico and Mary Micco, *Expert Systems for Reference and Information Retrieval* (Westport, Conn.: Meckler, 1990); Rao Aluri and Donald E. Riggs, eds., *Expert Systems in Libraries* (Norwood, N.J.: Ablex, 1990); Louis E. Frenzel, Jr., *Crash Course in Artificial Intelligence and Expert Systems* (Indianapolis: Sams, 1987); F. W. Lancaster and Linda C. Smith, eds., *Artificial Intelligence and Expert Systems: Will They Change the Library?* papers presented at the 1990 Clinic on Library Applications of Data Processing, March 25–27, 1990 (Urbana-Champaign, Ill.: Graduate School of Library and Information Science, University of Illinois at Urbana-Champaign); George F. Luger and William A. Stubblefield, *Artificial Intelligence and the Design of Expert Systems* (Redwood City, Calif.: Benjamin/Cummings Pubs., 1989); A. Morris, "Expert Systems for Library and Information Services—A Review," *Information Processing and Management* 27, no.6:713–24 (1991); and Ernst J. Schuegraf, "A Survey of Expert Systems in Library and Information Science," *The Canadian Journal of Information Science* 15:42–57 (Sept. 1990).
9. A detailed article about Reference Expert by Judy E. Myers, Charles W. Bailey, Jr., Jeff Fadell, Jill Hackenberg, and Thomas C. Wilson is in preparation. The working title is "Reference Expert: An Expert System for Print and CD-ROM Reference Sources."
10. James Parrott's work helped stimulate the thinking of the Knowledge Engineering Group about the structure of the knowledge base. See James R. Parrott, "Simulation of the Reference Process, Part II: REFSIM, an Implementation with Expert System and ICAI Modes," *The Reference Librarian*, no.23:153–76 (1989).
11. For further information about knowledge representation using frames, see Kamran Parsaye and Mark Chignell, *Expert Systems for Experts* (New York: Wiley, 1988), p.161–210; and John R. Walters and Norman R. Nielsen, *Crafting Knowledge-Based Systems: Expert Systems Made Easy/Realistic* (New York: Wiley, 1988), p.209–52.
12. *Expert Systems in ARL Libraries, SPEC Kit 174* (Washington, D.C.: Office of Management Services, Association of Research Libraries, 1991), p.2 of the flyer. Also available in ERIC (ED 337 178).
13. Charles W. Bailey, Jr., "Intelligent Library Systems: Artificial Intelligence Technology and Library Automation Systems," *Advances*

in Library Automation and Networking 4:11 (1991).

14. To obtain a copy of the expert system, send a stamped, self-addressed diskette mailer and a formatted 5 1/4-inch 1.2 MB or 3 1/2-inch 1.44 MB diskette to: Charles W. Bailey, Jr., Assistant Director for Systems, University Libraries, University of Houston, Houston, TX 77204-2091. If you reside outside of the U.S. and cannot get appropriate stamps, enclose $2 in your local currency to cover postage costs. ■■

Arabic Online Catalog

Zahiruddin Khurshid

The article provides background information on the processing of Arabic materials using a combination of local and modified cataloging rules and the creation of the Arabic card catalog at the King Fahd University of Petroleum and Minerals Library (KFUPM). It also gives a brief history of KFUPM library automation and then presents various options considered for developing the Arabized version of DOBIS/LIBIS. Finally, the functions and features of the Arabic online catalog are described.

King Fahd University of Petroleum and Minerals (KFUPM, formerly UPM) was founded as a college in 1963. The status of the college was later changed to a university in 1975. KFUPM provides advanced training of students in the fields of science and engineering to prepare them for service and leadership in the Kingdom's petroleum and mineral industries.[1]

The academic programs of the university are well supported by a central library with a strong collection of more than 250,000 volumes. Because the university's main focus is on study and teaching in scientific and technical areas, the library's collection is comprised mostly of non-Arabic materials. Only about 7.5 percent of its collection is in Arabic, most of which supports the Islamic and Arabic studies programs.

PROCESSING OF ARABIC MATERIALS

The Arabic collection of the library received less attention than others in both development and processing. Until 1976, there was only one person with a professional degree in library science, responsible for acquisitions, bibliographic control, shipment clearance, and all paperwork regarding Arabic materials. For processing, a brief description of books was provided on cards without much attention to cataloging rules. For classification, a temporary modified Dewey Decimal Classification scheme was used, according to which a book was assigned a call number composed of a general number for the class, followed by a slash and an accession number.[2]

It was soon realized that the local system for processing Arabic materials was creating access problems. For example, a second copy of a title would appear with a call number different from the first copy, whereas two separate books were at times assigned the same call number. A decision was made therefore to shift from the local system to a standard cataloging system using *AACR*, Library of Congress (LC) Subject Headings, and the LC Classification Scheme. The idea was also to make use of the LC card sets.

To save effort and time in consulting two separate catalogs for Arabic and non-Arabic materials, integration of the two was considered necessary. The transliterated LC cards enabled us to interfile them with the non-Arabic catalog cards. However, to satisfy the library patrons, who still preferred access to the collection through the Arabic alphabet, an Arabic title file was provided wherein one card in every card set was arranged alphabetically by Arabic title. On the other hand, the Arabic collection was also integrated with the non-Arabic collection so that the readers could browse the library's holdings in their subject of interest in one area of the stacks.

The decision to adopt a transliterated system for Arabic material was taken also in view of a growing backlog of Arabic books for cataloging and the shortage of Arabic catalogers. The idea was to make use of the LC catalog

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records and thus reduce the amount of original cataloging. This decision ran against the general feeling of the Arabic speakers who take pride in their native language and show strong opposition to subordinating Arabic to another language in bibliographic records. It was observed that fewer and fewer people were using the card catalog. They resented this scheme and were not willing to learn it.

In 1979, the policy was modified to drop transliteration practice in favor of vernacular script records, except for subject heading and class number, which remained in English. The main entry and added entries except for subject added entries and the shelflist cards were filed in a separate Arabic catalog. The reasons to continue to use the LC Subject Headings for Arabic materials and to have an integrated subject file for both Arabic and non-Arabic materials were: (1) ease of locating an Arabic book on a specific subject with related non-Arabic books in the same file; (2) the unavailability of a reliable, periodically updated Arabic subject headings list; (3) the fact that the majority of KFUPM Library holdings are in English and it is a must to use the LC Subject Headings list; and (4) earlier attempts at translating scientific and technical headings into Arabic have proved disastrous.

LIBRARY AUTOMATION

Planning for library automation at the KFUPM library began in 1975, when five systems were investigated by the library administration. They were DOBIS, CLSI, BALLOTS, BATAB, and Hewlett Packard's 3000 System. One of the features that KFUPM wanted in a library automation system was the multiple language capability, which DOBIS/LIBIS had only for the Latin script languages, German, French, and Italian. We finally selected DOBIS/LIBIS in June 1980 with a long-term objective to modify it to handle both Latin and Arabic scripts. Modifying a program and adapting it to the local requirement was considered a better choice than developing an Arabic program from scratch. This was the time when even the Library of Congress was seriously considering complete romanization of its bibliographic records for all nonroman scripts except Chinese, Japanese, and Korean. One of the reasons for adopting this approach was that the software required for interfacing nonroman characters with the library's automated systems was not available and would entail great expense to develop.[4]

DEVELOPMENT OF THE ARABIZED VERSION OF DOBIS

Following the completion of the implementation of DOBIS/LIBIS for handling non-Arabic materials in 1986, the attention was focused on handling the Arabic script materials using DOBIS. We considered the following three options:

1. Creating records for Arabic documents in romanized form using the English version of DOBIS;
2. Entering the Arabic script data using the English version of DOBIS; or
3. Developing an Arabized version of DOBIS for handling bibliographic information in the Arabic script and keeping the Arabic files separate from the English files.

Option number one was rejected for two main reasons. First, no acceptable standard exists for romanization that has resulted in transliterating a single word into several different ways. Second, romanization is not acceptable to the users.

The second option was rejected for two reasons. First, the orientation for entering Arabic and non-Arabic data is different. Whereas the Arabic data are entered from right to left, the non-Arabic data are entered from left to right. Second, if the Arabic data are integrated with the non-Arabic data, they would confuse the user in both searching and displaying the bibliographic information.

In view of the serious problems with the first two options, the third option was found to be the most appropriate. Thus, to prepare an Arabized program, the following steps were taken:

1. Adopted ASMO 449, the standard coding system for the Arabic language developed by the Arab Organization for Standardization and Metrology (ASMO) to translate Arabic information consisting of letters and numbers to equivalent binary numbers. ASMO 449 is based on the 7-bit coding table in ISO 646 adapted for the specific requirements of Arabic and contains 128 characters (inclusive of controls, graphic symbols, and alphanumerics) with their coded representation[5];
2. Acquired an IBM X-BASIC terminal, 3192, which is most suitable to handle both English and Arabic characters and is com-

patible with ASMO 449 conventions for letters, numbers, and special signs. It also allows a number of special functions, such as switching between Arabic and Latin scripts, mixing both right-to-left and left-to-right fields on the same screen, having the overall screen direction from right-to-left or left-to-right, and changing keying direction within a field[6];

3. Wrote some programs in PL/1 and Assembler languages and translated screens, maps, and tables of the English version of DOBIS/LIBIS;

4. Prepared a diacritical table to handle special characters not supported by the IBM X-BASIC terminal and developed a stopword list for those characters and words that are insignificant and therefore required to be ignored in filing;

5. Introduced necessary modifications to LIBIS-batch programs to print catalog cards, spine labels, accessions list, and notices in Arabic;

6. Prepared nine special files for storing the following segments of bibliographic information: author, title, subject, publisher, classification number, LC card number, ISBN, and primary and secondary bibliographic file information.

The Arabized programs for cataloging and catalog search functions were developed in 1986. The testing of the two functions followed immediately and continued for about a year.

Before implementing the Arabized version of DOBIS program in the production system for creating catalog records in Arabic, it was decided to replace the LC Subject Headings by the Arabic Subject Headings prepared by Nasser M. Swaydan to make the catalog record completely in vernacular script.[7] However, the classification number remained in English to keep the English and Arabic materials integrated on the shelves.

In October 1987, the retrospective conversion of the Arabic card catalog and the creation of catalog records for new Arabic materials started simultaneously. By June 1989, the entire catalog records for Arabic monographs were completed, and about the same time an IBM 3192 bilingual terminal together with an Arabic printer was placed on the plateau level of the library for users to search the Arabic online catalog.

ARABIC ONLINE CATALOG

The Arabic online catalog has almost the same features as the non-Arabic catalog. When the transaction code PF24 (PF1 to access non-Arabic catalog) is entered, the system displays the first screen that gives a choice of one of the three local libraries, Main Library (LO1), Recreation Center Library (LO2), or Data Processing Center Library (LO3) (see figure 1). For each library, the patron can perform two functions: (1) search the catalog and (2) display the borrower record (see figure 2).

The only thing that is not available in the Arabic catalog at this point is the third function of the non-Arabic online catalog, "send a note to the library staff." For technical reasons, the provision of this facility in the Arabic catalog is not considered feasible. In its place, a log-off function has been added as function number 3.

Searching the Catalog

Selection of this function displays a screen that includes numbered indexes representing access-point files. These indexes have been grouped into three categories: (1) Arabic indexes, (2) English indexes, and (3) Other indexes (see figure 3).

1. Arabic indexes: Index numbers 1 to 4 (names, titles, subjects, and publishers) are used to access the Arabic catalog.

2. English indexes: Index numbers 11 to 14 (names, titles, subjects, and publishers) are used to access the non-Arabic catalog. However, after selecting the desired index, the user is required to press the REV key to position the cursor for inputting the search term from left to right.

3. Other indexes: Index numbers 20 and 21 are common to both Arabic and non-Arabic catalogs and provide access to the two catalogs by the call number and copy number. Since the call number is based on the LC Classification system comprising alphanumeric characters, the user is required to change cursor position before entering the search term. Copy number is entered from right to left.

The facility to attach abstracts to Arabic documents is not available yet; as such there is no index for searching the abstract file. Abstracts have been attached only to the selected non-Arabic documents and can be

King Fahd University	جامعة الملك فهد
Central Library	المكتبة المركزية
Local Libraries	مكتبات محلية
1 Main Library	١ المكتبة المركزية
2 Rec. Center Library	٢ مكتبة مركز الترفيه
3 DPC Library	٣ مكتبة مركز تبويب المعلومات
Type in a line number, then press ENTER	اطبع رقم السطر ثم ادخل

Figure 1. Selection of Library in OPAC.

King Fahd University of Petroleum & Minerals	جامعة الملك فهد للبترول والمعادن
Central Library	المكتبة المركزية
Library Automation System	نظام ميكنة اعمال المكتبة
Choose the number of the function, you wish to use	اختر الرقم المناسب
1 Search the catalog	١ بحث الفهرس
2 Display your borrower record	٢ عرض سجل الاعارة الخاص بك
3 Logoff	٣ انتهاء
Type in a line number, then press ENTER	اطبع رقم السطر ثم ادخل

Figure 2. OPAC Functions.

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                                              Search the catalog  بحث الفهرس
رموز يمكن استخدامها فى الشاشات الأخرى :           الفهارس التي يمكن بحثها :
Codes you may enter on other screens              Indexes you can search
                                               فهارس عربية :  فهارس انجليزية :
New term    د مدخل جديد : لمحاولة بحث مدخل جديد    English indexes  Arabic indexes
New index   ف ملف جديد : لاستخدام ملف آخر         ١ أسماء     Names ١١ أسماء
Forward     ا أمام : لسحب الملف للأمام            ٢ عناوين    Titles ١٢ عناوين
Backward    خ خلف : لسحب الملف للخلف              ٣ مواضيع    Subjects ١٣ مواضيع
Show index  ظ اظهر : لعرض الملف مرة أخرى          ٤ ناشرين    Publishers ١٤ ناشرين
Short info  م موجز : لعرض قائمة العناوين                       ١٥ أرقام تصنيف
Full info   ك كاملة : لعرض المعلومات التفصيلية   Class numbers        فهارس أخرى :
Copies      ن نسخ : لمعرفة النسخ الموجودة                       Other entries
Reference   ت احالات : لعرض الاحالات            Call numbers     ٢٠ أرقام الطلب
            ل تفاصيل: لمعرفة تفاصيل عن المدخل   Copy numbers     ٢١ أرقام النسخ
     For more information about searching       اطبع رقم السطر أو الرمز ثم أدخل
          ت لمعلومات أكثر                       Type a line number or code, Press enter
  M for more information
                      ة انه
                      E End
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Figure 3. File Selection in Public Access.

searched by the abstract keyword in the non-Arabic catalog.

The missing index numbers from 5 to 10 are for those files that, at present, are not available in the Arabic catalog, e.g., ISBN/ISSN, LC card number, "other entries" number, etc. Most of the Arabic publications lack these numbers, and this was the main reason for not making provisions for their files. However, they can be added at any time.

On the left side of the screen are a number of mnemonic codes (single character DOBIS/LIBIS commands) with brief descriptions. Only these codes can be used for searching. The use of any other code is not accepted by the system. Here, entering a code will display a help screen that provides information on how to perform Boolean combinations of saved document lists to refine the search.

The full bibliographic information screen retrieved by entering one of the "Arabic indexes" or "other indexes" includes the following bibliographic elements: author, title, publisher, subject, classification number, call number, and notes (see figure 4).

As stated earlier, the user can also search the English catalog by selecting one of the English indexes on the search panel followed by changing the dialog mode from Arabic to English to enter the search term from left to right. The procedure for changing dialog modes has been posted near the bilingual terminals. The full information screen of a non-Arabic document retrieved from the Arabic OPAC panel is presented in figure 5.

Displaying Your Borrower Record

Function number 2 is used to display the borrower record. The user is first required to identify himself to the system by entering a password, which is the KFUPM ID number in our case. The input field for the ID number, also called the borrower number, is dark to prevent others close to the terminal from seeing and perhaps copying the input.

DOBIS then displays the screen shown in figure 6. The two addresses (mailing and other), telephone number, borrower type (faculty, student, staff, etc.), local codes (four fields), number, text, number of loans, fines, paid fines, title holds, and copy holds are displayed.

The reason for address information being in English is that the circulation function has not been Arabized. We are making use of the

Search the catalog — بحث الفهرس
Authors, editors, etc. — مؤلف ، محرر ، الخ
Full information — معلومات كاملة مستند ٨٥٨٣٧٣ document
Author(s) — أسماء : الماشطة ، محمد علي عبد العريم
Title: — عناوين : الطاقة ـ النفط واتجاهات الطلب حتى عام ١٩٨٥
Publisher — ناشرين : بغداد : دار الثورة للصحافة ، ١٩٧٧
Subjects — مواضيع : البترول ـ صناعة و تجارة / مصادر الطاقة
Classif.: — أرقام تصنيف : HD9578,A55 M38
Notes: — يحتوى : ٣٤٤ص ، ٢٤سم
Copy: — نسخ : HD 9578,A55 M38 main

Type 'k' (copy overview) or another code — ادخل ن (لعرض النسخ) أو رمز آخر
s short م موجز — ن نسخ — د مدخل جديد
k copies — t new term
p circ status ع معلومات الاعارة — ف ملف جديد
i new index
v save احفظ ح — e end انه ة — ظ أظهر الملف
w show file

Figure 4. Full Information in Public Search.

بحث الفهرس
عناوين
معلومات كاملة مستند ٧٧٦٣٥٠
أسماء : Clayton, Marlene, 1951-
عناوين : Managing library automation
ناشرين : Aldershot, Eng. : Brookfield, Vt. : Gower, 1987
ملاحظة : Includes index
أرقام دولية : 0566035294 : $35.00 (U.S. : est.)
مواضيع : Libraries - Automation - Management / Library science - Data processing / Library administration
أرقام تصنيف : Z678.9 .C54 1987
نسخ : Z 678.9.C54 1987 main

ادخل ن (لعرض النسخ) أو رمز آخر
د مدخل جديد ا أمام ن نسخ م موجز
ف ملف جديد ع معلومات الإعارة
ظ أظهر الملف ة انه ح احفظ

Figure 5. English Document Retrieved from the Arabic OPAC Panel.

```
                                       Your borrower record   سجل المستعير
        Other address    عنوان آخر     Mailing address   عنوان المراسلة
                               8/              UPM  BOX  #  450
                  LIBRARY  AFFAIRS

May borrow?    هل يجوز اعارته ؟ نعم           860-3014  Tel     الهاتف
Trap set?      يوجد مانع لاعارته نعم      Tech      فني      Type      نوع
On loan     ٤      ١٣ كتب معارة      ***************  Code 1    ١ رمز
Fines       .      ١٤ غرامات         On Payr  راتب    Code 2    ٢ رمز
Paid fines  .      ١٥ غرامات مدفوعة  ***************  Code 3    ٣ رمز
Holds       .      ١٦ حجوزات         ***************  Code 4    ٤ رمز
Copy holds  ١      ١٧ نسخ محجوزة           ٢٥         Number      رقم

                                                        Text     نص
                                      اطبع رقم السطر أو الرمز ثم أدخل
  انه ة  E  End                 Type a line number or code, Press enter
```

Figure 6. Display of Borrower Information in Public Search.

English borrower file for displaying the borrower address on the borrower record screen.

CONCLUSION

For any system to become successful in the Middle East, it must support processing of Arabic script materials. That is why MINISIS is currently a leading system in the region. Following the KFUPM Library's success in Arabizing DOBIS/LIBIS cataloging and catalog search functions, IBM signed a study contract with KFUPM to Arabize the remaining functions. The contract also gave IBM the right to distribute the Arabized programs to DOBIS/LIBIS user libraries in the region free of charge. Several libraries have acquired and implemented the Arabized version of DOBIS/LIBIS, thus making it the second most popular system in the region.

The KFUPM Library's Arabic online catalog has been in use for over three years. The users are very excited about the catalog because it is more complete and more Arabic than the card catalog and it has almost the same search features as the English catalog. However, there are some limitations to the catalog that are related to both the hardware and software. The hardware limitations are mostly related to the keyboard, which does not fully support the various diacritical characters extensively used in the Arabic script. The escape character is used in combination with alpha and/or numeric characters to form substitute characters for diacritical characters. This not only is difficult to use but also increases the chances of mistakes. IBM is aware of its present hardware limitation of Arabic special characters, and it is expected that they will come up with an improved keyboard in the near future.

The software problem is related to the input, sort, and display forms of the Arabic definite article " ال". If " ال " is not ignored in sorting, it would result in a large number of entries being clustered together in the file and would impede searching. " ال " therefore, is generally ignored in filing. However " ال " in certain Arabic words such as " المانيه " is an integral part of the word and should not be ignored in filing. To resolve this problem, a list of about 200 words starting with characters similar to those of the definite article " ال " is stored in the computer so that the program will not ignore the articles in these words and it will sort, display, and file them as they are entered. The list is updated with new words as we come across them while cataloging.

REFERENCES

1. King Fahd University of Petroleum and Minerals. *Graduate Bulletin* (Dhahran: College of Graduate Studies, 1989), p.7.
2. Talat M. Okby, "New Cataloging Procedures for Arabic Materials," *UPM Library Scene* 2:5 (Oct. 1977).
3. Talat M. Okby, "Finally . . . ! a Vernacular Catalog at UPM," *UPM Library Scene* 4:20 (April 1979).
4. "Library Offers Plans for Romanization," *Library of Congress Information Bulletin* 37:654 (Oct. 27, 1978).
5. "From Chaos Into Order But Not Quite!" *Middle East Computing* (May 1983), p.12.
6. International Business Machines Corporation. *IBM 3192 Display Station User's Guide Supplement For: Arabic* (North York, Ontario: IBM Canada, 1987), p.3.
7. Nasser M. Swaydan, *Arabic Subject Headings* (Riyadh: King Saud University Libraries, 1985).

Making Shareware Available at Reserve

Robert L. Bolin

Computer software known as shareware may be distributed freely by libraries. A tremendous number of shareware computer programs are available on CD-ROM discs. A shareware workstation can be used to make shareware CD-ROM discs available to library patrons. This article discusses the shareware workstation set up near the reserve desk in the University of Idaho Library to make the Software Du Jour, Shareware Grab-Bag, and PC-SIG Library CD-ROM discs available to users. Several shareware programs were used to make the discs accessible. The shareware hypertext program PC-Browse was used to create a menu that allows users to run search software and utility programs and to view help files and instructions. The PC-Browse menu written as the user interface is included in appendix B.

Shareware is an ingenious concept for marketing computer software. The author of a computer program releases it for free distribution among the public but retains the rights to it. Anyone may try it. However, the user who keeps it and uses it is morally obliged to pay a registration fee. Authors often provide documentation, upgrades, and access to technical assistance as an incentive to register. Of course, software that is in the public domain may also be shared freely.

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A large number of computer programs are available as shareware. Those include conventional word processing, database, and spreadsheet programs as well as a wide variety of utility programs, games, graphics programs, text, and even graphic images in digital form. One of the more successful shareware products, the PC-Write word processing program from Quicksoft, was used to prepare this article.

A small industry has grown up to distribute shareware. A number of firms sell it through the mail. The Software Labs, for example, issues a lengthy mail-order catalog. Another vendor, PC-SIG, publishes the bimonthly *Shareware Magazine* to advertise its offerings and has published several editions of its book-length *PC-SIG Encyclopedia of Shareware.* Those firms distribute diskettes containing copies of shareware programs but do not collect registration fees.

Since CD-ROM discs can hold vast amounts of data in digital form, it was only a matter of time before vendors started distributing shareware on discs. Norman Desmarais discusses shareware and other software available on CD-ROMs in his article "CD-ROM as a Software Distribution Medium."[1]

By the summer of 1990, several shareware CD-ROM discs had found their way to the University of Idaho Library. The Software Du Jour disc from ALDE Publishing was given free to one of our librarians at a national library convention. A computer users club gave the library money to buy the PC-SIG Library. We had purchased Shareware Grab-Bag from ALDE.

Some users knew that we had the discs. If a user asked, we would let him or her use the shareware discs on one of the PCs ordinarily used for searching CD-ROM databases. The librarians on duty gave users any help they could. Although we had the shareware CD-ROM discs, we had not devised a good way to make them readily available to the public.

When an extra CD-ROM drive became available, we decided to install it on a PC near the reserve desk and to put the shareware discs on reserve. That decision presented us with the challenge of making search software and online help available to users.

EQUIPPING A PC AS A SHAREWARE WORKSTATION

The computer near the reserve desk, which became our shareware workstation, was an ancient IBM PC that had been used in a university computer lab for years. The library obtained that PC when the lab was equipped with more modern computers. To equip the PC as a workstation, we added a 20 MB hard disc and an external Toshiba CD-ROM drive to the existing low-density diskette drives—Drive A is a 5.25-inch drive and Drive B is a 3.5-inch drive. We designated the hard disk as "Drive C" and the CD-ROM drive as "Drive Z."

We chose a hypertext program named PC-Browse from Quicksoft as the user interface to give our patrons access to search software and help files.[2] PC-Browse can be used to create a tailor-made menu. A PC-Browse menu is a cross between a text file and a computer program; the menu options can be used to start other software or leap to another screen. A copy of the PC-Browse menu that we wrote as the user interface for the shareware workstation is included in appendix B. The menu allows the user to exit to DOS, to read text files, to start the search software for one of the discs, or to run a number of utility programs available on the PC.

SOFTWARE PROBLEMS

Installing the search software for the different shareware discs provided different challenges and problems.

Software Du Jour

The Software Du Jour disc was the biggest challenge because it came with no search software. Software Du Jour is simply a collection of directories and subdirectories containing software of different types. For example, the "BUSINESS" directory contains subdirectories named Lotus, dBase, Stocks, and Write. Each subdirectory contains a ".DOC" file listing the contents of the subdirectory. For example, the WRITE subdirectory contains a file named WRITE.DOC which gives a brief description of the fourteen files contained in that subdirectory. Of course, the simplest way to search the disc is just to use DOS commands to change directories and copy files. Users can do that easily because the PC-Browse menu allows them to exit to the DOS prompt.

To facilitate sailing around the Software Du Jour disc, we used a shell program named "Disk Navigator." Disk Navigator, a shareware program from Stanley Peters, is handy for managing files on a hard disc.[3] We use it to list all the files in all the directories and subdirectories on the Software Du Jour disc. When a user selects the option to run the Software Du Jour extraction software from the PC-Browse menu, Disk Navigator lists the names of all the directories on the CD-ROM disc and of all files in them. The user can page through the directories and copy the files he or she wants onto diskettes. Disk Navigator allows the user to tag a number of files and copy them as a group.

