

# Information Technology and Libraries

December 1983

- 347 Guest Editorial: Convergence/Divergence:  
The Adolescence of Library Automation *Susan K. Martin*
- 351 Automation in a Special Library in Kuwait *Farooq A. Khalid*
- 364 CITE NLM: Natural-Language Searching in  
an Online Catalog *Tamas E. Doszkocs*
- 381 Thus Spake the OPAC User *Karen Markey*
- 389 Communications
- 389 Computer-Assisted Instruction in an Academic  
Library *Wayne Wilson*
- 393 The Beginnings of LCS at Illinois  
*Diane Foxhill Carothers  
and William Aguilar  
William Gray Potter*
- 400 Modeling Collection Overlap on a Microcomputer
- 409 Reports and Working Papers
- 409 Costs and Features of Online Catalogs: The State of  
the Art *Gary S. Lawrence,  
Joseph R. Matthews, and  
Charles E. Miller*
- 450 News and Announcements
- 454 Recent Publications
- 454 Reviews
- 454 Carter, Ruth C.; Bruntjen, Scott. *Data Conversion*, reviewed by Richard E. Asher
- 455 Dougherty, Richard M.; Heinritz, Fred J. *Scientific Management of Library Operations*, reviewed by Edward D. Garten
- 456 *Information and Innovation*, reviewed by Brian Aveney
- 458 *Information and the Transformation of Society*, reviewed by Brian Aveney
- 458 Kesner, Richard M. *Information Management, Machine-Readable Records, and Administration: An Annotated Bibliography*, reviewed by Lawrence Dowler
- 460 *The Management of Serials Automation: Current Technology & Strategies for Future Planning; Serials Management in an Automated Age: Proceedings of the First Annual Serials Conference, October 30-31, 1981, Arlington, Va;* Taylor, David C. *Managing the Serials Explosion; the Issues for Publishers and Libraries*, reviewed by Don Lanier
- 462 Sager, Donald G. *Public Library Administrators' Planning Guide to Automation*, reviewed by Edward D. Garten
- 463 *VideoPrint*, reviewed by Brian Aveney
- 464 Other Recent Receipts
- 465 Letters
- 467 Index to Volume 2 (1983)
- 466 Index of Advertisers

B/NA AUTHORITY CONTROL

# Improving patron access to your online catalog.

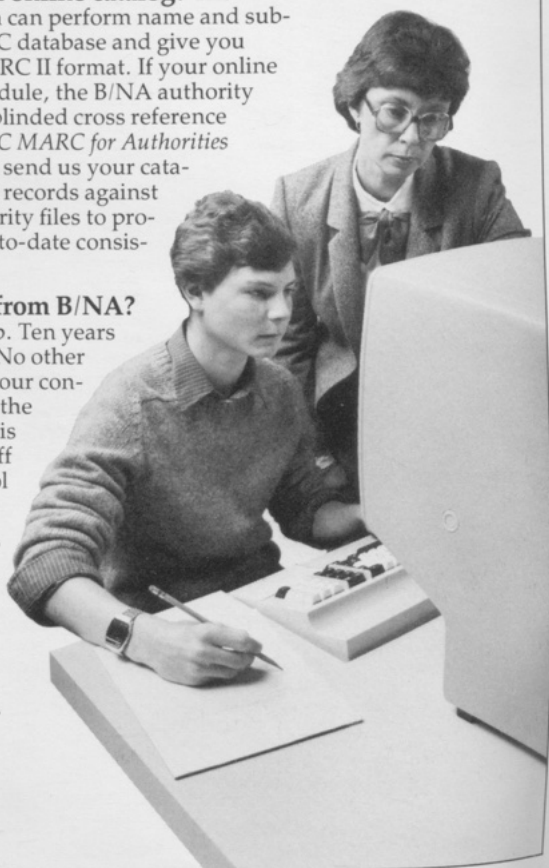
**Loading MARC records into an online catalog?** The B/NA automated authority control system can perform name and subject authority control on your MARC database and give you fully edited catalog tapes in the MARC II format. If your online catalog has an authority control module, the B/NA authority control system can also provide deblinded cross reference tapes in a format compatible with *LC MARC for Authorities* for loading into the system. Simply send us your catalog tape and we match your MARC records against current LC name and subject authority files to provide your library with the most up-to-date consistent headings available.

## **Why choose authority control from B/NA?**

Quality. Sophistication. Leadership. Ten years experience with authority control. No other system equals ours. Drawing from our constantly updated authority files and the skills of our experienced editors, this unique B/NA service frees your staff from retrospective authority control tasks.

**For more information**, write or call toll free, Dan Miller, Manager, Sales and Service, Technical Services Division.

**BLACKWELL  
NORTH AMERICA INC.**  
6024 S.W. Jean Road, Building G  
Lake Oswego, OR 97034  
Telephone (800) 547-6426



# Information Technology and Libraries

Volume 2, Number 4: December 1983

## CONTENTS

- 347 Guest Editorial: Convergence/Divergence:  
The Adolescence of Library Automation *Susan K. Martin*
- 351 Automation in a Special Library in Kuwait *Farooq A. Khalid*
- 364 CITE NLM: Natural-Language Searching in  
an Online Catalog *Tamas E. Doszkocs*
- 381 Thus Spake the OPAC User *Karen Markey*
- 389 Communications
- 389 Computer-Assisted Instruction in an Academic  
Library *Wayne Wilson*
- 393 The Beginnings of LCS at Illinois  
*Diane Foxhill Carothers  
and William Aguilar  
William Gray Potter*
- 400 Modeling Collection Overlap on a Microcomputer
- 409 Reports and Working Papers
- 409 Costs and Features of Online Catalogs: The State of  
the Art *Gary S. Lawrence,  
Joseph R. Matthews, and  
Charles E. Miller*
- 450 News and Announcements
- 454 Recent Publications
- 454 Reviews
- 454 Carter, Ruth C.; Bruntjen, Scott. *Data Conversion*, reviewed by Richard E. Asher
- 455 Dougherty, Richard M.; Heinritz, Fred J. *Scientific Management of Library Operations*, reviewed by Edward D. Garten
- 456 *Information and Innovation*, reviewed by Brian Aveney
- 458 *Information and the Transformation of Society*, reviewed by Brian Aveney
- 458 Kesner, Richard M. *Information Management, Machine-Readable Records, and Administration: An Annotated Bibliography*, reviewed by Lawrence Dowler
- 460 *The Management of Serials Automation: Current Technology & Strategies for Future Planning; Serials Management in an Automated Age: Proceedings of the First Annual Serials Conference, October 30-31, 1981, Arlington, Va;* Taylor, David C. *Managing the Serials Explosion; the Issues for Publishers and Libraries*, reviewed by Don Lanier
- 462 Sager, Donald G. *Public Library Administrators' Planning Guide to Automation*, reviewed by Edward D. Garten
- 463 *VideoPrint*, reviewed by Brian Aveney
- 464 Other Recent Receipts
- 465 Letters
- 467 Index to Volume 2 (1983)
- 466 Index of Advertisers

# Information Technology and Libraries

Brian Aveney, Editor, Blackwell North America, Lake Oswego, Oregon  
William Gray Potter, Editor Designate, University of Illinois, Urbana-Champaign  
Mary F. Ghikas, Managing Editor, Chicago Public Library, Illinois  
David L. Weisbrod, Book Review Editor, Yale University, New Haven, Connecticut  
William Z. Schenck, Advertising Manager, University of Oregon, Eugene

## Editorial Board:

Paul Fasana, New York Public Library, New York  
Douglas Ferguson, Stanford University Libraries, Stanford, California  
Michael Gorman, University of Illinois, Urbana-Champaign  
Peter S. Graham, Columbia University, New York  
Thomas B. Hickey, OCLC, Inc., Columbus, Ohio  
Ariene Farber Sirkin, University of Pennsylvania, Philadelphia  
Frances Spigai, Database Services, Los Altos, California  
Libby Trudell, CLASS, San Jose, California  
Herbert S. White, Indiana University, Bloomington

---

*Information Technology and Libraries* is the official publication of the Library and Information Technology Association, a division of the American Library Association, 50 E. Huron St., Chicago, IL 60611; *Executive Director*: Donald P. Hammer. The journal is issued quarterly in March, June, September, and December.

*Information Technology and Libraries* publishes material related to all aspects of library and information technology. Some specific topics of interest are: Automated Bibliographic Control, AV Techniques, Communications Technology, Cable Systems, Computerized Information Processing, Data Management, Facsimile Applications, File Organization, Legal and Regulatory Matters, Library Networks, Storage and Retrieval Systems, Systems Analysis, and Video Technologies. *ITAL* welcomes unsolicited manuscripts. Submissions should follow the guidelines stated under "Instructions to Authors" on page 80 of the March 1982 issue.

Manuscripts of articles, communications, and news items should be addressed to: William Gray Potter, Editor, *Information Technology and Libraries*, 246 A Library, University of Illinois, Urbana, IL 61801. Copies of materials submitted for review should be addressed to: Karin A. Trainer, *ITAL Book Reviews*, Yale University Library, Box 1603A, Yale Station, New Haven, CT 06520. Advertising arrangements should be made with William Z. Schenck, University of Oregon Library, Eugene, OR 97403.

*Information Technology and Libraries* is a requisite of membership in the Library and Information Technology Association. Subscription price, \$10, is included in membership dues. Nonmembers may subscribe for \$20 per year. Single copies, \$5.50.

Circulation and Production: American Library Association, 50 E. Huron St., Chicago, IL 60611. Please allow six weeks for change of address.

Publication of material in *Information Technology and Libraries* does not constitute official endorsement by the Library and Information Technology Association or the American Library Association.

Abstracted in *Computer & Information Systems*, *Computing Reviews*, *Information Science Abstracts*, *Library & Information Science Abstracts*, *Referativnyi Zhurnal*, *Nauchnaya i Tekhnicheskaya Informatsiya*, *Otdelnyi Vypusk*, and *Science Abstracts Publications*. Indexed in *Computer Contents*, *Computer Literature Index*, *Current Contents*, *Current Index to Journals in Education*, *Education, Library Literature*, *Magazine Index*, and *NewSearch*. Microfilm copies available to subscribers from University Microfilms, Ann Arbor, Michigan.

Copyright © 1983 American Library Association. All material in this journal subject to copyright by ALA may be photocopied for the noncommercial purpose of educational or scientific advancement. Second-class postage paid at Chicago, Illinois, and at additional mailing offices. *Postmaster: Send address changes to* Information Technology and Libraries, 50 E. Huron St., Chicago, IL 60611.

## Convergence/Divergence: The Adolescence of Library Automation

Rumor has it that library automation is mature. Libraries have supposedly hurdled the automation of technical services and are including public services in the oft-desired "integrated system." Even more thrilling, the technologies of laser disc, satellite, and database engines await early application by eager librarians. The information community has developed many standards for communication and representation of data and has identified more that must yet be developed. Systems that used to operate in isolation are being linked, allowing one library to communicate with another and one application to talk with another.

Certainly these activities are signs of a growing maturity. When the CLR-funded Linked Systems Project allows the Library of Congress, the Research Libraries Group, and the Washington Library Network to implement computer-to-computer communication in 1984, a significant barrier will indeed have been overcome. With the capacity to request journal articles from Information Access Corporation using OCLC, the convergence of cataloging with reference systems begins to be a reality.

But the level of this convergence and maturity is a shaky one. The advent of the microcomputer reveals the sensitivity of library automation to the available technology and poses questions about library organization and cooperation. Microcomputers are easy to obtain, relatively inexpensive, and fun to play with. A recent issue of *Library Journal* carried several articles by librarians who had obtained microcomputers and then developed local systems, usually for small libraries.

With micros, we have cycled back to the library automation of the 1960s and early 1970s. Although libraries talked with each other about computer applications and even managed to agree upon the MARC format, they were busy at home writing computer programs for local systems to perform circulation control, acquisitions functions, and other tasks. A hot topic of conversation was whether systems could be "shared" or "transplanted"; generally, it was agreed that sharing systems was at least difficult, if not impossible.

The microcomputer boom of the 1980s resembles the 1960s. Librarians talk with each other about their microcomputer applications, and then go home and write local programs for local systems. After a decade of shared cataloging, cooperation, and turnkey commercial systems, divergence is with us once more. Surely, library automation cannot be mature when librarians are generating BASIC programs in their spare time to provide computer tools for their own libraries, but for *no* others. Microcomputers with locally developed software may have the capacity to solve problems at particular institutions, but cannot yet bring to bear the vast resources needed to answer the information requirements of library patrons.

Librarians must now cope with "convergence" and the extent to which it is desirable. The strong trends toward convergence continue to be mixed with divergences that repre-

sent valid attempts to apply innovative technologies to local situations in those cases where a generalized solution is financially, politically, or technically impossible. Nationwide databases, linked systems, cooperation—these are all examples of converging trends. Their progress is halting, because the library community is not always sure that each library's "particular" needs can be properly served by joining with the systems that are used by all others. Therefore, the not-invented-here (NIH) syndrome surfaces frequently, whenever a library designs a system that has already been developed elsewhere.

Like an adolescent, library automation is now seeking its own identity for the adult world in the decades ahead. This identity must encompass *both* converging and diverging trends, balancing the benefits of cooperation with the desire to support local idiosyncrasies. Librarians do not need to become computer programmers, but on the other hand, libraries should not be forced into lockstep with other libraries. Library automation will be a mature application by 1990. The question will then become, when will its mid-life crisis occur, and what will it be?

SUSAN K. MARTIN

Director, Milton S. Eisenhower Library  
The Johns Hopkins University

#### EDITOR'S NOTES

##### *Moo Goo Gai Network*

If OCLC were Chinese food, then UTLAS would be Mongolian firepot, WLN would be Szechwan cooking, and RLIN Mandarin cuisine.

##### *Love of Cataloging*

Michael Gorman passes on the following quote from Marlowe's *Dr. Faustus*: "Sweet analytics, tis thou hast ravished me."

##### *Thank You*

A distressing aspect of being complimented on the journal is the realization of how little readers understand how many hands are involved in its creation. For three years, Mary Ghikas, our managing editor, has taken the manuscript of each issue and guided it through the various stages of editing and production on tight deadlines. David Weisbrod has supplied his twelfth review section with this issue. The members of the Editorial Board have read numerous papers and worked long hours on editing those of merit. All of our efforts are voluntary; the only reward is thanks.

Eileen Mahoney and her staff at the Central Production Unit have redesigned the journal and produced its current, we think stylish, look. They have dealt with problems of reproducing faint printouts and color photographs. They have met difficult deadlines in order to deliver each issue to readers in a timely fashion. In particular, Chere Elliott of CPU has been responsible for much of the journal's fine appearance. Most of all, they have been very patient with a strong-headed editor.

If you like the journal and happen to see any of these people . . . say thank you.

##### NEXT

Bill Potter and his new editorial team have already put the March issue to bed as you read this.

# PLAIN AND SIMPLE

Our physical size and financial strength—necessary to make and honor commitments—indicate the successful working relationships we have with thousands of libraries worldwide.

But the plain truth is, simply, that it is our sensitivity to your unique requirements, and our flexibility in providing an exhaustive and relentless effort for total customer service that is our real strength.

We want to work with you—to help you provide exceptional patron service, which is your strength.

We can help. Write today—

## **EBSCO SUBSCRIPTION SERVICES**

The Serials Professionals



P.O. Box 1943/Birmingham, AL 35201-1943  
(205) 991-6600 Telex: 78-2661

# Doctor of Arts in INFORMATION SCIENCE

A COMPUTER-BASED PROGRAM FOR INFORMATION AND MEDIA PROFESSIONALS

## **The Program—***"Study while you work"*

Nova University now makes it possible for you to earn a doctoral degree while you continue to work. The field-based Doctor of Arts in Information Science (D.A.I.S.) program brings Nova University to you. Most of the D.A.I.S. program can be completed at your place of employment or in your home in as little as three years.

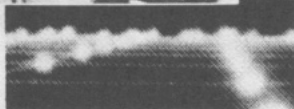
## **Courses—**

### *"Computer instruction"*

The D.A.I.S. curriculum consists of six "core courses" completed through a computer-based learning system. Once you are provided with a personal computer, you will begin a unique "on-line" study experience. You will use the computer to study in such areas as computer science, systems analysis and design, networking, telecommunications, and strategic management techniques for libraries, media and information centers.

## **Practicums—***"Research that counts"*

Practicums are applied research projects related to the core courses undertaken to address significant problems in institutions and organizations. At any time during the program you encounter problems or



have questions that need immediate attention, Nova "on-campus" faculty are available through electronic mail or telephone for guidance and answers.

## **Regional Seminars—**

### *"Bringing it all together"*

Each year you will attend four weekend seminars. These meetings give you the opportunity to share your progress and experiences with other D.A.I.S. students. Recognized authorities in information science conduct the sessions. These experts share the latest developments in

digital computers, telecommunications, and information science. Seminars help integrate what you have learned in the core courses, in practicums, and in the field project.

## **Tuition—***"No hidden expenses"*

Aside from textbooks and seminar travel expenses, all courseware and communications equipment are included in the \$3,500 per year tuition. A partial payment plan of \$875.00 per quarter is available to help make tuition manageable. A tuition reduction will be made if you have a personal computer or terminal available.

## **Enrollment—***"Targeted admission"*

An important condition for entering the program and earning a degree is that you be currently employed in a library, media, or information center. A master's degree in library, media, or information science is also required.

Applications are now being accepted for the D.A.I.S. program that begins in February, 1984.

## **Information—***"Immediate answers"*

Call us today at (305) 475-7047 or in Florida call toll free 1-800-432-5021 or for a brochure and application materials write to:

**Nova University**  
Information Sciences  
3301 College Avenue  
Fort Lauderdale, Florida 33314



## Nova University

*Nova University is accredited by the Southern Association of Colleges and Schools and admits students of any race, color, and national or ethnic origin.*

# Automation in a Special Library in Kuwait

Farooq A. Khalid

*This paper traces the introduction of automation in the National Scientific and Technical Information Center (NSTIC) of the Kuwait Institute for Scientific Research (KISR). The growth from a modest remote batch-mode environment to online applications in both English and Arabic are highlighted. Provided is a brief discussion of the systems designed and developed by NSTIC, which include the bibliographic control programs, the circulation control system, KWOC indexes, and online databases of NSTIC's English and Arabic collections. The use of STAIRS for an integrated database approach for library automation is envisaged.*

This paper highlights the development of automation in the National Scientific and Technical Information Center (NSTIC) of the Kuwait Institute for Scientific Research (KISR). Automation in NSTIC started in 1975, at that time KISR was a remote user of a central Government Computer Center (GCC) located in the Ministry of Planning.

The computer-related programs developed by NSTIC can be grouped into two major types. The first projects and programs were designed and developed when NSTIC was operating in a batch environment. The very nature of the computer facilities available to NSTIC from 1975 through 1980 forced the design of only those systems that did not require a fast turnaround. After KISR acquired its IBM 4341 in 1981, automation in NSTIC evolved from a modest remote batch mode to the use of online applications in both English and Arabic languages. The latter part of this paper will concentrate on the development of NSTIC's online database.

## HISTORICAL BACKGROUND

In 1975 when NSTIC was a Documentation and Information Division (DID), it had approximately four hundred journal titles and fifteen hundred book titles. As a result of the CASTARAB conference held in Rabat, Morocco, in August 1976, it was recommended

to support and develop the Documentation and Information Division to become the National Scientific and Technical Information Center and the major network for information centers and special libraries in Kuwait, for the purposes of collecting, organizing, identifying and utilizing information resources in science and technology in providing bibliographic and information services and in the transfer and exchange of documents and information on a national level, so that the center would become regional for the Gulf area.<sup>1</sup>

At the time, the only use of computers in DID was an alphabetic listing of its periodicals, inclusive of bibliographic data and holdings. The success with the use of a com-

---

Farooq A. Khalid is head, Automated Information Systems, National Scientific and Technical Information Center, Kuwait Institute for Scientific Research. Manuscript received August 1983; accepted September 1983.

puter for what was an extremely simple application encouraged NSTIC to produce a union list of periodicals at the national level, and by 1977 at the regional level. In so doing it had taken the first step toward meeting the responsibilities that had been recently bestowed on it as the National Scientific and Technical Information Center. This was to be the beginning of one of the major programs of NSTIC.

NSTIC has had access to Lockheed and SDC since 1979 and later subscribed to BRS as well. The automated programs discussed here pertain to those that have been designed and developed in-house. The rest of this paper will provide a brief description of these automated programs.

#### NSTIC'S EXISTING AUTOMATED PROGRAMS

NSTIC's automated programs designed and developed in-house are grouped as follows:

- Bibliographic control programs
  - Circulation control system
  - Keyword-Out-of-Context (KWOC)
- Indexes
- Word processing applications in NSTIC
  - Online database development in both English and Arabic.

#### BIBLIOGRAPHIC CONTROL PROGRAMS

The bibliographic control programs of NSTIC include the design, the development, and the maintenance of union lists.



*Farooq A. Khalid*

Given below are the various union lists in NSTIC.

- Union list of scientific and technical periodicals at the national and regional levels. (Updated biannually for the region and annually for the national union lists.)
- Union list of Arabic periodicals at the national level. (Updated annually.)
- Union book catalog at the national level. (This program will be updated when a new input methodology has been adopted.)

The underlying philosophy in the development of the union lists has been spelled out in the report of the Kuwait delegates to the CASTARAB conference. There are many compelling reasons why developing countries like Kuwait and other Gulf states should apply themselves in creating these very necessary instruments of progress. The UNESCO document about the techniques of union catalogs has listed several reasons in support of developing union catalogs.<sup>2</sup>

The development of union catalogs must go hand in hand with the development of libraries, firstly to facilitate maximum utilization of existing collections and, secondly, to ensure the coordination of acquisitions. Union catalogs are a prerequisite for the development of effective interlibrary loan programs. The ability to share resources is already helping the participating libraries in Kuwait, and it is NSTIC's sincere hope that this cooperative effort will be beneficial for all the libraries in the Gulf area.

#### REGIONAL UNION LIST OF SCIENTIFIC AND TECHNICAL PERIODICALS IN THE GULF AREA

The Regional Union List of Scientific and Technical Periodicals is a good example of the bibliographic control program, a brief description of this program will provide an insight into one of NSTIC's undertakings.

The Regional Union List provides alphabetic listing of periodical titles within subjects with the bibliographic and holding information, along with an alphabetic arrangement of titles in the title index. Cross references to former and ceased titles are also provided to assist the user.



The Regional Union List is printed biannually. Presently it includes ninety-eight hundred unique titles. The list of the participating libraries is provided below so that the dimension and scope of the program can be comprehended. Figure 1 shows a page from the Regional Union List of Scientific and Technical Periodicals.

#### List of Participating Libraries

##### *Kuwait*

Kuwait Institute for Scientific Research, Kuwait University, Organization of Arab Petroleum Exporting Countries, Arab Planning Institute, Kuwait Medical Association, Kuwait Society of Engineers, Kuwait Fund for Arab Economic Development, Arab Fund for Economic and Social Development, Central Bank of Kuwait, Kuwait National Petroleum Company, Water Resources Development Center, Ministry of Planning, Kuwait Chamber of Commerce and Industry, National Housing Authority, Ministry of Oil, Kuwait Institute for Applied Technology.

##### *Iraq*

University of Baghdad, Institute of Industrial Engineering, Scientific Research Institute, Agriculture Institute, Biological Research Institute, National Research Center, Directorate of Geological Survey, Mustansiriyah Library, Building Research Center, Institute for Applied Research on Natural Resources, Palm and Dates Re-

search Center, Petroleum Research Institute, Mosul University, University of Basrah.

##### *Saudi Arabia*

University of Petroleum and Minerals, King Faisal University, King Saud University (formerly, University of Riyadh).

##### *United Arab Emirates*

United Arab Emirates University

##### *Bahrain*

University College of Arts Science and Education.

#### CIRCULATION CONTROL SYSTEM

The circulation control system used in NSTIC supports several functions such as the generation of overdue notices, lists of items borrowed by users, and circulation statistics. The system allows online verification of the status of any item in the circulation files. Figure 2 shows different circulation control system files.

The circulation system has undergone modifications to ratify problems that were encountered in its initial implementation. However the problem associated with the data capturing process (which is by means of manual keying) remains the most serious deterrent in the effectiveness of the system. NSTIC is looking into mechanical devices such as bar coded labels, OCR, and other mechanical means of data capturing to resolve the problem of data entry.