Some of the files on the Software Du Jour disc are archived—that is, compressed and combined. A single archived file can contain several files. That makes archiving a convenient way to bundle a shareware program with its auxiliary files and documentation. Those archived files must be unarchived using a program named PKXARC before they can be used. The archived files on the Software Du Jour disc are indicated by the suffix "ARC." For a discussion of archiving and unarchiving software see the interview with Philip Katz in a recent issue of *Shareware Magazine*.[4]

To simplify unarchiving files, we wrote two macros. A macro is a set of instructions that are executed when a certain combination of keys is pressed. The version of Disk Navigator we used, Version 1.4r, allows the use of macros. To execute those macros, a user puts the highlight over a file name shown on the screen. He or she could choose, for example, BAR.ARC which is the first file listed in the DBASE subdirectory of the BUSINESS directory. A macro is executed when the user holds down the "Alt" key and presses the "A" or the "B" keys. The Alt-A macro executes a one-line DOS batch file which tells the PKXARC program to unarchive the file indicated, writing the files extracted onto the diskette in drive A.[5] The Alt-B macro unarchives the file onto drive B.

To help users explore the contents of the Software Du Jour disc, we copied the ".DOC" files in the various subdirectories onto the hard disc and set up the PC-Browse menu so that users can view them. If a user selects the option to "Read about DuJour" on the PC-Browse menu, the program "leaps" to a screen giving a brief description of the Software Du Jour disc and presenting the option of viewing the contents of each directory. If the user selects one of those options, the program moves to another screen that gives a brief description of the directory and provides the user the option to see a list of the files in each subdirectory. The screen describing the BUSINESS subdirectory, for example, explains that Lotus 1-2-3 and dBase are not available as shareware and that the "Lotus" and "dBase" subdirectories "contain utility programs, product upgrade reports, and similar useful files to be used with Lotus and dBase." That screen gives the user the option of seeing lists of the contents of subdirectories named Lotus, dBase, Stocks, or Write. If the user selects the "Lotus" option, PC-Browse uses a utility program named LIST to display the LOTUS.DOC file which gives one-line descriptions of the 45 other files in that subdirectory.[6]

PC-Browse is adept at displaying text and we could easily have incorporated the ".DOC" from the Software Du Jour disc into the PC-Browse menu. However, we chose to use LIST here, and several other places in the menu, because the user is returned to the same place on the menu after viewing the text. A user can view the list of Lotus-related files and then return immediately to the "BUSINESS" menu to select the "dBase" option.

Shareware Grab-Bag

Shareware Grab-Bag is also from ALDE Publishing. Unlike the Software Du Jour disc, Shareware Grab-Bag is provided with excellent search software right on the CD-ROM disc. It contains a variety of shareware programs in nearly 7,000 archived files divided among thirty-four directories. After the user has selected a directory, he or she can page through lists of one-line descriptions of the files in that directory. When the user finds an interesting file, he or she selects that file and presses the F10 key. The search software automatically "UNZIPS" the files which are stored on the CD-ROM disc in archived form. As files are unarchived, they are written into a subdirectory named CDWORK on Drive C, the hard disk.[7]

Of course, the user can run, erase, or copy the files written into the CDWORK subdirectory. To help the user copy the contents of the CDWORK subdirectory onto his or her own diskettes, we wrote two DOS batch files that move the contents from the subdirectory onto a diskette. One moves the files to Drive A and the other to Drive B. In several places on the PC-Browse menu, users are given the option of "Moving Unzipped Files" onto Drive A or Drive B. The batch files use a shareware program named CMOVE to move the files.[8]

The PC-SIG Library

This disc presented no special problems because it was distributed with sophisticated search software. We simply gave the user the option to start the search software on the PC-Browse menu. Users do not need a great amount of online help because they can read the printed *PC-SIG Encyclopedia of Shareware*, which is also kept at the reserve desk, to review the contents of the PC-SIG Library disc before going near the computer.

Formatting Diskettes

We enabled users to format diskettes in drive A or B simply by choosing options from the PC-Browse menu. We renamed the DOS FORMAT utility program and hid it in a subdirectory to try to prevent users from formatting the hard disc. We then wrote two brief DOS batch files, FORMATA.BAT and FORMATB.BAT, which format the drive specified. As an extra protection, we changed the name of a utility program that reboots the PC to "FORMAT.COM." If a user enters the "FORMAT" command, the computer simply reboots.

Other Details

The Toshiba drive used by the shareware workstation requires that the CD-ROM discs be stored in a caddy. We keep the discs in those caddies all of the time. That discourages users from trying to put the CD discs in the 5.25-inch diskette drive.

We keep the CD-ROM discs for Software Du Jour and Shareware Grab-Bag in their caddies in plastic software boxes. The boxes are marked with the call number of the item and instructions for using the discs are given on the outside. The PC-SIG Library came with two manuals. We keep those manuals in a binder and put the disc and caddy in a pocket in the cover of the binder. Pockets for circulation cards are attached to the boxes and the binder. In addition, the *PC-SIG Encyclopedia of Shareware* is kept at the reserve desk with the PC-SIG disc.

Since users are allowed to get to the DOS prompt, there is a chance that they will erase or alter files. We have tried to overcome that danger in two ways. First, we used a program named ALTER to change the attributes of files on the hard disc to "read only."[9] That prevents them from being erased or altered casually.

As a second defense against tampering and against viruses, we backed up the hard disc using a tape back-up system. Because we have it backed up, we can restore the hard disc to its original condition if it becomes damaged or infected.

CONCLUSIONS

The shareware workstation near the reserve desk at the University of Idaho Library has been in use successfully for two years. Several hundred people have obtained the software they want off the shareware CD-ROM discs using that workstation.

We used shareware programs to make the shareware CD-ROM discs accessible because it works well, and it is inexpensive. The registration fees for the programs used were low. We could not locate some of the authors so we could not pay their fees.

The basic approach described in this article could be used to make other types of CD-ROM products available in libraries. CD-ROM discs can be used to distribute a variety of computer programs and files, such as maps, pictures, and blue prints in digital form, large collections of text and hypertext, and even multimedia products yet to be devised. Workstations similar to the one described could be used to identify and download computer files; search and print text; or run programs found on CD-ROM discs. Since the CD-ROM discs themselves can be handled like other items on reserve, routine procedures can be used at the reserve desk for storing them and checking them out to users.

REFERENCES AND NOTES

1. Norman Desmarais, "CD-ROM as a Software Distribution Medium," *Optical Information Systems* 9:209–13 (July–Aug. 1989).
2. PC-Browse is available on the PC-SIG Library disc as Discs 1670 and 1671.
3. Version 1.3 of Disk Navigator is available on the PC-SIG Library CD-ROM disc as Disk 810. The PC-SIG Encyclopedia of Shareware classifies Disk Navigator as a "DOS Shell" program.
4. "Phil Katz Zips Ahead," *Shareware Magazine* 6, no.1:14,15,47 (Jan./Feb. 1991).
5. The use of macros is explained thoroughly in the manual accompanying the Disk Navigator program. Here is the entire contents of the file which contains both macros:

   alt-a aun ^
   alt-d dun ^

   Here is the batch file AUN.BAT the "alt-a" macro executes:

   pkxarc %1 a:\
6. LIST is a shareware program from Vernon Buerg which does what the TYPE command should have done. It allows the user to page up and down through a file and to print or copy selected parts. According to Victoria Irwin at PC-SIG, who has been very helpful, LIST is on PC-SIG Disk 2565. That disk is available directly from PC-SIG or on the most recent edition of the PC-SIG Library CD-ROM disc.
7. The program that unzips Grab-Bag files is descended from the PKXARC program used with Software Du Jour. It is reviewed in: Jane Cross, "PKZIP PKUNZIP 1.1," *Shareware Magazine* 6, no.1:17,19 (Jan./Feb. 1991).
8. CMOVE was written by Daniel Doman. We obtained it from the Grab-Bag disc. It is in Directory 014, "UTILITIES—FILES."
9. ALTER was written by Bruce Gavin. We obtained it from the Grab-Bag disc. It is in Directory 014 "UTILITIES—FILES." ■■

APPENDIX A. SOFTWARE VENDORS MENTIONED

Software Du Jour and Shareware Grab-Bag shareware CD-ROM discs—ALDE Publishing, 6520 Edenvale Blvd.,Suite 118, Eden Prairie, MN 55346; (612) 835-5240.

The PC-SIG Library shareware CD-ROM disc, the *PC-SIG Encyclopedia of Shareware,* and *Shareware Magazine*—PC-SIG, 1030 D East Duane Ave., Sunnyvale, CA 94086; 1-800-245-6718.

Mail-order catalog—The Software Labs, 3767 Overland Ave. #112-115, Los Angeles, CA 90034; 1-800-359-9998; (213) 559-5456.

The PC-Write word-processing program and the PC-Browse hypertext program—Quicksoft Inc., 219 First Ave. N #224, Seattle, WA 98109; (206) 286-8802.

APPENDIX B. PC-BROWSE MENU

Notes on the PC-Browse MENU shown below.

The MENU we wrote as a user interface for the shareware CD-ROM workstation is shown below. Construction of a menu like this is described in detail in the PC-Browse manual.

This menu was written using PC-Write. The lines at the top—above "PRESS THE TAB KEY. . ."—are comments that do not appear on the screen when the program is run.

This menu uses special symbols that ordinarily are not printable to delimit menu options. To make the menu options visible to you, I have replaced the delimiting symbols with the "$." "LEAP" is the first word delimited. When the MENU program starts, the user is presented with the first screen. The first time the user presses the TAB key, the word "LEAP" will be highlighted. If he or she presses return the menu will leap to the second screen which is headed by the word "<LEAP>." In the PC-Browse file the string "[BR= /I60.62 /J22.20 /K0.0]" appears on the first line beyond space 80. It is not visible to the user since it is off the screen. That string tells PC-Browse which characters are used as delimiters.

This menu uses a form feed symbol between screens. To make the breaks between screens clearly visible to you, I have replaced that symbol with "[BREAK]."

Note how the menu can be used to start other software. On the second screen, the user could choose the menu option "Du Jour." If that option is chosen, a DOS batch file named "DUJOUR.BAT" is executed. That batch file in turn uses the menu DNAV (Disc Navigator) to list the contents of the Software Du Jour disc in Drive Z. Of course, when the PC-Browse menu program is running, "[?DUJOUR]" does not appear on the screen.

```
.PROGRAM:    MENU (Version 1.1)
.AUTHOR:     BOB BOLIN
.DATE:       JULY 16, 1990
.COMMENTS:   THIS IS A PC-BROWSE PROGRAM TO HELP PEOPLE USE SEVERAL
             CD-ROM DISCS CONTAINING SHAREWARE

PRESS THE TAB KEY TO HIGHLIGHT YOUR OPTIONS.
Experienced users can $LEAP$ into the extraction programs.
YOU MUST CHOOSE BETWEEN:
     Downloading software from CD-ROM Discs.
     Using DOS to run other software.
SELECT ONE OR THE OTHER. Use the TAB key to select the one and then press ENTER.
     $Downloading$ software
     $Use DOS$[?C:\COMMAND]
(You can return to this menu from DOS by entering the command EXIT.)
```

[BREAK] **<LEAP>**

To escape, Select: $GO TO DOS$[?C:\COMMAND].

To return from DOS, use the EXIT command.

To leap into the shareware extraction software, Select:

$Du Jour$[?DUJOUR]

$Grab-Bag$[?GRABBAG]

$Moving Unzipped Files$.

$PC-SIG$[?PCSIG]

Press F4 to return to the screen you were viewing previously.

[BREAK] **<Downloading>**

Three CD-ROM shareware discs are available from the reserve desk. Those discs contain a great variety of software for personal, educational, and business use. To use the CD-ROM discs, you must use a special drive unit, Drive Z. To find out how to use the CD-ROM Drive, Select: $Drive Z$[?NOTICE].

SELECT ONE OF THE OPTIONS SHOWN BELOW. Use the TAB key to select it and then press ENTER.

> Use or learn more about one of the $CD-ROM Discs$:

> Return to DOS[?C:\COMMAND]. To return here, use the EXIT command.

Press F4 to return to the screen you were viewing previously.

[BREAK] **<CD-ROM Discs>**

Three CD-ROM discs are available at the reserve desk. Use the TAB key to SELECT one of the options shown below and then press ENTER.

> Software Du Jour—the easiest to use but contains smallest number of programs. Also it is several years old.

$Run Du Jour$. $Read about DuJour$.

> Shareware GRAB-BAG—easy to use and up-to-date

$Run GRAB-BAG$. $Read about it$[?LIST GRABBAG.TXT].

> The PC-SIG Library—fairly difficult to use but contains a vast amount of shareware. It uses a sophisticated extraction program called WordCruncher.

$Run WordCruncher$[?PCSIG]. $Read about it$[?LIST PCSIG.TXT].

> Go to DOS, Select: DOS[?C:\COMMAND]. To return here, use the EXIT command.

[BREAK] **<Run Du Jour>**

Put the Software Du Jour disc in the CD-ROM Drive Unit, Drive Z.

If you need help using the CD-ROM Drive Unit, Select: $CD-ROM Drive$[?NOTICE].

A program named Disc Navigator, DNAV, is used to extract files from the Software Du Jour Disc. DNAV can be used to tag and copy groups of files onto your diskettes. Many of the files on this disk were "archived"—one or more files were compressed into a single file. Those archived files have the extension .ARC. Before you can use them, you must unarchive them. DNAV will do that too.

To learn more about using DNAV, Select: $Downloading with DNAV$.

To learn to use DNAV to unarchive files, Select: $Unarchiving with DNAV$.

To search the Software Du Jour disc, Select: GO[?DUJOUR].

To go to DOS, Select: DOS[?C:\COMMAND]. To return here, use the EXIT command.

Press F4 to return to the screen you were viewing previously.

[BREAK] **<Downloading with DNAV>**

Disc Navigator is very handy for sailing around a disc. We use it here to show all the contents of the Software Du Jour disc. DNAV can be used to copy groups of files from the Software Du Jour disc to your diskette on Drive A or B. To do that:

1. Put a formatted diskette in Drive A or Drive B. (To format a diskette, Select: $FORMAT A$[?FORMATA]: or $FORMAT B$[?FORMATB]:)

2. Start the Software Du Jour extraction program. It will list the software available on the disc. Use PgUp and PgDn to look through the listings.

3. Use the arrow keys to highlight a file you want to copy. Then press the T key to

Tag that file. Repeat until all the files you want to download are tagged.

4. Then press the G key. A "Group menu" will appear. Select C - Copy from that menu. Then specify where you want to copy the files with "A:" or "B:."

Press F4 to return to the screen you were viewing previously.

[BREAK] **<Unarchiving with DNAV>**

The DNAV program used to search the Software Du Jour disc will unarchive files for you quickly and simply. Here is how:

1. Put a formatted diskette in Drive A or Drive B. (To format a diskette, Select: $FORMAT A$[?FORMATA]: or $FORMAT B$[?FORMATB]:)

2. Start the Software Du Jour extraction program. It will list the software available on the disc. Use PgUp and PgDn to look through the listings.

3. Select an archived file—one with the suffix .ARC—from the listing by highlighting it. For example, CACPO.ARC is a file in the Z:\BUSINESS\DBASE subdirectory on the Du Jour Disc. You can use the down arrow to highlight the name CACPO.ARC.

4. Hold down the Alt key and press the letter that corresponds to the drive you have put the diskette in. The computer will unarchive the files onto the diskette on the drive you specified. For example, Alt B would unarchive files onto Drive B.

Press F4 to return to the screen you were viewing previously.

[BREAK] **<Run GRAB-BAG>**

Put the Shareware Grab-Bag disc in the CD-ROM Drive Unit, Drive Z.

If you need help using the CD-ROM Drive Unit, Select: $CD-ROM Drive$[?NOTICE].

Unzipping Files

The files on this disc are "archived," one or more files were compressed into a single file. To use them, you must unzip them and move them onto your diskette in Drive A or Drive B. To learn about that, Select: $Moving Unzipped Files$.

To run the Shareware Grab-Bag search software, Select:GO[?GRABBAG].

Be patient. It is slow!

To go to DOS, Select: DOS[?C:\COMMAND]. To return here, use the EXIT command.

Press F4 to return to the screen you were viewing previously.

[BREAK] **<Moving Unzipped Files>**

The files on the Shareware Grab-bag disc are "archived," one or more files were compressed into a single file. The search software will "unzip" the software you select into a subdirectory on the Drive C named CDWORK. To use the programs you have unzipped, you must get them from Drive C on this machine onto your diskettes. This program will do that. To move the contents of subdirectory C:\CDWORK onto your diskette in Drive A or in Drive B, Select:

$Move it to Drive A$[?MOVEA] OR $Move it to Drive B$[?MOVEB]

To run the Shareware Grab-Bag search software, Select: GO[?GRABBAG].

To go to DOS, Select: DOS[?C:\COMMAND]. To return here, use the EXIT command.

Press F4 to return to the screen you were viewing previously.

[BREAK] **<READ ABOUT DU JOUR>**

The Software Du Jour disc was created by ALDE Publishing, 6520 Edenvale Blvd., Suite 118, Eden Prairie, MN 55346; (612) 835-5240.

The disc contains four unique directories—business, computer, home and school. Each directory named relates to the programs that are contained within. A separate Button directory contains shareware programs (Including BAKER'S DOZEN, PC-CALC+, PC-DIAL, PC-FILE+, PC-STYLE, PC-TICKLE, PC-TYPE+, and EXTENDED DOS) written by Jim Button (used with the permission of ButtonWare).

To see listings of the contents of the subdirectories under each,

Select:

$BUSINESS$

$COMPUTER$

$HOME$

$SCHOOL$

$BUTTON$[?LIST C:\KRUD\BUTTON.DOC]

To go to DOS, Select: DOS[?C:\COMMAND]. To return here, use the EXIT command.

Press F4 to return to the screen you were viewing previously.

[BREAK] **<BUSINESS>**

The BUSINESS directory contains four subdirectories that relate to business applications. They include LOTUS, DBASE, STOCKS, and WRITE (for word processors). Lotus 1-2-3 and the dBase programs are are not shareware, and they are not available here. The Lotus and dBase subdirectories contain utility programs, product upgrade reports, and similar useful files to be use with Lotus and dBase.

To see a list of the files in this subdirectory, Select:

$Lotus$[?LIST C:\KRUD\LOTUS.DOC]

$dBase$[?LIST C:\KRUD\DBASE.DOC]

$Stocks$[?LIST C:\KRUD\STOCKS.DOC]

$Write$[?LIST C:\KRUD\WRITE.DOC]

To go to DOS, Select: DOS[?c:\command]. To return here, use the EXIT command.

Press F4 to return to the screen you were viewing previously.

[BREAK] **<COMPUTER>**.

The COMPUTER directory contains four subdirectories that relate to personal computer applications and utilities.

To see a list of the files in this subdirectory, Select:

EGA[?LIST C:\KRUD\EGA.DOC]

$Graphics$[?LIST C:\KRUD\GRAPHICS.DOC]

$Printer$[?LIST C:\KRUD\PRINTER.DOC]

$Utility$[?LIST C:\KRUD\UTILITY.DOC]

To go to DOS, Select: DOS[?c:\command]. To return here, use the EXIT comand.

Press F4 to return to the screen you were viewing previously.

[BREAK] **<HOME>**

The HOME directory contains two subdirectors that relate to using the computer at home.

To see a list of the files in this subdirectory, Select:

$Games$[?LIST C:\KRUD\GAMES.DOC]

$Personal$[?LIST C:\KRUD\PERSONAL.DOC]

To go to DOS, Select: DOS[?c:\command]. To return here, use the EXIT comand.

Press F4 to return to the screen you were viewing previously.

[BREAK] **<SCHOOL>**

The SCHOOL directory contains six subdirectories that relate to education.

To see a list of the files in this subdirectory, Select:

$Geography$[?LIST C:\KRUD\GEOGRAPHY.DOC]

$Language$[?LIST C:\KRUD\LANGUAGE.DOC]

$Math$[?LIST C:\KRUD\MATH.DOC]

$Music$[?LIST C:\KRUD\MUSIC.DOC]

$Teacher$[?LIST C:\KRUD\TEACHER.DOC]

$Typing$[?LIST C:\KRUD\TYPING.DOC]

To go to DOS, Select: DOS[?c:\command]. To return here, use the EXIT comand.

Press F4 to return to the screen you were viewing previously.

Press F10 to return to the first screen.

Bringing the Mountain to Mohammed without Falling off the Cliff of Unmanageable Technology

Virginia Algermissen, Sharon Helton, and Jack Smith

This is the description of one library's trouble and success in creating a customized online service that could bring published medical information to remote locations for physicians, researchers, and clinicians who were often too busy to visit the library. The staff at Lister Hill Library of the Health Sciences, serving the University of Alabama Medical Center at Birmingham, wanted to establish a dial-in modem system for clients to access twenty-five years of medical literature. They tried one method that failed and then developed a successful system. Today, clients are enthusiastically using so many hours on the system that the library may consider rationing time.

This paper will describe one library's trouble and success in creating a customized online service that could bring research material to remote locations, into the hands of medical clients who are too busy to visit the library. The goal is to save other libraries that may want to provide a similar service from falling into technical problems while trying to provide the leading edge of technology.

THE CHALLENGE

As the library that services one of the top medical centers in the nation, Lister Hill Library (LHL) faced a challenge. In order to serve clients at the University of Alabama (UAB) Medical Center at Birmingham, LHL wanted to find a way to bring research material into the hands of clients who needed the information but could not take time away from their work to visit the library. The staff wanted to provide remote access to more than twenty-five years of medical literature indexed by the National Library of Medicine in an online database called MEDLINE, several years of the seventy-seven journal titles and twenty book titles found in Comprehensive Core Medical Library (CCML) full-text medical journals and books, *Medical and Psychological Previews*, and the *AIDS Knowledge Base* information from San Francisco General Hospital.

The library staff believed their clients needed ready access to this information through modems, the UAB fiber optics network, and computer screens in their offices and homes. The problem: which of the several technical options would provide the easiest method for clients to use and yet remain within the library's budget?

The answer took time, trial, and error. However, the solution brought a customized online search service that made LHL one of the first libraries in the nation to provide remote access to this extensive database of medical information. It also brought very enthusiastic client response.

CHRONOLOGY OF THE SEARCH FOR A SOLUTION

Step number one was finding out if any system in the market already had what LHL wanted. Several vendors had MEDLINE, but aspects of some systems did not meet LHL's goals or the cost for equipment and personnel was prohibitive for the library's budget. Consequently, LHL staff set up their own hardware, software, and communication system. The library became one of the pioneers of a tie-in with the host computer system that provides the full complement of medical information LHL wanted, according to Pat Ryan, marketing representative from Maxwell Online. Maxwell is the prime vendor for BRS Colleague, a search retrieval system that allows access to MEDLINE, CCML, and other databases.

Designing the System

Lister Hill Library began with a powerful microprocessor, the IBM RT 135, that has a multiprotocol adapter card. It provides recovery backup to the library's DYNIX automated library system and allows access through fiber optics to the campus communication networks. In addition, its network software, Systems Network Architecture, together with a 3270 emulation program provided the best

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emulation for the Customer Information Control System.

The library established an arrangement with the vendor to access directly the BRS computer network based in Chicago. On the basis of BRS specifications, LHL's IBM RT was defined as a 3274 control unit with sixteen available 3270 ports.

Trouble Begins

Then the problems began. When a patron user established a logical unit session and logged on, the session could be abnormally terminated and then not recognized by the system, taking the session out of operation. This meant that the entire network had to be shut down and brought back up again. In some cases, after a shut down of the network, some of the available ports were not reset. By the end of the day, library staff considered themselves lucky to have five out of the sixteen ports communicating with BRS in Chicago.

Another problem was that clients misunderstood the system. They did not realize that printing was only possible through the "Print Screen" key, nor did they know how to avoid having several logical unit sessions going at once.

The Solution Emerges

After reviewing the problems carefully, LHL found the significant element causing the problem was a hardware/software incompatibility. LHL suggested using a MICOM X.25 pad. A consultant from BRS confirmed the suggestion would work since it was the same environment used by single subscription users through TYMNET and TELENET. The library used the same modems and lease line. The only thing that changed was that the IBM RT was replaced by a MICOM X.25 pad.

Success

With that, the technical problems were solved! LHL found success using the following: MICOM X.25 with sixteen ports (four local and twelve remote access); a 9.6 digital line; two IBM 5822 modems; and twelve US Robotics Courier HST modems to receive calls from offsite clients. The modems can accept baud rate speed adjustments from 300 to 9600.

The system is accessible from home or office through computer terminals, modems, and telecommunications software. The library subscribes to BRS on an annual basis and recently began asking clients to pay a fee for the service to cover costs.

LHL subscribers can now link into a network of knowledge encompassing more than twenty-five years of MEDLINE; hence the name *LINK!*

BRINGING THE SERVICE TO USERS

The next step was telling clients about the service. LHL sent one-page fliers to all medical center faculty and announced it at all library orientations and special group meetings. To understand better the needs of their clients, LHL staff compiled information about those who requested LINK! asking what software program they used, about their online searching experience, and whether they were accessing the program from office, home, or both.

The physical arrangement includes four local ports attached to terminals located behind the information desk on the first floor of the library and twelve remote ports attached to the MICOM Instanet series 40 Dataswitch. The Dataswitch provides access to a menu of resources. Anyone with access to the Dataswitch may now have access to the LINK! service through an authorized password.

One stipulation required by the vendor was that passwords be assigned to only individuals and to LHL's in-house terminals. Before a client can have a password for off-site use, he or she attends a short training session in a group or one-on-one session in the workplace or at LHL, conducted by LHL staff. BRS supported the efforts by sending a representative to train larger groups for several days.

The sessions teach the user how to access the system, set the parameters on his or her program, dial and log into the system, understand the BRS menu structure, search for author or subject, and use other customer services options.

BRS Colleague searchers on staff at LHL trained the other staff at the information desk and provide instruction cards at each library terminal for users who want to access LINK!. Staff report that they spend minimal time with users once the initial setup is completed and very little system management time troubleshooting hardware problems or maintaining the network.

POSITIVE RESULTS

The trial-and-error effort to find a way to bring twenty-five years of medical research to clients has succeeded in doing what LHL staff hoped it would. From LINK!'s debut at the Academic Health Sciences Center in April 1990 to October 1991, LHL trained and distributed almost 1,000 of the allotted LINK! passwords to remote access patrons. The user population expanded from students who had used a mini-MEDLINE system restricted to in-library use, to researchers and clinicians who had not regularly (if ever) visited the library.

Heaviest usage was in April 1991, when the system recorded 1,400 hours of use. In its less than two-year history, LINK! usage shows a 500 percent increase over the library's previous mini-MEDLINE in-library database. Moreover, it has spurred increased use of all dial-up usage by patrons. Clients report that they enjoy the twenty-two-hour-a-day availability, the easy-to-use software, and the convenience of receiving information at their locations.

Through LINK!, LHL has raised users' expectations about easy access to medical information. In fact, the service is so well received, LHL staff must now develop a system to limit or control usage to allow all clients equal access. ■■

Z39.50 and the Scholar's Workstation Concept

Gary Lee Phillips

This study examines the potential application of the ANSI/NISO Z39.50 library networking protocol as a client/server environment for a "scholar's workstation." As we will see, Z39.50 is well suited to the communication needs of this environment, and can provide a major building block for a flexible environment that is vendor-independent at both ends of the link.