(CONT.) 580 BOTANICAL SCIENCES

KUWAIT KU FS Y. 1, 1988-  
S. ARABIA D. BITAD CS Y. 6, 1965-

BULLETIN OF THE BRITISH MYCOLOGICAL SOCIETY

S. ARABIA K.F.O. NO 1978-

BULLETIN SIGNALATIONS. PART 370: BIOLOGIE ET PHYSIOLOGIE VEGETALES  
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE

1961  
KUWAIT KU FS Y. 29, 1969-  
IRAQ BASRAH U CA 1973

CANADIAN JOURNAL OF BOTANY (FRENCH-CANADIAN JOURNAL OF RESEARCH)  
NATIONAL RESEARCH COUNCIL OF CANADA

1929 S-N FS Y. 1, 1928-  
KUWAIT KGD, U CL Y. 39, 1981-  
IRAQ BASRAH U DB 1970-3  
1976-1

S. ARABIA D. BITAD CA 1951-66  
D.A.E. U Y. 4, 1965-  
Y. 53, 1975

CANADIAN JOURNAL OF MICROBIOLOGY  
NATIONAL RESEARCH COUNCIL OF CANADA

1958 K  
KUWAIT KUSP FS Y. 1, 1958-  
IRAQ BGD, U CL Y. 22, 1976-  
Y. 6, 1960-  
BGO, U CF 1970-  
BIO, B-C Y. 16, 1972-  
P.-D.-R.-C. Y. 22, 1976-  
BOSOL U CR 1968-73  
P.-D.-R.-C. DB 1978-

S. ARABIA O.P.-R. Y. 1-20, 1954-1978  
K.F.O. RE 1977-  
D. BITAD CS Y. 11, 1965-  
D.A.E. U Y. 2, 1975-

D.A.E

CANADIAN JOURNAL OF PLANT SCIENCE  
AGRICULTURAL INSTITUTE OF CANADA

1921 OTTAWA Q  
1921 BGD, U CL Y. 4, 1961-  
BGO, U CA Y. 42, 1962-  
AGRIC. C Y. 98, 1968-  
1988-  
1988- C. Y. 53, 1973-  
BASRAH U CA 1972  
P.-D.-R.-C. Y. 76-  
S. APADIA D. BITAD CA Y. 45, 1965-

CANADIAN JOURNAL OF RESEARCH (SEE: CANADIAN JOURNAL OF BOTANY)

BIOLOGICAL MONOGRAPHS  
DURHAM OS

1931 IRRP FS Y. 1, 1931-  
KUWAIT KU Y. 31-38, 1961-1978  
IRAQ BASRAH U Y. 36, 1966-  
BASRAH U MR 1931-71  
D.A.E. U Y. 45, 1975-

ECONOMIC BOTANY  
BROOK NY Q

1947 NYM YORK BOTANICAL GARDEN  
KUWAIT KU FS Y. 1, 1947-  
KUSP Y. 34, 1980-  
IRAQ CL Y. 15, 1929-  
AGRIC. C. CA Y. 15, 1929-  
BASRAH U DB 1964-71

S. APADIA D. BITAD CS Y. 16, 1964-

EGYPTIAN JOURNAL OF BOTANY (FRENCH, J. OF BOTANY OF THE UNITED ARAB REP.)  
CAIRO NATIONAL INFORMATION AND DOCUMENTATION CENTRE

1958 J/TR BGD, U CA Y. 1-4, 1958-1961  
S. ARABIA J. BITAD CS Y. 1-17, 1958-78

EMOLOGIST

S. APADIA D. BITAD CS Y. 1-8, 1969-1976

ENVIRONMENTAL AND EXPERIMENTAL BOTANY  
OXFORD PERGAMON PRESS

1961 Q  
KUWAIT KU FS Y. 19, 1979-

EXERCPTA BOTANICA SECTIO II: SOCIOLOGICA  
STUTTGART GUSTAV FISCHER VERLAG

1959 8/TF  
KUWAIT KU FS Y. 11, 1970-

EXPERIMENTAL MYCOLOGY

IPAO B.-R.-C. CL 1977-

PALOMIRA JOURNAL OF PHYCOLOGICAL BOTANY  
PALOMIRA LIBRARY & HERBARIUM OF HARVARD UNIV.  
1941

PLONING PLYT'S OF AFRICA  
SOCIETY OF AGRICULTURAL TECHNICAL SERVICES  
1945 2/TF  
IPAO P.-D.-R.-C. 1976-

Fig. 1. Partial Page from the Regional Union List of Scientific and Technical Periodicals.

Because NSTIC does not presently possess all its book titles in machine-readable format, the circulation control staff have been burdened with this added responsibility of maintaining a brief bibliographic file. This added responsibility has made the circulation control system prone to some errors.

After the control numbers, the multiple copies, and multiple volumes have been added to the existing online catalog (an ongoing project), the file will be used by the circulation control system. The status field will indicate if the item searched is on request, on order, in process, on the shelf, on loan or recalled, etc. System design is under way to test the viability of this approach.

#### KEYWORD-OUT-OF-CONTEXT (KWOC)

Keyword-Out-of-Context (KWOC) is defined in the *Librarians' Glossary* as a refinement of KWIC.<sup>3</sup> Titles are printed in full under as many keywords as the indexer considers useful; these may be chosen from a thesaurus or list of standard headings as well as from the title, and there is no limit to the source of keywords. The keywords are separated from the title on a line of their own and act as subject headings.

These are popular because they are straightforward and relatively cheap to create. Words in a title are compared with a stop list to suppress the generation of useless index entries. The merits and demerits of such indexes have been discussed by many authors.<sup>4</sup>

Since KWOC indexes support certain functions in NSTIC, it is important to understand the environment in which these indexes are used. One of the areas where KWOC is employed is in supplementing NSTIC's COM catalog. Figure 3 shows a page of the KWOC index as used in NSTIC.

NSTIC presently uses a computer output microfiche (COM) catalog, which serves as a backup to the online catalog. The COM catalog is generated by Blackwell North America (B/NA). NSTIC's holdings are identified and B/NA generates a COM catalog amongst other services for NSTIC. NSTIC's COM is accumulated once every quarter. At any given time there are always items that are in process and are not accessi-

ble via COM. In order to retrieve these items, it is important to supplement the COM with an index for the items that are in process. This is one of the applications of KWOC in NSTIC. KWOC indexes of special groups of materials are produced as need arises.

#### WORD PROCESSING

NSTIC is utilizing word processing capability available through the KISR computer center. The WATERLOOSCRIP word processor was acquired through the University of Waterloo and is IBM compatible. This allows NSTIC considerable flexibility in editing and printing files in an extremely professional manner.

Several NSTIC manuals, documentation, and reports are produced by the use of the WATERLOOSCRIP. There are other administrative applications, such as electronic mail, which will be used by NSTIC in routing searches amongst the users, throughout KISR. As soon as good-quality printing is available, the word processor will be used for many NSTIC applications.

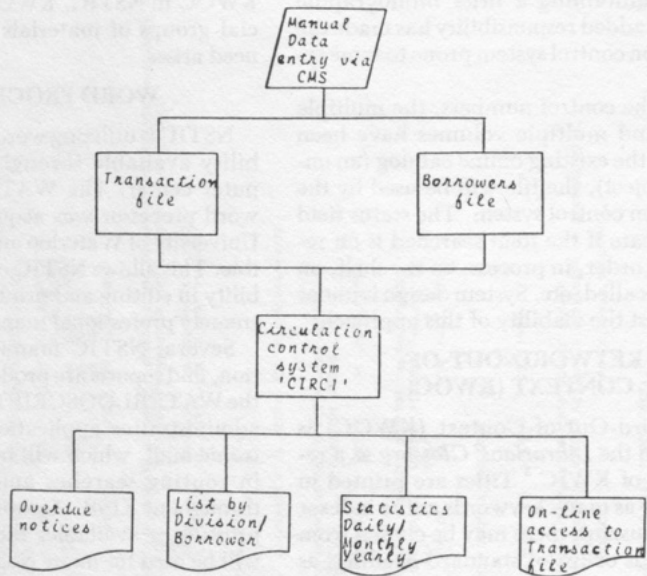
#### ONLINE DATABASE DEVELOPMENT

The library is basically a file-centered organization and all operations, except a few purely manual ones, depend upon access to one or several files. The requirements for automation in the library are quite stringent, therefore the whole system depends, to a large extent, on the efficiency and accuracy of data input, file maintenance, and search and retrieval.<sup>5</sup>

The programs mentioned so far depend on files using fixed field formats that are limiting as they do not lend themselves to use in an integrated database approach to automation, especially in a library.

Adhering to an integrated database approach, NSTIC has undertaken the most ambitious of programs that is bound to have a dramatic impact on the future of automation in NSTIC. The development of an online catalog in both English and Arabic, with an integrated database approach, has been conceived to serve several subsystems in NSTIC.

The philosophy behind the integrated or a database concept is discussed by Salmon,



Sample Overdue Notice

FILE: OVERDUE NOTICES      A1 KISR CMS/SP

---

KUWAIT INSTITUTE FOR SCIENTIFIC RESEARCH  
 NATIONAL SCIENTIFIC & TECHNICAL INFORMATION CENTER  
 CIRCULATION SYSTEM  
 OVERDUE NOTICES  
 AS OF 8 FEB 1982

PLEASE RETURN OVERDUE MATERIALS AT YOUR EARLIEST CONVENIENCE. IF YOU HAVE RETURNED THE MATERIAL/S IN THE LAST FEW DAYS PLEASE DISREGARD THIS NOTICE IF THERE ARE ANY QUESTIONS PLEASE CALL EXT. 237 THANK YOU.

.. TITLE	DATE BORWD	DATE DUE	DAYS OVRDGE
.... TS 222 ABU WAHIDA 1330			
.. URANIUM			
>>>001374>>>                      TN490 .U7 0717	06JAN82	06FEB82	2
.. STATESMAN'S YEAR-BOOK WORLD GAZETTEER			
>>>001845>>>                      G103.5 1975	01DEC81	01JAN82	38
.. BIBLIOGRAPHY OF INTEGRAL CHARGED PARTIC			
>>>001910>>>                      Z7144 .N8 .B5 1979	19NOV81	19DEC81	50
.. NUCLEAR POWER & ENVIRONMENT; QUESTIONS			
>>>003088>>>                      TD195 84 A45 1976 C.4	04NOV81	04DEC81	65
.. LASER PHOTOCHEMISTRY TUNABLE LASERS AND			
	05DEC82	05FEB82	3

Fig. 2. Circulation Control System's Files.

Wagner, and Uluaker.<sup>6</sup> It is where a database is a centralized common collection of interrelated data for one or more applications that access it. The characteristics of this approach are reflected in the functional integration, completeness, and standardized nature of the data being used in the system.

### USE OF MACHINE-READABLE BIBLIOGRAPHIC DATA

As mentioned by Woods, no library need plan to input all the data for all its records. The most important single decision a library manager may make is where, when, and how the library should buy machine-readable records.<sup>7</sup> Chervinko says that ideally a library would convert all the records in its catalog into full-MARC format. One way to achieve a full-MARC conversion is through a commercial vendor, who normally matches card records against its own MARC database and edits the MARC records to match the cards.<sup>8</sup>

This is precisely the route that NSTIC adopted when B/NA's services were contracted to provide the COM catalog and other services. In 1979 NSTIC decided to convert its card catalog to a COM format; by 1981 the conversion was completed.

One of the by-products of this conversion was a machine-readable database, in MARC format, of NSTIC's book collection; the successful utilization of the MARC machine-readable records in producing an online database in NSTIC is a great step forward for NSTIC, as many future subsystems in NSTIC will depend on it.

There are several texts on what MARC is and how it is used. It has been successfully applied to all sorts of bibliographic data, including monographs, periodicals, and book and nonbook materials. It has been used by individual libraries, and its advantages in a cooperative programs have been significant. Because of its universality, data between cooperating libraries can be readily exchanged. It is worth mentioning here that cooperation between libraries and information centers in the region in the development of an information network will be possible if all participating organizations conform to an internationally accepted

standard such as MARC from the very outset.

### SOME EXISTING PROBLEMS

Even though NSTIC has the bulk of its catalog available in a machine-readable form, the data are not complete because:

- All multiple copies and volumes are represented in the database as a single entry.
- During the conversion to COM, NSTIC did not provide B/NA with the control numbers of its collection.

As mentioned earlier, because of the inadequacies in the data, it cannot be used readily by other systems such as for shelflist control or for circulation control.

### SOLUTIONS TO THE EXISTING PROBLEMS

As has been mentioned before, a procedure has been devised and tested, to both add the multiple copies and volumes and also to append the control numbers to each record in the database.

At any given time, the complete book holdings of NSTIC will be available. This database will serve several systems in NSTIC including the circulation control system, shelflist control, online catalog assistance, referral system, SDI, and current awareness, etc. By appealing the on-order file to the database, the verification for the acquisition of materials will be possible online.

An integrated database approach remains at the heart of the design of automation in NSTIC. As mentioned by Wagner, most important in the understanding of the database concept is the fact that database maintenance is carried out by a database management software package.<sup>9</sup> Patterson describes a database management system as a combination of staff, software, and hardware functions responsible for providing access (storage and retrieval) to the databases.<sup>10</sup> The information storage and retrieval system being used in NSTIC is an IBM system called STAIRS.

### STAIRS/CMS

Kuwait Institute for Scientific Research acquired its STAIRS package in March 1981 to be housed on its IBM 4341 com-

FILE: JANWAY2 KWIC A1 KISR CMS/SP REL 1-3

PAGE 227

PUBLICATIONS  
 001727 P. A. C. DEPARTMENT OF FISHERIES LIST OF PUBLICATIONS & DOCUMENTS 1948-1977>> MRF  
 011201 LIST OF RESEARCH PUBLICATIONS OF FOUNDATION OF SCIENTIFIC RESEARCH IBA  
 PUBLICATIONS  
 012054 ANNOTATED BIBLIOGRAPHY & EVALUATION OF REMOTE-SENSING PUBLICATIONS  
 PUBLICATIONS  
 014269 PUBLICATIONS ON FISH PARASITES & DISEASES 330 B. C. A. D. 1923  
 PUBLICATIONS  
 015265 MUNICIPAL GOVERNMENT REFERENCE SOURCES, PUBLICATIONS AND COLLECTIONS  
 PUBLICATIONS  
 022310 CICLIC AMP 1975 CLASSIFIED BIBLIOGRAPHY OF PUBLICATIONS 1975  
 PUBLICATIONS  
 03671 CATALOGUE OF ADMIRALTY CHARTS AND OTHER HYDROGRAPHIC PUBLICATIONS  
 PUBLICATIONS  
 038829 CATALOGUE OF ADMIRALTY CHARTS AND OTHER HYDROGRAPHIC PUBLICATIONS  
 PUBLICATIONS  
 040069 PUBLICATIONS DOCUMENTATION AND MEANS FOR THEIR DISSEMINATION  
 PUBLICATIONS  
 002976 CATALOGUE OF ADMIRALTY CHARTS AND OTHER HYDROGRAPHIC PUBLICATIONS  
 PUBLICATIONS  
 040860 STATE GOVERNMENT REFERENCE PUBLICATIONS AN ANNOTATED BIBLIOGRAPHY  
 PUBLICATIONS  
 001089 RECHERCHE PUBLIQUE MORS UNIVERSITE DELEGATION A LA RECHERCHE SCI.  
 PUBLICATIONS  
 011285 PUBLISHED REGULATORY GUIDELINE OF ENVIRON. CONCERN TO CIL-INDUS. IN WE  
 PUBLISHED  
 012836 PUBLISHED REGULATORY GUIDELINES OF ENVIRONMENTAL CONCERN TO CIL-INDUST  
 PUBLISHED  
 030050 TITLE-AUTHOR COMPANY INDEX RECORDS PUBLISHED BY U. S. DEPARTMENT INTERIOR>>  
 PUBLISHED  
 007096 AUTHOR-PUBLISHER RELATIONSHIPS IN SCHOLARLY PUBLISHING  
 PUGNAX  
 040273 ENERGY FLOW FOOD HABITS AND POPULATION DYNAMICS OF UCA PUGNAX  
 PULP  
 019126 INFORMATION SOURCES ON THE PULP AND PAPER INDUSTRY  
 PULP  
 028504 GROWTH OF SELECTED CELLULOYTIC FUNGI ON WOOD PULP  
 PULP-MILLS  
 026611 APPROPRIATE INDUSTRIAL TECHNOLOGY FOR PAPERPRODUCTS AND SMALL PULP-FILL  
 PULSE  
 023486 MODIFIED CIRCUIT FOR TV SYNC PULSE GENERATECE  
 PULSE  
 030784 PULSED NEUTRON LOGGING  
 PUMP  
 031677 HEAT PUMP TECHNOLOGY  
 PUMPING  
 019590 MANUAL ON HYDRAULIC-RAM FOR PUMPING WATER  
 PUMPING  
 036629 WASTEWATER ENGINEERING COLLECTION AND PUMPING OF WASTEWATER  
 PUNCTATUS  
 014044 SELECTED REFERENCES ON CHANNEL CATFISH ICTALURUS PUNCTATUS  
 PURCHASING  
 019108 GUIDE TO INDUSTRIAL PURCHASING  
 PURCHASING  
 027779 PROFIT-CONSCIOUS PURCHASING TREASURY OF NEWLY-DEVELOPED CGST-REDUCTION  
 PURCHASING  
 028486 PURCHASING COMPUTERS GUIDE FOR BUYERS OF COMPUTES & COMPUTING EQUIPMENT  
 PURIFICATION  
 014872 SHELLFISH PURIFICATION IN INSTALLATIONS USING ULTRAVIOLET LIGHT  
 PURIFICATION  
 030649 AUTOPURIFICATION & PURIFICATION IN THE HYDROSPHERE  
 PURIFICATION  
 030808 STUDY OF THE POLLUTION & NATURAL PURIFICATION OF THE TIGRIS RIVER  
 PURIFICATION  
 039305 HANDBOOK OF WATER PURIFICATION  
 PURITY  
 019458 PURITY & ANALYSIS OF LABELLED COMPOUNDS  
 PURITY  
 022177 INFRARED SPECTRA OF HIGH PURITY PESTICIDE SAMPLES  
 PURPOSE  
 012066 PURPOSE BEY ISSUES & ORGANIZATION OF WORK PARTICIPANTS WORKING PAPERS  
 PURPOSES  
 017948 DEVELOPMENT & EVALUATION OF INTERDICTIONARY GEOLOGY CCUESE FOR EUBROSES  
 PYMATUNG  
 027443 ECOLOGY OF ALGAE A SYMPOSIUM HELD AT THE PYMATUNG LAB- OF FIELD EICLC>> MRF  
 QATAR  
 026714 CITY IN THE DESERTI QASE AL HAYE E.  
 QATAR  
 032115 BUSINESS LAWS AND PRACTICES OF QATAR  
 QATAR  
 032115 BUSINESS LAWS AND PRACTICES OF QATAR  
 QUADRANGLE  
 017955 GEOLOGY OF NOACHIS QUADRANGLE MARS  
 DS99 -C2 C5  
 HF1365 -C3 E8  
 HF1385 -Q3 B8

Fig. 3. Partial Page from KWOC Index Used in NSTIC.

puter. NSTIC had a need to provide quick and easy access, to the researchers and its outside users, to a growing book collection that to date numbers around thirty-six thousand titles, thirty-eight hundred periodical titles amongst a host of other information sources such as KISR's technical reports, Kuwait collection (NSTIC is the depository of all documents produced by various government agencies in Kuwait), newspaper articles, ongoing research and development, etc. NSTIC's initial experience with STAIRS has been successful, and there appears to be considerable promise for its use in the immediate future.

Selection of STAIRS as an information storage and retrieval system was due to a number of factors. NSTIC had been using CMS for more than two years and all its files were created via CMS, since STAIRS/CMS works with CMS-created files our past experience would not be discounted if STAIRS/CMS were to be used. The fact that STAIRS could be used by all of KISR (being a generalized storage and retrieval system) did not require NSTIC to tie down computer power exclusively for itself. The features available were extremely favorable to the working conditions and the fact that STAIRS would be given complete systems support by IBM was a definite plus. It is worth noting here that many organizations in Kuwait are using STAIRS, allowing the exchange of ideas between users. The criteria against which STAIRS was compared are mentioned by Blue and Lancaster.<sup>11</sup>

The IBM Storage and Information Retrieval System/Conversational Monitor System (STAIRS/CMS) is a multiuser dialog system for the storage and retrieval of documents.<sup>12</sup> The system is based on the use of CMS-organized databases that may contain formatted and/or nonformatted (paragraph) data, it operates as an interactive program running under VM/SP with CMS and offers both database retrieval services and database creation and maintenance services.

STAIRS allows searching of up to sixteen concatenated files, provided they are logically organized in the same way. Queries can be formulated at different levels of precision so that a precise query will retrieve

relevant documents only, whereas a general search may retrieve many irrelevant documents.

Queries are constructed using English-like statements, phrases, and logical commands. The retrieved documents serve as a feedback for the searcher to modify his search strategy. The retrieval commands include SEARCH, SELECT, RANK, BROWSE, SORT, SAVE, PRINT etc.

As pointed out by Quinn: to build good strategy, you should have detailed knowledge of the database.<sup>13</sup> If the term or concept to be searched is in a formatted field, then the most efficient search strategy is to use the SELECT command, which limits its search to the formatted fields. Similarly, to create effective search strategy, an understanding of the retrieval commands is a must. An excellent table is provided in Quinn's paper, which displays the search levels of the various logical connectors as used in STAIRS.

By reframing queries, users can not only zero in on the information they need, but can also have these printed or copied onto a CMS file, which can be modified as required and reentered into STAIRS. As a record is added to a database or a new file created, the database creation programs automatically index the words in each document according to user-defined specifications.

All STAIRS databases are privacy-protected at all levels. The user has to have clearance to obtain certain paragraphs, formatted fields, or documents.

Input to STAIRS can be submitted in many different formats. CMS files modified by user-written programs to conform to any one of a number of formats can be used to directly load the database from CMS. However, establishing the database format requires considerable thought and planning as the effectiveness of the final system depends to a large extent on how efficiently the input format has been planned.

STAIRS has its constraints, As has been pointed out by Poor, one of the major disadvantages is the inability to modify a database quickly and easily.<sup>14</sup> STAIRS is a relatively static system. The formatted fields are the only alterable elements within a

STAIRS database. While in the BROWSE mode, these fields can be "modified." However, correcting the text of any particular entry is an involved process that requires deleting the entry from the database and then reentering the modified record via CMS.

In spite of some of the problems encountered in using STAIRS, it is felt that its use has brought NSTIC on the threshold of a new era in the use of computers. The design of new systems, capable of providing timely and uniform information, is within reach for NSTIC automated systems. A sample search on STAIRS is provided in figure 4.

### ARABIC IMPLEMENTATION OF STAIRS

In order to satisfy the inevitable need to store and retrieve Arabic documents, NSTIC has in use an Arabic version of STAIRS. STAIRS/CMS allows the user to modify the system to accept non-English characters. By translating the panels, commands, and operands and increasing the character set to include the Arabic characters, a version of STAIRS has been developed that allows a user to retrieve Arabic documents using Arabic commands and Boolean operands. The Arabic version of STAIRS is a result of a combined effort of several organizations in Kuwait—the Government Computer Center, the Ministry of Interior, and the local IBM representatives have actively participated in making it a viable product.

The use of a look-up table (synonyms) allows the user to load the variant forms of a word so that on entering one word all the related words or other forms of the words can be retrieved simultaneously, this feature, combined with the technique of masking (truncation), has provided the Arabic searches with added power.

NSTIC has presently two IBM 3278/2 (bilingual) terminals that allow the user to first log on using Latin keys; on successfully entering the system, the user is prompted with Arabic panels and messages. The search terms, commands, and operands are all in Arabic. The Arabic version of STAIRS is being applied very successfully

for two files that have been prepared in NSTIC.

In May 1983, a program was launched in NSTIC to catalog and store online all Arabic material pertaining to Kuwait. This special group of material has been named the Kuwait collection. The data is prepared using MARC tags and Library of Congress cataloging rules. The subject authority is maintained by using an enhanced version of Khazindar's *List of Arabic Subject Headings*.<sup>15</sup>

The Arabic implementation of STAIRS is a great step forward for NSTIC. With its extremely sophisticated retrieval capability, Arabic STAIRS provides tremendous potential to develop automated systems in an area that has been neglected so far. A sample search conducted on Arabic STAIRS is provided in figure 5.

To date, the following online files exist in NSTIC that can be accessed online.

File No.	Lang.	Brief Description of the files.
Name Docs.		
OCAT 36582	Eng.	Full MARC records of KISR online book catalog.
NCAT 46480	Eng.	National book catalog representing seven libraries.
KRPT 350	Eng.	KISR internal reports including abstracts.
SR01 600	Eng.	KISR Serials in full MARC (experimental file).
ARAB 200	Arab.	Kuwait collection documents catalogued in NSTIC.
ARUL 1188	Arab.	National Union list of Arabic Periodicals.

### CONCLUSION

Automation in a library environment is by no means an easy task, especially when some well-known problems are coupled with problems associated with logistics, known to be prevalent in the developing countries including the Gulf region. The lack of infrastructure and manpower is felt at various levels.

Every so often automation is considered the panacea for existing problems. At the expense of appearing pessimistic, I would like to mention that deliberate and detailed planning is required before embarking on automation. We are lucky to be entering

## 1. After logging on initiating STAIRS and pressing PFl key, response is:

AQUARIUS - SEARCH MODE - BEGIN YOUR QUERY AFTER THE STATEMENT NUMBER  
00001

## 2. Enter the search term

AQUARIUS - SEARCH MODE - BEGIN YOUR QUERY AFTER THE STATEMENT NUMBER  
00001 \*(GULF ADJ STATES)

## 3. System response (Note: Synonym table was used by the system)

AQUARIUS - SEARCH MODE - BEGIN YOUR QUERY AFTER THE STATEMENT NUMBER  
00001 \*(GULF ADJ STATES)

KUWAIT	2257 OCCURRENCES	437 DOCUMENTS
BAHREIN	3 OCCURRENCES	3 DOCUMENTS
BAHRAIN	81 OCCURRENCES	33 DOCUMENTS
SAUDI	224 OCCURRENCES	90 DOCUMENTS
ARABIA	223 OCCURRENCES	108 DOCUMENTS
OMAN	76 OCCURRENCES	35 DOCUMENTS
QATAR	37 OCCURRENCES	22 DOCUMENTS
IRAQ	134 OCCURRENCES	56 DOCUMENTS
DUBAI	7 OCCURRENCES	3 DOCUMENTS
ABU	20 OCCURRENCES	11 DOCUMENTS
DAHBI	16 OCCURRENCES	8 DOCUMENTS
SHARJAH	3 OCCURRENCES	2 DOCUMENTS
UNITED	5376 OCCURRENCES	2720 DOCUMENTS
ARAB	823 OCCURRENCES	256 DOCUMENTS
EMIRATES	44 OCCURRENCES	26 DOCUMENTS
ARABIAN	294 OCCURRENCES	151 DOCUMENTS
GULF	510 OCCURRENCES	268 DOCUMENTS
GULF	510 OCCURRENCES	268 DOCUMENTS
STATES	4033 OCCURRENCES	2127 DOCUMENTS
RESULT	3115 OCCURRENCES	635 DOCUMENTS

## 4. Combine search statement 1 with another term (system responds)

AQUARIUS - SEARCH MODE - BEGIN YOUR QUERY AFTER THE STATEMENT NUMBER

00002 1 AND INFORMATION

\*(GULF ADJ STATES)

INFORMATION	3115 OCCURRENCES	635 DOCUMENTS
RESULT	2150 OCCURRENCES	1136 DOCUMENTS
RESULT	40 OCCURRENCES	40 DOCUMENTS

## 5. Search on another concept (Note: Masking has been used)

AQUARIUS - SEARCH MODE - BEGIN YOUR QUERY AFTER THE STATEMENT NUMBER

00003 LIBRAR\*3

LIBRAR*03	4465 OCCURRENCES	
LIBRAR	12 OCCURRENCES	11 DOCUMENTS
LIBRARI	3 OCCURRENCES	3 DOCUMENTS
LIBRARIAN	32 OCCURRENCES	31 DOCUMENTS
LIBRARIE	3 OCCURRENCES	3 DOCUMENTS
LIBRARIES	1095 OCCURRENCES	615 DOCUMENTS
LIBRART	1 OCCURRENCES	1 DOCUMENTS
LIBRARY	3305 OCCURRENCES	2052 DOCUMENTS
LIBRARY.	7 OCCURRENCES	2 DOCUMENTS
LIBRARY'S	3 OCCURRENCES	2 DOCUMENTS
RESULT	4465 OCCURRENCES	2280 DOCUMENTS

Fig. 4. Sample Search for Books on Information and Libraries in the Gulf States, in NCTIC's Database 'CATI.'

1. After logging on, Arabic STAIRS is initialized by entering:

معلومات

2. The System responds by providing a welcome panel with brief explanation about STAIRS commands

```

ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز
ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز
ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز
ستيز
ستيز |
ستيز |      بسم الله الرحمن الرحيم
ستيز |      مرحبا بكم في ستيز
ستيز |
ستيز | نظام تخزين و استرجاع المعلومات ( ستيز ) خاص بخدم نظم المعلومات
ستيز | اوليه في المركز الوطني للمعلومات.
ستيز | سوذ بكمكم نظام ستيز من البحث في قاعده معلومات عربيه اليه
ستيز | مستخدمين في ذلك معاملات بوليان العربيه باللغه العربيه مثل و؟
ستيز | الكطق، او، هنيه، مثل.. الخ. و ذيما يلي قائمه باسماء ذواعذ المعلومات
ستيز | العربيه المتوفره مع شرح مبسط لكل منها. اذتر القاعده التي تشاسك
ستيز | و اذتل ردمها الموجود امامها من موضع ووذ علامه الادخال المضبطه.
ستيز | اضعط على الزر " اذتل " و سوذ تظهر لك صفحه المحدثيات ...
ستيز |
ستيز |      ذفا سعيدا
ستيز |
ستيز |
ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز
ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز
ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز ستيز

```

3. On hitting 'ENTER' the system provides a list of files with a one line description of each file. The user enters the appropriate number (e.g. 1)

المدتويات	رذم الملذ
1	عربي هذذا الملذ يذتوي على كل الملذات العربيه في المركز الوطني للمعلومات
2	مجلات هذذا الملذ يذتوي على القاعده الموخده للذوريات العلميه العربيه بالكويط

اذتل رذم الملذ المطلوب : 1

4. The system responds with a message that Arabic STAIRS has been accessed and that the user has to hit 'ENTER' and wait.

سوذ يذتل لان نظام ستيز ، اضعط على الزر " اذتل "
   
 ذرمو اذنتظار كذيلما

Fig. 5. Sample Search Conducted on an Arabic File of NSTIC's Database Using the Arabic Version of STAIRS.

automation at a time when some of the age-old problems in libraries have been solved, and we can concentrate on designing a system that can make use of readily available machine-readable records. We have a tremendous choice in both hardware and software, the costs of which have fallen considerably over the past few years.

To sum it up, I feel that automation as it has evolved in NSTIC has put us in a better position to evaluate both our present and future needs and to take better advantage of the computer revolution that is here to stay.

REFERENCES

1. Report of the Kuwait delegation to the CASTARAB conference, by the General Secretary, Council of Ministers, November 28, 1976.
2. Willemijn Silvere, *Technique of Union Catalogues: A Practical Guide* (Paris: UNESCO, 1966), p.5-6.
3. Leonard M. Harrod, *The Librarians' Glossary of Terms Used in Librarianship, Documentation and the Book Crafts, and Reference Book* (4th ed.; London: Trinity Press, 1977), p.472.

4. J. E. Rowley, *Mechanised In-House Information Systems* London: Clive Bingley, 1979), p.74-78.
5. Barbara E. Markuson and others, *Guidelines for Library Automation: A Handbook for Federal and Other Libraries* (Santa Monica, Calif.: Systems Development Corporation, 1972), p.38.
6. Stephen R. Salmon, *Library Automation Systems* (New York: Marcel Dekker, 1975), p.8-9; Judy Wagner, "Data Base Management System Design for Library Automation," *Journal of Library Automation* 13:56-61 (Mar. 1980); Tamer Uluaker, Anton R. Pierce, and Vinod Chachra, "Design Principles for a Comprehensive Library System," *Journal of Library Automation* 14:78-89 (June 1981).
7. R. G. Woods and C. M. Philips, "Managing Library Computers," *Library Management* 2, no.2:23 (1981).
8. Chervinko S. James, "Online COM Catalog to Revolutionize Library Service and Efficiency," *Data Management* 20:27 (Jan. 1982).
9. Wagner, "Data Base Management System Design," p.58.
10. Albert C. Patterson, "Data Base Hazards," *Datamation* 18:48 (July 1972).
11. Richard I. Blue, "Questions for Selection of Information Retrieval Systems," *Online Review* 3:77-83 (1979); F. W. Lancaster and E. G. Fayen, *Information Retrieval On-Line* (Los Angeles: Melville Publishing, 1973), p.237-44.
12. IBM World Trade Corp., *Storage and Information Retrieval System/Conversational Monitor System, Terminal User's Guide* (Uithoorn, Netherlands: IBM World Trade Corp., 1981).
13. Karen Takle Quinn, "STAIRS Search Strategy Ideas and Opinions," *Online Review* 4:164 (1980).
14. William Poor, "STAIRS a Storage and Retrieval System Applied in Online Cataloging," *Special Libraries* 73:57 (Jan. 1982).
15. El-Khazindar A. Ibrahim, *List of Arabic Subject Headings* (2d. ed.; Kuwait: Scientific Research House, 1978). ■■

# UTLAS INC.

## Automated services, products, and systems for libraries

UTLAS has more than a decade of experience with online systems and related products and services, and a growing network of institutions in Canada, the United States, and Japan.

Services: Online Cataloguing Network  
Complete Name and Subject Authority Control  
RECON Services  
Acquisitions Control, including Fund Accounting  
Upgrading of Databases to AACR2

Products: COM and Book Catalogues  
Cards  
Bibliographic and Authority Records on Tape  
Labels



**UTLAS**...effective solutions for libraries everywhere.

80 Bloor Street West 2nd Floor Toronto Ontario Canada M5S 2V1  
Telephone 416/923-0890

# CITE NLM: Natural-Language Searching in an Online Catalog

Tamas E. Doszkocs

*The National Library of Medicine's CITE public access online catalog offers unique subject search capabilities, such as natural-language query input, automatic medical subject headings display, closest match search strategy, ranked document output, and the use of dynamic end user feedback for search refinement. The system also supports conventional known-item search options.*

In 1971, the National Library of Medicine (NLM) initiated MEDLINE, the world's first nationwide remote access online information retrieval system. The ensuing growth and acceptance of online search systems, such as NLM's ELHILL, BRS/SEARCH, DIALOG, ORBIT, and others during the 1970s and 1980s has been partially due to the impressive speed and search efficiencies inherent in the inverted list file structures and Boolean set operations commonly employed. Because of the complexities of the command-language-oriented user interface, file content, structure, and search strategies, the use of information retrieval systems requires considerable user training. Consequently, the majority of online searches are performed by trained intermediaries, in a delegated search mode, on behalf of end users. The conventional user interfaces thus represent barriers to retrieval access by the very end users whose information needs the databases are intended to serve.

The development of alternative interfaces, specifically designed to facilitate direct end user interaction in information re-

trieval systems, is a relatively new phenomenon. In 1979, the National Library of Medicine implemented the CITE (Computerized Information Transfer in English) prototype end user interface for its MEDLINE medical journal citation database.<sup>1</sup> In 1981, researchers at the Beth Israel Hospital in Boston reported on the successful implementation of the PAPERCHASE system for accessing a local subset of NLM's MEDLINE file.<sup>2</sup> The BRS/After Dark and Dialog Knowledge Index commercial end user services were inaugurated in 1982.<sup>3</sup> The ISI SCI-MATE microcomputer end user interface and personal bibliographic data management system became available in 1983.<sup>4</sup>

NLM's machine-readable book catalog file, CATLINE, has been available for online network searching on the library's ELHILL retrieval system since 1973. Due to the single-level, Boolean search logic user interface of ELHILL, however, online searching of CATLINE has largely been confined to trained medical reference librarians and catalogers. Until the closing of the card catalog in 1980, walk-in patrons of

---

Tamas E. Doszkocs is computer scientist in the Specialized Information Services Division of the National Library of Medicine, Bethesda, Maryland. Manuscript received September 1983; accepted September 1983.

NLM consulted the computer-produced but manually maintained card catalog when requesting books from the stacks. While the closing of the card catalog eliminated the need for its expensive maintenance, the card catalog's interim successor, a COM catalog, proved less than ideal for NLM and its patrons due to the high cost of updates, as well as problems of currency and ease of use. Following the recommendations of the Task Force on Closing the Card Catalog, in 1981 NLM initiated a search for suitable software to serve as the library's patron access online catalog. The search was eventually narrowed to two internally developed systems, CITE and ILS (Integrated Library System).<sup>5</sup> The former emphasized user flexibility in subject searching, while the latter was essentially modeled on the traditional card catalog access pattern.

#### SYSTEM EVALUATION AND SELECTION

In January 1982, an Online Catalog Study Group drew up specifications and requirements for a public access online catalog to be installed in NLM's reading room. The specifications addressed database content, record composition, search/access features, display formats, and user-friendly characteristics. The specifications were stated as technical requirements against which CITE and ILS would be evaluated. Initial plans called for an in-house evaluation study to be conducted over a period of nine months. In March, the designers of both systems were asked to implement needed software capabilities in order to conform to the technical requirements. System-specific HELP messages, printed instruction materials, and public notices were developed by a working group. Both CITE and ILS were to be made available for public testing on identical HP 2626A terminals, already in place in the reading room as part of another project.

CITE was made available to walk-in patrons in April, ILS starting in June. Testing and evaluation were conducted from April through September. The study was aimed at providing an objective assessment of both technical performance and user ac-

ceptance. In November 1982, the study findings resulted in a decision to adopt CITE as NLM's public access online catalog.<sup>6</sup>

#### THE CITE APPROACH

ELHILL, like other command-language-oriented information retrieval systems, limits the user to a kind of passive system interaction in which the searching is automatic but the search strategy formulation is cumbersome and is solely the searcher's responsibility. There is no provision for automatic terminology mapping or ranked document output. Relevance judgments are used only indirectly by the searchers who themselves, rather than the system, change the term composition of queries based on online browsing. By contrast, CITE offers a considerable degree of flexibility and dynamism in the user-system interaction. Queries can be entered free form, that is full English-language sentences; phrases or keywords are equally accepted by the system. CITE automatically suggests potentially applicable keywords and medical subject headings, attempts to identify spelling errors and allows the user to correct them, automatically assigns weights to search terms, but lets searchers override the default weights according to their perceived importance of the given terms. Instead of Boolean set operations, CITE performs a combinatorial or "closest match" search, identifying documents that have all or some of the user selected search terms. The resulting records are displayed in ranked sequence, with those likeliest to be relevant to the search query being shown first. Importantly, CITE allows the searcher to indicate which of the retrieved records appear to be relevant to the search question. CITE then uses this feedback information to try and locate other items in the collection that are similar to the relevant records.

In adopting the CITE prototype to meet the requirements of the CATLINE public access online catalog, the unique functional features of the CITE/MEDLINE experimental user interface were consciously retained and strengthened. The designers deliberately chose not to emulate the card

catalog access paradigm with its emphasis on known-item searching, one-at-a-time search concept lookup, sequential browsing, and assumptions of user familiarity with NLM medical subject headings (MESH) and classification scheme. Similarly, no prior user training or user familiarity with notions of Boolean searching, command language, or file content was presupposed. Instead, major emphasis in the implementation was placed upon utmost flexibility in subject searching. In fact, the latter was assumed to be the dominant mode of end user searching, with the additional recognition that the end user will typically contribute something that the intermediary searcher is often unable to provide, namely the intuitive recognition of potentially significant search terms and relevant bibliographic items displayed by the system, thus providing valuable direct feedback for automatic search refinement and iteration.

The implementation of the NLM CITE/CATLINE public access online catalog offered the challenge of translating the results of state-of-the-art information retrieval research into a sophisticated operational public service capability (see appendix A).

### SUBJECT SEARCHING IN CITE

As was noted earlier, from its original inception in 1979, the CITE project has placed prime emphasis on ease of end user access and subject searching in bibliographic/textual retrieval. The key subject search features of the original CITE prototype, such as natural-language query input, automatic term weighting, closest match search strategy, and ranked display of retrieved records were further enhanced during the implementation of the CITE/CATLINE public access online catalog and new, powerful capabilities were added. Among these are the automatic identification of morphological variants of the original query terms and automatic mapping of the query to medical subject headings and subheadings. Both medical subject headings and topical subheadings are given in the NLM classification and are used by NLM catalogers to describe the subject of

works cataloged for the library's collection.<sup>7</sup>

The CATLINE database contains more than 500,000 authoritative references to books and serials cataloged at NLM, including all monographs published from 1801 to the present. The primary subject access points in the CATLINE inverted index are title (text) words and a limited number (average one to two per record) medical subject headings and subheadings.

### Natural-Language Query Input

Users of the CITE/CATLINE public access online catalog enter subject searches in free-form language, e.g., English sentences, paragraphs, phrases, term lists, or a combination of the above. No query syntax restrictions are imposed on the searcher. Figure 1 shows natural-language query input in CITE/CATLINE. Since foreign (transliterated) titles are inverted the same way as English titles, search questions can be typed in other languages as well, for instance in Spanish, German, Hungarian, etc. Natural-language query input avoids the time-consuming and "unnatural" keyword- or concept-at-a-time subject entry restriction commonly found in online catalogs and text retrieval systems. Some retrieval systems that seemingly allow the input of multiword phrases typically translate the query into a Boolean AND or, worse yet, a Boolean OR keyword list, which more often than not results in no retrieval or confounded, imprecise retrieval. CITE actually does break up the query into component keywords but makes no attempt to translate it into a Boolean expression. English-sentence queries are processed according to the same indexing and text segmentation algorithm used for ELHILL in generating the CATLINE inverted file. The resulting keywords are filtered against an expanded stopword list of approximately six hundred terms derived from an actual list of high-frequency CATLINE inverted text words.

### Automatic Stemming

Bibliographic databases, with their heavy dependence upon the text of titles and/or abstracts in subject retrieval, re-



medical dictionaries. For instance, *treat, treatment, treating, therapy, therapies, therapeutic, care, regimen* all map to the subheading *therapy* when encountered in a search query.

#### Displaying Suggested Search Terms

The automatically identified keywords, medical subject headings, and topical sub-headings are grouped and ranked by weight and are displayed for the end user's selection.

Figure 2 illustrates a typical term display in CITE/CATLINE. The user's implicit

priority in term selection triggers an automatic reweighting of the selected entries according to their importance as perceived by the human searcher.

#### Processing Term Lists and Displaying Retrieved Records

Terms selected by the user correspond to inverted lists of CATLINE items indexed by the given terms. CITE merges these lists and produces a retrieval set whose items carry the combination of weights associated with the individual lists or search terms. The combined weights of list items

SUBJECT SEARCH - PLEASE TYPE YOUR SEARCH QUESTION

: the use of biofeedback and relaxation in the treatment of stress headache

Looking in the index for terms to use in searching...

THE FOLLOWING 13 SEARCH TERMS ARE BEING PROCESSED FOR YOUR SEARCH:

RANK	TERM
1	RELAXATION TECHNICS (medical subject heading )
2	BENZODIAZEPINE TRANQUILIZERS (medical subject heading )
3	BIOFEEDBACK (text word )
4	FEEDBACK (medical subject heading )
5	BIOFEEDBACK (PSYCHOLOGY) (medical subject heading )
6	RELAXATION (text word )
7	RELAXATION (medical subject heading )
8	HEADACHE (text word )
9	HEADACHE (medical subject heading )
10	STRESS (text word )
11	STRESS (medical subject heading )
12	TREATMENT (text word )
13	THERAPY (subheading )

Type the rank numbers of the search terms you want to use  
IN THEIR ORDER OF IMPORTANCE or type ALL  
5 thru 9, 1, 3 and 10-13

Fig. 2. Automatic Term Display and User Selection.

are then used to rank the resulting documents for display to the user. Items that have all or most of the user-specified search terms, i.e., closest match items, are displayed at the top of the list. Within identically weighted groups of items, those with the most recent publication dates are displayed first. Terms that caused the retrieval are highlighted in the display to facilitate quick user assessment of an item's potential relevance. The user can choose a brief or a detailed display format, with full flexibility in viewing items sequentially or selectively in a browsing mode. Since close to half of all records in CATLINE are foreign-language items, users are given the option to limit retrieval display to English-language items only. Similarly, patrons can indicate to CITE that they are interested in "current" books only. When this is noted, CITE allows the user to define *current* by specifying the earliest publication date of interest. Figure 3 shows a ranked and highlighted CITE/CATLINE record display.

#### Dynamic User Relevance Feedback

When looking at ranked records, the end user sooner or later comes to a point where he/she no longer sees any relevant items in the display. At that point CITE provides the option for the user to specify items of interest among those already seen and to direct the system to find similar items. This dynamic relevance feedback feature takes advantage of the fact that the end user is in an ideal position to know which items are relevant or interesting. CITE utilizes the feedback by performing a frequency analysis of the medical subject headings from the records noted as relevant by the user. Subsequently, CITE displays a ranked list of such medical subject headings for the user's selection. In addition to the medical subject headings chosen by the searcher at this point, CITE also automatically uses the classification number portion of the call numbers of relevant records in an iterative combinatorial search. The user does have the option of adding additional keywords for search modification. CITE/CATLINE thus provides a form of "electronic shelflist browsing," whereby items with like classification numbers, and also containing simi-

lar medical subject headings and text words, are presented to the end user.

The process can be iterated at will to accomplish narrowing or broadening the search in different directions. Figure 4 illustrates dynamic user feedback and search modification.

Although maintained in machine-readable form, the NLM classification is not currently available for computerized searching. This precludes the automatic mapping of search queries directly to the classification schedule by CITE.

Appendix B shows a complete CITE/CATLINE subject search session.

### NATURAL-LANGUAGE SEARCHING VERSUS ARTIFICIAL INTELLIGENCE

CITE, although it gives the illusion of "understanding" English or foreign-language search questions, is not an artificial intelligence (AI) application. (It certainly cannot answer medical questions like "Why me?"). Natural-language question answering systems and end user front ends to database management systems like Artificial Intelligence Corporation's INTELLECT, typically deal with limited subject domains with relatively few discrete data elements and textual field values. Bibliographic-textual databases, by contrast, have diverse content domains and a very large number of data elements and textual-field values.

The question answering approach is basically inappropriate for bibliographic reference files which, by and large, do not contain answers, but merely surrogate references to primary sources that may have the answers. Nonetheless, AI techniques do have a potential role in interpreting the type of question if not the meaning of a question in a public access online catalog. It appears that the state of the art in natural-language understanding is sufficiently mature to be able to accept completely unrestricted natural-language queries and automatically recognize what type of search the end user wishes to perform (e.g., subject search, author search, limiting the search by language or date or type of mate-

Search in progress...

507,036 RECORDS SEARCHED

310 ITEMS CONTAIN ONE OR MORE OF THE SEARCH TERMS

NONE OF THE RECORDS MATCH YOUR SEARCH QUESTION EXACTLY

1/; Stress and the art of biofeedback; / Barbara B. Brown.;  
Brown, Barbara B.; xiv, 298 p. ::ill.; S:1977; 1st ed.; New York ::Harper &  
Row.;c1977.; Eng; Biofeedback (Psychology); Stress  
CALL NUMBER; WM 420 B877s 1977;

2/; Kopfschmerz, Diagnose, Pathophysiologie, Pharmakotherapie,  
Biofeedback; / Milo:s Sov:ak.; Sov:ak, Milo:s; 128 p. ::ill.; S:1980;  
Heidelberg ::Verlag für Medizin Fischer.;:1980.; Ger; Biofeedback  
(Psychology); Headache  
CALL NUMBER; AA1338;

3/; Migr:ane-Therapie; : Biofeedback, Akupunktur; / von Milos  
Sovak und Erich W. Stiefvater.; Sov:ak, Milo:s; Stiefvater, Erich W.;  
Schriftenreihe Erfahrungsheilkunde ; 61 p. ::ill.; S:1975; Heidelberg ::Haug,  
:c1975.; Ger; Acupuncture; Autogenic Training; Feedback; Migraine  
CALL NUMBER; HL 344 S729m 1975;

CONTINUE DISPLAY? (TYPE YES, NO, OR X (START NEW SEARCH), OR STOP:yes

WOULD YOU LIKE TO SEE ONLY ENGLISH LANGUAGE ITEMS? Y/N:yes

WOULD YOU LIKE TO SEE ONLY CURRENT BOOKS? Y/N:yes

PLEASE ENTER EARLIEST PUBLICATION DATE (YEAR) OF INTEREST:1980

4/; Symptom reduction through clinical biofeedback; / Ivan  
Wentworth-Rohr.; Wentworth-Rohr, Ivan; S:1983; New York, N.Y. ::Human Sciences  
Press.;c1983.; Eng; Biofeedback (Psychology); Psychophysiologic  
Disorders

<< THIS ITEM IS NOT YET OWNED BY NLM >>

Fig. 3. Ranked and Highlighted CITE/CATLINE Record Display.

5/; Behavioral medicine, biofeedback, and behavioral approaches in psychosomatic medicine; / editor, H. Leigh.; Leigh, Hoyle; Psychotherapy and psychosomatics, ISSN 0033-3190 ; v. 36, no 3-4; Psychotherapy and psychosomatics ; v. 36, no. 3-4; p. 150-260, i-iv : :ill.; S:1981; Basel ; New York ::Karger,:1981.; Eng; Behavior; Behavior therapy; Biofeedback (Psychology)  
CALL NUMBER; W1 PS86K v.36 no.3-4 1981;

6/; Treatment of migraine, pharmacological and biofeedback considerations; ; [proceedings of symposium, November 30-December 1,1979; / sponsored by the Texas Research Institute of Mental Sciences, Houston] ; edited by Roy J. Mathew ; technical editors, Lore Feldman, Karen Hanson Stuyck. ; Mathew, Roy J.; Feldman, Lore; Stuyck, Karen Hanson; 171 p. ::ill.; S:1981; Texas Research Institute of Mental Sciences; New York ::SP Medical & Scientific Book,:c1981.; Eng; Biofeedback (Psychology)  
CALL NUMBER; WL 344 T784 1979;

CONTINUE DISPLAY? (TYPE YES, NO, OR X (START NEW SEARCH), OR STOP: no

(Fig. 3. Continued).

CHOOSE THE ITEM(S) IN WHICH YOU ARE MOST INTERESTED

TYPE CHOICE NUMBER(S) OR NUMBER RANGE(S) OR ALL  
or type X (to start new search), or type STOP

:1,2 3 and 6

SELECT FROM THE FOLLOWING OPTIONS:

- 1 = DISPLAY IN BRIEF THE ITEM(S) YOU CHOSE
- 2 = DISPLAY IN DETAIL THE ITEM(S) YOU CHOSE
- 3 = FIND ITEMS SIMILAR TO THE ONE(S) YOU CHOSE
- 4 = START NEW SEARCH

: 3

7 SEARCH TERM(S) WILL NOW BE  
DISPLAYED IN RANKED ORDER

Fig. 4. Dynamic User Relevance Feedback and Search Modification.

RANK	TERM
1	BIOFEEDBACK (PSYCHOLOGY) (medical subject heading)
2	STRESS (medical subject heading)
3	HEADACHE (medical subject heading)
4	ACUPUNCTURE (medical subject heading)
5	AUTOGENIC TRAINING (medical subject heading)
6	FEEDBACK (medical subject heading)
7	MIGRAINE (medical subject heading)

TYPE CHOICE NUMBER(S) OR NUMBER RANGE(S) OR ALL  
or type X (to start new search), or type STOP

:1 5 and 7

TYPE ADDITIONAL SEARCH TERM(S) OR PRESS RETURN TO PROCEED  
:psychosomatic

Search in progress...

THE FOLLOWING 10 SEARCH TERMS ARE BEING PROCESSED FOR YOUR SEARCH:

RANK	TERM
1	BIOFEEDBACK (PSYCHOLOGY) (medical subject heading)
2	HEADACHE (medical subject heading)
3	THERAPEUTIC USE (subheading)
4	THERAPY (subheading)
5	PSYCHOSOMATIC (text word)
6	PSYCHOSMATICS (text word)
7	THERAPEUTIC USE (subheading)
8	MIGRAINE (medical subject heading)
9	WM 420 (call number)
10	WL 344 (call number)

Search in progress...

507,036 RECORDS SEARCHED

(Fig. 4. Continued.)