Scholar's Workstation: Theory and Practice

The scholar's workstation is defined for our purposes as a single-user microcomputer equipped with a network or telephone communication interface, local storage, and software capable of displaying and manipulating bibliographic data in the USMARC or similar formats. Weissman identified twelve elements considered essential to a modern scholar's personal computing environment:

1. Provide windowing capability for multiple documents.
2. Integrate text and graphics when desired.
3. Support multimedia (sound, graphics, text.)
4. Support complex documents with many parts.
5. Permit multitasking operations.
6. Accommodate large, fast mass storage devices.
7. Include connectivity to external databases.
8. Include electronic mail capabilities.
9. Support data acquisition devices (scanners, etc.)
10. Address substantial amounts of memory.
11. Permit the user to customize the environment readily.
12. Offer enough speed to permit intensive processing.

Multitasking is the key to usability, according to Weissman. Human activities and the world in which they take place are inherently multitasking operations. The single-threaded paradigm of personal computing as it has become familiar to most of us is not adequate for efficient and productive work.[1]

In that context, the scholar may need, for example, to recheck a reference while a document is being prepared. Multitasking permits the microcomputer to connect to the library or other bibliographic source, retrieve the needed reference, and insert it directly into the document, all without ever closing down the word processing software or writing either the document or the reference to disk storage. Both the communications session and the document remain open and accessible on the screen, in a situation analogous to opening a reference book on the desk while a

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document is in the typewriter. Direct comparison and transfer of information between the two applications is a much more natural and human operation than the more typical microcomputer sequence of steps in which the communication session would be captured to a file, the file edited, and finally inserted into the main document.

Multitasking environments are readily available today. They range from relatively inexpensive systems such as Amiga OS or Microsoft Windows to high-powered and costly environments like Unix or VMS. It is from the growing availability of powerful and multifaceted environments that the scholar's workstation will arise.

Of particular interest to librarians and designers of library technology is the essential connection between scholarly research of all sorts and bibliographic information. Whatever form a scholar's workstation may take, it requires a reliable and flexible communication link that permits retrieval and manipulation of bibliographic data from external suppliers.

Simple communication software, though it has served until now, does not realize the full potential of modern technology. The user must still capture an entire session with the bibliographic source and later select and manually separate the needed data from the "chaff" inserted by the supplier's software to permit user communication.

A further obstacle is posed by the fact that virtually every bibliographic source has a unique command language, and all are tied to textual commands that the user must remember and type in through a keyboard. Although a common command language has been designed and standardized, there has not yet been a concerted movement toward its implementation by data suppliers.[2-4]

Can the scholar's workstation provide a remedy for this situation? If suppliers of data begin to accommodate "smart" connections from outside systems, the answer is yes.

Z39.50: The Linked Systems Protocol

In order to place the Z39.50 standard into context, it is necessary first to understand the more general computer networking model known as Open Systems Interconnection (OSI). This model is an evolving concept that provides both a vocabulary and a reference standard for description of the linkage by which computers share data.

Open Systems Interconnection subdivides such communication into seven levels or "layers" of interaction. The four lower levels (physical, data, network, and transport) are concerned primarily with physical and electronic elements of the interaction.[5] The upper three layers (session, presentation, and application) define the logical elements and sequence of operations, such as activating a session, sending a query, receiving a reply, and terminating the session.[6] The three upper layers are relatively independent of the lower four, permitting logical protocols designed for these layers to be used almost unchanged on a variety of physical linkages.

The Z39.50 standard specifies an OSI service definition for the application layer (layer seven in the seven-layer OSI model). Also known as the Linked System Protocol (LSP), the protocol allows an application on one computer to query the database of another computer, and it specifies the procedures and structures for essential operations involved in such an interchange: session parameter initialization, search request and response, record display request and response, access security and resource control, and session termination.

This standard was developed by the National Information Standards Organization (formerly ANSI committee "G") and was approved January 15, 1988. Preliminary versions of the protocol were already in use by the Linked Systems Project (a joint experiment by WLN, the Library of Congress, and OCLC.) Another experimental implementation was in use by the New York State Education and Research Network (NYSERnet) by late 1988.[7]

While LSP was originally conceived as a format for two-way, peer-to-peer communication, such as might be used between large systems in a consortium, it is flexible enough to be used without revision for one-way, client-to-server inquiries in which one machine (the client) requests information from another machine (the server) on which one or more databases may reside.

Unlike the common command language standard, LSP is receiving attention from many of the major software vendors and database suppliers in the library field. Because it can be used to provide "value-added" service by permitting linkage between large systems, it will soon be supported by most database suppliers as well as by many of the vendors of library local systems.

Particularly interesting with respect to the scholar's workstation concept is the fact that LSP provides a *lingua franca* that can permit virtually any library software system to converse with any other in a manner almost entirely transparent to the user. The user no longer has to know the command languages of several different systems; he or she need only be able to connect to one supplier of data who can in turn route requests to other databases and interpret the results.

THE SCHOLAR'S WORKSTATION AS AN LSP CLIENT

Figure 1 shows a hypothetical online public access catalog (OPAC) installation with Z39.50 linkages in place and operating. The user at the workstation has access to the local OPAC system over a campus Ethernet linkage, and through that OPAC as a host the user can also query OCLC/EPIC, Wilsonline, or the OPAC at a neighboring institution. Full peer-to-peer Z39.50 links are operated between the two universities in the sense that either can function as a server for the other's client requests. The OCLC and Wilson systems operate as servers for client requests initiated by the local OPAC system.

The link between the workstation and the local OPAC is similar to the link from the OPAC to the database providers in the sense that one system (the OPAC) acts as a server for the client workstation. In this case, the workstation software is always cast in the inquiring role, while the OPAC is always a respondent.

The workstation user enters commands and receives responses in any format supported by his hardware and software. This may be a graphical interface such as is typically seen on the Apple Macintosh, or a command-driven one more typical of MS-DOS environments. The user is no longer bound to use only the command language and structure of the server system. Since user requests will be translated into LSP packets, the OPAC server has only to understand Z39.50 and does not deal with the actual user interface, so the same OPAC software can support a wide variety of user environments.

Workstations to aid users with special needs will no longer require any accommodation on the part of the host system. For example, some microcomputer hardware is now capable of producing synthesized speech output without any added hardware other than a loudspeaker, earphone, or other audio device. Appropriately designed client software written for such an environment would be of great assistance to the visually handicapped user and could be capable of use with any host system that supports Z39.50.

The local workstation translates commands into Z39.50 service requests and sends them to the host OPAC. The host acts on those requests, creating responses locally or relaying the requests to a remote peer system. Responses are routed back to the local workstation where they are translated back to the form required by the user. This relieves the host of any responsibility for multilingual messages or special formatting and requires only that it accept Z39.50 requests rather than parse any other command language itself. The workstation parses commands, assembles and disassembles packets, and displays or stores responses.

THEORETICAL IMPLEMENTATION

In theory, Z39.50 will support complex operations such as searching across multiple sources with a single request, but we will examine only the simplest subset of possibilities here. The workstation user is able to select a target system for requests (perhaps from a menu) and then to direct any appropriate search requests to that target. The workstation software formulates the request in accordance with Z39.50 and submits it to the selected host, which then acts accordingly. Only one source system is searched at a time, though the workstation software may offer the ability to repeat a search on a new system.

Adding Z39.50 to an OPAC System

In order to add Z39.50 capability to a host system, the existing OPAC command driver would be supplemented by a Z39.50 interpreter. The OPAC interface would remain in place for use by dumb terminals or communication software that does not support Z39.50, while the Z39.50 interpreter would handle processing for ports identified as requiring the new protocol. Instead of passing result tables to the original display formatting rou-

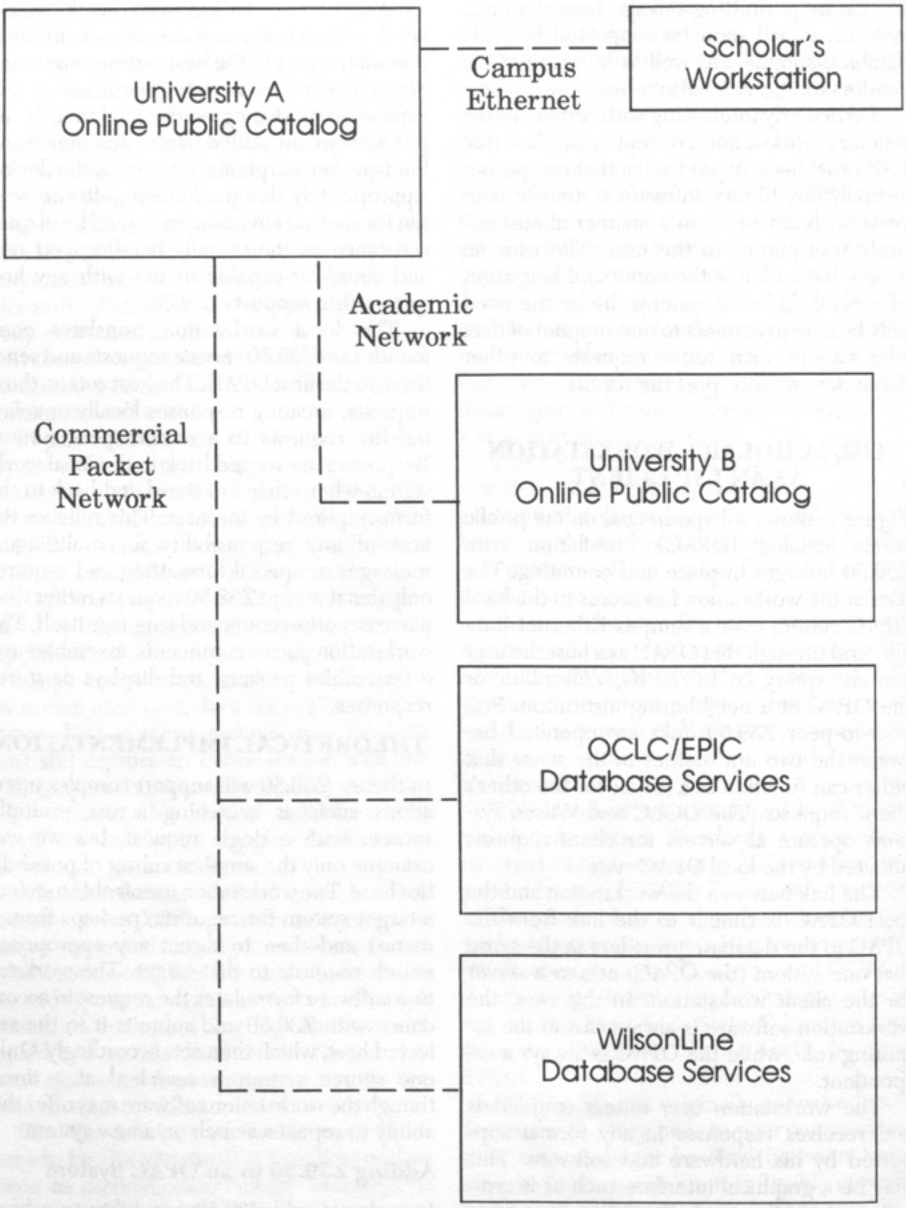

Figure 1. Hypothetical Configuration.

tines, the Z39.50 interpreter would convert results to appropriate protocol responses and route the responses to the requesting port. Figure 2 shows the original functions of a generic OPAC as shaded blocks. The only new function required is a Z39.50 translator for linkage to workstations requesting this type of access. This translator module could simply turn Z39.50 requests into the locally supported command language, or it might be more closely bound to the internals of the system. Results would be buffered and re-

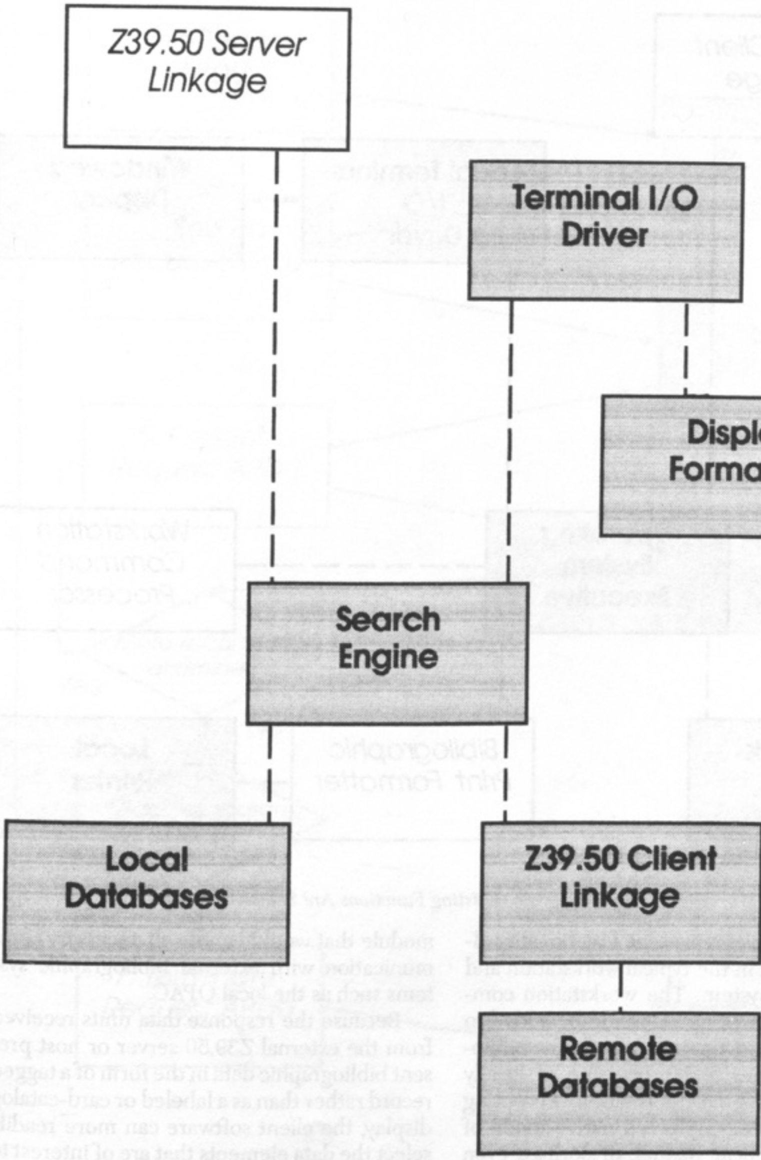

Figure 2. OPAC Server Block Diagram (Existing Functions Are Shown Shaded).

ported back to the workstation as Z39.50 response units.

Implementing the Workstation

Workstation software could be implemented by the OPAC vendor or by third parties. Designers of local library software would provide a document specifying the supported features of Z39.50, and anyone wishing to design a suitable workstation would have complete freedom with respect to user interface and features. Figure 3 shows how the special functions required by Z39.50 bibliographic software would fit in with the existing portions of a multitasking workstation environment.

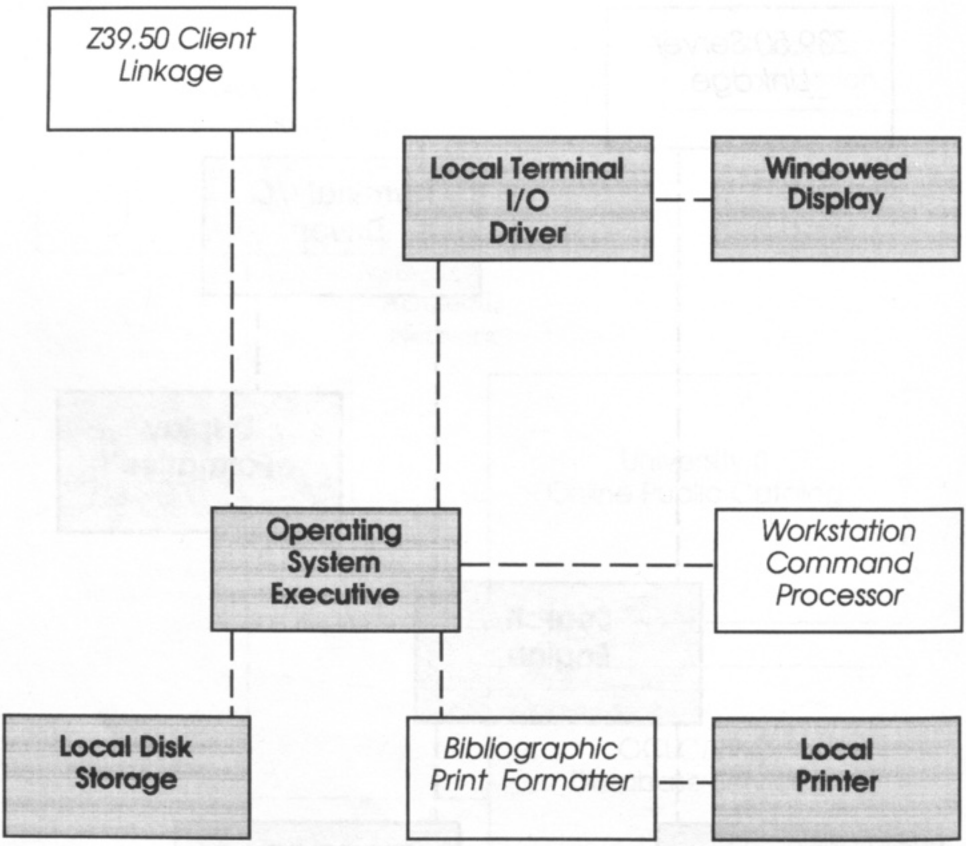

Figure 3. Client Workstation Block Diagram (Existing Functions Are Shown Shaded).

Shaded blocks represent functionality already inherent in the typical workstation and its operating system. The workstation command processor program would be added to provide the main control process for bibliographic inquiries and processing of locally stored bibliographic information. Accepting commands in the preferred native mode of the user (graphical, textual, or perhaps even verbal in the near future), this processor would translate them into actions to be carried out by the core operating system or executive. The command results might be sent to the workstation display screen, stored on the hard or floppy discs, or passed to one of two other new processor segments.

The other new processes would be a print formatter that could convert tagged records into printed bibliographic citations in various standard formats, and a Z39.50 translator module that would handle all necessary communication with external bibliographic systems such as the local OPAC.

Because the response data units received from the external Z39.50 server or host present bibliographic data in the form of a tagged record rather than as a labeled or card-catalog display, the client software can more readily select the data elements that are of interest to the user and display or store the information appropriately. The tagged data format is much less prone to error than the technique used by some of the presently available workstation front ends that attempt to parse the elements of a screen display and reformat them in a more suitable manner.

Well-designed client systems should be able to conform to the user's requirements to present the data on the screen in a selected format, store it on disk in either the raw for-

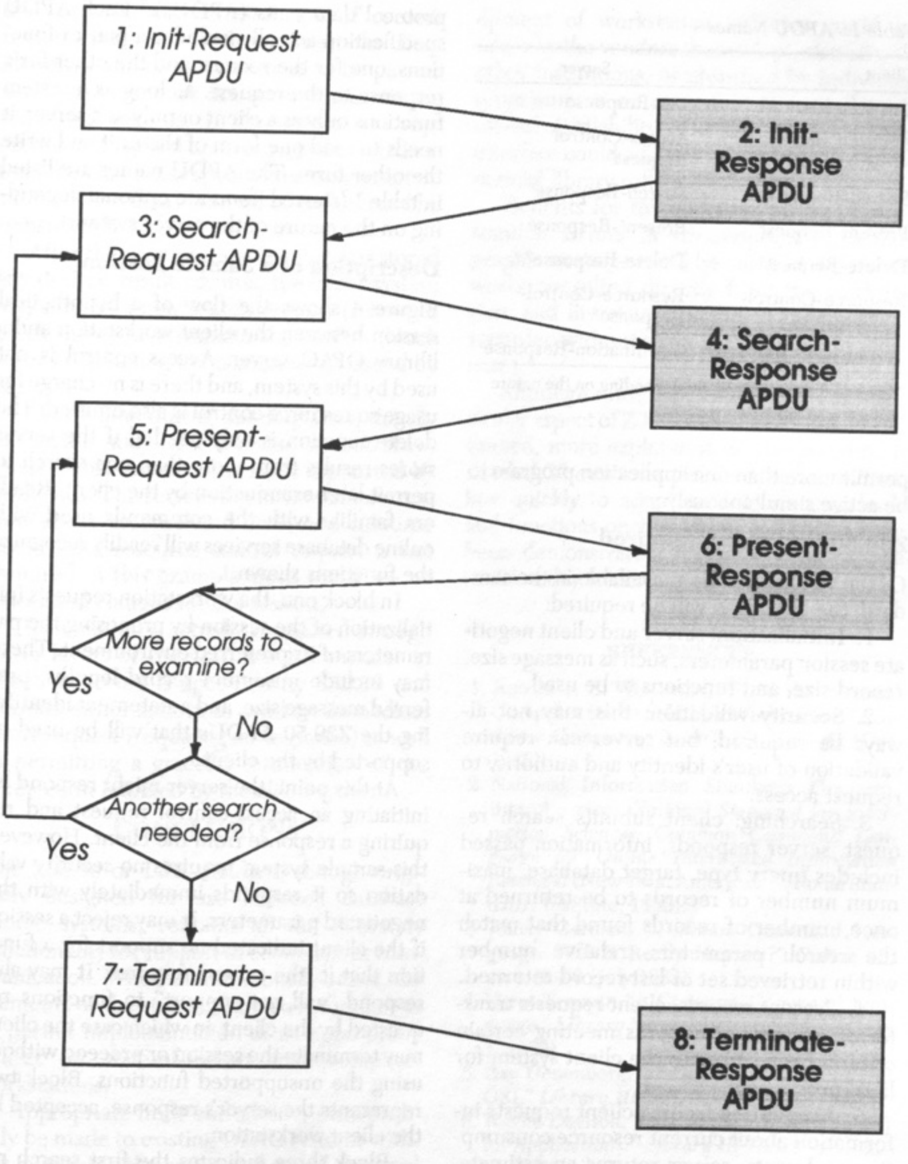

Figure 4. Client-Server Interaction (Server Functions Are Shown Shaded).

mat or a selected bibliographic format, or print it in the desired format. Availability of a macro language such as Rexx would permit the user to plan and store complex sequences of operation so that they could easily be repeated at intervals to retrieve new citations, relieving the server system of the need to store and manage these specifications for the user.

The processing power required to use Z39.50 effectively is well within the range of capabilities of many individual workstations in use on college campuses today. A multitasking operating system with a fast processor is desirable in order to provide adequate performance, and there must be sufficient memory and disk storage available to handle a practical number of MARC formatted records and to

Table 1. APDU Names

Client	Server
Init-Request	Init-Response
Access-Control-Response*	Access-Control Request*
Search-Request	Search-Response
Present-Request	Present-Response
Delete-Request*	Delete-Response*
Resource-Control-Request*	Resource-Control-Response*
Termination-Request	Termination-Response

* Starred items are optional depending on the nature of the server system.

permit more than one application program to be active simultaneously.

Z39.50 Functions Required

Of the various functions available in the standard, the following will be required:

1. Initialization: server and client negotiate session parameters, such as message size, record size, and functions to be used.
2. Security validation: this may not always be required, but server can require validation of user's identity and authority to request access.
3. Searching: client submits search request, server responds, information passed includes query type, target database, maximum number of records to be returned at once, number of records found that match the search parameters, relative number within retrieved set of last record returned.
4. Present records: client requests transfer of some or all records meeting certain criteria from server to the client system for local processing.
5. Accounting facility: client requests information about current resource consumption and costs; server returns an estimate. This function may be omitted by any server for which it is not applicable.
6. Delete facility: if server retains more than the current result set for recall and display by client, client must have ability to delete a result set no longer needed.
7. Termination facility: client initiates termination of session and requests deletion of remaining result sets.

All these functions are provided by the Z39.50 standard in the form of application protocol data units (APDUs).[8] Each APDU specification actually includes a pair of functions, one for the request and the other for a response to the request. As long as a system functions only as a client or only as a server, it needs to read one form of the unit and write the other form. The APDU names are listed in table 1 (starred items are optional depending on the nature of the server system).

Description of a Sample Session

Figure 4 shows the flow of a hypothetical session between the client workstation and a library OPAC server. Access control is not used by this system, and there is no charge for usage so resource control is also omitted. The delete function is only needed if the server stores results from more than one search to permit later examination by the client. Readers familiar with the commands used with online database services will readily recognize the functions shown.

In block one, the workstation requests initialization of the session by proposing the parameters of its preferred environment. These may include maximum record lengths, preferred message size, and a statement identifying the Z39.50 APDUs that will be used or supported by the client.

At this point, the server might respond by initiating an access-control request and requiring a response from the client. However, this sample system requires no security validation so it responds immediately with the negotiated parameters. It may reject a session if the client indicated no support for a function that it (the server) requires. It may also respond "will not support" to functions requested by the client, in which case the client may terminate the session or proceed without using the unsupported functions. Block two represents the server's response, accepted by the client workstation.

Block three indicates the first search request initiated by the client. This APDU identifies the database to be examined, provides the search arguments, and specifies values related to the number and identity of immediate results that may be returned. In block four, the server responds with an actual count of records that met the search criteria and provides the necessary information to permit their selection for examination.

The present request and response, blocks five and six, may be repeated many times as the user requests transmission of records from the result set. In each request, the client identifies one or more records to be passed, and in the response the server transmits the requested records. If the option was supported and agreed upon during the initialization, the client may specify that only a certain subset of the data elements of each record be transmitted.

After the user has examined and/or stored any desired result records, the client system may initiate a new search request (return to block three) or terminate the session (block seven) depending upon commands issued by the user.

At any time during this sequence, the client system may issue a resource control request if this function has been supported by both ends. The server responds with information about accumulated costs and resource usage. The resource control request is not required in this example since there are no associated charges for the session.

Termination is actually supported through lower layers of the OSI, but the manner in which it occurs is specified by Z39.50 and permits either system to send an immediate abort request (requiring no response) as well as permitting a graceful termination of the connection initiated by the client system.

CONCLUSIONS

The Z39.50 or LSP standard, though originally designed for use between database source systems, contains all the necessary functionality for support of client-server communication. Whether intentionally or not, the elements of the standard are structured so as to permit implementation of an appropriate subset on state-of-the-art microcomputer workstations.

Appropriate front-end additions can probably be made to existing OPAC systems without disturbing the software beyond the level of the current OPAC interface. This would permit Z39.50 functionality to be made available to users without taking away any of the existing features.

Potential benefits would include greater flexibility of the user interface, more powerful capabilities for users with access to appropriate equipment and software, and reduction of demand on OPAC vendors for provision of custom interfaces or enhancements to the command language. Responsibility for development of workstation software could be taken by the vendors themselves, shared with other institutions, or absorbed by individual programmers or computer science departments. Availability of a Z39.50 workstation interface could add perceived value to a commercial library software product.

Benefits for the end user would be substantial. Errors in transcription of bibliographic citations could be reduced, reference works consulted directly from the workstation, and literature searches conducted and recorded without a trip to the library in some cases.

Although some experiments with this particular aspect of Z39.50 are already being conducted, more exploration of the potential is needed. The commercial marketplace will follow quickly to adopt workstation standards and functions once working prototypes have been demonstrated. Libraries need to take action today to develop such models.

REFERENCES

1. Ronald F. E. Weissman, "From the Personal Computer to the Scholar's Workstation," *Academic Computing* 3, no.3:10–14,30–41 (Oct. 1988).
2. National Information Standards Organization, *American National Standard for Information Sciences: Common Command Language for Online Interactive Information Retrieval* (New York: American National Standards Institute, 1986).
3. Nancy Garman, "Common Command Language: Will It Really Happen?" *Online* 13, no.4:49–50 (July 1989).
4. Carol Tenopir, "A Common Command Language." *Library Journal* 114, no.8:56–57 (May 1, 1989).
5. Ray Denenberg, "Data Communications and OSI," *Library Hi Tech* 8, no.4:15–32 (1990).
6. Wayne Davison, "OSI Upper Layers: Support for Applications." *Library Hi Tech* 8, no.4:33–42 (1990).
7. *Connecting the Networks: Proceedings of the Joint Library of Congress Network Advisory Committee and EDUCOM Meeting, December 5–7, 1988,* network planning paper no. 18 (Washington, D.C.: Library of Congress, 1989).
8. National Information Standards Organization, *American National Standard for Information Retrieval Service Definition and Protocol Specification for Library Applications* (New Brunswick, N.J.: Transaction Publishers, 1989).

BIBLIOGRAPHY

Boss, Richard W. "Linked Systems and the Online Catalog: The Role of the OSI." *Library Resources & Technical Services* 34:217-28 (April 1990).

Boss, Richard W. "The Open System Interconnection as a Building Block in Electronic Networking." Association of College and Research Libraries. 4th National Conference, Baltimore, Md., 1986. *Energies for Transition.* Baltimore: ACRL, 1986. P.209–13.

Buckland, Michael K., and Clifford A. Lynch. "National and International Implications of the Linked Systems Protocol for Online Bibliographic Systems." *Cataloging & Classification Quarterly* 8, nos.3/4:15–33 (1988).

Buckland, Michael K., and Clifford A. Lynch. "The Linked Systems Protocol and the Future of Bibliographic Networks and Systems." *Information Technology and Libraries* 6, no.2:83–88 (June 1987).

Denenberg, Ray. "Open Systems Interconnection." *Library Hi Tech* 3, no.1:15–26 (1985).

Fenly, Judith G. *The Linked Systems Project: A Networking Tool for Libraries.* Dublin, Ohio: OCLC, 1988.

Hildreth, Charles R. "Communicating with Online Catalogs and Other Retrieval Systems: The Need for a Standard Common Command Language." *Library Hi Tech* 4, no.1:7–11 (Spring 1986).

Klemperer, Katharina. "Common Command Language for Online Interactive Information Retrieval." *Library Hi Tech* 5, no.4:7–12 (Winter 1987).

Levy, Louise R. "Common Command Language." *Bulletin of the American Society for Information Science* 13, no.5:31–32 (June/July 1987).

Lynch, Clifford A. "Information Retrieval as a Network Application." *Library Hi Tech* 8, no.4:57–72 (1990).

McCallum, Sally H. "Sidebar: History of Z39.50 and ISO SR." *Library Hi Tech* 8, no.4:61 (1990).

McGill, M. J. "Z39.50 Benefits for Designers and Users." *EDUCOM Review* 24:27–30 (Fall 1989).

Morrison, Margaret. "The NISO Common Command Language: No More 'German to the Horses.'" *Online* 13, no.4:46–52 (July 1989).

Peters, Paul Evan. "Sidebar: Z39.50 Maintenance Agency: The Library of Congress." *Library Hi Tech* 8, no.4:69 (1990).

Yee, Martha M. "System Design and Cataloging Meet the User: User Interfaces to Online Public Access Catalogs." *Journal of the American Society for Information Science* 42, no.2:78–98 (March 1991). ■■

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Special Section: Happy Birthday to MELVYL (Part 2)

Guest Editor's Introduction

Clifford B. Lynch

The literature of library automation and information technology is full of papers on new systems that are written in the enthusiastic days of early deployment. Such papers describe what has been done and emphasize promises and directions for future development but often say little about the yet-to-be-understood long-term effects that the system has had on its users. Often, too little is said about mistakes and what ultimately prove to be fruitless directions in the evolution of the system; such false starts often require hindsight from a greater distance. It is difficult for an author to have much perspective on a system that has just been deployed.

The MELVYL system—what began as the online catalog for the nine campuses of the University of California (UC) and is now a considerably broader information system—was ten years old in 1991. In December 1982 and March 1983, *Information Technology and Libraries* published two special sections on the MELVYL system. In the June, September, and December issues of *ITAL* we revisit the MELVYL system, examine its evolution, assess previous prognostications—both right and wrong—from the early days, and attempt to gather some perspectives on the importance of the MELVYL system, its impact, and its successes and failures.

Many papers have been written about the MELVYL catalog since its initial release. The catalog played a key role in the Council on Library Resources' study of online catalogs; it figured prominently in Charles Hildreth's ground-breaking book on online catalogs, and Ray Larson has written a number of papers analyzing various aspects of searching behavior, to name only a few. Various staff members have also reported on selected developments in the literature. But now seems an appropriate time for a focused and comprehensive reassessment that revisits many of the topics covered in the previous *ITAL* papers.

The previous coverage of the MELVYL system included papers on policy and planning, the design of the user interface, the development of the supporting computer network, discussion of the computing environment, and a paper by Edwin Brownrigg and me discussing the future of online catalogs and trying to put into perspective the work done on the MELVYL system. In these three issues of *ITAL* I have invited papers from a number of the key players during various eras of the MELVYL system's development. I have also tried to fill what in hindsight was a remarkable gap in the earlier section and address issues of user training, support, and the impact of the MELVYL system on the UC libraries by inviting contributions from several of the campus librarians at various UC campuses. These authors labored to make the MELVYL system a success with the UC user community, helped the system designers correct various design errors, and coped with all manner of unexpected impacts of such an online union catalog.

The papers in the June issue included a look back at the MELVYL catalog by Steve Salmon, who was the assistant vice-president for Library Plans and Policies at UC in the late 1970s and early 1980s. Steve developed the original plan for the catalog and oversaw its inital construction. In the mid-1980s, Michael Buckland replaced Steve Salmon. His contribution in the last issue treated the current MELVYL system as a point of departure for future research directions in online catalogs in which he is now actively involved as a professor at the UC Berkeley School of Library and Information Studies.

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Michael Berger, the assistant director for Planning at DLA and a key member of the MELVYL project since the earliest days, looked at the future evolution of the MELVYL system, in particular the user interface, and described current efforts to develop the next generation of the system. Laine Farley, manager of MELVYL User Services at DLA, discussed how the system's designers incorporate user evaluations into design upgrades. Mark Needleman revisited computing resources support for online catalogs in light of the amazing changes that have taken place in information technology in the last ten years, updating a paper that he and I wrote with Mary Engle for the initial *ITAL* section on the MELVYL catalog. Finally, Alan Ritch from the University of California at Santa Cruz reviewed the development of the MELVYL system from a campus perspective.

This issue offers a paper by Ed Brownrigg, who was hired by Steve Salmon as the first director of the Division of Library Automation (DLA). Brownrigg revisits his 1983 *ITAL* paper, "Online Catalogs: Through a Glass Darkly." Karen Coyle, technical specialist at DLA, looks at the evolution of the bibliographic file format as card catalogs were replaced by online databases–the MELVYL online catalog in particular. Anne Lipow (formerly of UC Berkeley) contributes her views on the user perspective. Finally, Terry Ferl and Larry Milsap of UC Santa Cruz summarize their research on out-of-library users of the system and provide insights and details into a new and growing user group for the MELVYL system and similar systems.

The December *ITAL* issue will wrap up the special MELVYL retrospective with two articles. Richard West, the associate vice-president for Information Systems and Administrative Services and the senior university executive responsible for the MELVYL system, will share his thoughts on the evolving role of the system in the university information access strategy. I will provide some comments on the past, present, and future of the system from my own viewpoint.

Two final notes: Readers interested in additional viewpoints on the history of the MELVYL system at UC might find the special tenth anniversary issue of the *DLA Bulletin* of value (12:1, Issue 26 [Spring 1992]). Also, I have not included a paper on the evolution of the network providing access to the MELVYL system in this section, since this topic was covered in depth recently in my paper "From Telecommunications to Networking: The MELVYL Online Union Catalog and the Development of Intercampus Networks at the University of California," in *Library Hi Tech* 7:2, Issue 26 (1989).

I hope all of these papers will provide the library community with a new look at a major information access system that has now had a long and influential history, but that we at UC view as only now entering adolescence, and give some sense of the excitement with which we view its future potentials. ■■

Ten Years Later: A Retrospective Prospectus

Edwin Brownrigg

The invitation to write this article presents an opportunity to revisit prognostications that Clifford Lynch and I made in 1983 in our article "Online Catalogs: Through a Glass Darkly."[1] In that essay we sought to make generalizations and offer speculations. We wrote: "Some of these may seem outrageous; some will undoubtedly prove incorrect." All in all, however, what we foresaw based on the collective experience at the Division of Library Automation (DLA) has proved to be accurate and properly oriented, if not leading, toward the future of library automation.

By 1983 I had seen monumental barriers in library service between patrons and their access to informative materials. Ten years earlier, I had attended a lecture by David Besterman, who declared that if at that time he had needed to depend on the library service of that day he could not reproduce his *Bibliography of Bibliographies*. Even at libraries where the stacks were not closed, the bibliographic apparatuses were so fragmentary and inconsistent as to prevent the compilation of an exhaustive bibliography.

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Shortly before writing "Through a Glass Darkly," I visited a prestigious university library in the Midwest. My host asked if there was any book that I would like to see. I requested Michael Faraday's *Experimental Researches in Electricity*, a book that had been stolen from every library in which I previously had attempted to find it. My host escorted me to the rare book room.

There I found the two-volume set—four copies of it. Later, while being shown the library's new online catalog, complete with personal computer front-end, I discovered that a citation to *Experimental Researches in Electricity* was not in the catalog. My host explained that no rare books or manuscripts were represented in the "public" catalog: If casual readers knew that the library had such materials, they would want to use them, and these materials were available only to veteran scholars. I was reminded once again of Besterman's comments.

Even before hearing Besterman's admonition, I had learned much about the conscious building of barriers between readers and libraries' prized materials from having worked for major research libraries in New York City. However, when the quest for Faraday's famous work was finally over, I realized fully for the first time that the first measure of a library's success was the size of its collection, not the quality of its service.

It had also become apparent that because of OPACs the measure of a library's success was shifting from building collections to providing access. And, as we would suggest in "Through a Glass Darkly," there was real potential for delivering images of documents via the OPAC, thus preserving the collection and providing substantially enhanced service to the user, but also creating some daunting copyright-related problems.

CATALOGING FOR ACCESS

I remember vividly a University of California (UC) Library Council meeting in 1980, when there was an earnest debate over inclusion of subject access in the still-developing online union catalog, yet to be named MELVYL. The prevailing wisdom was that a union catalog was used for known-item searching and that subject access therefore would be a waste of university resources. Since the code for subject access already had been written for a separate project and this code could be used for keyword subject access in the online system, the debate ended for the moment.

A study of online catalog use sponsored by the Council on Library Resources (CLR) finally put the issue to rest.[2] The study showed that in an online environment, searching for unknown items was very common. However, because subject analysis was designed for cardboard and not for online databases, there remain to this day major deficiencies, which we discussed in "Through a Glass Darkly." Since then, there have been successful projects to enrich access to books by chapter-level indexing and even including terms from the back-of-the-book index. The Australian Defense Force Academy runs one such project. A more recent development that we had forecast is the use of natural-language searching, as found in the Wide Area Information Servers (WAIS) now proliferating on the Internet.

REDISCOVERING ANALYTICS

By the 1980s it was common practice in librarianship to treat monographs as separate collections in terms of access. There were and continue to be reasons for this practice. However, even though there is still no MARC standard for describing individual journal articles, there has been enough de facto standardization on the part of the respective abstracting and indexing (A&I) services that journal and newspaper articles can be identified and located through OPACs. DLA took a leadership position in this regard through the MELVYL MEDLINE project sponsored by the National Institutes of Health. What the MELVYL system could not do was present a seamless interface among the monographic and A&I databases as was once the practice of many libraries in their card catalog some fifty years ago. Those libraries created author, title, and subject entries for journal articles and interfiled them in dictionary arrangement with those for monographs. The path to recreating such a seamless interface among online databases, however, has been forged with the evolution of the Z39.50 Linked Systems Protocol, another area in which DLA has played a leadership role.

Again, the WAIS client station does what analytics used to do in a card catalog. Brewster Kahle of Thinking Machines, Inc., who invented the WAIS,[3] wanted to design a distributed database management system that would allow people to develop local databases; the distributed system would upload the ASCII components to a central supercomputer that would manage indexing and retrieval. Kahle's work was strongly influenced by Gerard Salton's vision about "the library of the future":

> We are assuming that the average man of that year (2000 A.D.) may make a capital investment in an "intermedium" or "console"—his intellectual Ford or Cadillac comparable to the investment now made in an automobile . . . The computer would be used as an interface in applying various sequences of procedures to named texts, graphs, and tables; observing the results; and intervening whenever a change or extension of plan is required.[4]

Many others, including Vannevar Bush, after whose ideation of the "Memex" my organization is named, had similar visions. With WAIS, Kahle has put into practice Salton's theories about "automatic indexing methods," which include "term extraction and weighting, recall improving methods," and "precision improving methods," all of which were based on earlier information theory involving "bibliometrics," the study of statistical distributions of various bibliographic elements within library materials.

As we observed in 1983 with analytics, "the librarian and the patron finally can have bibliographic access to [multiple] material formats within the same catalog." Because Kahle has adhered to one of Salton's "basic principles—the widest possible use of cooperative and shared operations, including collaborative . . . policies, shared cataloging and standardized . . . operations"[5] by adhering to the Z39.50 protocol, he has demonstrated a solution to the paradox that "all systems for subject analysis, whether computer-based or completely manual, evolve in the direction of greater complexity of terms."[6] With WAIS the user merely enters English-language queries, such as, What is the annual coffee production of Kenya?, and an authoritative answer returns to the user's client workstation through the Internet from one or more databases anywhere on the planet.

Could it be that the librarian's procrustean beds of subject analysis, controlled vocabulary, and thesauri will disappear forever? Of that set of knowledge, will we be able to apply Asimov's admonition?:

> But do we dare forget things? Why not? We've forgotten much; more than you imagine. Our troubles stem not from the fact that we've forgotten, but that we remember too well; we don't forget enough.[7]

CATALOGING AS ADVERTISING AND NEW DIMENSIONS OF ACCESS

We made the point in 1983 that, between information tailored for inclusion in the catalog copying utilities and journal article titles and abstracts tailored for inclusion in A&I databases, publishers have turned cataloging into a form of advertising. The locus of the act of cataloging had shifted from within individual libraries to external sources. Since that time, a change in the locus of the source of catalog copying could, and maybe should, move away from the utilities to the MELVYL database itself. Because the MELVYL database includes MARC records from sources such as the Library of Congress, a little additional cooperation between DLA and the campuses could prevent millions of California's dollars from going to OCLC every year for copy cataloging.

The notion of a change of the locus for cataloging leads to a broader discussion of a simultaneous change in the locus of usership, as we noted in 1983:

> The most revolutionary change in the nature of libraries will be that they will become distribution points or switches for electronic information, both bibliographic and textual. Telecommunications topology for online catalog networks will be determined in great measure by the geographic distribution of libraries. Library buildings will house telecommunications concentrators attached to telephone lines, optical fibers, and a variety of radio devices. . . . As for justification, it will inevitably devolve to arguments like those that caused capital investment in aviation, following a century or so of rail transportation. . . . those libraries that do not make the investment will take on the air of old railway stations: A few custodians will guard the halls, but the public will not be waiting, because "the train doesn't go there anymore."[8]

The Internet now provides an information highway among our academic and research libraries. The public libraries are next. A new project sponsored by the CLR and Apple Computer, Inc., and managed by the Memex

Research Institute is applying packet radio technology earlier investigated at DLA to link public libraries with academic libraries and continue the trend whereby libraries become distribution points or switches for delivery of electronic information. As this trend continues and a wireless infrastructure is created among libraries, individuals in their homes or on the go will avail themselves of high-speed, wireless, untariffed connectivity to the information network.

This project is based on research and development from the California State Library Packet Radio Project undertaken at DLA. during the middle and late 1980s. The California State Library (with LSCA funds), IBM, and the CLR-funded DLA projects explored the potential of packet radio for libraries. The early goals of this R&D were to demonstrate technological feasibility and adapt extant Federal Communications Commission (FCC) rules to packet radio technology among libraries, but the outcome of the work demonstrated the need for a fresh approach. The project showed that the conventional radio technology and the standard digital encoding techniques of the time were becoming arcane approaches to achieving the R&D goals. In fact, the FCC was just then introducing into its rules Part 15.247, which allowed an exotic method (called spread spectrum) of digitizing a radio wave, and which held promise for packet radio. The new FCC rules were a welcome alternative to the university policy of recycling the instructional television spectrum for packet radio communication, which was proving to be daunting.

Under the new rules, users would share the same radio spectrum simultaneously; within the prescribed transmitter power, no user license would be required from the FCC. The challenges were to transfer spread spectrum technology from the military sector, where it had been perfected as a means of secure communication, into the FCC-regulated civilian sector, and at a reasonable price. R&D now underway involves The Memex Research Institute, Tetherless Access, Ltd., and special-interest user groups in California. Among the latter is the City of San Diego Public Library, which is using packet radio for a 1.5-megabit link among the central and branch libraries, the San Diego Zoological Library, and San Diego State University; the network also has a gateway to the Internet. The private individual will be the next customer for affordable, high-speed connectivity via packet radio that, combined with a desktop workstation, will realize the visions of Bush, Licklider, and others.

REMOTE PUBLIC ACCESS, DOCUMENT DELIVERY, AND ELECTRONIC PUBLISHING

By 1983 it was possible to imagine the combination of an ever-growing Internet, the MARC standard, and the Linked Systems Protocol, such that patrons of one online catalog could access other online catalogs remotely. At that time we considered the economic implications of sharing versus charging. Now it appears that with few exceptions sharing is the preferred course, if for no other reason than it is easier.

Today hundreds of online catalogs are connected to the Internet, but some librarians are questioning the wisdom of this. Only when electronic document delivery becomes feasible, as the next paragraphs elaborate, will the bibliographic Internet become permanent.

In 1983 we wrote that:

> In electronic publishing, the computer network becomes the primary medium for the creation, storage, and dissemination of a document. This is a fantastically powerful concept that changes the way people think about information, rather than merely changing the way they get access to it.

Since then the stage has been set for a change in the locus of usership. During the same era in which the MELVYL catalog was developed, Alan Pratt eloquently summed up the functions of libraries: to collect, preserve, organize, and disseminate the means of information.[9] During that era most of the library profession took for granted the economics of those four functions. Ten years later, the economics of those four functions are under severe strain.

Speaking from within the Coalition for Networked Information, Paul Evan Peters aptly describes the collection practice of the past as "just in case" someone might want what a library collects, rather than "just in time" to satisfy a library user's demand. Of the "just in case" mode of library operation, the following eight points prevail today:

1. Collection costs are increasing.

2. The costs of collection storage are increasing.
3. Processing costs often exceed purchase prices.
4. Funding to libraries is not increasing at the same rate as costs.
5. The gap between total information production and any library's information acquisition is increasing.
6. Information demand and consumption are increasing.
7. Some information storage formats are nonpermanent.
8. Information is becoming more time-critical.

As long ago as 1977, *The University of California Libraries: A Plan for Development* took the view that "most of the difficulties in meeting the needs of users for specific items, or for information on a topic, arise from the traditional methods employed by libraries."[10] It cited as causes rising costs and the "noblesse oblige" spirit of interlibrary loan service, without any compensation to the lending library. Most significantly for the MELVYL catalog's impetus, it recognized that "from the standpoint of the user, the library's first significant task is to provide him with the means of identifying the materials he needs, or if these items are already known, to locate them."[11]

To that end, the *Plan* called first for systemwide bibliographic information and second for an online catalog. It asserted that "there is growing evidence that such online systems are both feasible and acceptable, even desirable, to the public."[12] Thus, the *Plan* introduced two new library functions to Pratt's, but from the perspective of the user: identification and location of information materials—which is what the MELVYL catalog today provides.

As the CLR survey showed, the user wants more than to identify an information item and know where it is housed. The user wants the item delivered. For the user, the MELVYL computing and communications system will be complete only when it offers delivery. Ten years later, the infrastructure to provide this function is rapidly maturing, but electronic delivery still awaits action.

There is general agreement that one of the most difficult issues in electronic document delivery is copyright law. The American Association of Publishers routinely sues those who use technology to abuse the U.S. Copyright Act. Obviously, fear plays a major role in holding back electronic delivery of published materials housed in libraries. A method of intellectual property management for electronic document delivery is definitely required. OPACs, imaging technology, and the Internet represent a complex set of resources, drawn from the broad palette of information technology. However, the critical element of electronic delivery of information is not the flow of information itself. Rather, it lies in understanding that these electronic systems have intellectual property implications (usually involving copyright and trademark) not yet faced by librarians and faculty in earlier automated systems, including the MELVYL system.

AUTOMATING THE REFERENCE LIBRARIAN

In 1983 we propounded a classification of public access library automation systems in a partial hierarchy of difficulty based on what they would provide to the patron[13]:

1. Places to look for an answer (online catalog).
2. Places to look for an answer with evaluation (extended online catalogs that integrate bibliographies and reviews).
3. Material containing an answer (extended online catalog with document delivery/electronic publishing).
4. Answers.
5. Answers to poorly posed questions.

We concluded that library automation was still dealing primarily with level 1. Levels 2 and 3 were technologically within our grasp. Levels 4 and 5 remained fertile fields for speculation and research rather than realities. With the richness of the A&I records, it is safe to say that we have now reached level 2.

Considering the significance of the WAIS project described above, we probably were incorrect to place level 3 ahead of levels 4 and 5. Because of copyright law, level 3 may be achieved last although it appears to me that level 3 will be achieved this decade. However, as David Penniman, Executive Director of the Council on Library Resources asserts, such developments will arise on the fringes.[14]

REFERENCES AND NOTES

1. Edwin B. Brownrigg and Clifford A. Lynch, "Online Catalogs: Through a Glass Darkly,"

Information Technology and Libraries 2, no.1:104–15 (Mar. 1983).
2. *Users Look at Online Catalogs: Results of a National Survey of Users and Non-Users of Online Public Access Catalogs, Final Report to the Council on Library Resources* (Berkeley, Calif.: Division of Library Automation and Library Research and Analysis Group; Office of the Assistant Vice-President—Library Plans and Policies, University of California Systemwide Administration; November 16, 1982).
3. Brewster Kahle and A. Medlar, "An Information System for Corporate Users: Wide Area Information Servers," *Online Magazine* 15, no.5:56–60 (Sept. 1991).
4. J. C. R. Licklider, *Libraries of the Future* (Cambridge, Mass.: MIT Press, 1965).
5. Gerard Salton, *Dynamic Information and Library Processing* (Englewood, N.J.: Prentice-Hall, Inc., 1975).
6. Theodore Hines, in: Jessica Lee Harris, *Subject Analysis* (Metuchen, N.J.: Scarecrow, 1970).
7. Isaac Asimov, *Of Time, Space, and Other Things* (Avon Books, 1975), p.139.
8. Brownrigg and Lynch, "Online Catalogs."
9. Allan D. Pratt, *The Information of the Image* (Norwood, N.J.: Ablex, 1982).
10. *The University of California Libraries: A Plan for Development 1978–1988* (Berkeley, Calif.: Office of the Executive Director of Universitywide Library Planning, July 1977).
11. Ibid., p.57.
12. Ibid., p.60.
13. Brownrigg and Lynch, "Online Catalogs."
14. W. David Penniman, "Libraries and the Future: Critical Research Needs," Lazerow Lecture, Simmons College, September 13, 1991. ■■

MELVYL Input Ten Years Later: The Changing Face of Our Bibliographic File

Karen Coyle

Ten years ago, the libraries contributing to the UC union catalog, later to be known as the MELVYL catalog database, were divided into two distinct camps: users of RLG's RLIN system and users of Ohio's OCLC system. The busy folks at DLA thought that there was no greater busyness than keeping track of these two diverse systems. It is just as well that we did not know what the future had in store for us, that one day every library could have its own local library system, and that each of these systems would contribute independently to the union catalog. There have been many changes in the input to the union catalog; each one was a new challenge, and each has opened up positive avenues in our journey toward shared bibliographic information.

THE DEMISE OF THE CARD CATALOG

The 1980s saw the end of the card catalog as a public access tool. The first years of database building in the early 1980s were characterized by the care and upkeep of elaborate "card profiles" for each contributing library. The first tapes of MARC records that we received could really be viewed as a byproduct of the utility's card printing. At that time not many people had any use for the machine-readable MARC record. While these card profiles had a limited set of options for library input, libraries found ways to overcome any perceived inadequacies in the card print schema. OCLC users were especially creative in devising ways to make the OCLC card print program turn out such curiosities as underlined notes and neat place holders for data that would be later written in by hand. Left-hand card margins were filled down to the last character position, and the proper input of call numbers in either OCLC or RLIN was an art form mastered by only a few people in each catalog department. Accomplishing all this required some bending of the utilities' MARC records, co-opting otherwise standard fields for nonstandard uses.

As part of maintaining a union catalog, it was our responsibility to corral all of these bits of data into a form that would convey information uniformly in the online system. Where different UC libraries had selected different fields for essentially the same information ("Latest copy in . . . ," "oversize"), these notes had to be identified and moved to the same field in all union catalog records for online display. Programs for processing records at DLA not only had to know every location code

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and whether their display constants had changed over the years, but that there were anywhere from one to four places to look for a note beginning "Library Has:" in any given record.

The libraries' difficulty with the card profiles generally grew out of past practices. If certain notes had always snaked down the side of the card, the library needed to get that same note in the same place because that was where everyone expected to find it. There is a clear intellectual economy to uniformity in any kind of system, and the card catalog was no exception. The problem with cards is that once you've placed notes in a certain position on some number of cards you cannot change this placement without getting out the eraser and attacking all of the cards that need to changed—if you can even identify them. If the data have been properly coded, the online system can change the display of information in all records in the system. The card catalogs prevented us from making the best use of the machine-readable data that was being so painstakingly created.

The card catalog could not be retired until the online catalog was equally broad as a system, that is, until everything or nearly everything in the card catalog had been converted to machine-readable form. As the online catalog gained scope, libraries hedged their bets by eliminating the filing of certain cards until some libraries got down to filing only a title card and a shelflist card. One-by-one, card catalogs were removed to make room for banks of online catalog stations. There was the occasional protest from members of the university community who were still more comfortable communicating with the card catalog than with computer technology, but it was clear that the card catalog had been replaced with a more flexible, more powerful tool.

For the DLA staff responsible for the great flow of library records going into the online catalog, the demise of the card catalogs was far from sad. As libraries closed their card catalogs, most of the more obscure data input practices simply melted away. It was now possible to look at the MARC record as a tool rather than a misshapen mold into which the library card had to fit. Information could be coded for what it meant or for its intended audience rather than for how it had to print. We had essentially been freed from the constraints of the old paper product.