88 ITEMS CONTAIN ONE OR MORE OF THE SEARCH TERMS

NONE OF THE RECORDS MATCH YOUR SEARCH QUESTION EXACTLY

1/; En las cefaleas prescriba tambien "Valium: Roche.; [11] p.:illus.; S:1966; Servicio Cientifico Roche, Montevideo; [Montevideo,::1966]; Spa; Diazepam; Headache  
CALL NUMBER; W6 P3 v.7465;

2/; Treatment of migraine, pharmacological and biofeedback considerations; ; [proceedings of symposium, November 30-December 1,1979; / sponsored by the Texas Research Institute of Mental Sciences, Houston] ; edited by Roy J. Mathew ; technical editors, Lore Feldman, Karen Hanson Stuyck. ; Mathew, Roy J.; Feldman, Lore; Stuyck, Karen Hanson; 171 p. ::ill.; S:1981; Texas Research Institute of Mental Sciences; New York ::SP Medical & Scientific Book,::c1981.; Eng; Biofeedback (Psychology);  
Migraine  
CALL NUMBER; WL 344 T784 1979;

3/; Kopfschmerz, Diagnose, Pathophysiologie, Pharmakotherapie, Biofeedback; / Milo:s Sov:ak.; Sov:ak, Milo:s; 128 p. ::ill.; S:1980; Heidelberg ::Verlag fur Medizin Fischer,::1980.; Ger; Biofeedback (Psychology);  
Headache  
CALL NUMBER; AA1338;

CONTINUE DISPLAY? <TYPE YES, NO, OR X (START NEW SEARCH), OR STOP:y

WOULD YOU LIKE TO SEE ONLY ENGLISH LANGUAGE ITEMS? Y/N:n

WOULD YOU LIKE TO SEE ONLY "CURRENT" BOOKS? Y/N:n

4/; Behavioral medicine, biofeedback, and behavioral approaches in psychosomatic medicine; / editor, H. Leigh.; Leigh, Hoyle; Psychotherapy and psychosomatics, ISSN 0033-3190 ; v. 36, no 3-4; Psychotherapy and psychosomatics ; v. 36, no. 3-4; p. 150-260, i-iv ::ill.; S:1981; Basel ; New York ::Karger,::1981.; Eng; Behavior; Behavior Therapy; Biofeedback (Psychology)  
CALL NUMBER; W1 P586K v.36 no.3-4 1981;

(Fig. 4. Continued).

5/; Behavioral approaches to neurology; / Joel F. Lubar, William M. Deering.  
; Lubar, Joel F.; Deering, William M.; Behavioral medicine; xii, 209 p. ::ill.  
; S:1981; New York ::Academic Press, :1981.; Eng; Behavior [Therapy];  
Biofeedback (Psychology); Epilepsy; Hyperkinetic Syndrome; Learning  
Disorders

CALL NUMBER; HL 103 L926b 1981;

6/; Biofeedback, clinical applications in behavioral medicine; : clinical  
applications in behavioral medicine; / David S. Olton, Aaron R. Noonberg.  
Olton, David S.; Noonberg, Aaron R.; x, 437 p. ::ill.; S:1980; Englewood  
Cliffs, N.J. ::Prentice-Hall, :c1980.; Eng; Biofeedback (Psychology);  
Psychophysiological Disorders

CALL NUMBER; HM 420 052b 1980;

CONTINUE DISPLAY? (TYPE YES, NO, OR X (START NEW SEARCH), OR STOP:

(Fig. 4. Continued).

rial etc.). Future enhancements to CITE may incorporate pragmatic AI natural-language understanding capabilities in this limited sense.

#### THE UTILITY OF CLOSEST MATCH SEARCH STRATEGY FOR KNOWN-ITEM SEARCHING

In addition to its pivotal role in subject searching, the combinatorial closest match search strategy employed by CITE represents a powerful and useful capability for known-item searches as well. As is well known to librarians, when library patrons look for a specific book or journal title, corporate author, conference name or series, they often do not know or remember the complete or exact piece of information necessary for finding the right item. CITE is very lenient with its end users in such situations and is generally able to zero in on the appropriate bibliographic record. CITE/CATLINE users also tend to appreciate the serendipity effect of like items displayed by the computer. Figure 5 shows an example of an inexact title search.

#### OTHER FEATURES OF CITE/CATLINE

Besides subject searching, CITE/CATLINE also provides menu choices for personal author search, series, organization,

conference name, call number, book or journal title, and title/author searches.

To the extent possible, flexible user input is provided for in all function modules. For instance, alternative forms of personal author names can be entered. (The user is simply asked to type the author's name starting with the last name.) Spelling errors are identified, and user correction is encouraged. At any point in the interaction, the patron can press the HELP function key, or type HELP, or H, or ?, and the system will respond with an in-context, tutorial type message. CITE/CATLINE error messages are nonthreatening and nonaccusatory. The user has the option to terminate or restart the search at any point by typing an X (for exit). CITE maintains a transaction log file to assist in system performance monitoring. There is a bank of six Hewlett-Packard public access online catalog terminals in the NLM reading room. Response time is typically one to two seconds following user input. CITE/CATLINE extensively utilizes search heuristics in all its functional modules, emulating search strategies commonly employed by trained ELHILL intermediaries. For example, trained ELHILL/CATLINE searchers are taught to beware of title search keys for various symposia, since often too many records will be retrieved by the same user-generated title search key. Intermediaries

TITLE SEARCH - PLEASE TYPE TITLE OF INTEREST

: the problem of biomedical communications

Search in progress...

507,036 RECORDS SEARCHED

44 ITEMS CONTAIN ONE OR MORE OF THE SEARCH TERMS

NONE OF THE RECORDS MATCH YOUR SEARCH QUESTION EXACTLY

1/; The:biomedical communications problem.; Cummings,  
Martin Marc; p. 110-133.:illus.; S:1967; [London,::1967]; Eng; Information  
Systems; Medicine

CALL NUMBER; Z 699.5 M39 C971b 1967; SHELVING LOCATION: Arch.

2/; Lecture skills for health science educators; : a kit for designing  
training.; Carr, Victor; Jones, Beverly; Locatis, Craig; NLM/NMAC technical  
support ; TR-82-50; 1 v. (various pagings) ::ill.; S:1982; Lister Hill National  
Center for Biomedical Communications. Educational Training  
and Consultation Branch; Bethesda, Md. ::Educational Training and Consultation  
Branch, Lister Hill National Center for Biomedical  
Communications, National Library of Medicine,:[1982]; Eng; Teaching

CALL NUMBER; W 18 C312L 1982;

3/; A:review of the United States role in international biomedical  
research and communications; : international health and foreign  
policy; / Mary E. Corning.; Corning, Mary E.; NIH publication ; no. 80-1638;  
xxvii, 436 p. ::ill., ports.; S:1980; National Library of Medicine (U.S.);  
Bethesda, Md. ::U. S. Dept. of Health and Human Services, Public Health  
Service, National Institutes of Health, National Library of Medicine ;  
Washington : for sale by the Supt. of Docs., U. S. Govt. Print. Off.,:1980.;  
Eng; Communication; Health Policy; International Cooperation; Medicine;  
Research; United States

CALL NUMBER; JA 540 AA1 C8r 1980; SHELVING LOCATION: Ref. Gen. Coll.

CONTINUE DISPLAY? <TYPE YES, NO, OR X (START NEW SEARCH), OR STOP:

Fig. 5. Inexact, Closest Match Title Search.

are advised to AND significant key words from the title with the title key in order to narrow the search. CITE/CATLINE automatically generates the title search key and routinely uses keywords from the title in performing a closest match title search. This allows the automatic placement of the "right" title(s) at the top of the results display (see figure 5).

#### USERS AND USES OF CITE/CATLINE

Walk-in patrons of NLM represent a broad spectrum of professional roles and background. Most CITE/CATLINE users are infrequent visitors to NLM, and the majority of them are looking for books on a subject. The NLM public access online catalog user survey found that 84 percent of CITE/CATLINE users had a "very favorable" attitude toward the online catalog.<sup>9</sup> While observational evidence indicates substantially increased use of the catalog since going online, there is a need for extensive transaction log analysis and performance evaluation of the system in the future.

#### TECHNICAL NOTES

CITE/CATLINE accesses the same CATLINE database as NLM's MEDLARS network retrieval software—ELHILL. Consequently, there is no costly replication of data or double updates. The CITE/CATLINE program is a stand-alone end user interface. As such, it is entirely separate from ELHILL. The implementation language is PL/I with a few special-purpose ALC (assembly language code) routines for speed and efficiency. CITE/CATLINE runs on NLM's IBM 3033 MP (multiprocessor) mainframe, as a single user per program copy TSO (Time Sharing Operating system) application. Six HP 2626A terminals provide public access via CITE/CATLINE. The terminals utilize standard ASCII protocols. Color-coded programmable function keys are used for the patrons' convenience, e.g., HELP, PRINT, START keys (see appendix C). The terminals have a built-in thermal printer. Less-expensive Televideo terminals are on

order to replace the HPs. CATLINE presently contains 506,823 records. The file is updated weekly. CITE/CATLINE public service is available six days a week (8:30 a.m. to 9:00 p.m. Monday through Thursday, 8:30 a.m. to 6:00 p.m. Friday, and 8:30 a.m. to 5:00 p.m. Saturday).

#### WORK IN PROGRESS AND POTENTIAL ENHANCEMENTS

In addition to being utilized as NLM's public access online catalog, CITE continues to serve as a vehicle for research investigation in the development of new information retrieval and automatic indexing techniques.

Another project based on CITE is currently under way. Dubbed "CITEHILL," its main objective is to combine the best features of CITE and ELHILL in order to provide efficient, user-friendly access to CATLINE, as well as other important NLM databases, such as MEDLINE, NLM's largest and most heavily used file.

The list of enhancements awaiting future implementation includes the automatic mapping of author entries to the NLM name authority file, the automatic mapping of subject queries to the NLM classification, enhanced subject access via the use of an automatically generated associative thesaurus, the development of an AI front end for query interpretation, automatic multifile searching of NLM's diverse databases, support for microcomputers, and end user access on the MEDLARS network.

#### ACKNOWLEDGMENTS

Many good people have participated in the design, implementation, installation, testing, and evaluation of CITE/CATLINE. Special thanks are due to members of the Online Catalog Study Group and Gerry Guthrie and John Ulmschneider for their programming help.

#### REFERENCES

1. Tamas E. Doszkoacs and Barbara Rapp, "Searching MEDLINE in English: A Prototype User Interface with Natural Language Query, Ranked Output and Relevance Feedback," in *Proceedings of the ASIS Annual*

- Meeting 16* (White Plains, N.Y.: Knowledge Industry Publications, 1979), p.131-39.
2. G. L. Horowitz and H. L. Bleich, "Paperchase: A Computer Program to Search the Medical Literature," *New England Journal of Medicine* 305: 924-30 (Oct. 15, 1981).
  3. Richard V. Janke, "BRS/After Dark: The Birth of Online Self Service," *Online* 7:12-29 (Sept. 1983); Marydee Ojala, "Knowledge Index: A Review," *Online* 7:31-34 (Sept. 1983).
  4. Catheryne Stout and Thomas Marcinko, "SCI-MATE: A Menu Driven Universal Online Searcher and Personal Data Manager," *Online* 7:112-17 (Sept. 1983).
  5. C. M. Goldstein, E. A. Payne, and R. S. Dick, "The Integrated Library System (ILS): System Overview," *TR 81-05* (Bethesda, Md.: Lister Hill National Center for Biomedical Communications, National Library of Medicine, 1981).
  6. Elliot R. Siegel and others, "Research Strategy and Methods Used to Conduct a Comparative Evaluation of Two Prototype Online Catalog Systems," in *National Online Meeting Proceedings* (Medford, N.J.: Learned Information, Inc., 1983), p.503-11.
  7. *National Library of Medicine Classification* (4th edition; Bethesda, Md.: National Library of Medicine, 1981).
  8. John E. Ulmschneider and Tamas E. Doszkocs, "A Practical Stemming Algorithm for Online Search Assistance," *Online Review* 7: 301-18 (Aug. 1983).
  9. Siegel, "Research Strategy." ■■

#### APPENDIX A. NLM'S ONLINE PUBLIC ACCESS CATALOG

The National Library of Medicine began a major retrospective conversion project in 1979 to add older cataloging records to its existing online file, CATLINE. As a result of this project CATLINE currently contains approximately 500,000 items, including all monographs published from 1801 to the present. Records for pre-1801 printed monographs are currently being converted and will be added to CATLINE over the next several months.

The CATLINE file was designed for the professional library/information community and requires formal training for optimal use. While it fulfills its purpose of providing authoritative catalog information to medical libraries, NLM also wished to provide this information directly to end users. A user friendly interface to CATLINE called CITE (Current Information Transfer in English), was developed by Dr. Tamas Doszkocs of the NLM staff. CITE was made available to patrons of NLM's reading room in April 1982.

CITE is menu driven, guiding users through their search by a series of menus or choices. No previous knowledge of CITE or CATLINE is required. Patrons may search by personal or corporate author, book or journal title, series, conference name, subject, or call number. Subject queries are entered in plain English and CITE retrieves and displays related CATLINE text words, subject headings, and subheadings from which the user may select those most relevant to the search. The search process uses a combinatorial "best match" technique, rather than Boolean logic. Once a search has been completed, standard bibliographic information (author, title, publisher, date) as well as NLM's call number is provided for each item retrieved. Query terms are highlighted in the displayed records. Retrieval is ranked by most relevant first, and may be limited by language and publication date. At any point in the interaction with CITE, a series of explanatory or HELP messages can be displayed if needed.

NLM currently uses off-the-shelf CRT terminals with internal printers and programmable function keys to access CITE. Certain of these function keys have been programmed to perform specific tasks so that users of CITE will not be required to learn commands or undergo training. For example, if a user wishes to have a copy of the information that appears on the terminal screen, the "print" key is depressed. Other keys available include those for making corrections and reviewing information previously seen. All of these special keys are labeled in bright colors for easy location.

The National Library of Medicine seeks and encourages comments and suggestions from users of CITE/CATLINE. Questions or suggestions may be directed to the Reference Section, Reference Services Division, National Library of Medicine, 8600 Rockville Pike, Bethesda, MD 20209 or by calling (301) 496-6097.

Additional information on CITE can be found in T. E. Doszkocs, B. A. Rapp, and H. M. Schoolman, "Automated Information Retrieval in Science and Technology," *Science* 208: 25-30 (Apr. 4, 1980).

APPENDIX B. CITE/CATLINE SUBJECT SEARCH SESSION

Welcome to  
NLM  
and the  
CITE

PUBLIC ACCESS BOOK CATALOG

To search the catalog, press the RETURN key

To get information about CITE, press the HELP key

For more info see the CITE INFORMATION SHEET, or a Librarian  
ALWAYS PRESS THE RETURN KEY WHEN YOU ARE FINISHED TYPING

CHOOSE ONE OF THE FOLLOWING:

- 1 = SUBJECT SEARCH
- 2 = PERSONAL AUTHOR SEARCH
- 3 = SERIES, ORGANIZATION, CONFERENCE NAME OR CALL NUMBER SEARCH
- 4 = Book or Journal TITLE SEARCH or TITLE/AUTHOR SEARCH
- 5 = STOP THIS SEARCH

SELECT < 1=SUBJECT, 2=AUTHOR, 3=SERIES/CALL#, 4=TITLE, 5=STOP>: 1

SUBJECT SEARCH - PLEASE TYPE YOUR SEARCH QUESTION

: community health services for the elderly and the handicapped

Looking in the index for terms to use in searching...

## (APPENDIX B. CONTINUED)

THE FOLLOWING 16 SEARCH TERMS ARE BEING PROCESSED FOR YOUR SEARCH:

- | RANK | TERM   |
|------|--|
| 1    | COMMUNITY HEALTH SERVICES (medical subject heading)        |
| 2    | COMMUNITY MENTAL HEALTH SERVICES (medical subject heading) |
| 3    | ELDERLY (text word)  |
| 4    | IN OLD AGE (subheading)                                    |
| 5    | HANDICAPPED (text word)                                    |
| 6    | HANDICAPPED (medical subject heading)                      |
| 7    | HANDICAPPING (text word)                                   |
| 8    | COMMUNITY (text word)                                      |
| 9    | TRANSMISSION (subheading)                                  |
| 10   | CELL COMMUNICATION (medical subject heading)               |
| 11   | SERVICES (text word)                                       |
| 12   | CENTRAL SUPPLY, HOSPITAL (medical subject heading)         |
| 13   | SERVICE (text word)  |
| 14   | HEALTH (text word)   |
| 15   | HEALTH (medical subject heading)                           |
| 16   | CAREER MOBILITY (medical subject heading)                  |

Type the rank numbers of the search terms you want to use IN THEIR ORDER OF IMPORTANCE or type ALL :1 to 6, 14 and 15
---

Search in progress...
-----------------------

507,036 RECORDS SEARCHED

79 ITEMS CONTAIN ONE OR MORE OF THE SEARCH TERMS

NONE OF THE RECORDS MATCH YOUR SEARCH QUESTION EXACTLY
--

1/; Coordinated service delivery systems for the elderly; : new approaches for care & referral in New York State; / edited by Ruth Bennett ... [et al.]; Bennett, Ruth; Advanced models and practice in aged care ; no. 2; S:1983; Columbia University. Center for Geriatrics and Gerontology; New York : Haworth, :c1983.; Eng; Community Health Services; Health Planning; Health Services

<< THIS ITEM IS NOT YET OWNED BY NLM >>

(APPENDIX B. CONTINUED)

2/; Aging and prevention; : new approaches for preventing health and mental health problems in older adults; / editors, Sharon Simson .. [et al.].; Simson, Sharon; Prevention in human services ; v. 3, no. 1 (fall 1983); Prevention in human services ; v. 3, no. 1; S:1983; New York ::Haworth Press, :c1983.; Eng; Aging; Community Mental Health Services; Health Services for the Aged; Preventive Health Services

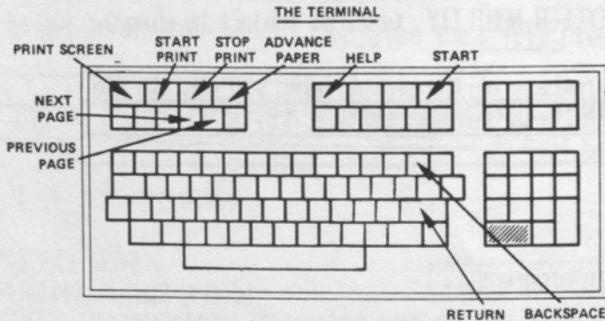
<< THIS ITEM IS NOT YET OWNED BY NLM >>

3/; Mental health programs for older adults; / edited by Michael A. Smyer and Margaret Gatz.; Gatz, Margaret; Smyer, Michael A.; Sage studies in community mental health ; v. 8; S:1983; Beverly Hills ::Sage Publications, :c1983.; Eng; Community Mental Health Services

<< THIS ITEM IS NOT YET OWNED BY NLM >>

CONTINUE DISPLAY? (TYPE YES, NO, OR X (START NEW SEARCH), OR STOP:

APPENDIX C. CITE INFORMATION SHEET



- TO BEGIN ..... press START
- TO GET HELP ..... press HELP
- TO CORRECT MISTAKES ..... press BACKSPACE and retype
- TO REVIEW DISPLAYS ..... press PREVIOUS PAGE
- TO ADVANCE DISPLAY ..... press NEXT PAGE
- TO PRINT A PAPER COPY
  - continuously as you search ..... press START PRINT
  - only individual screen displays ..... press PRINT SCREEN
- TO STOP PRINTING ..... press STOP PRINT
- TO ADVANCE PAPER ..... press ADVANCE PAPER

CITATIONS RETRIEVED

A citation typically retrieved by CITE appears below. Use the author, title, and call number information in citations to obtain books.

- if REF is indicated as the shelving location, the book is in the reading room and you can obtain it from the shelf.
- otherwise, complete a Reader Request Slip.

1/; The best doctors in the U.S.: : a guide to the finest specialists, hospitals, and health centers; / John Peckanen.; 1st ed.; New York ::Seaview Books.; c1979.; xxxv, 290 p.; 8000427; Eng

CALL NUMBER: W 22 AA1 P3b 1979; SHELVING LOCATION: Ref.

# Thus Spake the OPAC User

**Karen Markey**

In 1981, the Council on Library Resources (CLR) provided the funding to enable five organizations to conduct a study of library users and online public access catalogs (OPACs). The five organizations were J. Matthews & Associates (JMA), Library of Congress (LC), Online Computer Library Center, Inc. (OCLC), The Research Libraries Group, Inc. (RLG), and the University of California's Division of Library Automation (UC/DLA). These five organizations coordinated their activities in the development, pretesting, and administration of questionnaires used to survey library patrons at twenty-nine libraries in the United States.<sup>1</sup>

CLR also sponsored three (OCLC, UC/DLA, and RLG) of the five organizations to study online catalogs using other methods in addition to the questionnaire/survey method. OCLC<sup>2</sup> and UC/DLA<sup>3</sup> employed transaction log analysis to study OPAC use at seven libraries. RLG's study of OPACs included individual and group interviews with library staff at three academic research libraries.<sup>4</sup> The OCLC project team conducted focused-group interviews with library patron OPAC users and nonusers and library public and technical services staff at six libraries.<sup>5</sup>

This discussion presents the findings of the focused-group interviews conducted by OCLC. Each of the six libraries offered online searching of its collection through an OPAC. The libraries and the names of their OPACs (in parentheses) are: Dallas Public (LSCAN), Iowa City Public (CLSI/PAC), Library of Congress (MUMS and SCORPIO), Mankato State University

(MSUS/PALS), Ohio State University (LCS), and Syracuse University (SULIRS). At each interview site, focused-group interview participants were recruited either from "captured" groups, e.g., university classes and mandatory instructional workshops, or through a general plea for volunteer participation. Group participants at universities were undergraduate users, undergraduate nonusers, graduate users, graduate nonusers, faculty users, faculty nonusers, reference staff, and technical services staff. Group participants at public libraries and federal libraries were young adult users, young adult nonusers, adult users, adult nonusers, older adult users, older adult nonusers, reference staff, and technical services staff.

Focused-group interviews provide qualitative information on library patrons' and staff's needs and perceptions of online public access catalogs. This method has been employed in related research to obtain library patrons' expectations, needs, and criteria for success when searching libraries' subject catalogs.<sup>6</sup> Complete descriptions of the focused-group interview method and analysis procedures are given in Merton, Fiske, and Kendall's manual on the method.<sup>7</sup>

A focused-group interview requires a group of six to twelve individuals who are led through an open, in-depth discussion by a group moderator. The moderator follows a series of open-ended questions, focusing the conversation on pertinent subject areas in a nondirective fashion. The moderator is free, however, to pursue interesting topics that emerge in the discussion. Group mem-

---

Karen Markey was project manager of the Council on Library Resources-sponsored Online Catalog Project's evaluation phase, which was carried out by the Office of Research, OCLC Online Computer Library Center, Inc., from October 1981 to April 1983. She is presently a research scientist in the OCLC Office of Research. Manuscript received July 1983; accepted August 1983.

bers challenge, interact, and stimulate one another, and provide researchers with insights, spontaneous thoughts, and language that infrequently occur in personal interviews. One of the greatest strengths of the focused-group interview method is the qualitative nature of participants' remarks. Library patrons and staff can express their needs and perceptions of online catalogs *in their own words*. Quantitative data collection methods used in the CLR-sponsored online catalog studies, such as surveys and transaction log analyses, provided few opportunities for library patrons and staff to express in their own words their needs and perceptions of online catalogs.

Our analysis of participants' remarks yielded six generalizations about staff's and patrons' needs and perceptions of online public access catalogs:

1. Users of the online catalog like this new form of the library catalog.
2. There are positive aspects of the traditional catalog that library patrons and staff would like implemented as features of online catalogs.
3. OPAC users have problems finding the right subject heading to enter into the OPAC.
4. Library patrons and staff envisioned features to improve subject access to OPACs.
5. Library patrons and staff want access to much more than books in the OPAC.
6. Library patrons and staff want the OPAC to provide new services.

In the following discussion, each generalization is accompanied by focused-group interview participants' remarks that capture the flavor of the generalization and illustrate it from the perspective of library patrons and staff.