NEW SYSTEMS

Before we could celebrate our good fortune, however, something else developed that added to the diversity of catalog input: local systems. When did we first realize that there was now the technology available to create a library system that you could buy and operate in your own library? A single system that takes the place of a utility, an online catalog, and an acquisition/serials system? In our particular environment this meant that we were no longer receiving tapes only from OCLC and RLIN, but from local library systems as well. Naturally, it was not a simple process.

We soon learned that a local library system is not a true substitute for the national utility that the library had used previously. As a matter of fact, it only added a new link in the chain between the utility and the union catalog. A library would continue to use the vast bibliographic resources of the utility in its primary cataloging activities. The local system allowed it to build a local database, a kind of subset of the national pool of bibliographic data. The local system would also be linked to other local data like circulation and acquisitions, and therefore would generally contain a greater level of detail about the library's holdings. It would also allow the application of authority control at a local level.

Introduction of local systems has had a positive effect on the quality of the libraries' machine-readable files. It's not that a local system has better quality control or is necessarily more cataloger-friendly. The local system contains only that library's records, is free of "per use" charges, and can be customized in ways that help libraries find inconsistencies in their data. In essence, the great value of the local system is that it is controlled by the library. Most libraries would choose to make any corrections or upgrades to the records in their own system rather than return to the utility.

It became clear that the UC union catalog would need to take records from the local systems rather than from the utility, as the local record would be the best representation of the library's current cataloging. However, local library systems had not been designed to produce the kind of ongoing MARC tape output that we had received from the utilities. In addition, the libraries were not staffed like the large computer centers at OCLC and RLIN, so we were not guaranteed the kind of regular delivery of data that the utilities could provide. Also, the small computers running the local systems used different standards for writing tapes than we were used to, which caused a few more grey hairs to appear on DLA staff.

As each new local system is implemented, we receive replacements for many, sometimes all, of that library's bibliographic records. Records are updated for a variety of reasons, including online authority work, the addition of local data that were not carried in the national database record, and some cataloging upgrades. As a library moves from a utility to a local system, the actual number of records that we receive on a weekly tape may increase from two hundred to four hundred percent, of which the majority are changes to records previously received at DLA. This is not a one-time increase: libraries that have now had local systems for six to eight years still demonstrate this increased output of bibliographic records. This is a tribute to the power of the computer to help us do more work with no additional staff resources. We have been fortunate at DLA during these years that advances in our computer system have provided us with more disk space and greater processing power, which has allowed us to keep pace with the increased output of the libraries.

What continues to be difficult with bibliographic input is that each system, and this includes the utilities (and the MELVYL catalog), uses different conventions for the many bits of library data that do not fit conveniently into the USMARC format. Some of this data will be handled by the Holdings Format, but that is still to come into widespread use. Location codes, call numbers, and local holdings are expressed differently in each system that contributes to the catalog. Thus for each new library system that contributes to the union catalog, we have some new programming that must be done. Because local systems can be customized by the library, each local system becomes a separate input source for us, and therefore requires its own analysis and programming. Without increasing the number of libraries contributing to the union catalog we have gone from two to seven distinct input systems, and that seven will soon be nine.

Another difference between local systems and the utilities, from our point of view, has to do with the great flexibility of the local systems. Where in 1982 a month's worth of catalog input would produce a handful of records with "fatal errors," those errors so severe or perplexing that the record could not be processed, we now return 300–500 error records a month to campuses. To the campus system these records are only slightly flawed; they contain location code typos or their call number is missing, or their Leader codes do not match those we expect to receive. Within a local catalog such abnormalities are easily tolerated. Like the utilities, the great variety of input forces the union catalog to be strict about standards for some data in order to present a coherent picture to the user. Local systems also allow the libraries to make frequent and rapid changes in their system profiles. Many of these changes translate to work for DLA staff. The utilities always gave us three months' notice and were constrained to keep changes to a minimum because of the impact on their users.

We have worked to minimize our labor in some areas of input so that we can concentrate on others. We have begun to eliminate the exchange of tapes as our medium of communication. Instead, some campus libraries have begun to send their files of MARC records directly to our computer via the UCDLA-Net. We hope to be able to return error records to the campuses in this same way in the future.

RECON WHO?

Ten years ago retrospective conversion (recon) was a hot topic in the library world. Library literature was loaded with articles on how to do it, how we did it, or how we wish it could be done. Where today's ALA preconferences covered the holdings format or format integration, a decade ago they discussed retrospective conversion. Though not every cataloged item has been converted to machine-readable form, the issue of recon has waned. Thanks to projects like REMARC and recon services at OCLC and RLIN, most of the UC library cataloged holdings have entered the local and the union catalogs, though I fear we may have left ourselves the hardest part for last. Finishing the catalog means working with the less used, less mainstream materials; it also means working with language groups that are traditionally more difficult to catalog, especially those requiring alphabets outside the extended ASCII of the ALA character set. When will we complete the task? When will all of the UC libraries' cataloged materials be in machine-readable form? Some libraries answer with a date early in the new millennium.

NEW TYPES OF DATA

The computer enables us to create a more maintainable library catalog. It gives us the opportunity to make changes in what we present to our users, both in terms of search strategies and in data display. It might also give us a chance to tackle some material that libraries have not handled well in the past. As their catalogs of published materials, generally print materials, take shape, libraries have started thinking about other collections, some print, some not, that have not ever been represented in the public catalog. There are collections of slides, architectural drawings, archival films, and aerial photographs, to name a few.

Unfortunately, these collections are not as readily converted as regular print, published materials. The collections tend to have many one-of-a-kind items, so there is no available cataloging copy for the collection. Many special collections do not have an existing catalog that can be converted to machine-readable form. It is not even clear that these collections are suited to the same online catalog we present to the public today. Some materials are not available to the general public, but are intended only for special categories of users.

Like the interest in including Internet resources in the online catalog, these materials bring up more questions than we can answer at the moment. What is clear is that the basic library catalog has been replaced by a computer catalog, and now it is time to see what else we can do with this machine.

THE TRAVELING MARC RECORD

The first USMARC records were created at the Library of Congress and went . . . well, almost nowhere. They were used to print cards. With the development of the utilities, records went from LC to the utility . . . and then were used to print cards. In the last five years, this one-directional movement of machine-readable records has broken down.

OCLC records have been loaded into RLIN and vice-versa. Other sources of MARC records have arisen, such as the REMARC file of early LC imprints, or the MARCIVE file of GPO-produced records. These records may take any number of routes before entering the union catalog. They may come in directly from the original vendor; they may go to a third party, such as UTLAS, for processing before entering the union catalog; they may go to the local system, and from there to the union catalog; or they could even go into a utility database, and from there to the local system and then to the union catalog. Then these same records are sometimes recycled from the union catalog back to the local system for some "reprocessing," eventually to return as an update to the union catalog record. At each step of the way you can be sure that the machine-readable record changes in some way, however minor. The itineraries of some MARC records are so complex that their origins cannot be determined.

Most libraries today are using their first fully integrated library system. Many had circulation and serials control systems predating their current system, but these older systems did not use the full MARC record, and creating the "integrated record" was one of the difficult tasks that the library faced in the automation effort. Assuming that technological change does not slow down considerably in the next decade, by the year 2002 many libraries will be using their second- or third-generation integrated library system. The databases they have today will have been loaded into new software. Some changes will have been made to the data, including those brought on by the gradual evolution of the MARC record itself. The resemblance of those bibliographic records to the original USMARC record that was downloaded from a utility database in 1982 may be remote indeed.

SOME NUMBERS

Here are some interesting figures comparing catalog input today and that of ten years ago. These figures only include library input to the online catalog. Records from the Library of Congress are not counted, nor are specific contributions to the separate periodicals database. Also not included are the inputs to the many citation databases, such as MEDLINE and CURRENT CONTENTS.

Number of titles in the database:

1982: 875,000 representing 1,575,000 merged records

1992: 6,800,000 representing 12,500,000 merged records

Number of contributing libraries:
1982: 12 UC libraries
1992: 26 UC libraries and affiliated institutions, plus California State Library and Center for Research Libraries

Sources of input:
1982: OCLC, RLIN
1992: OCLC, RLIN, Innovative Interfaces (3 installations), GLADIS (developed locally at UCB), ORION (developed locally at UCLA), UCSC locally developed system, DRA, NOTIS

Number of records received per month for catalog input:
1982: 35,000
1992: 300,000

Number of location codes on the MELVYL system display table:
1982: (500?)
1992: 1,992 (sic)

Greatest number of codes from a single library: 367 ■■

A Catalog or a Reference Tool? Or, MELVYL's Exquisite Search Features You Can't Know Until Someone Tells You

Anne Grodzins Lipow

This article describes a few of the MELVYL system's search features that are not generally known, even to frequent searchers, so that readers can appreciate how difficult it is to discover these features without being told. The author postulates that users who view the MELVYL system as a reference tool instead of a catalog are willing to spend more time exploring the advanced system features and are more tolerant of its shortcomings as a library catalog.

EXPECTATIONS INFLUENCE ATTITUDES

From the perspective of this outsider, a nagging customer, so to speak, who always wants more, better, and quicker, the MELVYL system wins both credits and demerits. I say this as the principal author of the *Mynd of MELVYL* newsletter[1] (or *MOM*, for short) from issue number 1, February 16, 1984, through number 51, January 8, 1987. The point of the newsletter was to teach staff how to exploit the MELVYL system's "Command Mode" (the menu-driven "Lookup Mode" was so clunky and inferior that its use was to be discouraged at all costs, and so was rarely mentioned), and in particular to inform staff about the continual flow of significant changes. By definition, to help staff understand what was not obvious about the MELVYL system, or overcome frustrating aspects of the MELVYL system's search features, was to expose its shortcomings as well.

Personally, I have more success selling the MELVYL system as reference tool than as an online catalog. Users expect a catalog to reward them quickly. As Walt Crawford says, "if you need to go through seven or eight screens to get to the call number for a single item, you're not serving the majority of your users' needs."[2] The MELVYL system is best considered as a tool for exploring facets of a topic, or to develop bibliographies, or to answer questions based on highly fragmented information. In the MELVYL system, if you are unsure of how to get started or of what you are doing, you may need to jump a few hurdles to get results. The statistical reports showing very low use of the special commands and indexes lead me to conclude that it is mostly people who are paid to use the MELVYL

Anne Grodzins Lipow, an independent consultant in training and staff development since mid-1991, was formerly the Director for Library Instructional Services at the University of California, Berkeley, where she was responsible for instructional programs in online catalogs for staff and patrons. Through several years of the MELVYL system's development, she was an active participant in the systemwide MELVYL System User Group, which advised the Division of Library Automation about changes.

system (e.g., librarians) who take the time to learn the special options, and of those people, only the ones who use the system frequently remember them. The average user wants material easily and quickly, and becomes discouraged by the complexity of the system.

It is not as if the MELVYL system is difficult to learn. You can know most of what there is to know simply by reading. The online "help" structure is comprehensive: Nearly 1,000 clear, concise essays are accessible by either typing HELP [term] to get an explanation of the term, or typing just HELP to get a diagnosis of your present situation and options for what to do next. To keep up with system changes and upgrades, you need only type SHOW NEWS, SHOW EXPERIMENTS, and SHOW DLA NEWS. EXPLAIN STATISTICS will give you a lot of information about system use.

From my observations, users who expect the MELVYL system to behave like a catalog tend to become impatient with its imperfections and failures. Those who regard it as a reference tool, however, have a more tolerant attitude about its limitations: They are pleased when it produces desired results, and they will try other strategies when it does not.[3] They are more willing to explore the unknowns of the system, posing such questions to themselves as, "I wonder if the system will allow me to do this? I'll try."

Below are some of the MELVYL system's features that transform it from a catalog to a reference resource.

SHO HISTORY/REDO

The Feature

Every bibliographic search system should have a feature like SHO[W] HISTORY. It acknowledges the reality that the search process, whether or not for a "known item," is normally one of trial and error: search A: "0" results; search B: OK, but could be better; search C: totally off the mark; search D: also not so good—perhaps redo the one that was okay, but you cannot remember which it was. SHO HISTORY is your answer. This command displays a numbered list of your previous search statements. Followed by REDO [search statement number], it reexecutes the requested search. In December 1990, a new search feature was introduced that goes beyond SHO HISTORY: SAVE SETS holds both your specified previous searches and the results in numbered sets, and allows you to combine them in a new search statement, DIALOG style. For example: f set 1 and set 3. SAVE SETS is not a substitute for SHO HISTORY. In the latter feature, the search statements are automatically saved, and they cannot be combined with Boolean operators into a new search statement. Each option is needed at different times in a searcher's session.

The Limitations

When the system needs more computer space to manage a heavy load of simultaneous search sessions, it grabs space by eliminating search histories. Thus, too often when a user invokes SHO HISTORY, the system responds, "There are no previous searches." In addition, the history list appears in reverse order, an annoyance that will be fixed at some point.

DATING IN THE MELVYL SYSTEM

The Feature

The index ADDED limits a search to records that have been added to the database since a specified date or within a range of dates. This feature was added in late 1985, and enables you to update a bibliography with records added to the database since the last time you searched in the MELVYL system. This is a wonderful "current awareness" convenience for people trying to keep up to date on what is being published on a particular subject or by a particular author.

The Limitations

This feature has a detrimental impact on other aspects of the system and so was rendered almost useless by requiring that the ADDED dates be restricted to the previous seven days. ADDED is rarely used, but there are some who regularly use the feature, even with its severe limitation, and view it as a tremendous time-saver. Also, with the introduction of ADDED, the system made a distinction between three kinds of dates, each of which must be expressed differently: date of publication, date in a subject heading, and date added to the database. To complicate matters, there are two other date commands that limit by date but that are not expressed as dates: DATE RECENT limits the search to imprints of the last ten years; DATE CURRENT, to the last three years. Keeping in mind which form of date goes with which function is not easy, so even those of us who know about the differences have to rely on HELP DATES for reminders.

BROWSE/SELECT

The Feature

BROWSE would be a favored starting place for many searchers, if they knew about it. A very productive strategy exploring variations on relevant subject headings is B SU [your keywords]. The word BROWSE doesn't give a clue as to its usefulness, so even if you notice that the feature exists, it would be hard for you to understand how it is different from a FIND command. BROWSE searches a headings file and retrieves a list of headings. The SELECT command is then used to retrieve the records to which your chosen heading has been assigned. On the other hand, the FIND command searches the bibliographic record file. Thus, the following commands retrieve the same bibliographic records: F SU [your subject heading] and B SU [your subject heading] SEL ALL. But with the FIND command, you cannot be sure what generated the retrieval without looking into every record. "For the novice user in particular, the FIND command seems to produce good results as if by magic (unless you view the records in the long format), and poor results as if by curse—whereas the BROWSE searcher gets a clearer understanding of how the results were arrived at [having explicitly chosen the subject heading(s)] and then requested the attached records."[4]

The Limitations

The major drawback of the BROWSE command is that there is no breakdown of common headings; therefore you cannot choose to select from among the subdivisions of those headings. Of course, as time passes, more and more headings with their subdivisions become common, and so are inaccessible. But again, the reaction to this frustration ranges from "It's useless!" to "When it works, it's a gem; when it doesn't, I'll take the next best alternative."

SIMULTANEOUS DISPLAY OPTIONS

The Feature

Once users know about BROWSE, it helps if they can remember another worthwhile, but concealed feature: The MELVYL system keeps your latest FIND, BROWSE/SELECT, and PE (periodicals) searches. So if you had made all three types of searches in your current search session, you could weave in and out of the results of each by simply designating which search you want displayed. (For example, D FIND will display your FIND search in the default "short" format; D B REV will display your BROWSE result in the one-liner "review" format; and D PE LONG will display your PE search in the "long" format.)

The Limitation

Because so few people learn about the feature on their own, 99 percent of BROWSE users rekey searches needlessly.

HIDDEN SUBJECT HEADINGS

The Feature

A very useful MELVYL strength is its ability to display specified fields. That is especially handy when your approach to finding relevant subject headings is to search by title word (F TW), find a title on your subject, see which subject headings have been assigned to it, and continue searching in the subject index under those headings. A time-consuming way to view those subject headings is to display in the "long" format those records which look interesting. But you're forced to wade through much more information than you want. A more efficient strategy is to display only the title and subject headings of each record: D TI SU.

In the LONG format, the subject heading field displays only those headings found in the "base" record (to which all other locations for that title are attached). But displaying by field produces a special bonus in subject heading retrievals: The system displays all the subject headings assigned by all contributing locations. So, for example, for the work *The Whistleblowers,* by Myron Glazer, D LONG retrieves these subject headings: Whistle blowing — United States. Political corruption — United States. Corporations — United States — Corrupt practices., and D SU retrieves this additional subject heading: Corruption (in politics) — United States.

The Limitation

Searching by a subject heading may retrieve records in which that subject heading does not exist in the base record, leaving the searcher to wonder why the record was retrieved at all.

SWITCHING DATABASES AND SAVE

The Feature

The MELVYL system is made up of the catalog of UC books and, as of this writing, seven other databases (of which nonaffiliated remote users have access to only PE (the periodicals database) and TEN (the last-ten-years subset of the catalog database). (CURRENT CONTENTS, MEDLINE, and an index to major newspapers are among the others.) The same search commands apply in all the databases, and it is easy to compile a personal bibliography that consists of citations to books, journal titles, and articles using the SAVE command in all of the relevant databases. You just need to be careful how you switch from one database to the other, or you might lose what you saved. There are three commands that switch to another database: At the prompt, type the code for the database to which you want to switch (e.g., CC for CURRENT CONTENTS, NEWS for the newspaper file). At the prompt, type SET DB <database code>. At the prompt, type START <database code>. Only the first two commands switch to the designated database without ending your session in the current database. What you saved will be erased if you switch to a database using the START command. That is an important distinction when you are building a bibliography (for later downloading to your PC) by accumulating citations as you move from one database to another.

The Limitation

Using the wrong command will erase previously saved information.

The MELVYL system offers diverse, complex functions which, if properly understood and used, enhance the search process and truly exploit the system's vast resources. When the system, eventually, is able to make the user immediately aware of these features, it will really fulfill the researcher's—and the librarian's—dream. Until then, I think the MELVYL system should be billed as a reference system—sending the message that it is not a simple tool, but a very powerful one for the average researcher, and worth the time it takes to learn it.

REFERENCES AND NOTES

1. Though *MOM* was written for the Berkeley staff, it was distributed to library staff throughout the nine University of California campuses. After issue 51, *MOM* was produced by DLA and written by Alan Ritch, a UC Santa Cruz librarian, who had been a frequent contributor to the newsletter in its first three years. At that time, too, its title was changed to *Mynd of the MELVYL System* (to meet registered trademark requirements). Recent issues of *MOM* are available online by keying at the MELVYL system prompt: SHO MOM.
2. Walt Crawford, "Starting Over—Current Issues in Online Catalog User Interface Design," *Information Technology and Libraries* 11, no.1:62–76 (Mar. 1992).
3. Readers who wish to try any of the features described should type in the MELVYL system HELP [feature] for more information and up-to-date details about the feature.
4. *Mynd of MELVYL* (May 2, 1985).

Remote Use of the University of California MELVYL Library System: An Online Survey

Terry Ellen Ferl and Larry Millsap

This report presents the results of a survey of users who access the University of California's online union catalog, the MELVYL library system, via microcomputers with modems or connections carried through local or wide area networks. The report includes descriptive statistics on user location, status, subject interest, affiliation, in-library versus out-of-library usage patterns, need for assistance, and desire for new features.

Use of online public access catalogs from outside the traditional academic library environment is now a common occurrence. The growth of this type of use since the mid-1980s is the result of several factors. Chief among these are advances in microcomputer technology and reductions in hardware costs, coupled with the accessibility of local and wide-area electronic networks to greater numbers of scholars. The widespread adoption of the MARC format and the rise of OCLC as a powerful utility for creating and sharing machine-readable data provided the foundation for linking resources with scholars, wherever they might be. John Sack, director of the Data Resources Group at Stanford University, has advised librarians to "assume that extra-library use of library systems will be equivalent in volume to in-library use over the next decade . . . ."[1] The growth of out-of-library use has been dramatic. In 1987, the Association of Research Libraries (ARL) identified and surveyed fifty-seven of its member libraries that reported offering remote access to their online catalogs. The 1988 published report of the survey noted that "remote access to library online catalogs is a viable reality in more than half the ARL libraries."[2]

THE MELVYL LIBRARY SYSTEM

In early 1981, the MELVYL catalog began as a prototype union catalog for the nine campuses of the University of California (UC). The prototype contained bibliographic records for 600,000 unique titles that represented 1,200,000 volumes. Ten video display terminals were installed at each campus to search the database using the patron interface developed by the University of California Division of Library Automation (DLA).[3] In the fall of 1983, DLA began to make available an updatable version of the MELVYL catalog. Current records for monographs cataloged by the campuses on the Online Computer Library Center (OCLC) or the Research Libraries Information Network (RLIN) were added within two weeks of receipt, and loading of campus retrospective records began.[4] By February 21, 1991, the catalog database contained 6,103,501 monographic titles in all formats, representing about 12,983,200 holdings. The periodicals database contained 782,673 titles, representing about 1,390,100 holdings.[5] The MEDLINE and CURRENT CONTENTS databases were also mounted, and access to many other library catalogs was provided as well, so that the MELVYL catalog became the MELVYL system.

REMOTE USE OF THE MELVYL SYSTEM

Access to the MELVYL catalog from outside the library setting first became widely available in the mid-1980s. Between November 1987 and October 1988, there was a threefold increase in remote usage of the MELVYL catalog. By the end of 1988, remote users accounted for 9% of the searches. In April 1990, remote users made 15% of the queries. The total number of searches is typically lower in the summer months, but during one week in August 1990, queries from remote sites accounted for 28.4% of total queries. Statistics captured through the system during a one-week period in May 1991 show that users issued 379,126 FIND commands. One-fourth of those (95,940) originated from remote sites.[6] Remote users are currently accessing the system through more than 460 uniquely identifiable networks, most of them employing the Internet as their main highway.[7]

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SURVEYS OF REMOTE USE

The 1982 nationwide study of online public catalog use conducted under the auspices of the Council on Library Resources (CLR) included survey data on the MELVYL prototype online catalog. The study, however, preceded the advent of widespread dial-up and networked access, so remote users were not surveyed.[8] The aforementioned 1988 report on remote access in ARL libraries noted that while institutions could easily generate statistical or management reports on remote access, few libraries had analyzed the data gathered.[9] A survey of UC Berkeley's remote users of the MELVYL catalog was conducted offline in 1987,[10] and online surveys of in-library and remote users of the MEDLINE and CURRENT CONTENTS databases mounted on the MELVYL system were conducted in 1989 and 1991.[11]

The scarcity of published descriptive data on remote users of online public access catalogs encouraged the investigators to study the population of remote users of the entire MELVYL system. Results from the first phase of this study, based on an online user survey, are presented in this report. Results from the second phase, which will include analysis of user transaction logs, will be published separately. These data should prove useful for planning purposes both within and beyond the UC community.

THE QUESTIONNAIRE AND ITS PRESENTATION ONLINE

A survey instrument in the form of a questionnaire was presented to every third user who logged on remotely to the MELVYL system through the UC telecommunications network from May 7 through May 13, 1991. For the purposes of this study, remote access was defined as use of the system either through microcomputers with modems or through terminals, regardless of location, that contend for computer ports via phone lines or via local or wide area networks.[12]

The questionnaire was announced through welcome screens that contained two filtering questions. Through the initial filtering question, users who had already completed the questionnaire were prevented from answering it again. Those who replied they had not yet taken the questionnaire were given the second filtering question, which asked whether they wished to participate. If they agreed to do so, they were instructed to continue their sessions, then type END to receive the questionnaire.

Each of the fifteen questions was presented on a separate screen, and the answer choices were numbered. The following prompt appeared at the bottom of each screen: **Please type only one number and press RETURN, or Just press RETURN for the next question.** It was not possible to back up to previous questions, but the user could skip questions or exit the questionnaire at any point. A statement about the confidentiality of the user's search sessions was included in the welcome screens. The text of the welcome screens and the questionnaire are presented in appendixes A and B, respectively.

RESULTS

The Statistical Package for the Social Sciences (SPSS/PC+ version 4.0) was used to analyze the ASCII file of survey data transmitted to the investigators by DLA. During the survey period, 4,982 users were asked if they had taken the questionnaire. Of this number, 1,438 replied they had not but wanted to, so they were given the questionnaire; 21 of these answered no questions, leaving 1,417 cases to analyze. During analysis, the investigators removed 80 cases from the study when they discovered the respondents were in-library rather than remote users.[13] The number of cases ultimately included in the study was 1,337. A brief description and summary table of the survey data captured by DLA and presented to the investigators appears in appendix C.[14]

A wealth of data on remote use was captured through the questionnaire and the system's statistical programs. Questionnaire data available to the investigators included terminal and network identification that permitted analysis of responses associated with individual UC campuses. Campus-specific analysis, however, has generally been excluded from this report.

Responses to the Questionnaire

The first three survey questions were concerned with the location of the remote users: whether they were in their homes, offices, or other sites; how far they were from a UC campus; and what their general geographic location was. The status, subject interest, affiliation (UC versus non-UC), and age of users were the focus of the fourth through seventh survey questions. The eighth through eleventh questions concerned the frequency of remote and in-library use of the MELVYL system, frequency of printing and downloading, and change in frequency of visiting UC libraries. The twelfth through fifteenth questions dealt with help received in connecting to the system and in executing searches once connected, with the kinds of help that would be useful in the future, and with new features that were desired on the system. Appendix B contains the full text of each question. Tables 1–15 show the responses to the online questionnaire. Responses to the sixth survey question, which asked whether the respondent was a student or faculty or staff member affiliated with the University of California, are given in table 1. Approximately two-thirds of the respondents were UC-affiliated. The responses to this question were cross-tabulated with the responses for each of the other fourteen questions, and those results are presented in tables 2–15.

In tables 2–15, the numbers and percentages for UC and non-UC responses are given separately in the first four columns, and the totals for all respondents appear in the last two columns. The totals vary from table to table because respondents chose not to answer some questions. Among the 1,337 questionnaires that were analyzed, the number of valid responses to each question ranged from 1,270 (94.9%) to 1,306 (97.7%). Data for non-responses to each question, which have been excluded from the tables, may be found in the summary data presented in appendix C. The figures displayed in the percentage columns of tables 2–15 are always for responses in relation to the entire surveyed population, UC and non-UC combined. In the discussion that follows, however, it has frequently been useful to calculate percentages within the UC and non-UC groups separately, rounded to the nearest whole percent. The significant differences between the two groups are described below.

Location of Microcomputer or Terminal

Nearly 75% of all remote users and 77% of UC users accessed the MELVYL system with equipment at their homes or in their offices (see table 2). Almost one-third (30%) of non-UC users accessed the system from libraries of all kinds, but only about one-thirteenth (8%) of UC-affiliated remote use was from libraries. Some of this UC-affiliated remote use from libraries was by library staff members accessing the system in their offices.