#### USERS OF THE ONLINE CATALOG LIKE THIS NEW FORM OF THE LIBRARY CATALOG

##### Searching the OPAC Is Fun

- Computer gives one enjoyment looking for a book—not boring anymore. (Sources: Dallas Public, urban branch library, college student users)
- You can be lazy with the computer

catalog. It's more fun. Rather use computer than flip through cards. (Dallas Public, middle school student users)

- It [searching the OPAC] is more fun than the card catalog. (Iowa City Public, sixth-grade student users, junior high school student users; Mankato State, undergraduate student users)

##### Searching the OPAC Saves Time

- Instant gratification. Just punch [your topic] in. (Syracuse, graduate student users)
- I can always use the computer, whereas someone often had my card drawer. (Ohio State, undergraduate student nonusers)
- You know whether a book is on the shelf; computer saves time. (Iowa City Public, university library school student users)
- I don't have to walk a long way to [card catalog] drawers. (Library of Congress, General Reading Room reference staff)

##### The OPAC Provides New Services

- I don't copy anything down; I just get a printout. (Mankato State, media education faculty users)
- Computer tells me where and what floor books are on. I can find a book in any campus library without going there. (Syracuse, undergraduate student users, faculty users)
- Online catalog tells me whether a book is in or out of the library. I like having all the Ohio State libraries at my fingertips; it used to be that branch libraries only listed their own books. (Ohio State, undergraduate student users)

##### The OPAC Provides New Features

- I like the FIND command [i.e., keyword search]; especially when I don't know the right author or title or subject heading. (Library of Congress, Science Reading Room users)
- I like author/title search; I find what I want quickly. (Ohio State, graduate student users)
- It's so easy to limit. In the card catalog, when there were 100 cards under a subject, you had to look through all of

them. (Mankato State, undergraduate student users)

- I like CN [call number] search. I usually find books on a subject, e.g., Mexico, then put in the most frequent call number I see to get more books. (Syracuse, faculty users)

### THE TRADITIONAL LIBRARY CATALOG HAS POSITIVE ASPECTS THAT SHOULD BE IN THE ONLINE CATALOG

#### Subject Access in the Traditional Catalog

- The card catalog gives me cross-references. (Syracuse, graduate student users; Ohio State, formal instruction staff; Iowa City Public, university library school users, adult OPAC users)

- In the card catalog, I had more control over the sequences of subject headings; I could jump down four drawers and understand the logical sequence of headings. (Syracuse, reference staff)

#### Browsability of the Traditional Catalog

- The whole alphabet was in front of patrons in the card catalog. Sometimes they just stumbled on what they wanted. (Iowa City Public, reference staff)

- Looking up a book in the card catalog is a process that is a visual overview of what is available in the library. It offers a scan of material through which I find things that would never have occurred to me. It is stimulating that way. (Iowa City Public, adult users)

- Serendipity is hard to do on the computer. To browse, I must tell the computer catalog to browse; with cards, I just stick my finger in. (Library of Congress, General Reading Room reference staff)

- I still search for a book the ways I've always done it. I would locate the area it was in, and I'm a shelf browser. I like to browse the shelves. That's the fun of the library to me. (Dallas Public, volunteer trainers)

#### Physical Aspects of the Traditional Catalog

- You can take a card catalog drawer

and sit with it. I have more freedom to work with it. (Iowa City Public, older adult users)

- In the card catalog you could misspell something but just flip cards until you found it. Now patrons are put in the position of having to supply correct information. (Dallas Public, branch reference staff)

- It is so easy to flip [backwards and forwards] through cards, it takes a long time to do the same thing on the computer catalog. (Library of Congress, special collections users, General Reading Room reference staff)

### USERS HAD PROBLEMS FINDING THE RIGHT SUBJECT HEADING

#### Patrons Feel Their Search Terms Are Too Specific or General

- The more specific my topic is, the less likely I am to find the term listed in the computer. So I use a broad topic. (Ohio State, undergraduate student users)

- I either put in a subject that's too broad or one that's so specific that the library has nothing on it. I don't know how to organize my choice of subjects. (Syracuse, faculty users)

- I did a paper on birth order and I needed words more specific to birth order. I just never found the right term. (Mankato State, undergraduate student users)

#### Patrons Input Many Subject Terms into the OPAC

- I'll try [to find my topic in the computer catalog] 15 to 20 times. (Dallas Public, middle school student users)

- *Reader's Guide* suggests other topics, the computer catalog doesn't. I get tired after thinking of five ways to say the same thing. (Syracuse, undergraduate student users)

- Patrons waste a lot of time trying subject after subject. (Syracuse, reference staff)

#### Patrons Consult Library Staff about Vocabulary for Subject Searches

- When I can't find my term, I panic. I go to the information desk and have them look what my topic is under. (Iowa City Public, junior high school student users)

- When I can't find the subject, I ask the librarian to see if I spelled it right. (Dallas Public, middle school student users)

- I help patrons find subjects, especially uncommon words [i.e., words that do not have a lot of postings]. (Syracuse, reference staff)

#### **LCSH in Printed Format Is Not Adequate to Serve Patrons' Needs**

- The Children's Collection uses better terms [than LCSH], and patrons are indignant when they think we only have children's books on their topics. We could use some cross-referencing from Children to Adult LCSH. (Iowa City Public, reference staff)

- Students are intimidated by LC subdivisions, e.g., Drug Abuse—Congresses, Drug Abuse—Bibliography. They don't know what they mean. (Ohio State, catalog information desk staff)

- It's disappointing when the subject is listed in LCSH, but there are no books in our libraries on that subject. (Ohio State, undergraduate student users)

- I don't use LCSH because it seems faster to just keeping typing terms in. And LCSH is not close to the terminals. The x's in LCSH are confusing—you have to think about what they mean. (Mankato State, graduate student users)

- I don't want to fetch the LCSH volumes. I want them right on the computer. (Syracuse, graduate student users)

- Put LCSH online like MeSH. (Library of Congress, Science Reading Room users)

#### **USERS ENVISIONED**

#### **FEATURES TO IMPROVE SUBJECT ACCESS TO OPACs**

##### **Cross-Reference Capability for OPACs**

- Cross-references [are needed] so I don't have to know the darn way the librarian called it. (Library of Congress, General Reading Room users)

- I would like to type in what subject I'm looking for and the computer would type back to me, try this term or that. (Mankato State, undergraduate student users)

- "See" and "see also" references should tell me all terms I should or could use. (Syr-

acuse, undergraduate student users)

- We need cross-references. People look under "American History" and find nothing. I would like a crisscross subject index to link popular subjects to the actual LCSH. (Dallas Public, branch reference staff)

#### **Related Term Lists for OPACs**

- An online subject list is needed that leads the user to more specific topics. If he's interested in "France—History," a list of specific topics would lead him to what he's really after, "France—Revolutionary Period." (Syracuse, reference staff)

- Students need something to refine their topics. If only the computer would break down their topic like American Revolution into little topics, e.g., Stamp Act, Naval Battles, etc. (Syracuse, library support staff users)

- I want LCSH online; for example, the computer would produce lists of other terms for airplanes. (Ohio State, undergraduate student users)

#### **Augmented Subject Access to Books**

- I want to see the indexes of books so I can see whether I want the book. I could narrow down my search like I do when I look at the book in the stacks. (Mankato State, undergraduate student users)

- I want a description of the book jacket text material (in the OPAC). (Syracuse, undergraduate student users)

- We need individual essays in *festschriften* analyzed, as they sometimes were in the card catalog. (Syracuse, faculty users)

- Catalogers should increase the number of subject headings they assign to a book, like ERIC, where they give as many as 20 index terms to a book. (Library of Congress, General Reading Room users)

- There should be supplemental subject cataloging added to titles, like children's literature, which contains a two-sentence summary. Why not other literature? (Library of Congress, shelf holder users)

- Some music albums might contain 35–40 individual compositions that should be identified individually in the OPAC by title, composer, performance, instruments, edition, date of performance, etc., to be providing any useful information to serious

students. (Ohio State, faculty nonusers)

- The computer could read the introduction (of a book) to you. (Dallas Public, teenage library club users)

### Shelflist Searching Capability

- A shelf number search could be like reading the shelf. It would link terms with shelf numbers, e.g., DG = History. I would like a handlist like this, or the reverse, e.g., History = DG. (Library of Congress, Science Reading Room users)

- [We need to access the] shelf list online. Then I can call up a class number, see what books are there, and determine whether the book I'm cataloging will fit there. (Mankato State, technical services staff)

## USERS WANT TO ACCESS OTHER MATERIALS IN THE OPAC

### Reference Materials

- We need periodical literature in the computer. I want *Reader's Guide* right now. (Dallas Public, volunteer trainers)

- I want individual journal titles online, e.g., *Chemical Abstracts*, *Reader's Guide*, *Humanities Index*, *PMLA*. A lot of information in chemistry is only in journals. (Ohio State, graduate student users)

- Articles in the *Encyclopedia Britannica*. (Iowa City Public, reference staff)

- Patrons think periodical articles are in the computer. You spend 10 minutes performing a patron's search for a book called *Fertilizing Chickens* by Cunningham. Then the patron tells you it was in a journal. And patrons seem really shocked that you don't have access to articles in the computer. (Ohio State, Telephone Information Center library staff)

- I'd like newspaper indexes, like the *New York Times Index*, in the OPAC. (Syracuse, undergraduate student users)

- I'd like indexes in the computer. I was looking for articles on nutrition. *Psychological Abstracts* would have helped. (Mankato State, undergraduate student users)

### Library Materials Besides Books

- I'd like the library's older books, gov-

ernment documents, periodicals, theses, and films added to the OPAC. (Syracuse, faculty users)

- Everything in the library should be in the computer, e.g., comic books, paperbacks, movies, etc. (Iowa City Public, sixth-grade OPAC users)

- Add all of the library's resources, regardless of type of material—books, pamphlets, records, tapes, community resource file, vertical files. The OPAC should be a resource center, not a card catalog. (Iowa City Public, adult OPAC users)

### Nonbibliographic Information

Library patrons and staff at public and university libraries had plenty of suggestions concerning the inclusion of community and campus information in the online catalog. Here are their suggestions:

Community information: job ads, current city events, public concerts, local continuing education courses, university courses, subway routes, city maps, employment services, movies, plays, restaurant reviews, doctors' specialties, government and social agencies, city directories, information about local associations and service groups, dates of festivals, genealogical information.

Campus information: library hours, library displays and exhibits, campus phone numbers, local restaurants, upcoming television shows, university research in progress and investigator names, current local plays, public concerts, campus events, academic calendar.

Patrons' ideas about enhancing the contents of the online public access catalog were virtually limitless and very imaginative. Below are some of their more imaginative ideas:

- Whole sets of encyclopedias and almanacs.

- How to fill out a job application.

- Computer could tell about taking different drugs, describe them, what shapes they are, how many to take, harmful effects, etc.

- What kind of career I should take up.

- I'd like to search the knowledge of the world. You first read what is here at the library. Graduate students could also get

what is available through the state's interlibrary loan network but faculty would access everything in the world.

### USERS WANT NEW OPAC-RELATED SERVICES

#### Access to the Online Catalog at Locations Besides the Library

- At home. (Syracuse, faculty users, reference staff; Mankato State, graduate student users, faculty users, reference staff; Iowa City Public, sixth-grade school users, junior high school users, high school users, university library school users, adult users, reference and technical services staff; Dallas Public, volunteer trainers, reference staff)

- At university offices or classroom buildings. (Syracuse, faculty users, reference staff; Mankato State, faculty users, graduate student users, undergraduate student users, media education faculty users, reference staff)

- In dormitories. (Mankato State, graduate student users; Syracuse, undergraduate student users)

- At the supermarket. (Iowa City Public, reference staff)

- Everywhere, like drive-in beverage stores. (Dallas Public, middle school users)

#### Miscellaneous

#### OPAC-related services

- I'd like to put an automatic hold on the book instead of bothering the librarian to do it. (Dallas Public, middle school users)

- I'd like a chair at the terminal and a printer, especially for searches with a lot of output. (Syracuse, undergraduate student users)

- Librarians could profile faculty members' interests, input the profiles into the OPAC, and send them printouts on occasion. (Mankato State, faculty users)

- I would like the computer to talk to me. Show me lengthy results on a screen, and give me tickets with the book numbers. (Iowa City Public, sixth-grade school users)

#### Document Delivery

- Delivery of books to my home, especially in winter. (Mankato State, undergraduate student users)

- I want to order books, and have them

delivered at home; that would save me gas. (Dallas Public, urban branch users)

- I want to walk to a type of telephone booth, punch in my topic, and the machine gives me the actual book or whatever it is. (Iowa City Public, adult users)

- I could use the computer anywhere in town, and it would deliver a book to my home. (Iowa City Public, sixth-grade school users)

- The computer will have a vacuum like the bank and deliver the book to you. (Dallas Public, middle school users)

### CONCLUSION

These remarks about online public access catalogs revealed that patrons and staff like this new form of the library catalog. They had problems with subject access, but envisioned ways to improve it. Many of their remarks about new OPAC-related services and accessing library materials besides books in the OPAC were very imaginative, reflecting the high expectations our library patrons and staff have about this new form of the library catalog. Their remarks describe some of the characteristics of a third generation of online public access catalogs defined by Hildreth<sup>3</sup> in a discussion of milestones in online catalog development. As we approach this third generation of online catalogs, we must heed our online catalog users' suggestions for system enhancements and improvements to ensure that continued development of OPACs is accompanied by user acceptance.

### REFERENCES

1. Douglas Ferguson and others, "The CLR Public Online Catalog Study: An Overview," *Information Technology and Libraries* 1:84-97 (June 1982).
2. John E. Tolle, *Current Utilization of Online Catalogs: Transaction Log Analysis* (Final report to the Council on Library Resources, V.1, Dublin, Ohio: OCLC, March 1983).
3. Ray R. Larson, *Users Look at Online Catalogs, Part 2: Interacting with Online Catalogs* (Final report to the Council on Library Resources, Berkeley, Calif.: Univ. of California, April 1983).
4. Research Libraries Group, Inc., *Public Online Catalogs and Research Libraries* (Final

- report to the Council on Library Resources, Stanford, Calif.: Research Libraries Group, Sept. 1982).
5. Karen Markey, *Online Catalog Use: Results of Surveys and Focus Group Interviews in Several Libraries* (Final report to the Council on Library Resources, V.2, Dublin, Ohio: OCLC, March 1983).
  6. Neal K. Kaske and Nancy P. Sanders, "Online Subject Access: The Human Side of the Problem," *RQ* 20:52-58 (Fall 1980).
  7. Robert K. Merton, Marjorie Fiske, and Patricia L. Kendall, *The Focused Interview: A Manual of Problems and Procedures* (Glencoe, Ill.: Free Press, 1956).
  8. Charles R. Hildreth, "Pursuing the Ideal: First and Second Generation Online Public Access Catalogs" (Paper presented at the LITA/RTSD preconference entitled "Online Catalogs, Online Reference," Los Angeles, June 23, 1983). ■■



# OnTyme

## The Electronic Mail System for Libraries

- A network of more than 700 libraries
- Special rates for professional library organizations
- Simple protocols for interlibrary loan
- Local, national, and international communications

...plus **THE LOWEST** hourly connect rates available

The OnTyme service is available to libraries through CLASS,  
a cooperative library services agency. Contact:

***CLASS***

1415 Koll Circle, Suite 101 San Jose, CA 95112-4698  
ATTN: OnTyme Coordinator (408) 289-1756

# Who Needs A Command Language? You Don't · Your Patrons Don't

CHECKOUT

EMILS/3000 - INTEGRATED LIBRARY SYSTEM  
CIRCULATION DESK  
\*\*\* CHECK OUT COMPLETE \*\*\*

LIBRARY CARD NO	ID NUMBER	LAST REG	CATEGORY	STATUS
0000000000000000	000-00-0000	07/88	01	00
NAME	LAST ACTIVITY			
Place, Kevin	07/17/88			
ITEM BAR CODE 000000000000				
AUTHOR	TITLE			
Creasey, John	The thunder-maker			
LOAN PERIOD	CHECKED OUT	DATE	TIME	
02	DUE	07/17/88	07:16	07:16

Enter Item Bar Code Number

CHECKOUT CHECK IN RENEW PRESERVE 12 41 INQUIRY SOPPOWER DELINQ EXIT  
MAINT MAINT

## What You Do Need Is EMILS/3000

Easy-to-Read formatted screens that make inquiry and data entry quick and straightforward.

Fast Keys that execute functions or change screens with a single key stroke.

A powerful Data Base Management System which allows many different modules to access a single bibliographic record with multiple indexes—true integration.

An On-Line catalog that satisfies the public's need for simplicity, yet allows the sophisticated user quick and comprehensive access.

EMILS/3000 is an Integrated Library Management System built with Hewlett-Packard's sophisticated system software and the premier HP3000 computer. Up to 250 terminals can be networked to one system, and multiple systems can be linked.

Write us. Find out how you can automate your library now . . .

. . . without a command language.

### EMILS/3000

INTEGRATED LIBRARY MANAGEMENT SYSTEM



656 Munras Ave.—  
PO Box 1349  
Monterey, CA 93942  
(408) 646-9666

# Communications

## Computer-Assisted Instruction in an Academic Library

Wayne Wilson

Sandel Library at Northeast Louisiana University opened its Computer Assisted Learning Laboratory (CALL) in January 1983. CALL provides computer-assisted instruction (CAI) to approximately fourteen hundred remedial freshmen each year. Students using the lab may choose from among more than three dozen CAI programs designed to improve mathematical, language, and study skills. The study skills programs include four that teach library research techniques.

The facility, which is located on the second floor of the library, consists of a Digital (DEC) VAX 11/750 minicomputer, twenty-two CRTs, a print terminal, and a Digital LP25 lineprinter. It is open ninety-two hours a week and is supervised at all times by a library staff member or student worker. Students use the lab on a walk-in "first come, first served" basis.

### EQUIPMENT SELECTION

Northeast Louisiana's CAI lab is somewhat unusual in that it uses a minicomputer. Most CAI facilities, particularly in school media centers, employ stand-alone microcomputers or networked micros. Similarly, most commercial CAI software is written for microcomputers. The decision by university officials to purchase a minicomputer, however, had two advantages.

First, the minicomputer can be used in the future for library automation applications. Although it will be necessary to upgrade the system in order to add automated applications, a good nucleus of needed hardware now exists.

Second, microcomputers require cartridges or floppy disks to run CAI programs. With several hundred students using three dozen programs on twenty different terminals, the handling, book-keeping, and security problems could become complicated. The minicomputer eliminates handling and related problems by storing all of the programs on a single fixed disk and electronically calling them into memory as requested by individual students.

There are, of course, disadvantages to the minicomputer approach. For example, when the system fails, everyone is affected. To date, though, there has been virtually no unanticipated downtime. Another problem concerns the availability of packaged software. Since most commercially produced CAI software is written for microcomputers, it has been necessary at Northeast Louisiana to develop most of the CAI programs from scratch. Still, from the university's perspective the advantages of the minicomputer outweighed the disadvantages.

### PLANNING PHASE

The library received the computer and other hardware in September 1982. The staff spent the fall semester planning for a January 1983 opening. The planning phase included three stages.

During the initial stage, staff members, with the assistance of a mathematics professor, learned about operation of the terminals, systems procedures, and the idiosyncrasies of Digital's BASIC + 2 and DECAL, Digital's authoring language.

The second and most time-consuming

---

Wayne Wilson is sciences librarian at Chapman College Library, Orange, California. When this article was prepared, he was social sciences librarian at Northeast Louisiana University in Monroe, Louisiana.



An instructor proctors a student examination on the CAI system.

stage involved writing systems and applications software. The systems programs established user accounts and user verification routines; the applications programs created the actual CAI lessons. Software production took at least 125 hours of staff time each week.

Before selecting or developing any CAI lessons, two librarians held a series of meetings with instructors in the Developmental Education program to determine the needs and abilities of the remedial students. Most of the lessons developed during the planning phase were written in DECAL.

DECAL proved to be a valuable tool. It is a simple programming language designed specifically for CAI. Its major strength is that it entails relatively few commands and yet can execute several useful functions. Most people can learn DECAL in a few days. The language allows the programmer to anticipate incorrect student responses to questions, provide hints to users, set time limits on user response times, and overlook student typographical errors. Furthermore, DECAL lessons generate a wide variety of statistical reports measuring individual student and class performance.

A sample run of a portion of a DECAL lesson on how to use the *Reader's Guide to*

*Periodical Literature* appears in figure 1. Note that this lesson has been programmed to accept typographical errors and to provide explanatory comments in the event of an incorrect student answer.

In the final planning stage the programmers tested the lessons and wrote user guides and a program catalog. All of the student workers and library staff not directly involved in the project were then invited to an open house to learn to operate the terminals and try the new programs.

### IMPLEMENTATION PHASE

About 350 students, enrolled in Developmental Education 110, used CALL during its first semester of operation. Developmental Education 110 is a general studies skills course.

Students received one in-class and one in-lab orientation session before being permitted to use the lab on their own. Every student was then required to spend a minimum of four hundred minutes in CALL during the semester and to complete ten required lessons. Students could also run optional drills and educational games. Time spent doing optional programs counted toward the four-hundred-minute requirement.

Once a week CALL sent to the course instructors a report indicating how each student had performed and how much time he or she had accumulated. Instructors did not grade students on their weekly performance. However, at the end of the semester, each 110 section came to the lab, and, using the terminals, the students took an examination on the material presented in the required lessons.

Students encountered few procedural difficulties using CALL. The orientation sessions, user guides, and well-tested programs created a user-friendly environment.

Two problems, however, did arise. One was the lack of enough programs to keep students occupied throughout the semester. Students completed the lessons much more quickly than anyone had anticipated. Thus, production of new software continued through the spring and summer semesters.

The other problem was cheating. Some students gave their user identification num-

PLEASE READ THE SAMPLE ENTRY SHOWN BELOW

-----  
 CARTER, Jimmy  
 Carter enters race. I.C. Voats. Time 104:11-13 D 23 '74.  
 -----

-- THIS ENTRY TELLS YOU SIX THINGS:

1. THE TITLE OF THE ARTICLE -- Carter enters race.
2. THE WRITER OF THE ARTICLE -- I. C. Voats.
3. THE MAGAZINE IN WHICH THE ARTICLE APPEARED -- Time.
4. THE VOLUME NUMBER OF THE MAGAZINE -- 104.
5. THE PAGE NUMBERS OF THE ARTICLE -- 11-13.
6. THE DATE OF THE PUBLICATION -- December 23, 1974.

Look at this carefully. Be sure that you know what all of the numbers mean.  
 -- When you are ready to continue, type C and press "ENTER".  
 ? C

+++ NOW LET'S DO SOME QUESTIONS +++

-----  
 CARSON, Johnny  
 Johnny Carson's kitchen. J.M. Bauer. Designs 77:24-30 Ap '74.  
 -----

QUESTION: Who wrote this article?  
 -- Please type the writer's last name and press "ENTER".  
 ? BUAER

RIGHT! J.M. BAUER WROTE IT.

-----  
 CARSON, Johnny  
 Johnny Carson's kitchen. J.M. Bauer. Designs 77:24-30 Ap '74.  
 -----

QUESTION: On what page does this article begin?  
 -- Type the number and press "ENTER".  
 ? 30

NO. IT ENDS ON PAGE 30. TRY AGAIN. ON WHAT PAGE DOES IT BEGIN?  
 ? 77

SORRY, THAT'S WRONG. 77 IS THE VOLUME NUMBER. THE PAGE NUMBER COMES AFTER  
 THE VOLUME NUMBER. TRY IT AGAIN PLEASE.  
 ? 24

YES!! THAT'S IT.

-----  
 CARSON, Johnny  
 Johnny Carson's kitchen. J.M. Bauer. Designs 77:24-30 Ap '74.  
 -----

QUESTION: What is the title of this article?  
 -- Type the answer and press "ENTER".  
 ? DESIGNS

NO. DESIGNS IS THE NAME OF THE MAGAZINE. TRY AGAIN PLEASE.  
 ? JONNY CARSONS KITCHEN

YOU ARE CORRECT -- JOHNNY CARSON'S KITCHEN.  
 -----

Fig. 1. User Responses Follow the Question Mark ("P") Prompts that Appear in Left Margin.

bers to friends who then went to the lab and ran games, thereby accumulating time for the original users. As a remedy, future users will have to present a student ID card and sign a log sheet before using a terminal.

Following the first semester of operation, students responded to a questionnaire soliciting their opinions of CALL. The response was generally positive. In particular, students seemed to feel that the mathematics and library instruction lessons were useful. The major complaint was the lack of enough programs.

#### IMPACT OF CALL

It is simply too early to assess the educational impact of CALL. Faculty members in the Developmental Education program plan to conduct a four-year longitudinal study comparing groups of pre-CALL and post-CALL remedial students to determine whether attrition rates and grade point averages differ between the two groups.

CALL's impact on the library is also difficult to discern. During CALL's first six

months of operation, the total number of library users was greater than during the same period of the preceding year. The trend toward increased usage, however, was under way even before implementation of the lab. The number of directional questions asked at the reference desk also decreased. CALL offers a library orientation lesson that may have contributed to the decline, but again it is impossible to be certain about a cause-and-effect relationship.

One thing that is certain is that CALL has attracted the attention of faculty and students outside of Developmental Education. In response to faculty requests, CALL has also been used by a nursing class to run a medical terminology lesson, an undergraduate library science class studying alternatives to traditional bibliographic instruction, and a computer science class learning DECAL programming. It is hoped that in the future more groups will use CALL and that faculty will use the facility to write CAI programs for their classes.

#### CONCLUSION

Based on our experience at Northeast Louisiana, we have formed a number of conclusions that may be helpful to other librarians contemplating development of a CAI center:

- If you plan to use CAI for bibliographic instruction, be aware that packaged software has limitations. Packaged programs may be good for teaching the principles of library use, but they cannot orient users to *your* particular library.
- If you do write your own software, be prepared to make future modifications in response to user needs and criticisms.
- Purchase a system with a good authoring language. This will facilitate the production of software by people who are not sophisticated programmers.
- Make user documentation short and simple.
- Take a lot of time training users how to operate the equipment. You will save time in the long run.

Finally, it should be said that we firmly believe that providing CAI is a legitimate function of an academic library. Although librarians do not necessarily need to become involved in actually writing CAI soft-

**TPS Electronics**  
announces  
**PC-300**  
**Bar Code Reader**  
for  
**IBM PC**

An addition to our  
standard readers and  
interfaces for OCLC and  
RLIN cataloging terminals

4047 Transport  
Palo Alto  
California  
94303  
415-856-6833

ware, the task of collecting, organizing, and storing CAI programs is certainly within the range of their responsibilities. The library traditionally has been the campus repository for information resources. CAI programs are nothing more than information resources stored on a new type of medium. The library, thus, is the logical location for CAI materials.

#### ACKNOWLEDGMENT

CALL was funded by a U.S. Department of Education Title III Grant (Strengthening Developing Institutions Program). ■■

## The Beginnings of LCS at Illinois

Diane Foxhill Carothers and William Aguilar

The University of Illinois received funding from the Illinois Board of Higher Education in 1977 for the development of an online circulation system to link the libraries of its three campuses: Urbana-Champaign, Chicago Circle, and the Medical Center—and to make such information available to the numerous public libraries throughout the state. This was expected to provide more efficient circulation by furnishing data as to whether an item was owned by a library within the university and, if so, its availability for circulation. The system had to have expansion flexibility and the potential for development into a statewide sharing network as it was planned to incorporate the holdings of other college and university libraries within Illinois as a means of sharing resources.

Illinois selected the Library Circulation

System (LCS), later known as the Library Computer System, which had been designed originally by IBM for the Ohio State University in the late 1960s at a cost of approximately \$300,000. University of Illinois librarian Hugh Atkinson had developed and implemented LCS when he was OSU librarian and was able to provide guidance in the technical aspects of the project, but did not actively participate in the vendor selection and specifications.

Fundamentally LCS is an online system that provides a short bibliographic record as well as holdings information consisting of copy/volume number, location, length of loan period, and availability to the patron. Access to LCS is by author, title, author/title, or call number. Subject access is not available as such, but a limited subject approach is possible by using a shelf position search, a procedure that retrieves thirty-three shelflist titles surrounding an input call number.

In order to implement LCS, the university had to convert into machine-readable form a shelflist of approximately 1,645,750 titles, a figure based on a 1974 measurement. Titles acquired subsequently and titles not represented in the main shelflist, such as the law and music collections, and a number of smaller files brought the total to be converted to well over 2,000,000. The scope of the project is reflected not only by the volume of records to be keyed but also by their complexity. A large portion of these were in foreign languages, several of which use other than the Roman alphabet. The files had been created over a one-hundred-year period and reflected the use of various editions of classification schemes, cataloging codes, and maintenance supervision. Cards were in a variety of conditions, and there were old temporary records and incomplete removals. Some cards were handwritten, cryptic or faded. There were over 2,000 card trays containing an estimated 1,500,000 to 2,500,000 records, and keeping track of the various stages of shipment, conversion, proofreading, and acceptance was to be a complicated problem in itself.

In addition, Illinois maintained a serial record—a paper file showing the holdings of individual publications on a title-by-title

---

Diane Foxhill Carothers is assistant professor of library administration at the University of Illinois, Urbana-Champaign, and William Aguilar is library director, Central Connecticut State University, New Britain.

basis. This involved approximately 150,000 serial titles and an additional 464 drawers of cards. Since serials were classified, the main shelflist showed a limited amount of bibliographic information but did not indicate the holdings of volumes/issues or locations; accordingly, retrieval of a specific volume or issue necessitated the use of the serial record file. Both the serials file and the regular shelflist were to be converted. It was decided that the serial record would be keypunched and edited in house, while an outside vendor would be hired for the basic monographic collection.

### CONVERSION PROCESS

The conversion process as it was designed and implemented is shown in figures 1 and 2. The flowchart in figure 1 has one major step missing in the conversion of the shelflist: its cleanup and preparation prior to the onset of the project. Such procedure would have required an excessive amount of time that could not be spared; therefore, the existing records in unedited form were used even though many were difficult to interpret. The shelflist also contained many separate cards for multiple copies of serial titles, and, consequently, each of these was input. Experience has shown that this information could have been noted on the first record and the duplicate cards discarded before conversion. Additionally, there were OCLC machine-readable records for materials cataloged subsequently to 1974 that were easily recognizable by the type font. These could have been removed from the shelflist entirely and not converted, or the vendor could have been instructed to disregard them. The master tapes for these OCLC records could then have been integrated later with the conversion tapes produced by the vendor.

As the main shelflist was being input, departmental librarians did have the opportunity to weed and correct their specialized files before it was time for them to be keyed. Much duplicate or unnecessary inputting could have been avoided and fewer mistakes made if obscure or illegible cards had been corrected. Taking time to work on the shelflist before conversion versus inputting the existing records and making

corrections afterwards has been a debatable point. Each library planning automation should weigh the cost effectiveness of each of these approaches.

In contrast to the procedure used for the main shelflist, the serial record was edited by the library staff before it was input. Photocopies of cards were revised when necessary, then keypunched internally. The information entered showed call number, holdings, location, and a notation to indicate whether the item was classified as a locally defined periodical (titles published three or more times a year) or a continuation (two or fewer times a year). The serials printouts were proofread by members of the serials department in addition to their regular duties. They then used a text-editing program (WYLBUR) to make necessary corrections, and the university's Administrative Information System and Services (AISS) staff, responsible for computer-related programs on campus, generated a tape for each drawer of the serial record.

Since the serials conversion project was expected to take about two years, it was necessary to establish a process to allow for the addition of new issues. A manual update file was created to accommodate such changes. The cards indicating a bound volume or new issues were input into machine-readable form at the conclusion of the conversion project and the computer tapes for each drawer of the serial record were merged with the update records. This new tape was then combined with the records generated by the conversion of the shelflist so that the complete bibliographic information and holdings data appeared in the LCS record, which could then be accessed by the usual means to provide bibliographic and holdings data.

### VENDOR CONVERSION

The shelflist conversion specifications provided ground rules including the following responsibilities on the part of the vendor:

1. Conversion would take place on the vendor's premises.
2. Transportation of shelflist drawers was to be furnished by the vendor.

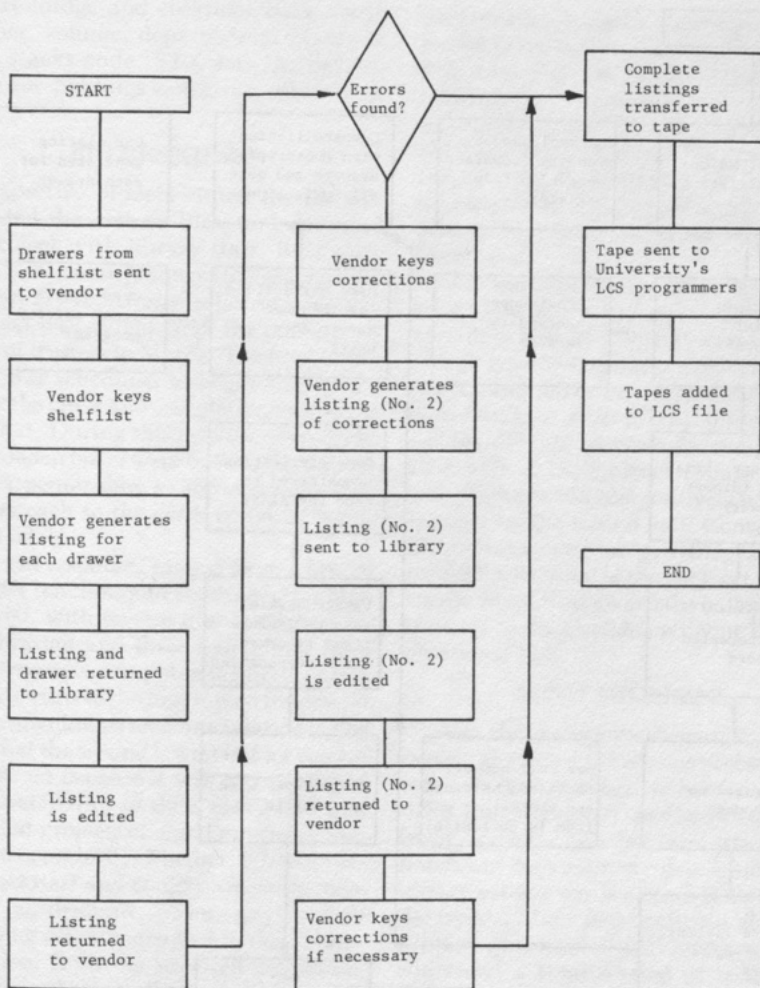


Fig. 1. Main Shelflist Data Conversion Procedure

3. Completion of work was warranted for ninety days after keying of last drawer, and the vendor was responsible for corrections prior to the expiration of that period.

4. Performance and payment bond were required.

5. Keying would take approximately four calendar months, but a range of three to five months would be allowed.

6. Bids would be based on ten thousand keystrokes (defined as characters supplied).

Two bids were requested, one bid to include the place of publication and another

without it. Although the place of publication would increase the number of keystrokes considerably, there was some question regarding the value of such information. Ultimately the place of publication was keyed, but the publisher was not. In addition, the vendor was to identify, code, and convert only certain data elements appearing on the catalog cards. Therefore, the inputting typists would have to be able to distinguish between the relevant and nonrelevant information on the cards. The specifications accordingly

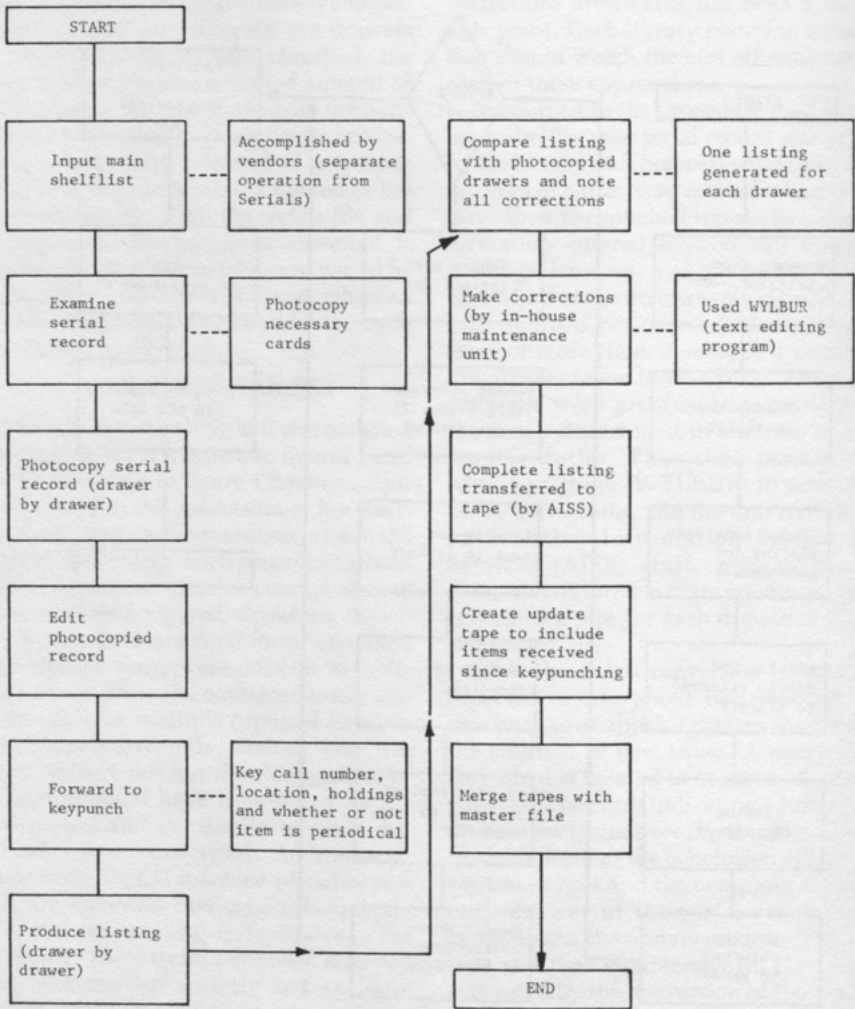


Fig. 2. Serials Conversion Procedure.

provided for a library liaison to instruct the contractor's personnel in recognizing such data. Because the shelflist files were used on a daily basis by library patrons and staff, it was necessary to place limitations on the vendor to restrict the number of drawers that could be removed at one time and for predetermined periods.

The specifications required keying of the following data, which were set apart using "@" as the delimiter and "\$" for the sub-fields:

a. Author—the first author appearing on the card could be personal, corporate, a meeting, or a uniform title.

b. Short title—the title to the first logical break or to the first significant punctuation to provide the most meaningful short title.

c. Edition—any edition other than first. This included revised, new, enlarged, or numbered editions such as 2d or fifth.

d. Call number—a combination of letters and numbers.

e. Library of Congress card number.

f. Place of publication.

g. Date of publication.

h. Serial/language code—serials were flagged SER; materials in languages other than English were flagged F (foreign).

i. Holdings and locations data—copy number, volume, departmental library or book stacks code. STX was the default value for holdings not given other locations.

### BID RESPONSES

Prospective bidders visited the library, inspected the various files, and discussed the project with library staff. Bids were submitted in mid-January 1977 and opened on February 15. After selection of a vendor, approval was sought from the university's board of trustees in March. The implementation was scheduled to begin within 120 days at the latest and completion six months after that. During this interim, forty lockable wooden boxes were built in the university's carpenter shop to accommodate four drawers each so the cards could be transported safely.

The bid responses ranged from a low of \$8.58 per ten thousand keystrokes to a high of \$20.60, with several intermediate bids. One librarian and three individuals from the university's computer facilities (AISS) made site visits to the four lowest bidders. It was the unanimous recommendation of this group that the second lowest bidder receive the contract because it was an established firm specializing in data entry and had completed projects of equal or greater volume and complexity. Further, it had an experienced staff and could provide the necessary equipment. The university's purchasing office concurred in this recommendation. Both the selection committee and the purchasing office agreed that this firm's strengths sufficiently justified the additional expenditure of approximately \$28,000, the dollar difference between the two low bids.

However, 1977 university regulations stated that contracts must be awarded to the lowest and best bid. The only way by which the university could reject the lowest bid was to declare that vendor incompetent. After consultation with the university's legal counsel, it was determined that the contract would have to be awarded to the lowest bidder, regardless of the selectors' recommendation. A major factor in judging each bid was the vendor's experience, but this was not actually written into the specifications. While data entry experi-

ence is basic, it may be more important that a contractor be familiar with library records since they can be extremely complex. Had this factor been explicitly stated, it is quite possible that the initial vendor would not have been awarded the contract because it was primarily a software firm lacking experience with large data entry undertakings in general, and library materials in particular.

One important stipulation in the contract allowed the university the option of awarding half the project to any one vendor, thus providing the flexibility of awarding the bid under two separate contracts. This condition provided that if the winning vendor did not successfully complete the first half of the project (phase one), it would have to bid competitively with other vendors for the second half. Conversely, if the winning vendor provided adequate results for its share of the contract, the university could then award the balance of the contract to that vendor without soliciting additional bids.

### INPUT PROBLEMS

After the conversion began, it became evident that the vendor faced problems owing to its lack of adequate hardware, software, programs, staff, and knowledge of library records. This last was particularly important because some details unique to library catalog cards caused difficulty for the typists. There was confusion about the Library of Congress card number, which contained a combination of letters and numbers and appeared in the lower right part of the card. The U of I's cataloging date code, which had a similar format, was also in the same part of the card as were other unrelated numbers at times. Old accession numbers stamped elsewhere on the card were inadvertently picked up as LC numbers, and the LC number was occasionally input as a call number.

The call number presented its own difficulties in conversion. Although it was in the upper left on each card, it was also a combination of numbers and letters. Dates are often included as integral parts of the call number and so is format such as DISC or FILM. The number zero and the upper- and lowercase letter O were confusing as were the lowercase letter l and the number

one. The script *l* was also misunderstood by the inputters. While these characters are readily recognized by library personnel, they can be indistinguishable to someone not familiar with library records. It would be beneficial for a library anticipating conversion of records to clearly point out such elements so they can be input correctly. Nevertheless, though guidelines are provided and examples given, there are always some discrepancies that are not explained for which guesswork will be substituted.

Another inputting problem was in the area of foreign titles. Some cards were for translations while others reflected transliterations of Hebrew or Greek letters. The appearance of letters in the Cyrillic alphabet were misunderstood and keyed as Roman letters. For example, the Cyrillic printing of the word for Moskva looks like MOCKBA, so the typists listed that as the place of publication for many Russian titles. A program was later written to correct this to Moscow.

There was high employee turnover on the vendor's staff so that training was virtually ongoing. Some inputters enlivened their workday by introducing deliberate mistakes, such as changing authors' names from Stillman to Stillperson and Stillwoman, and using Smirk and Quirk instead of Kirk. Kerr became Grrr, and titles were changed or shortened. The *Report to Hullett C. Smith, Governor of West Virginia* was keyed informally as *Report to Huey*. While the sometimes humorous (and other-times obscene) modifications broke the monotonous routine of inputting and proofreading, this "creative keying" necessitated correcting, rekeying, and editing a second time.

### PROOFREADING

At first the vendor's computer printouts were proofread by the original cataloging staff in addition to their regular work load. This was because they were considered the best equipped to do the job as a result of their technical skills and familiarity with the shelflist records. Later, proofreading was established as a separate process, and a great many other members of the library staff undertook portions of the work. Part-

time students were hired to supplement the correcting. By the time the main shelflist had been converted, more than one hundred people were involved in the proofreading, and more than 6,500 hours of student and staff time had been invested. After the printouts had been corrected, the vendor created a machine-readable tape as the final product that was accepted by the library.

The initial contractor did not perform any proofreading at all, but did make the necessary corrections. The final vendor involved in the project did preliminary proofreading before submitting the printouts to the library. In that way errors in the program and keying error patterns were identified before the computer proofs were sent to the library. Libraries who undertake such data conversion might well consider the various aspects of proofreading before the work is begun. The amount of proofreading, who does it, where, and how it shall be done should be discussed early. Any proofreading and correction responsibility of the vendor should be stipulated in the specifications. Greater cooperation on the part of the staff can be gained, also, if the full scope of the project and its ultimate benefits are explained beforehand. This could impart a feeling of taking part in something really important rather than just one more task.

### VENDOR NONPERFORMANCE

By the fall of 1977, it was evident that the prime vendor was unable to fulfill the contract within the allotted time. Extensions were granted, but they were not enough. The university's purchasing office then requested the vendor either perform or subcontract the work. Extensive correspondence between legal counsel of both parties was followed by an agreement that the work be subcontracted to an Ohio company with experience in data conversion. The original vendor, however, was still legally responsible for the fulfillment of the contract. This second vendor also was unable to provide the level of performance required by the university.

Exercising its option to open bidding for the second phase of the project, the univer-



**YOU'LL ADVANCE CONFIDENTLY  
IN THE WORLD OF TECHNOLOGY  
... WHEN YOUR ON-LINE SYSTEM  
IS BASED ON LIBRARY KNOWLEDGE**

*Baker & Taylor's LIBRIS II On-Line Acquisitions System represents state-of-the-art technology coupled with 155 years of library experience.*

*Only Baker & Taylor can offer a complete acquisitions system featuring:*

- *electronic ordering from the nation's largest stock of books*
- *a 700,000+ title database*
- *automated open-order control*
- *automated fund accounting*

*For details, contact the Sales Department of the division nearest you. LIBRIS II, only from Baker & Taylor.*

EASTERN , 50 Kirby Avenue, Somerville, NJ 08876, (201) 722-8000

MIDWESTERN , 501 S. Gladiolus Street, Mokenca, IL 60954, (815) 472-2444

SOUTHERN , Mt. Olive Road, Commerce, GA 30599, (404) 335-5000

WESTERN , 380 Edison Way, Reno, NV 89564, (702) 786-6700

EXPERIENCE YOU CAN DEPEND ON

**BAKER & TAYLOR**

a GRACE company

sity solicited bids in November 1977 and awarded a contract to a company that was dedicated solely to providing data conversion and related services to libraries and similar agencies. This vendor had extensive library experience including contracts with the Library of Congress. It had not, however, submitted a bid when the project was first advertised. The work undertaken by this firm on the second half of the LCS project was done well, and it was recommended that the original vendor's bonding company then hire this firm to complete the first half of the work, which was still incomplete. Because of the default on the initial contract, the bonding company was obligated to pay the difference in keying charged by the last vendor, \$11.00 per ten thousand keystrokes, and the original \$8.58. This outcome emphasized the importance of the stipulation that a performance and payment bond be issued when a contract is awarded.

#### BEGINNING OPERATION

LCS at Illinois was put into operation on December 11, 1978, though not all the proofreading and corrections had been completed and a few additional shelflists had not yet been keyed. LCS has been an ongoing project and has been broadened beyond its original circulation system concept. At the present time, all outstanding acquisition orders are in LCS, brief cataloging records for items in the remote storage areas can be retrieved, and an interface for serial check in is being programmed and tested. It has been expanded to include a network of twenty-three different academic libraries throughout the state, thus providing easy access to their combined holdings and facilitation of interlibrary loan. All eighteen public library systems in Illinois have LCS terminals. The latest campus to go on the system, Southern Illinois University at Carbondale, became operational July 4, 1983.

Amusingly, on January 17, 1979, the original vendor placed an advertisement in the student newspaper, the *Daily Illini*, that read it was "proud to have contributed to this project as prime contractors for the data conversion." It congratulated the University of Illinois on "leading the field with

its new computerized library system" and commended the university for its "vision and determination." It is evident now that the determination and vision in continuing the project is paying off in better services to the library patron and the library staff. ■■

## Modeling Collection Overlap on a Microcomputer

William Gray Potter

The purpose of this communication is to describe how a personal computer connected to a large, multilibrary bibliographic system can be used to model efficiently and effectively an analysis of record duplication across the entire system.

The LCS network in Illinois currently consists of twenty-three academic libraries with more than eight million volumes and four million records available online.<sup>1</sup> Each library has its own database containing its own brief records for virtually all titles in its collection. Because these records are primarily holdings records, each library has its own record for each title owned. The format of this record includes the following fields (see figure 1 for an example):

- Call number
- Main entry
- Title—including place of publication and an edition statement
- Library of Congress card number
- Publication date
- Format flag—monograph, serial, monographic set, periodical
- Language flag—English or non-English
- Number of copies
- Detailed holdings—one line of holdings for each circulatable piece

An examination of the extent of collection overlap and diversity within the LCS

---

William Gray Potter is assistant director for Acquisition/Circulation, University of Illinois at Urbana-Champaign.

LB1051.T681977 TRAVERS, ROBERT MORRIS WILLIAM, 1913-  
 ESSENTIALS OF LEARNING\$4TH ED.\$NY 76-4962  
 379088 1977 1 ADDED: 820408  
 01 001 12-3W STX  
 PAGE 1 END

Fig. 1. Sample LCS Screen.

network would be useful for collection development and resource sharing purposes. Further, the results of a study of the full databases would be useful in developing a full record union catalog using the WLN software now being implemented as an on-line catalog and linked to LCS at the University of Illinois at Urbana-Champaign.

Previous studies of collection overlap have either been hampered by small sample sizes necessitated by laborious procedures in comparing paper records or have been restricted to recent acquisitions because only a few years of holdings were available in machine-readable form.<sup>2</sup> The LCS network offers a great potential for a study of collection overlap because records for virtually entire collections are available in machine-readable form.

Earlier overlap studies and projects for integrating bibliographic records into union catalogs that have used machine-readable records have been based upon full MARC records.<sup>3</sup> Compared to the MARC format, the LCS record is very limited in the amount, detail, and standardization of bibliographic information, making previous work only partially relevant to the present study. To determine the feasibility of using the LCS records in a collection overlap study, a test project has been undertaken.

### PILOT PROJECT

Initially, a pilot project was designed based on a test database of between seventy-five thousand and one hundred thousand records. This would have provided an adequate test of a procedure for comparing and matching records that could then be used for a full comparison of the LCS databases. Ironically, while resources are available for a production run comparing the full databases, neither the machine time nor the programming staff for a large scale pilot are available. This is because a pilot project must be loosely de-

fined initially and requires much time and programming to test various schemes for detecting title overlap. An alternate test project had to be found that could be performed with available machine resources and that could be programmed by the investigator without reliance on professional programmers. The chief objective was to find a computer system and a programming package that could accommodate a great deal of trial and error, that would be readily and frequently available, that would have a small turnaround time on programs, and that was easy to use.

After examining several available machines and programming packages, attention turned to using an IBM Personal Computer (PC) to run the tests. The University of Illinois Library had an IBM PC available and the investigator was already familiar with the machine. The BASIC interpreter that comes with the IBM PC allows for fast and efficient coding with quick turnaround for debugging programs and a compiled version of a program is fast enough for efficient runs. Also, using an asynchronous communications port on the IBM PC, the computer can be connected as a terminal to the LCS system to strip out records for a test database and to retrieve records to verify the accuracy of various comparison schemes. Finally, while the IBM PC is relatively slow compared to larger-scale machines, it is also a single-user machine and therefore can be set up to run a program and left to run overnight or over a weekend without inconveniencing other users.

The flexibility of the IBM PC coupled with the attractiveness of being able to give the programmers a working program on which to model the final production program made it the best available choice for this test phase of the project.

### COMPRESSED RECORD

In the union catalog projects, various portions of fields were extracted from each record to establish a matching or consolidation key. These fields usually include a title key, the LC card number (if available), author entries, full or partial title, publication date, edition statement, and pagination. Using these keys, duplicate records are detected and merged.

A matching key or compressed record for LCS records was designed based upon the reported experience of the union catalog projects. To improve processing time, the compressed record is a fixed length with several fixed-length fields. Because the full LCS record is consulted only to verify the accuracy of the matching scheme, this compressed record becomes the record to be manipulated once it is extracted from the parent LCS record.

The following fields were selected for the compressed record:

*Title key*—LCS indexes each record using several keys including a 4,5 title key consisting of the first four characters of the first significant word and the first five characters of the second significant word. This nine-character key provides a manageable and consistent way to partition the databases into groups of potential duplicate records.

*Subject code*—in a previous study of interlibrary lending among the LCS libraries, a table was devised that translated LC, Dewey, and NLM call numbers into thirty-five subject codes.<sup>4</sup> For consistency, this same table was used to derive a two-character subject code to be used in matching records and in reporting the overlap results by subject.

*Format code*—a one-digit code was established to designate each record as (1) an English monograph, (2) an English serial, (3) a non-English monograph, or (4) a non-English serial.

*LC Card Number*—the numeric portion of the LC card number is stored.

*Publication date*—stored as a number.

*Main entry*—stored as a 4,3,2,1 key, based on the first four significant words.

*Place of publication*—the first two characters are stored after a small degree of normalization, e.g., converting New York to NY.

*Edition*—the numeric portion of the edition statement is stored.

*LCS title number*—a sequential record number assigned to each LCS record. Each library has its own sequence beginning with one. The compressed record allows for one number for each campus and the position of a number within the record designates the library database to which the record belongs.

*Title bit string*—an eighty-bit string representing the title that was stored.