Table 1. Respondents by Affiliation

	No.	%
UC	862	65.5
Non-UC	455	34.5
Total	1,317	100.0

Distance from UC

Most UC users (84%) were either on campus or within five miles of a UC campus or laboratory (see table 3). The non-UC users, not surprisingly, were more distant. Just over half (55%) were at least 26 miles away; this was the case for only 3% of UC users.

Geographic Location

Users within California comprised 86% of the total (see table 4). About one-fourth of these were not affiliated with the University. Just over 1% of UC users were outside California; about three-eighths of non-UC users were outside California. Total remote usage from outside the United States was 2.3%.

Status

Among all remote users, the largest groups were graduate students, faculty, library staff, and junior and senior undergraduates (see table 5). However, there was considerable difference between the UC and non-UC respondents in the most frequently represented user status. Most frequently represented among UC users were graduate students, faculty, junior and senior undergraduates, and staff. For non-UC users, they were library staff (which accounted for more than a quarter of non-UC users), faculty, general public, and graduate students, followed closely by "other."

Subject Interest

Users who reported their areas of subject interest to be in the physical and biological sciences represented nearly one-fourth of remote usage (see table 6). Users in the arts and humanities composed the second-largest group (14.4%), followed closely by the social sciences (13.1%) and engineering and math-

Table 2. Location of Microcomputer or Terminal

	UC		Non-UC		Total	
	No.	%	No.	%	No.	%
Office	389	29.8	170	13.0	559	42.8
Home	273	20.9	128	9.8	401	30.7
Academic Library	41	3.1	49	3.8	90	6.9
Laboratory	82	6.3	3	.2	85	6.5
Special Library	13	1.0	48	3.7	61	4.7
School Library	10	.8	22	1.7	32	2.5
Computer Center	19	1.5	5	.4	24	1.8
Dormitory	17	1.3	1	.1	18	1.4
Public Library	3	.2	14	1.1	17	1.3
Other	5	.4	8	.6	13	1.0
Classroom	3	.2	2	.2	5	.4
Total	855	65.5	450	34.5	1,305	100.0

ematics (11.5%). Among UC users, 30% were in the physical and biological sciences, 15% were in the social sciences, and 13% were in the arts and humanities. Within the non-UC group, arts and humanities was the largest, with 17%.

Age

Just over half (50.6%) of remote users were 34 years of age or younger (see table 7). UC remote users tended to be younger than non-UC users. Among UC users, 57% were 34 or younger, while 62% of non-UC users were 35 or older. This age difference is to be expected, since students make up a smaller proportion of the non-UC group (table 5).

Frequency of Use

Weekly use was by far the most frequent response (see table 8). It was the response of 47% of all users and just over half of the UC users. More UC respondents (23%) than non-UC respondents (15%) used the MELVYL system daily. Of the non-UC group, 16% were first-time users.

Printing and Downloading

The UC and non-UC users responded to this question almost identically (see table 9). About 70% downloaded or printed either frequently or occasionally.

Use in a UC Library

Just over half (50.9%) of the remote users rarely or never used the MELVYL system on public terminals in a UC library (see table 10). About 85% of non-UC users rarely or never used the system in a UC library. Forty percent of the UC group used the system in the library daily or weekly, while 26% reported monthly

Table 3. Distance from a University of California Campus

	UC		Non-UC		Total	
	No.	%	No.	%	No.	%
At a UC Campus	532	40.7	17	1.3	549	42.0
26 Miles or More	28	2.1	247	18.9	275	21.1
Within 5 Miles	189	14.5	63	4.8	252	19.3
6 to 10 Miles	66	5.1	51	3.9	117	9.0
11 to 25 Miles	42	3.2	71	5.4	113	8.7
Total	857	65.6	449	34.4	1,306	100.0

Table 4. Geographic Location of User

	UC		Non-UC		Total	
	No.	%	No.	%	No.	%
California	829	64.4	282	21.9	1,111	86.3
West of Miss. River	5	.4	81	6.3	86	6.7
East of Miss. River	5	.4	57	4.4	62	4.8
Outside U.S.			29	2.3	29	2.3
Total	839	65.1	449	34.9	1,288	100.0

usage. Interestingly, about one third of the UC users rarely or never used the MELVYL system in a UC library.

Change in Frequency of Visits to UC Libraries

For 52% of all users and 62% of UC users, having remote access to the MELVYL system has not changed the frequency of their visits to UC libraries (see table 11). For those UC users whose frequency of visits did change, the number who now visit less frequently is three times as large as those who visit more frequently.

Help Connecting to the MELVYL System

Just over 63% of remote users reported they did not need help connecting to the MELVYL system (see table 12). Among the 470 (37%) who did receive help in connecting, nearly three-quarters (332) were assisted by either on-screen messages or printed material. Other sorts of help (from a friend or colleague, library staff, telephone assistance, or group instruction) were reported by the remaining quarter.

Of the 269 UC users who needed help connecting, 33% (88) were served by on-screen messages and another 37% (100) relied on printed material. Almost half (48%) of the 201 non-UC users who needed help connecting were assisted by on-screen messages, and almost one-quarter (23%) consulted printed material.

Help in Searching the MELVYL System

A large number of users (59.2%) reported they did not need help conducting searches on the MELVYL system (see table 13). Among the 523 (41%) who did need help, 74% of UC users and 86% of non-UC users relied on on-screen messages. Of these same two groups needing search help, only 18% of

Table 5. Status of User

	UC		Non-UC		Total	
	No.	%	No.	%	No.	%
Graduate Student	275	21.2	51	3.9	326	25.1
Faculty	182	14.0	68	5.2	250	19.3
Library Staff	54	4.2	128	9.9	182	14.0
Junior or Senior	95	7.3	21	1.6	116	8.9
Staff	73	5.6	15	1.2	88	6.8
Postdoctoral	60	4.6	13	1.0	73	5.6
Other	23	1.8	48	3.7	71	5.5
General Public	4	.3	66	5.1	70	5.4
Fresh. or Soph.	45	3.5	16	1.2	61	4.7
Research Asst.	25	1.9	9	.7	34	2.6
Programmer	12	.9	15	1.2	27	2.1
Total	848	65.3	450	34.7	1,298	100.0

Table 6. Area of Subject Interest

	UC		Non-UC		Total	
	No.	%	No.	%	No.	%
Phys/Biol Sciences	259	20.0	58	4.5	317	24.5
Arts/Humanities	109	8.4	77	6.0	186	14.4
Social Sciences	125	9.7	44	3.4	169	13.1
Engineering/Math	101	7.8	48	3.7	149	11.5
Medicine	96	7.4	37	2.9	133	10.3
Computer Science	57	4.4	42	3.2	99	7.7
Other	30	2.3	39	3.0	69	5.3
Library Science	36	2.8	30	2.3	66	5.1
Business/Mgmt	13	1.0	36	2.8	49	3.8
Education	15	1.2	12	.9	27	2.1
Law	7	.5	17	1.3	24	1.9
Major Undeclared	4	.3	2	.2	6	.5
Total	852	65.8	442	34.2	1,294	100.0

Table 7. Age of User

	UC		Non-UC		Total	
	No.	%	No.	%	No.	%
25–34	318	24.5	119	9.2	437	33.7
35–44	220	17.0	151	11.6	371	28.6
17–24	168	13.0	41	3.2	209	16.1
45–54	90	6.9	94	7.2	184	14.2
55–64	42	3.2	27	2.1	69	5.3
65 or Over	11	.8	6	.5	17	1.3
16 or Under	1	.1	9	.7	10	.8
Total	850	65.5	447	34.5	1,297	100.0

Table 8. Frequency of Remote MELVYL System Use

	UC		Non-UC		Total	
	No.	%	No.	%	No.	%
Weekly	440	33.8	174	13.4	614	47.1
Daily	194	14.9	68	5.2	262	20.1
Monthly	124	9.5	80	6.1	204	15.7
Rarely	57	4.4	56	4.3	113	8.7
Not Before	37	2.8	73	5.6	110	8.4
Total	852	65.4	451	34.6	1,303	100.0

Table 9. Frequency of Printing or Downloading

	UC		Non-UC		Total	
	No.	%	No.	%	No.	%
Frequently	362	28.1	171	13.3	533	41.4
Occasionally	225	17.5	145	11.3	370	28.7
Never	136	10.6	67	5.2	203	15.8
Rarely	121	9.4	61	4.7	182	14.1
Total	844	65.5	444	34.5	1,288	100.0

Table 10. Frequency of Use of the MELVYL System in a UC Library

	UC		Non-UC		Total	
	No.	%	No.	%	No.	%
Rarely	226	17.6	134	10.4	360	28.1
Weekly	274	21.4	23	1.8	297	23.1
Never	55	4.3	237	18.5	292	22.8
Monthly	222	17.3	39	3.0	261	20.3
Daily	67	5.2	6	.5	73	5.7
Total	844	65.8	439	34.2	1,283	100.0

UC and 9% of non-UC users reported reliance on printed material.

Need for Future Help

A plurality (47%) of users did not expect to need help in the future (see table 14). Among the 670 (53%) who did expect to need help, 346 (52%) wanted additional on-screen help, and 184 (27%) wanted printed material. The remaining 140 respondents (21%) wanted other kinds of help.

Desire for Additional Features

Journal articles and journal indexes were the overwhelming choices for additional features on the MELVYL system (see table 15). Although UC and non-UC users had the same top three choices for additional features, the order of choices varied significantly. For UC users, the top choices were journal indexes (37%) and journal articles (35%); library catalogs were a distant third choice with 9%. For the non-UC group, journal articles were the first choice of 28%; library catalogs, of 26%; and journal indexes, of 20%.

ADDITIONAL OBSERVATIONS

The investigators examined several data sets more closely. Additional comparisons within subject interest and status groups are presented in tables 16–20. Because graduate students, faculty, and junior and senior undergraduates were the most heavily represented UC remote users, additional frequency

Table 11. Change in Frequency of Visits to UC Libraries

	UC		Non-UC		Total	
	No.	%	No.	%	No.	%
No Change	520	40.6	152	11.9	672	52.4
Less Frequently	222	17.3	68	5.3	290	22.6
Do Not Visit	24	1.9	186	14.5	210	16.4
More Frequently	71	5.5	39	3.0	110	8.6
Total	837	65.3	445	34.7	1,282	100.0

Table 12. Help Connecting to the MELVYL System

	UC		Non-UC		Total	
	No.	%	No.	%	No.	%
Did Not Need Help	575	44.6	243	18.9	818	63.5
On-Screen	88	6.8	97	7.5	185	14.4
Printed Material	100	7.8	47	3.6	147	11.4
Friend or Colleague	49	3.8	23	1.8	72	5.6
Library Staff	22	1.7	20	1.6	42	3.3
Telephone	6	.5	7	.5	13	1.0
Group Instruction	4	.3	7	.5	11	.9
Total	844	65.5	444	34.5	1,288	100.0

Table 13. Help Conducting Searches on the MELVYL System

	UC		Non-UC		Total	
	No.	%	No.	%	No.	%
Did Not Need Help	539	42.0	221	17.2	760	59.2
On-Screen	221	17.2	193	15.0	414	32.3
Printed Material	54	4.2	21	1.6	75	5.8
Library Staff	11	.9	2	.2	13	1.0
Friend or Colleague	8	.6	5	.4	13	1.0
Telephone	2	.2	2	.2	4	.3
Group Instruction	3	.2	1	.1	4	.3
Total	838	65.3	445	34.7	1,283	100.0

calculations are presented for them in tables 21–23.

Non-UC Subject Interest Groups

The largest subject interest group among non-UC users was the arts and humanities group, while for both UC and total remote users the physical and biological sciences group was the largest (see table 6). Closer examination of the status of non-UC arts and humanities users showed that faculty accounted for over one-fourth (28%) of them, and library staff, graduate students, and general public followed, closely clustered together (see table 16). These are the same status groups identified in table 5, but the order when all subjects were considered together was library staff, faculty, general public, graduate students.

Non-UC Status and Need for Help

Cross-tabulations were performed for help needed to connect to the MELVYL system by non-UC users according to status (see table 17). Of the 240 (55%) who reported they did not need help connecting, 83 were library staff, a group that might be expected to be more adept in using an online catalog than others. When this group's response was subtracted, the population of non-UC users who did not need help connecting dropped to 36%.

When the same analysis was applied to the need for help in conducting searches on the MELVYL system, the results were similar (see table 18). Non-UC users who did not need help constituted 49% (218). When the 78 library staff users were removed from that

Table 14. Need for Future Help

	UC		Non-UC		Total	
	No.	%	No.	%	No.	%
Will Not Need Help	378	29.8	222	17.5	600	47.2
On-Screen	217	17.1	129	10.2	346	27.2
Printed Material	135	10.6	49	3.9	184	14.5
Telephone	44	3.5	21	1.7	65	5.1
Library Staff	33	2.6	6	.5	39	3.1
Group Instruction	17	1.3	7	.6	24	1.9
Friend or Colleague	7	.6	5	.4	12	.9
Total	831	65.4	439	34.6	1,270	100.0

Table 15. Desire for Added Features

	UC		Non-UC		Total	
	No.	%	No.	%	No.	%
Journal Articles	298	23.2	122	9.5	420	32.7
Journal Indexes	311	24.2	90	7.0	401	31.3
Library Catalogs	72	5.6	115	9.0	187	14.6
Encyclopedias	60	4.7	31	2.4	91	7.1
No Opinion	50	3.9	41	3.2	91	7.1
Bulletin Boards	21	1.6	24	1.9	45	3.5
Graphics Images	25	1.9	15	1.2	40	3.1
Numeric Databases	5	.4	3	.2	8	.6
Total	842	65.6	441	34.4	1,283	100.0

population, the percentage for those not needing search help dropped to 32%. Data on the desire for future help by non-UC users according to status were consistent with the foregoing: 50% did not anticipate need for future help, but this dropped to 35% when library staff users were removed from the population (see table 19).

UC Status and Frequency of Remote Use

When frequency of remote use by UC users was compared by status, weekly usage was the most common response for all users except library staff (see table 20). For the library staff, daily use was the most common. The largest proportion of first-time users was among the freshmen and sophomore student group: 9 out of 45, or 20%.

Location of the Most Represented UC Remote Users

Table 21 shows frequencies for the heaviest UC remote users (graduate students, faculty, and junior and senior undergraduates) according to the location of their terminals. Table 2 shows that 45% of the total UC remote user population (389 out of 855) accessed the MELVYL system from their offices, and 32% (273 out of 855) did so from their homes. Table 21 shows, however, that 41% of UC graduate students (113 out of 274) accessed the system from their homes, 35% (97 out of 274) from their offices, and 15% from labora-

Table 16. Area of Subject Interest by Status for Non-UC Users

	Fresh or Soph	Junior or Senior	Graduate Student	Postdoctoral	Faculty	Staff	Research Assistant	Library Staff	Programmer	General Public	Other	Total
Arts/Humanities	3	1	12	1	21	4	3	14	2	9	6	76
Phys/Biol Sciences	3	3	5	3	9	1	3	14	1	7	9	58
Engineering/Math		1	4	3	9	4	1	9		7	9	47
Social Sciences	1	3	4		12	2		14		8		44
Computer Science	4	3	5	2	4	2		2	10	9	1	42
Other	1	2	1		1	1	1	16		5	11	39
Business/Mgmt	2	5	6	2	4			20	1	10	2	36
Medicine		2	4		2		1	19		2	3	36
Library Science			4		4			7	1		2	30
Law	1	1	2	1				2		3	2	16
Education			4		2					3		12
Major Undeclared										1	1	2
Total	15	21	51	12	68	14	9	123	15	64	46	438

Table 17. Help Needed to Connect to the MELVYL System by Non-UC Users According to Status

	Fresh or Soph	Junior or Senior	Graduate Student	Postdoctoral	Faculty	Staff	Research Assistant	Library Staff	Programmer	General Public	Other	Total
Did Not Need Help	8	14	20	4	37	8	8	83	7	26	25	240
On-Screen	3	5	15	2	14	4		20	4	20	10	97
Printed Material		1	7	2	9	2	1	7	2	9	6	46
Friend or Colleague	2		3	4	4	1		4	1	1	3	23
Library Staff	2		2		1			7	1	5	2	20
Telephone			2		1			1		2	1	7
Group Instruction		1			2			2		1	1	7
Total	15	21	49	12	68	15	9	124	15	64	48	440

Table 18. Help Needed to Search on the MELVYL System by Non-UC Users According to Status

	Fresh or Soph	Junior or Senior	Graduate Student	Postdoctoral	Faculty	Staff	Research Assistant	Library Staff	Programmer	General Public	Other	Total
Did Not Need Help	8	9	18	6	28	4	9	78	5	30	23	218
On-Screen	5	11	28	4	34	10		40	10	28	22	192
Printed Material	1		2	2	6	1		1		6	2	21
Friend or Colleague	1	1	1					2				5
Telephone			1					1				2
Library Staff								1			1	2
Group Instruction												1
Total	15	21	50	12	68	15	9	123	15	65	48	441

Table 19. Additional Help Desired on the MELVYL System by Non-UC Users According to Status

	Fresh or Soph	Junior or Senior	Graduate Student	Postdoctoral	Faculty	Staff	Research Assistant	Library Staff	Programmer	General Public	Other	Total
Will Not Need Help	4	8	27	4	40	6	6	65	8	31	20	219
On-Screen	7	13	14	3	20	4	1	34	5	13	14	128
Printed Material	3		4	4	6	2	1	12	2	7	8	49
Telephone	1		1	1	1	1		9		5	2	21
Group Instruction					1		1	2		1	2	7
Library Staff						1		1		4		6
Friend or Colleague	1							1		1	2	5
Total	16	21	46	12	68	9	9	124	15	62	48	435

tories. By contrast, 34% of faculty accessed the system through terminals at home, 61% through terminals in their offices, and 2% from laboratories.

Subject Interest Areas of the Most Represented UC Remote Users

Table 22 shows frequencies for the same groups of heavily represented UC remote users by their areas of subject interest. Table 6 shows the following order for the most represented subject areas of UC remote users: physical and biological sciences, social sciences, arts and humanities, engineering and mathematics, and medicine. While table 22 confirms that faculty and graduate students in the physical and biological sciences were indeed the heaviest users, the order of subject interest areas varied after that. For graduate students, the order was: engineering and mathematics, social sciences, arts and humanities, computer science, library science, and medicine. For the faculty, the order was: social sciences, medicine, arts and humanities, and engineering and mathematics. For the third heaviest UC user group, juniors and seniors, the social sciences and the physical and biological sciences were tied as the subject interest areas most frequently represented. These were followed by the arts and humanities, engineering and mathematics, and computer science.

UC Status and In-Library Use of the MELVYL System

Table 10 indicates that about one-third of the UC remote users rarely or never use the system in a UC library. Table 23 reveals the hierarchy of that group. Faculty and graduate students accounted for nearly half of the respondents, while UC staff accounted for almost 15%. Undergraduates as a group accounted for 15%.

CONCLUSIONS

The Survey Instrument

The investigators found the survey questions to be satisfactory for the purposes of the project. For the question that asked the location of the respondent's microcomputer or terminal, the investigators would now recommend different names for some types of sites. For example, a less ambiguous name for the choice of "academic library" might be "college or university library." "School library" should

Table 20. Frequency of MELVYL System Use by UC Remote Users According to Status

	Daily	Weekly	Monthly	Rarely	Not Before	Total
Graduate Student	58	146	51	7	10	272
Faculty	43	115	11	6	6	181
Junior or Senior	10	45	17	16	4	92
Staff	14	32	14	10	3	73
Postdoctoral	11	37	11			59
Library Staff	37	14		2		53
Fresh or Soph	3	15	7	11	9	45
Research Asst	9	10	6			25
Other	5	12	1	1	4	23
Programmer		9	2	1		12
General Public	2		1	1		4
Total	192	435	121	55	36	839

Table 21. UC Upper Division Students, Graduate Students, and Faculty by Location

	Junior or Senior		Graduate Student		Faculty		Total	
	No.	%	No.	%	No.	%	No.	%
Home	49	8.9	113	20.5	61	11.1	223	40.5
Office	8	1.5	97	17.6	111	20.2	216	39.3
Laboratory	6	1.1	42	7.6	3	.5	51	9.3
Academic Library	11	2.0	10	1.8	1	.2	22	4.0
Computer Center	6	1.1	8	1.5			14	2.5
School Library	5	.9	3	.5	1	.2	9	1.6
Special Library	2	.4	1	.2	2	.4	5	.9
Dormitory	3	.5			1	.2	4	.7
Other	1	.2			2	.4	3	.5
Classroom	2	.4					2	.4
Public Library	1	.2					1	.2
Total	94	17.1	274	49.8	182	33.1	550	100.0

be replaced by "elementary or high school library." In any case, respondents may interpret terms differently. For example, a branch library on a university campus may be identified by a respondent as a "special library." By combining the capabilities of the statistical package with information about the Internet identifiers, the investigators were able to test the validity of suspect results.

The Results

In a typical high-use period, one-fourth of the MELVYL system usage (measured either by number of FIND commands issued or by number of sessions recorded) is accounted for by remote users. Since the population of remote users is known to be growing, it is very useful to be able to describe this group.

Almost two-thirds of the remote users (65.5%) were students, faculty, or staff of the University of California. The largest groups of UC remote users were graduate students, faculty, and junior and senior undergraduates. The most likely remote location for UC students to be accessing the MELVYL system was their homes; for faculty, it was their offices. For a large proportion of these users, all or most of their use of the system was from a

Table 22. UC Upper Division Students, Graduate Students, and Faculty by Location

	Junior or Senior		Graduate Student		Faculty		Total	
	No.	%	No.	%	No.	%	No.	%
Phys/Biol Sciences	21	3.8	94	17.1	58	10.5	173	31.5
Social Sciences	21	3.8	41	7.5	33	6.0	95	17.3
Arts/Humanities	13	2.4	29	5.3	30	5.5	72	13.1
Engineering/Math	11	2.0	42	7.6	18	3.3	71	12.9
Medicine	7	1.3	15	2.7	31	5.6	53	9.6
Computer Science	9	1.6	18	3.3	3	.5	30	5.5
Library Science	1	.2	16	2.9	1	.2	18	3.3
Other	5	.9	6	1.1	3	.5	14	2.5
Business/Mgmt	3	.5	4	.7	2	.4	9	1.6
Education			8	1.5	1	.2	9	1.6
Law	4	.7	1	.2			5	.9
Major Undeclared					1	.2	1	.2
Total	95	17.3	274	49.8	181	32.9	550	100.0

remote site. Among the 36 UC users who reported using the MELVYL system remotely for the first time, 9 (25%) were freshmen or sophomores and 10 (28%) were graduate students. The collected data provide a strong argument for the need for an online catalog to be self-explanatory, because many users will not have access to printed guides or library staff to assist them. Indeed, the survey data showed a clear preference for on- screen help when some form of help was desired. For non-UC users of the MELVYL system, on-screen help is even more likely to be the only sort of help available.

Table 23. UC Users Who Rarely or Never Use the MELVYL System in a UC Library by Status

	No.	%
Faculty	68	24.4
Graduate Student	63	22.6
Staff	41	14.7
Junior or Senior	24	8.6
Library Staff	20	7.2
Fresh or Soph	19	6.8
Postdoctoral	16	5.7
Other	11	3.9
Research Asst	9	3.2
Programmer	5	1.8
General Public	3	1.1
Total	279	100.0

REFERENCES AND NOTES

1. John R. Sack, "Open Systems for Open Minds: Building the Library Without Walls," *College & Research Libraries* 47, no.6:541 (Nov. 1986). Attainment of the statistical watershed predicted by Sack has not yet been reported by academic libraries. However, the September 1, 1991, issue of *Library Journal* (p.129) reported that dial-up usage at Cuyahoga County Public Library (Ohio) is 20% higher than on-site catalog use in the busiest of the system's 29 branches.
2. *Remote Access to Online Catalogs*, SPEC Flyer 142 (Washington, D.C.: Association of Research Libraries, Office of Management Studies, Systems and Procedures Exchange Center, Mar. 1988). The associated SPEC Kit 142 (116p.) contains the substance of the report.
3. "The University of California Union Catalog," *DLA Bulletin* 1, no.1:2–6 (Feb. 1981).
4. Edwin Brownrigg, "And the Big News," *DLA Bulletin* 3, no.2:1–3 (Oct. 1983).
5. "Six Million," *DLA Bulletin* 10, no. 3:19 (Winter 1990).
6. These data were published on the MELVYL Library System. Users may logon to the system and view detailed weekly and monthly statistics by typing the command SHOW STATISTICS. During the past decade of MELVYL union catalog development, the libraries of the Berkeley and Los Angeles cam-

puses developed their own automated systems which include online public access catalogs. Other UC campuses, notably San Diego and Santa Barbara, have purchased automated systems which support local OPACs. This helps explain why MELVYL system statistics appear disproportionately small for some of these campuses, particularly the larger ones. For example, total MELVYL system sessions for May 7–13, 1991, were 13,801 for Berkeley, 6,300 for Los Angeles, and 11,873 for San Diego. By contrast, total sessions for the large Davis campus and the medium-sized Irvine campus (neither of which have local OPACs) were 23,128 and 17,590, respectively. Total sessions for Santa Cruz, the smallest general campus, which also has no local OPAC, were 10,029. For campuses without local OPACs, the MELVYL system may serve as the de facto local online catalog.