The derivation of the title bit string requires further explanation. Williams and MacLaury describe in detail how a representation of a title can be stored in a fixed-length bit string.<sup>5</sup> Briefly, a title is "normalized" by capitalizing all letters and removing all spaces and punctuation. The normalized title is then divided into overlapping trigrams or groups of three letters. Each trigram is used to turn on a bit in the bit string. In the present study, this was done by constructing a hexadecimal number from the ASCII codes for each of the three characters in the trigram, converting the hexadecimal number back to decimal, dividing it by 80, and adding 1 to the remainder. For example, ABC would be represented by taking the ASCII values ( $A = 65$   $B = 66$   $C = 67$ ), converting them to hexadecimal ( $65 = 41$   $66 = 42$   $67 = 43$ ), and stringing these numbers together to get a six-digit hexadecimal number (414243). This hexadecimal number converted to decimal is 4,276,803 which, when divided by 80, leaves a remainder of 3. Thus, ABC sets bit 3 + 1 or 4 in the bit string. It follows that the same title consists of the same trigrams and would set the same bits in the title bit string. Therefore, a comparison of the bit strings for duplicate records of the same title will show that the bit strings do not differ. When compared, the bit strings for any two titles will have between 0 and 80 bits different. The fewer bits that differ, the more likely it is that the records are duplicates. Compensations for typographical errors can be made by setting a threshold for how different two titles can be and still be potential duplicates. Further, this threshold can vary based upon a comparison of other factors.

## TEST DATABASE

Four libraries were used to build a test database—Southern Illinois University—Carbondale (SIUC), Northern Illinois University (NIU), Illinois State University (ISU), and Southern Illinois University—Edwardsville (SIUE). These libraries were selected from the twenty-two participating libraries because they have the largest LCS databases after the University of Illinois at Urbana-Champaign (UIUC), and the

Table 1. Number of LCS Records in the Four Library Databases.

Campus	# Records	Cumulative	% of total	Cumulative %
SIUE	405,786	405,786	17.50	17.50
ISU	572,729	978,515	24.70	42.20
NIU	637,768	1,616,283	27.50	69.70
SIUC	702,522	2,318,805	30.30	100.00

larger databases should yield the best variety of records for comparison. Table 1 shows the number of records in the databases of these four libraries as of July 1, 1983. UIUC was initially included in the test runs, but the size of its database produced so many titles unique to UIUC that the matching algorithm could not be adequately tested.

On the IBM PC, using random access files, the compressed record occupies 66 bytes on a 320 KB diskette, or about 4,800 records per diskette. To build the records, a program was written that takes the LCS record from the communications buffer as it is displayed on the screen and breaks it into its component fields. Figure 2 shows how the record in figure 1 would look as a compressed record.

This program automatically selects random records from the four test databases, determines the 4,5 title key, retrieves all LCS records in each of the four databases that use that 4,5 title key, and derives the compressed record for each full LCS record. These compressed records are then written to a diskette. For example, the program might generate the number 379088 for the SIUE database, which would retrieve the LCS record shown in figure 1. It would then derive the 4,5 title key ESSELEARN and would retrieve all the records from the four library databases that are indexed under this title key, including the title shown for any library that owns it. The title key ESSELEARN retrieves five records from SIUE, five from ISU, four from NIU, and four from SIUC. In fact, three of the four libraries have the fourth edition of Travers' *Essentials of Learning*, and the records are shown in figure 3.

When running this program, the IBM PC is set up as an LCS terminal. It issues the appropriate commands, reads the records when LCS responds, and derives and files the compressed records. Because the pro-

gram can be set to run automatically, it is connected to LCS during nights and weekends and left to run unattended. It stops itself when LCS comes down at 12 p.m. each night or when the diskette is full. The program was run until the records for more than four hundred title keys had been retrieved. This resulted in a test database of about twenty thousand records stored on five diskettes.

There is an inherent bias in this method of selecting title keys because the more often a title key is used in LCS, the more likely it is to be selected. For example, there are more records with the title key COLLWORKS than with the title key WHITALBUM, and thus the title key COLLWORKS is more likely to be selected. This bias makes duplicate detection more difficult in the test database than it will be in the actual database because the test database has proportionally more records with the same title key. The more records that have the same title key, the more potential matches there are to test. This bias was actually healthy, however, because it made developing an accurate matching algorithm in the test database more difficult. Thus, when transferred to the full database, the matching algorithm may be even more accurate than in the test database.

#### MATCHING SCHEME

The test database, then, consisted of about twenty thousand compressed records within over four hundred partitions, i.e., one partition for each title key. The next step was to write a program that would compare the compressed records within each title key partition and determine which were duplicates. In this program, the records within a partition—i.e., with the same title key—are examined sequentially. If a record does not match any of the previous records in that partition, then it is

*Title bit string*  
 00000101000000100101001001000010000110000000100000000000001001011000001000000

*Hexadecimal representation of title bit string*  
 05025242180800096040

*Title bit string actually stored as five single precision numbers, four bytes each*  
 1282 21058 6152 9 24640

*Subject category* = 27 (code for Education—stored as an integer)  
*Format code* = 1 for a monograph in English (stored as an integer)  
*LC Card Number* = 764962 (stored as a double precision number with eight bytes)  
*Date* = 1977 (stored as an integer)  
*Main entry key* = TRAVROBMOW (stored as a ten-character string with ten bytes)  
*Place* = NY (stored as a two-character string with two bytes)  
*Edition* = 4 (stored as an integer)  
*Title numbers* = 0 0 379088 0—position as third number indicates that this is an SIUE record (stored as single precision numbers with two bytes)

*Representation of record as stored* (spaces inserted)  
 2564 -23420 12304 18 -16526 27 1 764962 1977 TRAVROBMOW NY 2 0 0 379088 0

Fig. 2. *Compressed Record.*

*SIUE Record*  
 LB1051.T681977 TRAVERS, ROBERT MORRIS WILLIAM, 1913-  
 ESSENTIALS OF LEARNING\$4TH ED.\$NY 76-4962  
 379088 1977 1 ADDED: 820408  
 01 001 12-3W STX  
 PAGE 1 END

*NIU Record*  
 LB1051T681977 TRAVERS, ROBERT MORRIS WILLIAM, 1913-  
 ESSENTIALS OF LEARNING\$4TH ED.\$NY 76-4962  
 337281 1977 1 ADDED: 801019  
 01 001 52-4W EDX  
 PAGE 1 END

*SIUC Record*  
 154.4T781E1977 TRAVERS, ROBERT MORRIS WILLIAM, 1913-  
 ESSENTIALS OF LEARNING\$4TH ED.\$NEW YORK 76-4962  
 402182 1977 3 ADDED: 830627  
 01 001 4-16W EDX  
 02 002 4-16W EDX  
 03 003 4-16W EDX  
 PAGE 1 END

Fig. 3. *Example of Title Overlap.*

added to a master file. If it matches a record already on the master file but both records are for the same library, then an occurrence of an internal match is written to a separate file and the new record is discarded. If it matches a record on the master file from another library, then the new record is merged with the record on the master file by copying the record identifier and a code for the library to the master record. Figure 4 illustrates this procedure with compressed records for the full LCS records from figure 3. These four compressed records match on LC card number, date, main entry, and place and thus represent the same title. The consolidated record in Fig-

ure 4 shows how the compressed records are merged by adding the library-specific title number to the first record.

The most difficult and time-consuming problem is testing and refining the matching algorithm. This is where using a personal computer for modeling the project has proven most useful. Again using the IBM PC as an LCS terminal, a program was written that examines consolidated records from the master file—records that resulted from comparing records within a title partition—and retrieves and displays the full LCS records for analysis. Because the PC can be set up as a terminal, it is possible using this program for the operator to

<i>SIUC Compressed Record</i>															
2564	-23420	12304	18	-16526	27	1	764962	1977	TRAVROBMOW	NY	4	0	0	379088	0
<i>NIU Compressed Record</i>															
2564	-23420	12304	18	-16526	27	1	764962	1977	TRAVROBMOW	NY	4	0	0		337281
<i>SIUC Compressed Record</i>															
2564	-23420	12304	18	-16526	27	1	764962	1977	TRAVROBMOW	NY	4	402182	0	0	0
<i>Consolidated Record (shows that three libraries have this item in their database)</i>															
2564	-23420	12304	18	-16526	27	1	764962	1977	TRAVROBMOW	NY	4	402182	0	379088	337281

Fig. 4. Sample Compressed Records.

issue LCS commands to pull up records that the matching scheme might have missed. Thus, it is possible to test various matching schemes until the optimum scheme is established.

The matching scheme that gives the best results so far works on several levels. First, LC card number, date, main entry, and place of publication are tested. If these elements are present and the same in both records, then they are judged to match without a comparison of the title bit strings. If no match results from this comparison, then the LC card number and date of publication are checked. If both are present and both are different, then no match is possible and no further testing is done on that pair of records. If they do match or if either of these elements is absent from either record, then testing continues. At the next level, the number of bits set to "1" in each title string is tested. If the difference between the number of bits set to "1" is more than five, then no match is possible and no further testing is done on that pair of records. If the difference is less than or equal to five, then the title bit strings are compared position by position to determine the number of bit positions that are different between the two. If more than five positions are different, then no further testing is done. If five or fewer of the eighty are different, then testing continues.

If the pair of records being compared passes through all the above steps and no decision is yet possible, then further testing is done based on a comparison of the LC card number, publication date, main entry, and place of publication. When comparing any of these four elements between two records, one of three results is possible:

- the element is present and the same in both records

- the element is present in both records but is not the same
- one or both of the records lack the element

Comparing four elements with three possible outcomes each results in eighty-one possible results (i.e.,  $3^4$ ). A decision table was set up based on these eighty-one results and continues to be refined.

There are three possible decisions for each of the eighty-one results—match, no match, and check further. Further checks are performed using the other available elements—subject code, format code, and edition—as well as re-examining the other elements. For example, in certain cases it might be required that the title match exactly rather than have fewer than five positions different. This is significant with short titles such as *Richard II* and *Richard III*. In other cases, it might be necessary to require an exact match on date rather than allow up to two years difference. This is important with annuals that have been cataloged as separate titles.

Evolving configurations of the decision table are being tested using the interactive program described above by sampling consolidated records from the master file to determine if they accurately represent the true nature of the records in the full LCS databases. Internal matches—i.e., cases where the library had two LCS records for a title—are also monitored. There are two ways in which the matching scheme can fail—it can either falsely identify two records as duplicates, or it can fail to detect the occurrence of a duplicate. Records from the master file have been sampled and tested by examining records that the scheme had determined to be duplicates and by searching in LCS for possible variations on a record. Because the project is intended as a study of

the collections as represented in LCS, the card catalogs in the four libraries were not checked to see if a library owned a title but had not yet entered it into LCS. Records are searched in OCLC and the UIUC card catalog, when appropriate, to determine if variations in cataloging practice may have hidden a potential match—for example, one library may catalog a work under its monographic title while another may simply add it as a number in a monographic series. Searching OCLC will usually reveal a series entry to examine. In the records checked to date, this has not proven to be a serious problem.

The matching scheme is approaching 95 percent accuracy, but further refinement is still possible and work continues. When the continuing samples indicate that the matching scheme has reached an optimum level, then a statistically complete sample will be drawn and tested to determine the accuracy that can be expected in the production run on the full databases.

### CONCLUSIONS

As stated above, the purpose of this communication is not to describe collection overlap or to describe a scheme for detecting duplicates. Rather, it is intended to show how a microcomputer can be used to analyze a large database in an efficient and convenient manner. Using a personal computer in this manner puts the investigator much closer to the problem, forces the problem to be seen from a programming standpoint, allows a great deal of flexibility in specifying and analyzing the problem, and does not tie up the mainframe system or involve the programming staff. It is an effective way to model the full-scale project, and the end result is a program whose code can serve as a guide to the programmer. Theoretically, the program could be transferred to a compatible compiler on the mainframe and run with a minimum of revision. This is not advisable with BASIC, but other languages are available that could be transferred to a larger machine.

While the LCS project described here eventually will require a production run on the full databases, processing on a personal computer may be sufficient for other proj-

ects. Connecting a personal computer as a terminal to a large-scale bibliographic system has the potential to enhance greatly the use and analysis of that system. OCLC and WLN have both announced recently that they intend to use the IBM PC as their next generation terminal and both intend to encourage local programming. OCLC's micro enhancer project uses an Apple to assist in interlibrary loan processing. At the University of Illinois, we intend to use IBM PCs as intelligent terminals with a resident user interface. It is possible to have two or more communications ports on these machines and connect them to more than one system, thus providing access to more than one system simultaneously while using the processing power of the machine to smooth the transition between the systems. Projects involving the down-loading of records to a personal computer for analysis, monitoring of transactions, and providing guided interface programs resident in the personal computer are only a few of the possible applications in using these machines in conjunction with large bibliographic systems.

### ACKNOWLEDGMENTS

This work was partially funded by a grant from the Council on Library Resources, and is part of the author's Ph.D. dissertation project at the University of Illinois at Urbana-Champaign, Graduate School of Library and Information Science.

### REFERENCES

1. Bernard Hurley, "LCS: Automated Resource Sharing in Illinois," *Resource Sharing and Library Networks* 1:67-77 (Fall 1981). While there are twenty-three academic libraries now on LCS in Illinois, one has declined to participate in this collection overlap study.
2. William Gray Potter, "Studies of Collection Overlap: A Literature Review," *Library Research* 4:3-21 (Fall 1982).
3. Keith D. MacLaury, "Automatic Merging of Monographic Data Bases—Use of Fixed Length Keys Derived From Title Strings," *Journal of Library Automation* 12:143-55 (June 1979); Martha E. Williams and Keith D. MacLaury, "Automatic Merging of Monographic Data Bases—Identification of Duplicate Records in Multiple Files: The IUCS Scheme," *Journal of Library Automation*

12:156-68 (June 1979); Thomas B. Hickey and David J. Rypka, "Automatic Merging of Duplicate Monographic Records," *Journal of Library Automation* 12:125-42 (June 1979); Priscilla Caplan, "Retrospective Duplicate Resolution for the Harvard Distributable Union Catalog," *Information Technology and Libraries* 1:142-43 (June 1982); Dorothy S. McPherson, Karen E. Coyle, and Teresa L. Montgomery, "Building a Merged Biblio-

graphic Database: The University of California Experience," *Information Technology and Libraries* 1:371-80 (Dec. 1982).

4. William Aguilar and Hugh Atkinson, "Online Borrowing and Lending among Illinois Library Computer System (LCS) Member Libraries" (Unpublished report, Springfield, Illinois Board of Higher Education, April 1983), p.56-57.
5. Williams and MacLaury, 161-63.

**U** ULISYS is the recognized pacesetter in the real world of library automation —



**L** UNIVERSAL LIBRARY SYSTEMS is a software house comprised of highly skilled, experienced technical specialists who team their efforts to produce results.

**S** That is why ULISYS will always be the leader.

For more information, contact:

**Y** UNIVERSAL LIBRARY  
SYSTEMS  
1609A Broadway  
Bellingham, Wa. 98225  
(206) 676-4624

UNIVERSAL LIBRARY  
SYSTEMS  
205-1571 Bellevue Ave.  
West Vancouver, B.C. V7V 1A6  
Canada  
(604) 926-7421

**S**<sup>®</sup>

**SECRET**

On Microfiche...from Research Publications

# DECLASSIFIED DOCUMENTS

## **A Unique Reference System**

The topic could be Latin America or Africa, National Security or the Kennedy Assassination. Whatever the information, *The Declassified Document Reference System* is the only comprehensive compilation of its kind. Documents are microfilmed by Research Publications as they are released under provisions of the Freedom of Information Act Amendments in 1974.

Issued in quarterly installments, each annual subscription contains on microfiche 3,000 of the actual government documents which helped mold U.S. history over the last 35 years.

Printed quarterly abstracts and indexes, and an annual cumulative index, are included with each subscription. The abstracts and indexes may also be purchased separately.

## **Also Available**

- A *Retrospective Collection* containing 8000 documents in two hardbound volumes of abstracts plus a hardbound subject index.

- Backfiles from 1975 to the present.
- The annual subscription price for the complete collection (microfiche and abstracts and indexes) is only **\$725**. (Prices slightly higher outside the U.S. and Canada.)

To order, or for more information on either the *Declassified Document Reference System* or *Retrospective Collection*, write or call:

**rp**

research publications

**12 Lunar Drive/Drawer AB  
Woodbridge, CT 06525  
(203) 397-2600  
TWX: 710-465-6345  
FAX: 203-397-3893**

**Outside North and South America:  
P.O. Box 45  
Reading, RG1 8 HF England  
TEL: 0754-583247  
TELEX: 848336 NADL G**

# Reports and Working Papers

## Costs and Features of Online Catalogs: The State of the Art

Gary S. Lawrence, Joseph R. Matthews,  
and Charles E. Miller

*In mid-1982, results were beginning to flow from the massive study of online catalogs supported by the Council on Library Resources. It was apparent that the results needed some attention by those in a position to do something about them, system designers and library managers. Consequently, a meeting was arranged by the Council to bring a selection of online catalog system designers and library managers together. The information available about online catalogs included everything from their diversity (documented by Hildreth) to the impact of these systems on users (being explored in the CLR-supported studies of online catalogs). A missing ingredient and a necessary one for the discussion of online catalogs and their implementation in the library setting was that of costs. To provide some focus for a discussion of costs and how costs related to features of online catalogs, the Council awarded a grant to the University of California Systemwide Administration for the production of a draft focused on those issues. Gary Lawrence and Joe Matthews produced a draft for discussion at the meeting of designers and managers.*

*The meeting was held at the Aspen Institute's Wye Plantation facilities in Queenstown, Maryland. The draft accomplished one of its basic goals. It stimulated much discussion during the meeting, so much discussion that it became clear that extensive revision of the draft report was needed. In order to assist with issues of concern especially to library managers, Charles E. Miller was added to the project staff. The next draft was extensively reviewed by all of those at the Wye meeting and their comments have been, where possible, incorporated into the following version.*

*It is unlikely that this document will be the last word on the topic, nor do the authors expect it to be. But, it is certainly a reasonable focus for planning and discussion of the next generations of online catalogs and their implementation in libraries of all kinds and sizes.*

### ACKNOWLEDGEMENTS

The work reported here was supported in part by a grant from the Council on Library Resources, Inc. We wish to acknowledge the contributions of the CLR staff, including C. Lee Jones, our program officer, Keith Russell, and George Parsons; Dennis Smith, Vicki Graham, Heather Presley, Mark Needleman, Michael Berger, and Dorothy McPherson of the University of California; and the 27 participants in CLR's Wye Plantation conference in December of 1982,<sup>1</sup> who read and commented on two drafts of this paper and an oral presentation based upon it.

---

Gary S. Lawrence is director of Library Studies and Research Division, Office of the Assistant Vice President, Library Plans and Policies, University of California Systemwide Administration, Berkeley, California. Joseph R. Matthews is president, J. Matthews and Associates, Inc., Grass Valley, California. Charles E. Miller is director of University Libraries, Florida State University, Tallahassee, Florida.

## SECTION 1: INTRODUCTION

Despite the importance of the topic, no one really knows how much it costs to provide an online catalog. Certainly estimates are available,<sup>2</sup> and contract figures and purchase costs for various systems are announced almost daily.<sup>3</sup> However, few, if any, library administrators know how much it costs to acquire and operate their online catalog, or how much money is saved (if any) by its implementation. This may be because libraries are reluctant to talk about their cost experience, or because the online catalog touches so many aspects of library operations that it is impossible to separate out the costs attributable solely to the online catalog (OLC).

Whatever the reason, an initial expectation that a rough estimate of the costs of the various elements of an online catalog could be built from reviews of the library and computing literature, interviews, and the institutional experience of the University of California library automation staff was soon dashed—no one knows what it really costs.

While accurate cost estimation was not feasible, it is possible to show order-of-magnitude costs and to illustrate the cost effects of a number of searching features and support capabilities that are of interest to both the designers and users of bibliographic automation systems.

There are serious managerial implications involved in choosing a particular computer system configuration. These implications and considerations go beyond the questions of how much money is involved in an online catalog configuration and in what areas it is to be spent, and into the areas of the nature of the organization attempting to produce the catalog, what resources it has available to it and what goals it is attempting to accomplish. Among the important questions that need to be considered are:

1. What is the nature of funding available to the library? Does sufficient funding exist for initial development and acquisition of needed hardware and software? Will continued funding be available to support and maintain the operation including funding for additional hardware and staff salaries?
2. What is the intended audience for the online catalog and what is their level of sophistication? Does the system being acquired or designed match that level of sophistication and meet the users' needs? Will it continue to do so in the future?
3. Is the online catalog to be the primary library catalog or a supplement to the existing catalog? This question has implications in the areas of redundant hardware requirements, physical environment such as fire protection and backup power, data security for the database, and planning for disaster recovery and backup sites.
4. What special requirements does the library have and does the system meet them? What links are required to other library systems or other outside systems and is the proposed online catalog capable of performing them? What time constraints is the library operating under? How soon does the catalog need to be operational?
5. What is the size of the current database and how much and at what rate will it grow? What is the size of the current user population and how will it be increasing?

These issues must be addressed in all phases of planning for an online catalog. To facilitate that discussion the report is organized around the following points:

- The initial concern is for the *online catalog system* itself. The "system," as defined here, includes a *computer system*, a *database* of bibliographic records, and a *telecommunications system* to link the various parts of the system. The definition of the *computer system* includes not only the elements of equipment (hardware) and computer programs (software), but other matters related to installing and operating a local computer system of any type, including installation, support and maintenance, and security. Terminals are also considered as part of the computer system. In considering the *database*, we are concerned not only about its storage in the computer system, but also about such matters as the sources and formats for the data, the methods used to organize, access and update the database, and other issues that affect the cost and effectiveness of bibliographic computing, regardless of the use to which the bibliographic records are put. The discussion of the

*telecommunications system* considers both the equipment required to connect terminals, printers, and memory devices to the computer system and the availability and cost of communications lines of various sorts that may be required to provide library users with access to the computer system and the database.

- The *cost* of acquiring and maintaining the online catalog system is the cost of acquiring, operating and maintaining its components: the computer system, the database, and the telecommunications system. While a multitude of options and approaches can be considered in estimating the cost of an online catalog system, the approximate cost appears to be determined by two factors: the *size* of the system, in terms of computing capacity, database size, number and location of terminals, and similar factors, and the *features* offered by the system.

- Acquiring and maintaining an online catalog system, regardless of its characteristics and costs, presents some difficult choices in *financial management and planning*. Among the factors to be considered in deciding *how* to acquire an online catalog are its size and cost, the organizational setting, and the availability of critical resources like money and qualified personnel.

In this paper, we discuss the elements of the online catalog system and the factors that influence its cost; the issues and alternatives for financial management and planning; and actual costs and cost characteristics. Appendix A includes a checklist of issues and managerial questions for libraries planning an online catalog. The checklist, developed by Charles Miller as an aid for writing this report, has considerable value in its own right, and is therefore included for consideration as a planning aid for libraries considering their own online catalogs.

## SECTION 2: ONLINE LIBRARY CATALOGS: AN ANALYTICAL DESCRIPTION

An analysis of the features and costs of online catalogs has three parts:

1. The online catalog system itself.
2. Its cost.
3. Methods of financial management and planning.

This section discusses the first two elements, the catalog system and its cost characteristics. Financial management issues are covered later.

### 2.1 The Online Catalog System

An online catalog system can be described as having three components: a *computer system*, a *database*, and a *telecommunications system*. This description could be taken to apply to *any* online computer system. The special character of the online catalog is defined by the content of these components (especially the database).

#### 2.1.1 The Computer System

The *Computer System* consists of:

1. *Hardware*: central processor (CPU), direct-access storage devices (disk and drum), mass storage (e.g., tape), peripheral equipment (e.g., operator consoles, high-speed printers), etc.
2. *Software*: programs to control and operate the computer, manage telecommunications, communicate with users, conduct catalog searches, organize and display results, etc.
3. *Terminals*, including those for public access.
4. *Installation and environmental modification*: site preparation, air conditioning, fire protection, power supplies, cabling, furniture, etc.
5. *Provisions for operations and support*: system manager, system operators, repair staff, tape libraries, telecommunications support, hardware and software manuals and documentation, etc.
6. *Provisions for security, disaster prevention and disaster recovery*: operational backup,

system redundancy, data security, recovery procedures and training, physical security, off-site storage of tape data files, etc.

7. *Provisions for maintenance and replacement*: maintaining, repairing, improving and replacing hardware and software.

### 2.1.2 *The Database*

The *Database* consists of bibliographic records (and perhaps other records as well, e.g., business records for acquisition subsystems, information and referral records for community services), which can be characterized by:

1. The number of records in storage.
2. The size, format and contents of each record.
3. The method of organizing and accessing the Database.
4. The methods used to maintain and update the Database.

These bibliographic records may or may not be linked to authority control records with their associated cross references and notes.

### 2.1.3 *The Telecommunications*

#### *System*

The *Telecommunications System* connects elements of the computer system with other computers and with catalog users and library staff. The telecommunications system consists of:

1. *Communications lines*: direct lines, leased or dial telephone, cable, microwave, satellite, etc.
2. *Signal processing equipment*: modems, multiplexers, controllers, front-end communication processors, etc.; also, equipment to link different systems, such as "black box" processors to pass records from the library's cataloging terminal (e.g., OCLC) to the local online catalog system; and sometimes, specialized software to permit different systems to exchange data (e.g., communications protocol converters).

## 2.2 *Cost Characteristics*

The cost of computing equipment, the database, and the telecommunications system will be determined primarily by the *size* of the system and the *features* it provides.

### 2.2.1 *System Size*

System size can be defined in terms of three characteristics:<sup>4</sup>

1. *Bibliographic Records*: the number of bibliographic records in the database. Also of importance are the size of the records (which will influence online storage and processing costs) and the variety of records (adding record formats for different forms of material may add to the amount and complexity of software and influence processing cost). If the system provides authority control, the number of authority records in the database should also be considered. The number of access points (discussed below) also influences system size.
2. *Terminals*: the number of terminals to be connected to the system. Also of importance are the geographic area to be covered, the data transmission speed, and the total number of online catalog transactions that the system must be designed to support.
3. *Functions*: the number of library functions to be served by the computer system. Although the focus here is on online public access catalogs, many commercially-available catalogs are subsystems of products designed for other purposes (e.g., circulation control), or are components of "integrated systems" with multiple functions. While there may be economies to be realized from using the same computer system and database to serve multiple functions, the addition of new subsystems requires more software and more processing capacity. Indirectly, such additions may also require more terminals, further adding to cost.