7. This figure is derived from "Summary Terminal Usage Data for Networks, April 1991," published on the MELVYL Library System, May 1991.
8. Several reports document various aspects of this monumental study. For a work which integrates and analyzes those reports, see Joseph R. Matthews et. al., eds., *Using Online Catalogs: A Nationwide Survey* (New York: Neal-Schuman, 1983).
9. See Sally W. Kalin, "Support Services for Remote Users of Online Public Access Catalogs," *RQ* 31, 2:197–213 (Winter 1991), pp.197–213.
10. Evelyn-Margaret M. Kiresen, "Studying Dial-Up at UC Berkeley," *DLA Bulletin* 7, 4:12–14 (Dec. 1987).
11. Mary Horres and Susan Starr, "Evaluation of the MELVYL MEDLINE Database and Interface," *DLA Bulletin* 9, 2:14–16 (Fall 1989); and Margaret Gordon, "Users of the MELVYL Current Contents Database: A Survey and Evaluation," *DLA* Bulletin 11, 1:14–16 (Summer 1991).
12. This is the definition used in the ARL survey report cited above in reference 2.
13. The mounting of the online questionnaire to remote users of the MELVYL system was not a straightforward task, because of the complexity and dynamic nature of the system's network architecture. UC in-library terminals that appear to access the system remotely because of the way data are routed were successfully excluded from the project environment by DLA staff (with the exception of the single in-library site responsible for the eighty cases that were later deleted from the survey data). It was therefore not necessary to ask survey respondents whether they were using a public terminal in a UC library—a question that could have confused some respondents. In a few reported instances, the presentation of the questionnaire welcome screen interfered with the automatic logon script of a remote user. This was irksome for the user if the script contained a password not memorized, or if commands for automatic searching and downloading were contained in the script.
14. The total number of users who accessed the system remotely during the survey period was 14,946 (3 x 4,982). The total number of remote sessions for the same period was, however, 27,605. This apparent discrepancy is due to the way the system's statistical program counts sessions. Each START command issued (or its equivalent) signals the beginning of a session. A remote user may type START more than once in the period between connecting to and logging off the system. For example, the user might search the MELVYL catalog for a while, then type START CURRENT CONTENTS to enter that database. For session-counting purposes, entry to CURRENT CONTENTS constitutes a second session, even though the user is the same person. The average number of sessions or START commands per remote user in the period surveyed was therefore 27,605 divided by 14,946, or 1.85 per user.
15. Users who may have been unable to connect to the MELVYL system remotely during the one-week survey period of course had no opportunity to "be counted." The system does have information screens regarding remote access which may be viewed by keying EXPLAIN REMOTE. The DLA logs telephone calls received on its HELPLINE number, and some of these calls do pertain to connect problems. Although no data are readily available on the full extent of failure to connect, some information may be found in the user questions published on the MELVYL system. Users may enter questions on the MELVYL system via the COMMENT feature. The questions are answered online several days later by the DLA staff. For the one-week survey period, only eleven comments by remote users were subsequently published on the MELVYL system, a statistically insignificant percentage (0.0007%) in relation to the 14,946 users who accessed the system remotely. None of those comments pertained to connect problems. The investigators did review user comments from earlier periods and found several dealing with remote access. Some of these were suggestive of the kinds of connect problems remote users have. To see user comments on remote access, one may logon to the system and type the command SHOW COMMENT WORD, followed by terms such as *remote, dialup, connect, baud, Internet, Bitnet,* and the like. ■■

APPENDIX A. WELCOME SCREENS

Welcome to the University of California's
MELVYL LIBRARY SYSTEM*

PLEASE HELP US CONDUCT A SURVEY OF THE
MELVYL LIBRARY SYSTEM

In order to improve access to the MELVYL system, we are asking you to complete an online questionnaire consisting of 15 brief questions.

Have you already taken the questionnaire (since Monday, May 6, 1991)?
Please type YES or NO.

(c) 1984. *Registered trademark of The Regents of the University of California

[If the remote user typed NO, the following screen appeared:]

In order to study MELVYL system usage, we are conducting this questionnaire. We hope that the results will help us improve the system.
The questionnaire contains 15 questions and takes about three minutes to complete.

A small number of individual user sessions will be analyzed for this study.
All sessions will remain strictly confidential.
Are you willing to participate in answering the questionnaire?

Please type YES or NO, and press RETURN.

[If the remote user typed YES the following screen appeared:]

THANK YOU. PLEASE CONTINUE YOUR SESSION IN THE MELVYL SYSTEM.

When you are finished with your session, type END to receive the questionnaire.

[If the remote user typed END, the questionnaire appeared.]

APPENDIX B. ONLINE QUESTIONNAIRE

This brief questionnaire will help us to improve the MELVYL system databases. Please type the number corresponding to your answer for each question. Simply press RETURN without typing to go on to the next question without answering. Type END at any point if you do not want to complete the questionnaire.

MELVYL LIBRARY SYSTEM REMOTE USER QUESTIONNAIRE

A. Where is the microcomputer or terminal you are using located?
1. Your office or work area
2. Home
3. Dormitory
4. Laboratory
5. Classroom
6. Computer center
7. Academic library
8. Public library
9. School library
10. Special library
11. Other

B. How far is your microcomputer or terminal from a University of California campus or laboratory?
1. Located at a UC campus or laboratory
2. Within 5 miles
3. 6 to 10 miles
4. 11 to 25 miles
5. 26 miles or more

C. Is your microcomputer or terminal in:
1. California
2. Another state, west of the Mississippi River
3. Another state, east of the Mississippi River
4. Another country outside the U.S.A.

D. Which of the following best describes your present status?
1. Undergraduate student (freshman or sophomore)
2. Undergraduate student (junior or senior)
3. Graduate student
4. Postdoctoral student
5. Faculty or teaching staff at a college or university
6. Non-teaching staff at a college or university
7. Research assistant
8. Library staff
9. Programmer or systems analyst
10. General public
11. Other

E. Which one of these categories best describes your academic area of interest?
1. Arts and Humanities
2. Physical/Biological Sciences
3. Social Sciences
4. Business/Management
5. Education
6. Engineering/Mathematics
7. Computer Science
8. Medical/Health Sciences
9. Law
10. Library Science
11. Academic major not declared
12. Other

F. Are you a student, faculty or staff member affiliated with the University of California?
1. Yes
2. No

G. What is your age?
1. 16 or under

2. 17–24 years
3. 25–34 years
4. 35–44 years
5. 45–54 years
6. 55–64 years
7. 65 or over

H. Do you access the MELVYL system from your microcomputer or terminal:
1. Daily
2. Weekly
3. Monthly
4. Rarely
5. Have not accessed it before today

I. Do you print or download search results from your microcomputer or terminal:
1. Frequently
2. Occasionally
3. Rarely
4. Never

J. Do you use the MELVYL system public terminals in a UC library:
1. Daily
2. Weekly
3. Monthly
4. Rarely
5. Never

K. Since the MELVYL system is available outside the UC libraries, do you:
1. Visit UC libraries less frequently
2. Visit UC libraries more frequently
3. No change in frequency of visits
4. Do not visit UC libraries

L. Did you receive help in connecting to the MELVYL system for this session?
1. I received help from printed material
2. I received telephone assistance
3. I received help from instructions on the terminal screen
4. I received help from a library staff member
5. I received help from a friend or colleague
6. I received help through group instruction
7. I did not need help

M. After you connected to the system for this session, did you receive help in conducting your searches?
1. I received help from printed material
2. I received telephone assistance
3. I received help from instructions on the terminal screen
4. I received help from a library staff member
5. I received help from a friend or colleague
6. I received help through group instruction
7. I did not need help

N. Which one of the following would be most helpful to you in the future?
1. Additional or different printed instruction
2. Assistance over the telephone
3. Additional or different instructions on the terminal screen
4. Help from a library staff member
5. Help from a friend or colleague
6. Help through group instruction
7. I do not expect to need help

O. Which one of the following would you most like to see added to the MELVYL system?
1. Additional journal article citation indexes
2. Library catalogs of more non-UC libraries
3. Full journal articles in electronic format
4. Numeric databases
5. Encyclopedias, dictionaries, and similar works
6. Electronic bulletin boards
7. Graphic image databases
8. No opinion

APPENDIX C. SUMMARY OF SURVEY DATA

4,982 were asked if they had taken the questionnaire.
2,012 said Yes.*
26 said No and typed LOGOFF or START (i.e., didn't answer the second filtering question).
1,018 said they didn't want to take the questionnaire.
488 said they would, but forgot to.

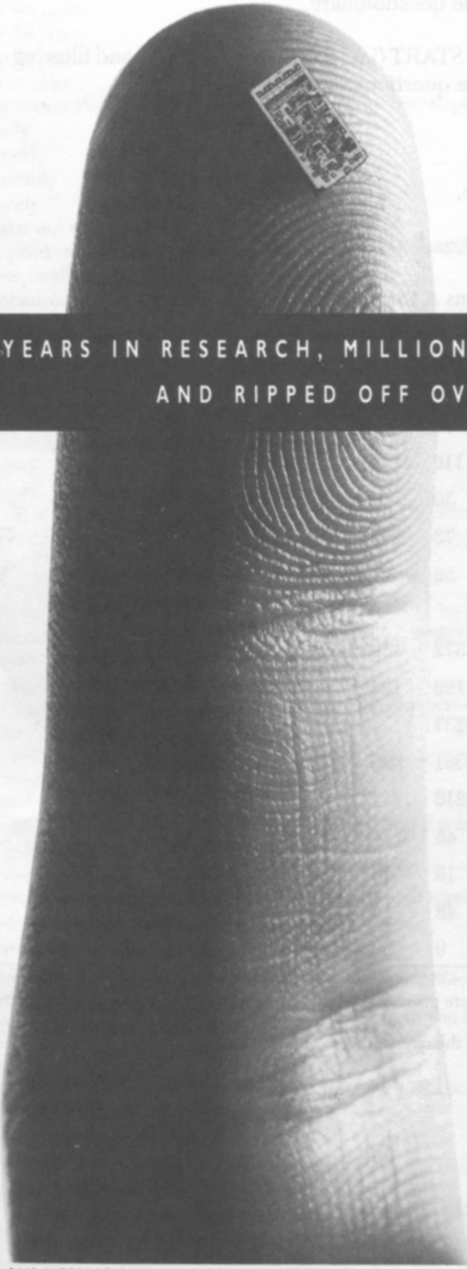
1,438 were given the questionnaire.
21 of those answered no questions,

Leaving **1,417** questionnaires to analyze.†

A summary of the answers to questions A through O:

		Answers											
Question	None‡	1	2	3	4	5	6	7	8	9	10	11	12
A	15	565	403	18	87	5	24	91	17	116	62	14	
B	17	636	254	117	116	277							
C	42	1,196	87	62	30								
D	32	79	115	333	73	253	88	35	184	27	81	77	
E	38	203	334	185	56	32	157	105	133	26	66	9	73
F	20	914	483										
G	36	11	269	453	372	189	70	17					
H	32	268	640	226	126	125							
I	48	555	387	190	237								
J	50	80	323	285	381	298							
K	57	292	117	738	213								
L	45	155	14	212	45	74	14	858					
M	54	84	4	435	19	16	6	799					
N	63	195	67	381	48	15	25	623					
O	48	425	195	433	9	99	49	47	112				

*The discrepancy between this figure and the 1,438 users who answered the questionnaire must be accounted for, in part, by the large number of daily users who were presented with the questionnaire more than twice in the one-week survey.
†This figure constitutes a 28% "return rate" for the questionnaire (1,417 divided by 4,982).
‡Number of non-responses.



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Tutorials

Downloading and Printing Search Results from Online Databases

Jon Hagee and Karl-Heinz W. Boewe

The University of Kentucky Medical Center Library is a medium-sized library serving five colleges and a hospital. During the past year the university's main library and its various branches changed automated systems from LS/2000 to NOTIS. In addition to an online public access catalog (OPAC), our system offers the MEDLINE and ERIC databases online through the Multiple Database Access System (MDAS) developed by NOTIS. There are four OPAC/MDAS terminals available to the public in the Medical Center Library.

Since NOTIS/MDAS did not include a program for downloading search results, the library was looking for a method that would allow a user to capture selected screens during the scanning process into a file that subsequently could be downloaded or printed before concluding the search session. This article describes the method we devised to provide patrons a downloading and printing capability.

HARDWARE

For terminals, we turned to inexpensive personal computers with both 5.25-inch and 3.5-inch floppy drives, 1 megabyte of RAM, and extended keyboards. Though a 286 provides adequate computing power for the downloading method described in this article, it is recommended that if libraries are acquiring new PCs, they acquire ones with at least 386SX processors to allow for future requirements. It should be noted that we did not install hard drives in these public-access PCs. There were several reasons for this decision:

1. To save money.
2. To avoid the problem of patrons using the terminals for other than their intended purposes.
3. To make use of the higher speed of RAM drives.
4. To avoid computer virus problems by using a write-protected bootup disk to bring up the workstations each morning.[1]

SOFTWARE

We used Procomm Plus, DOS 5.0, a file-viewing program (the DOS command "type [filename]" suffices), some custom programming, and various batch and communication script files. One of the functions of the custom programming is to strip out command lines from the screen snapshots before downloading them to disk; this programming will be slightly different when used with different databases to allow the program to take account of varying screen formats. Our programming is written for use with NOTIS/MDAS, but a few changes would allow it to work with other types of databases.[2]

IMPLEMENTATION

The bootup disk (1.44 Mb floppy) creates a RAM drive, called *drive C*, and copies essential files to it, freeing up the floppy drives for downloading. The bootup disk is not needed again unless the computer needs to be rebooted. With a disk for each workstation and batch and script files for automatic bootup, several stations can be started up at the same time.

We use Procomm Plus with Televideo 955 terminal emulation. This combination seems to allow for maximum key configuration, color choice, and flexibility for external programs. Other high-end communications packages likely would work as well.

A screen "snapshot" saves each screen to a file in drive C. With one megabyte of RAM, there is a limit of about 125 screen saves per session. This limit can be increased to several hundred more by adding more RAM memory. The user may view the "memory file" at any time, using a macro to activate the DOS command "type [filename for saved screens file]."

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When a patron wishes to download and print the contents of the file in memory containing the saved searches, a download and print command calls a custom program that strips the command lines out of the multiple-screen save file. Four inches are cut from each screen, allowing three screens per printed page. The program quickly checks for a formatted floppy in either drive, returning an error message if the floppy is not formatted. If the drive is ready, it will copy to the disk. If there are no disks, it proceeds to print. The program will wait until the printer is ready. After printing, it asks if everything went all right. If the user responds Yes, the program clears the memory file. Otherwise, it prepares to reprint the file. The guide card shown in figure 1 aids patrons in using this feature.

Printing and Downloading

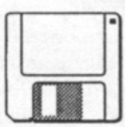
As you look through your references you can save individual screens to print (or download) when you have completed your session.

Step 1. Press **Alt-G** to take a "snapshot" of the screen and save it in memory. (The word SNAPSHOT will flash in the bottom left corner of your screen each time you use **Alt-G**.)

Step 2. Repeat for each screen you want to save (up to 125 screens).

Step 3. Press **Alt-A** to print or download your collection of snapshots. If you want to download to a disk, place a *formatted* floppy in either A: or B: drive.

Step 4. Press the **Enter** key at the prompt for parameters. The program will then either download to your disk (if one is in a drive) or ask if you want to print.



Reminders:

- Words in bold are the names of keys.
- Hold down the Alt key and tap the letter key at the same time.
- Press **Alt-V** at any time to view the screens (snapshots) you have saved so far. Note that the appearance of the screen changes in the "view" mode. Use the arrow keys (↓↑) to scroll through your collection of snapshots. Press **Esc** to exit from the "view" mode.
- If you download to disk, the file is automatically named 1NOTIS.TXT.

Figure 1. Guide Card.

The "Num Lock" key has been disabled by inserting a plastic ring under the key. The "Page Up" "Page Down" keys have been reprogrammed to allow the screen to scroll up or down. With color monitors, we are able to hide the Procomm status line by setting the color to black on black. The user may not even be aware that he or she is operating a communications program.

CONCLUSION

We have attempted to set up a low-cost, high-return workstation to provide maximum use of NOTIS for the patron and to ease setup and maintenance for the staff. Fast RAM drives and integration of printer and floppy downloading have helped us achieve these goals. The method we have devised for downloading and printing NOTIS screens could easily be applied to other online databases, though the software for stripping out unwanted lines would have to be customized for the particular database's presentation format.

NOTES

1. Booting up fresh each morning from a write-protected disk virtually eliminates computer virus problems and the need to constantly scan for viruses. Since all activity is an automated one-way data transfer (RAM drive C: to patron's A: or B: disk), accidental infection is avoided. Any attempt to deliberately boot up from a virus-laden disk will erase the RAM drive leaving an unusable station; only the staff-supplied boot disk will revive it.
2. Further information on the custom programming involved may be obtained by writing to the authors or contacting them on the Internet at (Hagee) MCLHAGEE@UKCC.UKY.EDU or (Boewe) MCLK-HWB@UKCC.UKY.EDU. ■■

Local Holdings Searching in CD-ROM Databases

Charles F. Priore, Jr., and Richard E. Miller

While CD-ROM technology has enhanced access to periodical indexes, some libraries have felt the need for an optional capability to limit search results to titles represented in the library's local holdings. This tutorial discusses a method for limiting a topical search of a CD-ROM bibliographic database to the titles held by the local institution.

Term papers form a major component of the curriculum at Carleton College. In addition to short term papers with brief deadlines, all Carleton degree programs have a major paper or exam required as part of the "comprehensive exercise." Comprehensive papers are extensive and almost always require access to periodical titles not held at Carleton. Minnesota academic libraries are members of MINITEX, a state-funded library network which has an outstanding record of enhancing interlibrary resource sharing. But even with this exceptional access to books and periodicals from beyond their own campus library, students often are limited by the time available for term paper research. The benefits of a CD-ROM database, in terms of the bibliographic access to relevant citations that it provides, can be negated by the material being unavailable in time to meet the research deadline. In such instances, students need to be able to focus their use of the CD-ROM database on materials held in their local campus library. At Carleton College, we have developed a method of customizing the SilverPlatter products, PsycLit and GeoRef, so that patrons have the option of identifying only journal articles that are held at our campus.

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METHODOLOGY

The first step in our methodology was to identify serial titles in the subject areas covered by the CD-ROM databases. At the Carleton College library, all periodical subscriptions are selected either by the faculty in the teaching departments or by the library staff. It was a simple task for the library's acquisitions department to identify all current periodical titles requested by the psychology department or the geology department and to obtain their ISSNs. Next, a librarian reviewed the current periodical subscription lists of allied departments (e.g., sociology and anthropology) and the general subscription list. Likely titles were identified based on the librarian's knowledge of the periodicals and on keywords in the periodical titles.

Using this working list of ISSNs, a librarian and a student assistant searched PsycLit and GeoRef by ISSN.[1] In PsycLit and GeoRef, the command is "FIND IS=1234-5678." It is possible to combine up to nine ISSNs in a single FIND statement with the Boolean OR operator. The final FIND statement combines all the ISSNs from the working list.

The command "F10 — H[istory] — S[ave]" saves this entire series of FIND commands as a search history file (SEARCH.HIS) to a floppy disk. The search history file is a text file that contains the FIND commands saved from a previous search. In effect, it is a batch file. The number of FIND commands may be small or large, depending on the number of titles held locally. The SEARCH.HIS file used at Carleton for current periodical subscriptions in psychology has over 150 FIND commands, and each FIND command has several ISSNs. This floppy disk can be made available at the reference desk as needed, and users can copy the SEARCH.HIS file to their own floppy disks for future use, if they desire.

Typically, a user will first search PsycLit or GeoRef for their topic, noting the number of the final result statement. This latter search result represents all the citations relevant to their topic in GeoRef or PsycLit, regardless of whether the local institution holds the title cited or not. In order to further limit this result to local holdings, it is necessary to run the search statements stored in the SEARCH.HIS file in order to arrive at a search result that represents titles in the local collection. To do this, the user inserts the floppy disk with the SEARCH.HIS file and executes the command sequence "F10 — H [istory] — R [un]." This holdings search will take three to four minutes to complete.

When the SEARCH.HIS file has been run, the user then combines the final result statement of the topical search with the final result statement of the holdings search, using the Boolean AND operator. The result will be a list of articles on the topical search that can be found in the local collection. For example, after a topical search on "tectonics" and "Malta" that is limited to English-language titles and that excludes abstracts, the final search set might be "#7." The searcher then combines set #7 with the last set number of the journal holdings search in the SEARCH.HIS file. The final FIND statement might be "FIND #7 and #73." The result of combining these search sets is a bibliography of journal articles, in English, on tectonics in Malta, limited to those journals held in our library.

DISCUSSION

At Carleton, patron instruction on use of CD-ROM resources includes tutelage on how to limit topical searches to local holdings, using the above method. As a result, geology and psychology students and faculty looking for a rapid list of local sources now employ this customizing feature regularly. Our inquiries reveal that it is heavily used and much appreciated since patrons know that the sources they retrieve will be readily available. Many students and faculty have requested copies of the SEARCH.HIS file to use when they work with the SilverPlatter CD-ROM databases, and we feel certain that this capability to limit a search to the local holdings is viewed by our community as being very important.

We must emphasize that Carleton's customizing service has some limitations. To begin with, we limited it to current periodical subscriptions; titles that were dropped or that ceased publication were not included nor were standing orders to series titles. Also, a large research institution might find that its holdings are too large to make a journal holdings search command file practical. The labor in compiling and keying it would be daunting, and the time required for the search to run might be unacceptably long. Another drawback for some institutions may be the large amount of RAM—2 megabytes—required to run a search combining a local holdings search and a patron's topical search. Another limitation for institutions that have several branch libraries is that there is no location information for the titles. For institutions that shelve periodicals by call number, the lack of call number information in the search result also could prove a problem.

In principal the method we use for SilverPlatter databases could be applied to other CD-ROM databases as well. What would be required is the ability to save searches to disk and run searches from disk, a list of relevant locally held titles, and a corresponding list of search keys for these titles searchable in the target database. If a database does not have ISSNs (or CODENs), then serial title might be an alternative search key, though a holdings search using serial title likely would take longer to enter and to run than a search using ISSN or CODEN.

SilverPlatter and some other vendors are working on releasing software to link CD-ROM search results to local holdings. Until this new feature is universally available, we are convinced that the local holdings customization described in this article is well worth implementing, especially in the small college library. The startup costs of the labor involved in compiling a title list, keying in search commands, and expanding the RAM on the microcomputers that run the CD-ROMs are relatively small compared with the benefits to patrons.

NOTE

1. Some SilverPlatter databases may not allow ISSN searching, but do allow CODEN searching. (The CODEN is a unique serial identification consisting of six characters. These are assigned and administered by the International CODEN Service of Chemical Abstracts.) Others use a slightly different way of searching for ISSNs. In other databases it is "FIND ISSN= 1234-5678." For CODEN searching, the command is "FIND CO= JGRCEY." ■■

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Recent Publications

Book Reviews

Davies, Peter. *Artificial Intelligence: Its Role in the Information Industry.* Medford, N.J.: Learned Information, 1991. 114p. paper, $39.50 (ISBN 0-938734-50-4).

In 1988, Peter Davies undertook a study of the role artificial intelligence can play in the information community. The study was prepared for members of the European Association of Information Services (EUSIDIC), which regularly publishes the results of its studies in book form. This book is the revised and updated version of his report.

Davies comes from a background in MIS and artificial intelligence (AI), calling himself a "newcomer to the information industry." His target audience is managers in the information industry, and his writing reflects the corporate arena far more than the public or academic library. His goal is to answer two questions: First, will artificial intelligence be useful and important for the delivery and use of information and, if so, when? Second, how does one go about adding new products and services incorporating AI technology? These are questions well worth asking, and information managers need to know the impact AI and its subgroup expert systems will have on them. However, this book falls far short of filling that need.

A report in book form is still just a report, and no update or expansion of the original material appears to have been made. The eight chapters of the book proper require only eighty-four pages. The thirty pages of the first three chapters attempt to provide a quick survey course on AI. Chapter 4 includes Davies' observations on the large interest shown in AI and expert systems among data processing and MIS people compared with those in the information field. Here Davies gives some of his most valuable advice: expert systems development tends to center in the Data Processing or MIS departments of organizations, and information providers who do develop them tend to consult only the experts and overlook the users. He contends that by allowing the software industry to lead in this technology, they will supplant the information industry as information providers to mangers. Chapters 5 through 7 have interesting suggestions for expert systems topics that could be developed by sectors of the information industry, but these could have been combined into a single chapter, especially since they include substantial amounts of identical material. The glossary offers nothing that could not be found in a standard AI work. The bibliography reflects the British source of the book: thirteen of the thirty-one titles named are from the U.K.

This book has interesting and important observations on the information industry's perception of AI and some valuable suggestions for projects, but these would have better served the information community had they been published in a journal article. In book form, the contents simply do not justify the price.—*Douglas A. Kranch, Ambassador College, Big Sandy, Texas.* ■■

Dewey, Patrick R. *Adventure Games for Microcomputers: An Annotated Directory of Interactive Fiction.* Westport Conn.: Meckler, 1991. 157p. $49.50 (ISBN 0-88736-411-X).

Patrick R. Dewey, author of several books and articles on microcomputers, has updated his 1988 directory titled *Interactive Fiction and Adventure Games for Micro Computers: An Annotated Directory*. In the introduction he describes the different categories of computer games available (e.g., simulations, board games, strategy games). While the author notes that images have been available on television for many years, he sees the computer's added capacity for interaction as new and positive. Computer games, besides being entertaining, are a good way to introduce children to microcomputers, to increase their interest in reading, and to improve other such as logical thinking and puzzle-solving. Since the first edition of this book, adventure programs, which were originally mostly text based, have added graphics and sometimes animation, and now rely less on reading and keying. An increasing number of these more sophisticated games are now available.

This book is an annotated directory of adventure games for adults and children. For each program it includes (when available) program name, vendor, cost, grade or difficulty level, hardware requirements, type (i.e., graphics or text), and a description. Sample screens are shown for some of the programs. Dewey's program descriptions are easy to understand, and many point out the skills that can be gained from using the program. Games for all ages, for different types of microcomputers, and for users with different levels of computer skill are included.

The appendixes include vendors and their addresses, books to help the user of adventure games, game magazines, software available to help create games, and discount sources for game software and products. There is also a title index.

In a previous book, *Public Access Microcomputers: A Handbook for Librarians, Second Edition*, the author explored the use of microcomputers in libraries. For librarians who have computers for public use this current work would be a valuable companion volume as a guide for selecting available and appropriate game software for their users. It would also be a useful reference tool for individuals interested in purchasing software for home use.—*Bonnie Birman, New York Public Library.* ■■

Intner, Sheila S., and Josephine Riss Fang. *Technical Services in the Medium-sized Library: An Investigation of Current Practices*. Hamden, Conn.: Library Professional Pubs., 1991. 189p. $35 (ISBN 0-208-02173-6).

Building on earlier studies by Tauber, Gorman, and others, Sheila Intner and Josephine Fang explore, in their new book, the entire gamut of library technical services. Whereas other publications on this subject have concentrated on large, research libraries, the emphasis here is on medium-sized libraries, both academic and public. Intner and Fang define "medium-sized libraries" as those serving student populations between 2,500 and 10,000 or general populations between 50,000 and 150,000.

To the authors, "technical activities focus on materials rather than on the people who use them." Thus, technical services encompass the acquisition, cataloging, processing, maintenance, and preservation of items. The authors cover all of these functional areas and also the not-so-easily-classified areas of collection development, circulation, and interlibrary loan.

The book is based on a survey conducted by Intner and Fang, who mailed questionnaires to 120 libraries and received 61 usable responses. In no place is it indicated whether the libraries chosen represented a random sample.

Since the authors wished to explore the thesis that computer-based systems have become integral to technical services, they include an entire chapter on automation. They follow that with sections on acquisitions, preservation, cataloging, circulation, interlibrary loan, and finally collection development. The concluding chapter is a futuristic view of the electronic library, especially as it relates to technical services. The author of this last essay, Pamela McKirdy, is sensible and conservative; she predicts no startling revolutions.

In each of the middle chapters, Intner and Fang present a historical background followed by a description of current operations. Only at the conclusions of chapters, and then only for two to three pages each, do the authors discuss the pertinent survey results, which rarely offer surprises, but do provide useful data.

The stated audience of the book is library managers, library school educators and students, and practicing librarians—in both public and technical services. The book does not begin to supply enough information to be a how-to manual for any technical services librarian, but it does provide a fine overview of each functional area. Technical services personnel might find the chapter on preservation to be the most instructive if only because of the "alarming lack of any preservation policy" in most libraries.

Intner and Fang's prose is generally clear and consistent, and the arrangement of their book is logical. They provide a good index and glossary, complete notes, and up-to-date bibliographies. The appendix includes a partial list of institutions participating in the survey, but leaves out the survey instrument itself—a grave shortcoming.

There are relatively few idiosyncracies in the book. The authors at one point define "retrospective conversion" as the "conversion of pre-AACR2 headings to AACR2 style," (a definition I have yet to hear anyone else employ). They are also fans of conversion tables between the Library of Congress and Dewey Decimal classification tables (a theoretically lovely concept that becomes impractical in view of the tables' complexities and the constant upheavals in Dewey Decimal classification).

All in all, this book succeeds admirably in its attempt to introduce, in moderate detail, library students and librarians to all functions that might conceivably be classified under the rubric "technical services."—*Douglas Koschik, Baldwin and Bloomfield Township Public Libraries, Birmingham, Michigan.* ■■

Mates, Barbara T. *Library Technology for Visually and Physically Impaired Patrons*. Westport, Conn.: Meckler, 1991. 190p. $42.50 (ISBN 0-88736-704-6).

This book is a wake-up call for libraries and librarians who have paid little or no attention to the needs and challenges faced by the growing number of patrons with disabilities. A concise, well-illustrated guide to the explosion in new assistive technology and equipment, Mates' book will serve as an excellent introduction for libraries wanting to know what is out there.

Based on her convictions that the fastest growing group needing library and print access is the visually impaired (p. 8) and that the most critical gap in the National Library Service for the Blind and Physically Handicapped Network's service has been its inability to provide timely and quick reference service to its patrons (p. ix), Mates devotes a great deal of attention to computer hardware and software and CD-ROM products, since these forms of technology will provide access to information for people with disabilities.

In each of the ten succinct chapters, Mates describes (and often illustrates) both the generic types of technology available and a number of specific products currently produced, often with evaluative comments based on testing by centers like the National Technology Center of the American Foundation for the Blind. The overwhelming focus of the book is on visual impairments, with separate chapters on large print access, braille access, optical character recognition systems, keyboards, and processing information without a keyboard.

Appendixes include a list of distributors, "CD-ROM Titles That Translate into a Special Format," "Bulletin Boards Addressing Handicapped Person's Needs," and "Funding Sources for Adaptive Equipment."

Mates' book should be essential reading for any library, whether public, academic, or special, that is seeking to respond to the needs of its patrons with disabilities. This volume will have to be supplemented by others that address more fully the rationale and motivation for providing these services, the importance of careful needs assessment and community involvement, and the requirements of populations with the many other kinds of disabilities (like mental retardation) that are not currently served by most libraries.—*Dennis A. Norlin, University of Illinois at Urbana-Champaign.* ■■

Ogg, Harold C., and Marlene H. Ogg. *Optical Character Recognition: A Librarian's Guide*. Westport, Conn.: Meckler, 1992. 171p. $39.50 (ISBN 0-88736-778-X).

This introduction to optical character recognition (OCR) technology, targeted for use in libraries and schools, succeeds at only part of its mission. The most useful sections are those that list and describe hardware and software products for OCR and related applications, such as desktop publishing and image editing. The book is much less successful in explaining the technology to novices.

Some of the book's problems are organizational. After a good introductory chapter that covers the basics of what OCR is and how it works, the authors launch directly into the descriptions of specific hardware and software packages. The descriptions often use terminology which is not explained until a later chapter. For example, the software descriptions list the image file formats supported by each software package, but the concept of these file formats is not explained until later. Adding a glossary of terms might have solved some of these problems.

Four brief case studies, which provide the only motivation for why a library might want to use this technology, are at the very end of the book. The applications described include production of a newsletter, converting a manually typed index to a university's master's thesis, producing a revised edition of a textbook that was not already in machine-readable form, and compiling the results of a university's class evaluations. Over half of this chapter is devoted to a copy of the dBASE program used to compile the class evaluations, which would be useful only for someone with a very similar application. The deemphasis on practical applications of the technology makes the book useful mainly to librarians who already know they want to use OCR for a particular project. A librarian who is not already convinced of a need for this technology will not be persuaded by reading this book.

The hardware chapter, on the other hand, may be helpful to a broader audience than just those interested in OCR. It contains a good introduction to both IBM PC and Apple Macintosh architecture. Topics such as IBM compatibility, clock speed, microchips, storage, and memory are explained for people with little technical knowledge. Details about different models and pricing are given for the Macintosh but not for the IBM PC because, as the authors say, there is so much more variability in the IBM PC world. Unfortunately, the IBM/Macintosh comparison focuses on technical architectural features, rather than on the user interface issues that might be more important to a library audience.

The book includes a thorough index and an annotated bibliography. A half-page "Closing Thoughts on OCR" was, by the authors' admission, added as an afterthought to provide "some sort of concluding chapter," but adds no significant conclusions to this uneven work.—*Fae K. Hamilton, Information Technology Consulting, Carlisle, Massachusetts.* ■■

Olsen, Nancy B. ***Cataloging Motion Pictures and Videorecordings.*** Lake Crystal, Minn.: Soldier Creek, 1991. 150p. paper, $25 (ISBN 0-936996-38-2).

This book is a basic "how-to" manual for cataloging motion pictures and videorecordings, and is intended to be used in conjunction with the 1988 revision of *AACR2*. It begins with twenty-four pages of text clearly laid out in the same order as the relevant chapters in *AACR2R*, beginning with the chapter on descriptive cataloging (chapter 7) and proceeding with a discussion of access points (chapter 21). Following this are Library of Congress (LC) guidelines for assigning subject headings and LC classification numbers, and a brief discussion of interactive media.

The remainder of the manual consists of forty examples of all types of motion pictures and videos—feature films, animated films, television shows, instructional programs, documentaries, etc. The vast majority of examples are for videos, although some of these videos were originally issued as theatrical films. This is perhaps understandable because of the widespread popularity of videocassettes and the fact that most catalogers would be more likely to have to catalog them than other audiovisual materials.

In each example, information important to cataloging has been transcribed from the item, and a complete catalog record has been prepared, which is then presented in both card format and in OCLC MARC format, complete with appropriate tagging and subfield codes. Examples represent the sort of full, archival cataloging done for the LC Copyright Collection. Some examples are drawn directly from LC MARC cataloging. With their extensive tracings and use of uniform title main entry, they may go beyond what some libraries require.

The information contained in the manual is generally quite accurate and comprehensive, but unfortunately there are errors. For instance, the information transcribed for one example states that Humperdinck's opera *Hansel and Gretel* was performed in English, but nowhere is this mentioned in the catalog record. There should be a 500 note so stating, and the composer/uniform title added entry should also include the word "English," since the work is not being sung in the original German but in an English translation. "Live from the Met" is a television program and merits a 730 added entry. Also, the date and place of performance should be coded in a 518 field, not a 500.

Several examples include the 500 note "Closed-captioned for the hearing impaired" with the requisite 650 "Films for the hearing impaired" or "Video recordings for the hearing impaired." According to the information from the back of the container, example 17 is also closed-captioned, yet there is no 500 note or 650 in the catalog record to indicate this.

Another example is an episode of the television program "Star Trek." Why does it have the 650 "Science fiction films" instead of "Science fiction television programs?" "Science fiction films" is a more appropriate 650 for *Star Trek, the Motion Picture*. "Amos n' Andy" is also a TV program, yet the 650 says "Comedy films." The correct 650 should be "Television comedies."

Some of these errors and omissions might be forgiven were it not for a more serious flaw. Despite the 1991 copyright date, the contents of the manual actually date from early 1989, making it much more out of date than one might initially suppose. This means that subsequent changes in cataloging practice, such as the validation of fields 518 and 538 for videorecordings, are not included. Information that would correctly be coded in those fields today is instead coded in the 500 field in the examples in the manual.

Somewhat dated and not entirely error-free, *Cataloging Motion Pictures and Videorecordings* still provides a helpful compilation of useful information about its topic. Although this manual might be too basic for a more experienced cataloger, the novice cataloger confronted with processing audiovisual materials for the first time should find it quite helpful in exploring a rather complex topic.—*David L. Brown, The Branch Libraries, New York Public Library.* ■■

Search Sheets for OPACs on the Internet: A Selective Guide to U.S. OPACs Utilizing VT100 Emulation. Ed. by Marcia Klinger Henry, Linda Keenan, and Michael Reagan. Westport, Conn.: Meckler, 1991. 175p. $39.95 (ISBN 0-88736-767-4).

This guide to Online Public Access Catalogs (OPACs) on the Internet is a welcome addition to the various lists of Internet resources, most of which are "published" on the Internet itself. The volume begins with an overview of OPACs, describing the need for this work, its coverage, the methodology used to compile the data, the arrangement of the information, and a brief bibliography.

Although not stated, the readership most likely to make use of this work is presumably librarians trying to locate an item not found via an OCLC or RLIN search, and researchers with a need to search a collection with a particular subject strength which is outside their own institution. Whereas the search sheets themselves should be understandable for most users, some of the terminology in the introductory section of the book will likely prove foreign to nonlibrarians. For novice users of the Internet, a more thorough discussion outlining some of the pitfalls of accessing the Internet would have been useful. The authors do mention that "Internet connections can be slow and unreliable" but it is also not uncommon to find that certain keys (e.g., the back-space key) do not always function as they were meant to in various OPACs. It can be particularly irritating to find oneself locked into a long display of full records because the break key will not cut off the display.

The authors have taken the idea of standardized work sheets, such as those used by DIALOG or BRS, to outline the major functions of an OPAC in a clear, easy-to-scan display. They have wisely identified five primary functions or commands that are of major importance to the remote searcher of an unfamiliar OPAC: author, title, subject; truncation command; Boolean capability; limit options; and display commands. With these elements clearly delineated in a standardized format on the worksheet, searching OPACs on the Internet is made quick and efficient. Additional indexes, such as call number, ISBN, language, etc., are included on the search sheet where relevant, but only after the major elements listed above.

A very useful feature of these search sheets is the emphasis on command mode or experienced user commands. Often these are not intuitive to the casual, distance user. For the experienced searcher, being given the command mode basics rather than having to use the novice interface, not only makes the interaction more efficient, it often enables searches that would otherwise not be possible in the novice mode.

Since resources, particularly OPACs, are being added to the Internet so rapidly, this volume will, as the authors acknowledge, become rapidly outdated. A loose-leaf format, where revisions and new sheets could be purchased on a subscription basis, would have extended the useful life of this work.

The main body of the work contains search sheets for twenty-five U.S. OPACs using VT100 emulation. However, as the authors point out, these twenty-five OPACs provide access to collections in approximately 1,000 libraries. This guide does not attempt to cover gated OPACs. For example, although the MELVYL system provides a gateway to the Dartmouth University Library catalog among others, Dartmouth is not included in the index, because MELVYL system commands are not effective in searching the Dartmouth catalog. This is a selective listing—in the example of ILLINET Online, although there are 800 participating libraries in ILLINET, only the college, university, and regional library systems are included in the index.

Appendix A identifies the turnkey platform on which eighteen of the twenty-five OPACs are based. The remaining seven are custom-designed OPACs. The usefulness of this one-page listing would seem to be for potential purchasers of turnkey systems wanting to look at viable applications. Most users would probably not find this appendix very useful.

Appendix B details online help for seven of the featured OPACs. This section of the book covers some 100 pages but I found it of marginal use. Because most help screens are context sensitive and are therefore designed to be used online at the point where the user finds him or herself in trouble, I question the usefulness of this information in printed form. One possible use is to look through the listings, which can be extensive (the MELVYL system section covers some forty pages and is an edited listing at that), in order to determine how to find more information online about a specific function that one is particularly interested in. In this manner the section does act as a brief manual for the particular system. Two indexes are provided; the first is an alphabetical index by library name and the second is a geographic index arranged by state. Both of these are useful access points for searchers requiring access to a known OPAC.

Search Sheets for OPACs on the Internet is a useful set of guidelines for searching a selected number of OPACs currently available on the Internet. It is recommended for purchase by libraries who have a clientele with a need to search any of the OPACs covered in this work. It provides an easy primer for conducting such searches without having to take time to experiment online with an unfamiliar search interface.—*Dawn Talbot, University of California, San Diego.* ■■

Talley, Marcia D. and Virginia A. McNih. *Automating the Library with askSam: A Practical Handbook.* Westport, Conn.: Meckler, 1991. 184p. $39.50 (ISBN 0-88736-801-8).

Judging from recent activity on the LIBRARY electronic bulletin board (accessed through an Internet listserv owned and coordinated by Donna B. Harlan and John B. Harlan), the timing of this handy volume is perfect. A subscriber to the bulletin board had asked if there was an inexpensive, easy-to-use PC software package to help manage a small library. Several respondents recommended askSam in the most laudatory terms. The authors of this volume describe themselves as two "average librarians," but the quality of the book they have written suggests otherwise. This handbook will prove indispensable to anyone who chooses to automate a small library using askSam.

For the uninitiated, askSam is a generic text-based data management system. It is mature (originally released in 1985) but consistently upgraded software (version 5 released in 1991). Data can be highly structured, completely unstructured, or a combination of the two. AskSam operates under DOS 2.0 or higher. File size is limited only by the capacity of the PC's disk storage.

The authors have organized their text into a logical chapter sequence that begins with general "getting started" instructions, followed by chapters on serials check-in, acquisitions, cataloging, and interlibrary loan. The last four chapters discuss importing and exporting files, using askSam as an office manager, developing menus, and using available askSam information resources. Although one author wrote five chapters and the other, four, they obviously have honed their editing skills. Stylistic variation is not obvious and in no way impedes the reader.

The chapters on serials check-in, acquisitions, cataloging, and interlibrary loan are particularly strong. Each uses a formula that is easy to follow: the purpose and results of the programming that follows, the template for the record type, creating records, using records, record examples, and programming reports and other output products. Readers of this handbook will find suggested templates and the step-by-step program instructions to be especially valuable.

The chapters on exporting and importing files and on office management also contain a great deal of helpful information and programming instructions. The authors describe, in just enough detail, importing ASCII, spreadsheet, and other database files. Because askSam is so easy to use, they also suggest ways to use askSam for entering data and then converting and exporting the data in another format. AskSam can also manage invoices, create budget reports, manage mailing lists, and create labels and cards by following the authors' programming instructions.

The last chapter, among other things, describes the askSam electronic bulletin board, to which askSam users may subscribe. The authors have thoughtfully made all the programs described in their handbook available in a single file from the bulletin board. An appendix lists all files available from the bulletin board as of March 1991.

Even without an index, *Automating the Library with askSam* would be a valuable handbook. Its excellent index, which includes proper names, general terms, and specific terms, however, makes it a superlative example of the practical "how-to" guide.—*Stephen Marine, University of Cincinnati Libraries.* ■■

Woodsworth, Anne, with the assistance of Thomas B. Wall. *Library Cooperation and Networks: A Basic Reader.* New York: Neal-Schuman, 1991. 208p. $39.95 (ISBN 1-55570-088-8).

This work deals broadly with most aspects of current interlibrary cooperation and includes some historical background. The impact of technological developments on the formation and functioning of library networks is a major theme, but there is as much emphasis on the sociology and politics of the movement.

Woodsworth first gives a useful definition of a network as "a formal organization composed of member libraries that have some shared goal or goals, and that realize the goal(s) in part through reliance on computing and telecommunications techniques." Automation is clearly a powerful means to achieve an ancient professional end.

A second chapter covers the growth of library cooperation with special attention to OCLC, Reasearch Libraries Group, UTLAS, and WLN. Chapters follow on types of cooperation, technology to realize it, motivations, governance, cost/benefit, management, government support, and achievements/failures.

The book does a service to researchers, neophytes, and decision makers. For the researcher, it is an excellent summary of the current state of library cooperation. It does not attempt much detailed description, but includes chapter bibliographies and a full bibliography at the end for those desiring it. The author also points out areas requiring further research, for example, the lack of adequate documentation on networks using local automated systems, or problems in evaluating costs against the benefits of cooperation.

The wide-ranging treatment of cooperation and the historical introduction give the beginning student a good introduction to the subject. At the end of each chapter are "suggestions for discussion," evidence of the educator's concern for reinforcing student learning.

But the book is probably most useful to the library administrator weighing the economics of joining or remaining in a network. There is no case study of cost/benefit, but considerable text is devoted to the possible pitfalls and rewards for each kind of library. In this, the economics of automation has an important role to play. Some small consortia have been wiped out by rapid advances of technology which by comparison made locally developed systems prohibitively expensive to maintain. But the major point Woodsworth brings out is that after twenty-five years of technological advances, a large number of small libraries do not participate in regional networks, and this for mostly economic reasons.

In the 1970s, major economies of scale in technical processing were achieved by the bibliographic utilities. In the 1980s, the local automated systems came into the networking picture by offering local systems that facilitated cooperation in a wider range of services. Both of these developments seem to have run their course without being able to bring prices to the level of the little guy. The author does not say so directly, but small library automation seems to be taking place on a purely lócal level using CD-ROM and PC-based systems. It can't use the more expensive technologies needed for resource sharing.

Clearly most librarians want interinstitutional cooperation. The successes documented here are testimony to their loyalty to bibliographic ideals such as the national union catalog. The challenges facing automation for the nineties are less technological than economic and political. What must be done to make the benefits of library cooperation available to all? We have heard some very similar questions in the areas of health care and housing. Woodsworth contributes importantly to the discussion from the library cooperation perspective.—*Thomas P. McGinn, Wayne State University.* ■■

Software Reviews

Lesko, Matthew. *Lesko's Info-Power.* Ed. by Andrew Naprawa. Kensington, Md.: Information USA, Inc., 1990. 1,085p. $33.95 plus $5 P&H. Diskette version, $59.95. Available from Infobusiness Inc., 887 S. Orem Blvd., Suite B, Orem, UT 84058-5009.

Matthew Lesko's newest "how-to-find-out" book, *Lesko's Info-Power,* is a massive compendium of information sources. Most of them are in the federal government, though there are a number of listings by state of sources in housing, education, the arts, travel, banking, and the like. The entries all provide an address and phone number. The topics cover virtually every imaginable subject.

Lesko's primary focus is not on printed sources, but on phone numbers to call of people who are likely to have the information you want. His first rule is that there is a government expert on whatever you are looking for. His second rule is that it will take you, on an average, seven phone calls to find that person. He also provides a useful list of pointers and courtesy tips that will improve your odds of reaching the right person and getting the information you want.

The book is primarily addressed to information brokers and end users. It is difficult to imagine a public or academic reference librarian making seven phone calls and conducting a lengthy interview to answer a patron's query. The volume would, however, be useful in a reference collection as a source to which patrons could be directed so they could make their own phone calls.

The substance of the volume is contained in some thirty-odd chapters ranging from "Consumer Power" through "Vacations and Business Travel" and "International Trade" to "Government Databases and Bulletin Boards." Each chapter is broken into subdivisions, which naturally are different from chapter to chapter. Within subdivisions, the individual entries are arranged alphabetically by a kind of "catchword" title. Sometimes the titles are derived from the name of the referenced organIzation, sometimes from its function, and sometimes from other sources. This leads to some curious headings, such as "Largest Defense Contractors" and "Free Boat Inspections." Fortunately, most subdivisions are sufficiently small that it is easy to browse through the entire listing.

A particular entry may be repeated, logically enough, in different chapters or subdivisions to which it is relevant. Sometimes, however, there seems no logical reason for repetition. For example, on page 573 there is an entry for "Mine Map Repositories." Three entries later, the identical heading and identical text appear again. Similarly, in the same column, "Mine Companies and Property Ownership Maps" appears. Two entries further down the column, the heading "Mine Maps" appears, followed by the identical descriptive text.

One extraordinarily valuable chapter in the book hides under the name "Current Events and Homework." It consists of an index, over one hundred pages long, to Congressional Research Service reports. As Lesko points out, it is necessary to contact your congressperson or senator to get these, and of course, his listing is out of date. However, since CRS reports are vrrtually inaccessible through other means, the chapter is useful.

The final chapter is meant to short-cut the "seven phone calls" rule of thumb mentioned earlier. Eight thousand names and numbers of experts are listed, ranging from Ed Taylor, knowledgeable about ABS Resins, to Gail Burns, who knows all about Zoris.

The diskette version of the text is distributed in compressed format on four 360KB diskettes, which presented the first problem in using it. There is no indication anywhere on the package or in the modest documentation of how much disk space the text will require when expanded. The first attempt at loading it resulted an "Insufficient Disk Space" message after about twenty minutes of unpacking. Producers of such massive files should indicate the amount of disk space required in their list of system requirements. The search engine accompanying the disks is a run-time version of Infobase, a retrieval system developed by Infobusiness. In some ways, searching is simple, but in others, very mystifying.

The system allows all the usual Boolean operations, which can be nested. The expressions can be quite complex. The search process is presented in an interesting way. If you type in the query *drug abuse programs*, the following appears immediately below what you've typed:

```
drug 480 ——— &—184—┐
abuse 254 ———┘      &—75
programs 1634 ──────┘
```

This immediately lets you know the number of occurrences for each of your search terms, and the results after each Boolean operation (all "and" in this example). You can search for exact phrase matches as well. If you search on "drug abuse programs," including the quotation marks, you will get only seven hits, rather than the seventy-five shown above, since the former includes ail references in which the three words appear in any order in a particular relerence. Once a search is complete, pressing the space bar brings the references on the screen. You can then scan, print, or save them to disk.

However, navigating around Infobase is not so simple. The detailed "Help" promised at the bottom of the screen often is not there. Sometimes you can go back and forth by using the escape key, sometimes by using the grey plus/minus keys, sometimes by using Enter. There seems to be no consistency. In addition, it appears that Infobase is designed to perform many more functions than this product uses. In the tutorial and in the modest documentation, considerable space is devoted to hypertext-like links. However, none is used in the disk version of Lesko's book. In a recent article, Walt Crawford at RLG referred to what he called the "mutter test"—how long after starting to use a new computer interface does it take for you to begin muttering under your breath. In my case, the Infobase failed the mutter test in under two minutes.

Infobase does full-text indexing. This means that every building number, department number, and zip code in those thousands of addresses is indexed. This seems excessive. Infobase also has a feature called "Groups," which are predefined collections of references relating to a given topic. These have been established by the data compilers and are not changeable by the user—or if they are, I was unable to figure out how.

This book plus data arrangement also illustrates the fact that just converting printed text to electronic text is not always best. The unnecessary duplication of entries noted earlier in this review is compounded by computerization. When searching, duplicate entries will be retrieved from all the sections of the book. What was reasonable duplication in widely different chapters now becomes redundant.

I would recommend the book itself for most general reference collections. The software version will require some practice in getting used to. Unless you plan to use the disk version extensively, it is probably not worthwhile climbing Infobase's learning curve.—*Allan Pratt, American Graduate School of International Management, Glendale, Arizona.* ■■

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Other Recent Receipts

Listed here are books and other publications received for review that are of potential interest to LITA members. Some of these materials may be reviewed in later issues of ITAL.

Automating School Library Catalogs: A Reader. Ed. by Catherine Murphy. Englewood, Colo.: Libraries Unlimited, 1992. 211p. $27 (ISBN 0-87287-771-X).

Dewey, Patrick R. *202+ Software Packages to Use in Your Library: Descriptions, Evaluations, and Practical Advice*. Chicago, IL: American Library Assn., 1992. 190p. paper, $27.50; ALA members $24.75 (ISBN 0-8389-0582-X) (ALA Order Code 0582-X-0010).

Ensor, Pat. *CD-ROM Research Collections: An Evaluative Guide to Bibliographic and Full-Text CD-ROM Databases*. Westport, Conn.: Meckler, 1991. 302p. $55 (ISBN 0-88736-779-8).

Ferl, Terry Ellen, and Larry Millsap. *Subject Cataloging: A How-To-Do It Workbook*. New York: Neal-Schuman, 1991. 92p. paper, $35 (ISBN 1-55570-099-3).

Glazier, Jack D., and Ronald R. Powell. *Qualitative Research in Information Management*. Englewood, Colo.: Libraries Unlimited, 1992. 238p. $35 (ISBN 0-87287-806-6).

Kranch, Douglas A. *Automated Media Mangagement Systems. New York: Neal-Schuman, 1991. 282p. paper, $45 (ISBN 1-55570-091-8).*

Library LANs: Case Studies in Practice and Application. Ed. by Marshall Breeding. Westport, Conn.: Meckler, 1992. 403p. $42.50 (ISBN 0-88736-786-0).

Machalow, Robert. *101 Uses of Lotus in Libraries*. Westport, Conn.: Meckler, 1992. 350p. $42.50 (ISBN 0-88736-791-7).

Managing Technical Services in the '90s. Ed. by Drew Racine. New York: Haworth, 1991. 150p. $22.95 (ISBN 1-56024-166-7).

Mandelbaum, Jane B. *Small Project Automation for Libraries and Information Centers*. Westport, Conn.: Meckler, 1992. 341p. $42.50 (ISBN 0-88736-731-3).

Morris, Leslie R., and Sandra Chass Morris. *Interlibrary Loan Policies Directory. Fourth Edition*. New York: Neal-Schuman, 1991. 75p. paper, $99 (ISBN 1-55570-090-X).

Operations Research for Libraries and Information Agencies: Techniques for the Evaluation of Management Decision Alternatives. Ed. by Donald H. Draft and Bert R. Boyse. San Diego, Calif.: Academic, 1991. 193p. $49.95 (ISBN 0-12-424520-X).

Opportunities for Reference Services: The Bright Side of Reference Services in the 1990s. Ed. by Bill Katz. New York: Haworth, 1991. 213p. $29.95 (ISBN 1-56024-137-3) (also published as *The Reference Librarian*, no.33, 1991).

Optical Publishing Directory: 1991-1992 Edition: The World of CD-ROM Products for Information Seekers. Fourth Edition. Ed. by James H. Sheldon and Joseph A. Webb. Medford, N.J.: Learned Information, 1991. 293p. paper, $59 (ISBN 0-938734-54).

Schuyler, Michael. *Dial In 1992: An Annual Guide to Online Public Access Catalogs*. Westport, Conn.: Meckler, 1992. 282p. paper, $55 (ISBN 0-88736-808-5).

Staff Development: A Practical Guide. Second Edition. Ed. by Anne Grodzins Lipow and Deborah A. Carver. Chicago: American Library Assn., 1991. 104p. paper, $25 (ALA Order Code 3402-1-0010-0); ALA members $22.50 (ISBN 0-8389-3402-1).

Symposium of Law Publishers. Ed. by Thomas A. Woxland. New York: Haworth, 1991. 166p. $29.95 (ISBN 1-56024-229-9) (also published as *Legal Reference Services Quarterly*, v.11, nos. 3/4, 1991).

Westin, Alan F., and Anne L. Finger. *Using the Public Library in the Computer Age: Present Patterns, Future Possibilities*. Chicago: American Library Assn., 1991. 70p. paper, $16.50; ALA members $14.85. (ISBN 0-8389-0565-X).

Williams, Brian. *Directory of Computer Conferencing in Libraries*. Westport, Conn.: Meckler, 1992. 429p. $59 (ISBN 0-88736-771-2). ■■

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