### 2.2.2 System Features

Presently-available online catalogs offer an almost bewildering variety of *features*. For the purposes of this discussion, a number of the most important features have been grouped into three classes: *interface* features, *access* features, and *structural* features.

#### 2.2.2.1 Interface Features

Interface features are those that involve the "user interface," the interaction between the user and the online catalog system. Examples of interface features include:

1. *Search method.* Online catalogs can allow users to control their searches through direct entry of search and display commands (e.g., *FIND TI WINDS OF WAR*), or by menu selections, in which the user chooses among options presented by the system. Systems may offer a mixture of command and menu approaches,<sup>5</sup> and some systems allow the user to choose between the command and menu approach.
2. *Display formats.* Some systems display bibliographic records in only one format. Most, however, offer a number of alternatives and options, ranging from one-line displays of abbreviated authors and titles to complete records in catalog-card formats and even fully-tagged MARC records.
3. *Online assistance and instruction.* Online catalogs offer a considerable array of online instructions, prompts, reminders and help displays, ranging from messages that supply virtually no information to complex messages that provide assistance on practically every aspect of the catalog at the user's request. Some systems even provide assistance when the user is in trouble but does not request help.

The salient characteristic of interface features is that they are generally created in a layer of software that lies between the user at the terminal and the actual search and retrieval mechanism of the catalog. The "interface software" exists to translate the user's entries into search and display commands that the catalog system can use, and translates and formats computer results into a form that the user can understand.

It should be possible to add, change or remove interface features without changing the basic structure of the online catalog system. To clarify the distinction: interface software can be modified to change the way (or to add new ways) that the user enters a subject search, but adding subject search capabilities where they do not already exist requires significant structural changes beyond the scope of the interface software.

Although it is relatively easy to add or change interface features, changes are not without cost. New software must be developed, programmed and tested. Storing and using the new software may require additional computer capacity. However, the cost of changing interface characteristics may be marginal compared to other aspects of online catalog cost, and interface features are likely to be the least costly of all features of an online catalog.

#### 2.2.2.2 Computer Access Features

Computer access features are those that provide users with more convenient access to the online catalog system itself, or use the online catalog to provide users with access to other bibliographic computing systems. The most important aspects of improved access are subsumed under the headings of computer system hardware and the telecommunications system: that is, more terminals, in more places both inside and out of the library.

Two important computer access features are:

1. *Dialup access.* Many online catalogs make it possible for users with their own terminals or computers to connect to the online catalog by telephone.
2. *Linkages to other systems.* Although it is not now common practice in bibliographic computing, it is possible to link library users to other computer systems through the online catalog. For example, the online catalog (when not otherwise integrated with these functions) could connect to local circulation and acquisition systems at the user's command, to provide circulation status or on-order information about wanted items.

As a variation on this theme, linkages with other systems can provide a gateway *into* the online catalog. For example, a linkage to a university computer center could provide campus computer users with access to the library's catalog. There are several examples of this kind of linkage in academic libraries.

Physical access features, like interface features, can often be provided without any revision of the central structure of the catalog. Like interface features, they also carry a price tag, in the form of software development, additional computing capacity, communications equipment, and the like. In the case of linkage to other systems, the cost of developing and running necessary software may be substantial, and telecommunications charges for using those links must also be considered.

### 2.2.2.3 *Structural Features*

A structural feature is one that is inextricably bound to the overall design of the catalog software system, the structure of the database, or both. In general, adding or making a major change to a structural feature involves major development work to assure that the changes work well with other aspects of the system. New structural features often require substantial redesign of the software system and the database structure. Structural features may or may not be expensive initially, depending on the nature of the feature and other aspects of the system. In most cases, however, it will be very expensive to add or extensively modify a feature in an existing system. Examples of structural features include:

1. *Access points.* For a particular kind of bibliographic information to be used in a search, it must generally be identified as an access point at the time the record is added to the database. If, for example, a library decided after installing its online catalog that it wanted to allow users to search by series name, the added access point could be enormously expensive to provide, perhaps requiring that the entire database be recreated with the series field flagged as a legitimate access point,<sup>6</sup> assuming, of course, that the series data are available in the original machine-readable records. The number and type of access points varies considerably in currently operational online catalog.<sup>7</sup>
2. *Authority control.* The ability to link various forms of an entry can be a difficult computational task, especially complicated because it operates in two different directions. First, in helping users search the database, an authority control system must be able to link the variant terms that users enter with "authorized" headings in the database. Second, when records first enter the database, the authority control system must be able to link the record with its "authorized" heading, even when the authorized form of the term may not appear in the record itself. Thus, authority control appears to be central to the structure of the online catalog, profoundly affecting both the creation of the database and the methods by which it is searched.
3. *Union catalog features.* When several libraries share a system, either cooperatively or under the direction of some larger authority, it is necessary to have the capability to merge identical or nearly identical records from several contributing libraries, and to search and display the catalog's holdings selectively. Certainly not all online catalogs are, or will be, sponsored by multiple libraries, but the cost of automation on the one hand, and the resource-sharing benefits of access to a union database on the other, will lead many libraries to adopt shared systems requiring consolidation and unionization capabilities. The ability to search and display records on the basis of holding library may be a rather modest software enhancement, and a new index file may be required, adding somewhat to storage requirements. The original consolidation of records, however, could conceivably be quite expensive, depending on the number and variety of input formats involved, and the importance of storing and displaying the unique or variant data for each individual library.
4. *Boolean searching.* Boolean searching (the linking of search terms and/or access points using terms like *AND* or *OR*) is a useful technique for limiting or expanding search results. Evidence from the CLR Public Access Project suggested that this ability would be useful to many respondents,<sup>8</sup> a finding supported by data from University of Califor-

# Faxon figures.

Productivity is a critical concern in today's library. That's why more and more decision makers are looking into Faxon. We can be the best source for all of your journal and continuation subscriptions. Our services enable you to devote your valuable personnel resources to other crucial library functions.

As a full service agent with access to more than 150,000 different periodicals, we can handle ordering, claiming, check-in, and routing. Our growing international network links you to other libraries, publishers, and in the near future, other online systems.

If you can profit from improved productivity, a call to Faxon figures.

1-800-225-6055  
or 1-617-329-3350 (collect)

**faxon**

**ON THE FRONTIER OF INFORMATION MANAGEMENT**

F.W. Faxon Company, Inc. 15 Southwest Park Westwood, MA 02090

nia transaction logs.<sup>9</sup> Even in single-index searches, Boolean logic may be an indispensable tool for limiting overly large search results (by using, e.g., AND or NOT to select a subset of the retrieval set), and at least one vendor uses Boolean searching for this purpose alone. The manner in which Boolean searching is implemented will affect the cost of the systems. Some of the early (and larger) systems have done all of the necessary searching and combining and/or excluding of the search results before returning a message or display to user. Other systems have implemented Boolean searching as if the user had entered a series of search requests to the system. Under this latter approach, the system searches using the first term and when completed provides the results of the first search to the user in the form of a message *prior* to beginning the search for the second term. The two (or more) sets are then acted upon by the Boolean operator and the results are then displayed for the user. This latter approach may take slightly longer to complete but users may be unaware of the delay since they are receiving messages from the system at various intervals during the search.

5. *Search limiting.* Among 29 potential problems that users might experience with the online catalog system, respondents to the CLR questionnaire ranked "reducing the result when too much is retrieved" as the fourth most serious problem.<sup>10</sup> It is not clear that all limitation techniques (publication date, language, Boolean arguments, etc.) are equally successful, but the provision of at least some methods to reduce overly large search results is important to users. Limiting features add to software development and operating costs. Of more importance, the limiting variables must be uniquely identified in the database records, and in many database management designs, must be indexed, even if these fields are not to be searched directly (e.g., date of publication).
6. *Keyword searching.* The ability to search by keywords rather than full headings could be a mixed blessing; it may increase the chances of retrieving relevant material, but can generate numerous irrelevant citations as well. Nonetheless, there are strong reasons to support this feature, especially for subject searching. The chief alternative to subject searching by keyword, entering the exact heading, from left to right, as it would appear on a catalog card, appears unnecessarily restrictive, especially given current practice regarding the construction of LC subject headings, with their various word orders, inversions, and subdivisions.<sup>11</sup> Keyword searching is likely to add significantly to the expense of an online catalog. It has been estimated that a full MARC record, having an average size of 750 characters,<sup>12</sup> will, with its associated indices, occupy about 2,000 characters on a disk drive.<sup>13</sup> Adding keyword searching will increase storage requirements for the record by about 1,000 characters, the space required for the keyword index entries. Therefore, keyword access means the disk drives must be larger by a factor of one half, and suggests that equipment capacity may need to be increased commensurately to handle the additional disk access requirements. However, the cost of disk storage space is dropping considerably, a matter that will be discussed later. The availability of these (and other) features varies considerably in currently operational catalogs.<sup>14</sup>

### SECTION 3: FINANCIAL MANAGEMENT AND PLANNING

There are two aspects to the purchase (or development) and operation of an online catalog: estimating how much the catalog will cost, and determining how to pay for it. The second issue is the topic of this section.

There are several ways to acquire online catalog services, ranging from "pay-as-you-go" service bureaus or utilities to a full-fledged in-house effort, with a computer system in the library and software developed by library staff. For the purposes of this section, it is assumed that an online catalog sufficient to meet the needs of a particular library will cost about the same amount no matter what approach is used; only the manner of acquiring the

catalog varies. The manner of acquiring the catalog chiefly influences *what* you pay for and *when* you must pay; service standards are a factor too, because some approaches are less amenable to tailoring to specific local needs than others.

This section discusses the basic planning factors that contribute to financial management decisions for the online catalog, and proceeds to identify and describe the range of approaches embodied in these factors.

### 3.1 Planning Factors

The analysis of the cost of online catalogs has two basic dimensions: the *timing* of financial outlays; and the items or services purchased, or the *objects of expenditure*. *Timing* divides conventionally into two basic classes: *initial* costs and *annual* costs. *Objects of expenditure* can be divided into four groups: *Hardware*, *software*, *personnel*, and *other expenditures*. These two dimensions produce a variety of financial management combinations that offer significant alternatives to the library planning an online catalog.

#### 3.1.1 *Timing: Initial and Annual Costs*

Initial costs include all items that the library must purchase in order to begin offering an operational online catalog. Elements of initial cost include the formal selection process, the period in which the library is making its determination of what type of online catalog to acquire, and may also include the time-consuming process of bidding and the selection of suppliers of equipment or vendors of systems. Depending on the kind of system chosen, initial costs may include outlays for the computer system itself (some or all of the items listed in section 2.1.1), an "opening-day" database (if library records are not already in machine-readable form) and telecommunications.

Annual costs are incurred to maintain the elements of the computer system (both hardware and software), the database, and the telecommunications system. The category also includes provision for planned growth in the database, improved features (including interface features, access features, and structural features), and attendant upgrading of the computer system (hardware, software, and storage) to support growth and improvement. Operating costs, such as utilities, communications costs, supplies and staff salaries are also included here.

#### 3.1.2 *Objects of Expenditure: Hardware, Software, Personnel*

1. *Hardware*. Perhaps the largest and certainly the most tangible element of any online catalog will be the actual computer hardware on which it will run. Among the pieces of computer hardware that may need to be acquired are such things as the central processing unit itself (CPU), storage disks and their associated controllers, tape drives and associated controllers, terminals, printers (both high speed and small scale terminal printers), communications controllers and phone line equipment such as modems and multiplexers as well as the actual transmission media such as phone lines, microwave, or satellite transmission. Monitoring and test equipment may also be necessary, as may such things as switching equipment and redundant hardware in a multi-cpu environment.

In addition to the initial acquisition costs, the hardware configuration will have substantial ongoing maintenance and support costs. Foremost among these will be the maintenance and repair of the hardware itself, provided by the hardware manufacturer, system vendor or other contractor. Other important costs that need to be considered are support supplies, such as printer paper and magnetic tapes, and ongoing costs of the transmission medium, such as monthly rentals of phone lines or whatever transmission medium is used.

Another important hardware cost that must be mentioned is planning for equipment depreciation and obsolescence. All modern computer equipment has a finite lifetime

after which it becomes both extremely expensive to maintain and also technologically obsolete. The costs involved in planning for replacement of hardware on a fixed cycle should be considered, but are frequently ignored, in any discussion of hardware costs. Typically, computer equipment can be expected to have a useful life of from 5-10 years; standard computer industry practice is to plan to replace equipment every five years.

2. *Software.* Along with the computer hardware is a need for software or programs to control it. Depending on the type of online catalog system involved, some or all of the following items may represent cost factors. An operating system control program, which is the primary underlying software component that drives the hardware, may be required. In addition to the operating system, it may be necessary to acquire one or more pieces of telecommunications software to drive the terminals. Other major software components that may represent cost factors are such things as a database management system to manage the bibliographic data, monitoring software to monitor hardware and response time performance, and support software such as utility programs, language compilers and text editors to support development activities. Finally, of course, come the online catalog applications programs. These may be divided into such areas as the patron interface, production software to create and load the bibliographic records, the information retrieval system, an authority control system to aid in managing and improving access to the database, development software required to enhance the production system, and statistical and monitoring software to gain information on its performance.
3. *Personnel.* The approach taken by the library to acquire an online catalog, i.e., develop an in-house system or purchase a turnkey system, will significantly influence personnel costs. For a turnkey system, types of personnel that may be required to operate the online catalog include a system manager and computer operator(s). Services for other types of personnel necessary to maintain and enhance the online catalog can be obtained by the library under the umbrella of a software maintenance contract with the turnkey vendor or organization providing the online catalog software.

The types of personnel positions that may be required to develop and maintain an in-house system include a system manager, computer operations personnel to run the hardware, systems programming staff to support the operating system, telecommunications personnel to support and develop the telecommunications programming that will drive the terminals, bibliographic analysts and design support staff, applications programmers to write and maintain the online catalog applications, and telecommunications and terminal hardware support personnel. Most of the hardware maintenance personnel will probably be provided as part of the hardware maintenance agreements but, depending on the size of the terminal network, onsite people may be needed to support and maintain the telecommunications and terminal equipment.

It may also be necessary to have people who will handle documentation and control data stored on disk and tape, and it will undoubtedly be necessary to have staff available who can train the end users.

4. *Other Expenditures.* An onsite computer can use a great variety (and a large quantity) of supplies: paper, magnetic tape, disk packs, and the like. Depending on the kind of system involved, there may be substantial charges for purchased services as well. An important example, and one that must be faced by most OLC managers, is the telephone bill for telecommunications connections to OLC terminals. Other examples include fees for archival tapes from bibliographic utilities, computer center charges or service bureau fees, electricity for computer equipment and air conditioning, costs for building alterations and utilities work (power, cabling, and the like).

### 3.1.3 *Other Considerations*

Certain other factors that do not fall into the three major areas discussed above deserve mention. These fall into two basic areas: the physical environment needed to support the

hardware configuration, and provision for both physical and data security and handling disaster recovery. In the first area, some of the elements that represent major potential cost outlays are such things as the machine room and the systems needed to protect it such as raised flooring, electrical rewiring, air conditioning, fire and water protection systems, and an uninterruptible power system to provide backup power in an emergency. Some of the considerations in the area of security include such things as providing backup and off-site storage of the database, providing software to insure the integrity of the data if editing or update functions are included in the catalog, providing for the physical security of the computer installation, and providing for the availability of alternative sites on which to continue the operation of the system in the event of an emergency which renders the main facility unusable for an extended period of time.

### 3.2 Five Approaches to the Online Catalog

Some people never buy a car. They use common carriers to meet their transportation requirements, and pay only for what they use on a "pay as you go" basis. It's up to the carriers (bus and cab companies, etc.) to choose appropriate equipment, finance its purchase, maintain it, and so on.

At the other end of the spectrum, no doubt there are some people who still build their own cars (certainly there are a number who are willing to assemble cars from kits). Obtaining parts, assembling them in proper order, testing, obtaining licenses, maintaining the vehicle, financing the purchase: all these things are within the purview of the "end user."

Between these extremes lies a spectrum of alternatives: renting or leasing, buying a new car, buying a used car, and so on. So it is with online catalogs: a spectrum of alternatives exists, from "pay as you go" plans in which a vendor or "service bureau" is responsible for most aspects of selection, finance, operations and management, to complete in-house systems in which the library purchases and assembles all the hardware elements and writes all the software itself.

All the approaches discussed below have some common elements:

- No matter what alternative is chosen, the library must invest in determining its requirements and specifying what the system is to do. The content of this planning and specification phase may differ among the alternatives, but its primacy and scope do not.
- Bibliographic data have to come from somewhere. In all these alternatives, a source of bibliographic records, either from original keying, or from a bibliographic services vendor (e.g., OCLC, Carrollton Press REMARC, a COM catalog vendor, etc.) is included. In discussing the characteristics, costs and features of catalogs, it is well to keep in mind the paramount importance and potentially substantial cost of obtaining, maintaining, and updating the bibliographic database.

The following approaches are listed in order of complexity and the degree of local library control over the characteristics of the catalog. In the simplest approach, the library purchases standardized online services from a service bureau, while in the most complex approach the library is responsible for all aspects of specification, design, and maintenance of a computer center.

#### 3.2.1 Service Bureau Approach

In the *Service Bureau* approach, an external organization provides online catalog services through terminals placed in the library. Generally the library pays for the lease or purchase of the terminals, installation fees, a fee for loading the library's records, and fixed or varying charges for use of the online catalog. The catalog itself exists at the *Service Bureau* and may also be utilized at other unrelated institutions. The creation of the catalog and the addition of new records is usually handled as a flat rate per record, separate from the actual charges to use the catalog. The library should still expect some personnel costs, specifically for someone to act as coordinator and liaison with the service bureau, and for personnel to train the local users in the use of the system. Other costs that could be expected

are for whatever local documentation is required to support the training process.

The *Service Bureau* approach provides a basic catalog appealing to a range of institutions. The major benefit from this approach is that the one-time start-up costs are minimized or totally eliminated. The library also has a limited investment in the catalog in terms of specialized staff and hardware beyond the terminals.

However, there is little option for customizing the catalog for the local library except through user groups. In addition, the continuing or annual use charges may be substantial. The library may have to purchase its own terminals, not an insignificant cost. Telecommunications charges can be substantial, especially if the service bureau computer is distant from the library. Some bureaus could provide communications access as part of their invoiced service.

There are numerous examples of library automation service bureaus, including OCLC, Inc., and the Research Libraries Information Network. The major citation-searching vendors (Lockheed, BRS, etc.) are also service bureaus in this sense. In the online catalog area, service bureaus can be found: Inforonics, Avatar Systems, and, prospectively, Carlyle Systems.

In terms of financial planning factors, the *Service Bureau* approach has these characteristics:

1. Hardware
  - a) *Initial cost*: Purchase of terminals, and perhaps associated telecommunications equipment (modems, multiplexers, etc.).
  - b) *Annual cost*: Additional terminals to accommodate growth of demand for the online catalog; maintenance and repair of terminals and telecommunications equipment.
2. Software
  - a) *Initial cost*: None (included in service bureau charges).
  - b) *Annual cost*: None (included in service bureau charges).
3. Personnel
  - a) *Initial cost*: Database creation, if the database is keyed directly, or if existing records (e.g., brief records from the circulation system) must be upgraded. If records are obtained as a byproduct of cataloging, costs are incurred in the "Other" category (see below). If the online catalog is part of, or linked to, another automated system with complete and satisfactory records, the cost of creating and maintaining the database may be very nearly zero.
  - b) *Annual cost*: Additions to the database (current acquisitions, retrospective conversion), if keyed directly.
4. Other expenses
  - a) *Initial cost*: Terminal installation and connection, including site preparation. Charges for acquiring and loading database records from another source (e.g., archive tapes from bibliographic utilities). Initial telecommunications installations and arrangements.
  - b) *Annual cost*: Service bureau charges for (a) records added to the database and (b) online catalog transactions. Charges for acquiring database records. Telecommunications charges.

The elements of cost for the *Service Bureau* approach are reviewed in Table 1.

### 3.2.2 Turnkey Vendor Approach

In the *Turnkey Vendor* approach an external organization provides a specialized hardware/software package containing the online catalog. This package is installed in the library and may or may not duplicate other systems in other libraries. The system may also be linked to other systems and contain other functions beyond the online catalog. Most often vendors aim at the total integrated library system built around the vendor package. Often vendor turnkey systems are patterned after or developed from existing circulation control systems.

Table 1. Cost Characteristics: Service Bureau Approach.

	Initial	Annual	Notes
Computer			
Hardware		O	
Software		O	
Terminals	H	H	Ongoing costs for additional terminals
Installation	O	O	Initial costs for terminal installation; Bureau costs amortized and incl. in regular billing
Operations		O	
Security		O	Included in regular billing
Maint. and Repl.		H,O	Term. maint. and replacement local responsibility; Bureau costs amortized & incl. in reg. billing.
Database	P,O	P,O	Depends on method of input
Telecommunications			
Lines	O	O	
Equipment	H	H	Equipment and installation could be part of regular billing.

KEY: H = Hardware (equipment) expense  
 S = Software expense  
 P = Personnel expense  
 O = Other expense (purchased services, etc.).

There are more options for customizing the *Turnkey Vendor* system as the library generally has choices among characteristics of the software/hardware package. Systems of this type are often developed in stages tailored to the library's funds and ability to absorb new systems. The library has more responsibility in accepting a *Turnkey Vendor* system. It must provide a suitable physical environment, specialized operating staff, and often staff to enter records into the system, and bibliographic staff to review vendor performance. It may also be the library's responsibility to provide telecommunications equipment, including phone lines if the system is to communicate with remote locations.

Typically the large share of the ongoing costs with vendor turnkey systems tends to be for hardware and software maintenance charges. Annual telecommunications charges may also be significant. Unless carefully planned, additional hardware beyond what was initially contracted for, including more terminals and increased storage capabilities to handle larger database sizes, may need to be purchased.

Examples of the *Turnkey Vendor* approach include CLSI, Geac, and the like.

Examples of the costs associated with the *Turnkey Vendor* approach, classified by financial management factors, include:

1. Hardware
  - a) *Initial cost*: Purchase of computer(s), mass memory (disk and tape drives), and related peripheral equipment (printers, communication controllers, etc.). Purchase of terminals and associated telecommunications equipment. Provisions for physical security (computer room and remote terminals).
  - b) *Annual cost*: Annual maintenance costs for hardware. Additional terminals. Upgraded equipment. Additional storage for expanding database. Additional storage for data security (backup files).
2. Software
  - a) *Initial cost*: Software for computer operating system, applications, telecommunications and database management (often sold by the vendor as a comprehensive package). Software to backup the database. Management information and statistical monitoring software.
  - b) *Annual cost*: Software maintenance contract. Software upgrades, if not included in software maintenance contract. Additional software for new features or functions.

3. Personnel

- a) *Initial cost:* Database creation (if keyed directly). System training for operating and management staff. Recruiting and training computer operators, and perhaps systems and applications programmers.
- b) *Annual cost:* Additions to the database. Staff training and retraining. System manager, computer operations staff, plus programmers if needed. Maintenance and repair personnel for computer equipment and terminals, if services not obtained on contract.

4. Other expenses

- a) *Initial cost:* Terminal installation and connection, including site preparation. Charges for acquiring and loading database records. Initial telecommunications installations and arrangements. Installation of computer equipment, including site preparation, air conditioning, power, etc. Initial inventory of operating supplies.
- b) *Annual cost:* Operating supplies. Remote storage of backup data (data security). Charges for acquiring database records. Communications costs.

These cost elements are reviewed in Table 2.

3.2.3 *Local Hardware, Purchased Software*

In this approach the institution procures and maintains the computer hardware and separately purchases the online catalog software. It is possible that the computer center exists for a number of other purposes and the online catalog will become a new application for an already functioning center. Or, as in the case of the *Turnkey Vendor* approach, the library may need to provide a suitable physical environment and hire and train an operating staff.

Note that the hardware, while dedicated to the library's applications, may not be physically located in the library; an example is the University of California system, where the computer is at a central site and is shared by the nine UC campuses.

Typically, the library has few choices in selecting the appropriate software to run on the local computer once the manufacturer of the local computer system becomes a "given." Because it is a software package, the library must provide specialized staff to mount, maintain, and monitor the catalog. The library can also expect to need specialized bibliographic staff to specify the catalog features and monitor the bibliographic aspects of the catalog. In return, the library has a greater opportunity to adapt the software package to the library needs. However, it should be noted that at least initially, the library will proba-

Table 2. *Cost Characteristics: Turnkey Vendor Approach.*

	Initial	Annual	Notes
Computer			
Hardware	H	H	
Software	S	S	
Terminals	H	H	
Installation	O	O	
Operations	P	P,O	
Security	H,S	H,P,O	Includes security
Maint. and Repl.		H,P,O	
Database	P,O	P,O	Depends on method of conversion and input
Telecommunications			
Lines	O	O	
Equipment	H	H	Annual expenses for maint.

KEY: H = Hardware (equipment) expense  
 S = Software expense  
 P = Personnel expense  
 O = Other expense (purchased services, etc.).

bly have to live with the strengths and limitations of the software as delivered.

Examples of purchased software are the University of Illinois system, with software purchased originally from Ohio State University and run on campus computing equipment, and the recent Illinois program involving purchase and adaptation of the Washington Library Network software. Other examples are the original National Library of Medicine version of the Integrated Library System, the software for which is in the public domain and can be purchased from NTIS for mounting on the library's computer; and the software available from the Virginia Polytechnic Institute, the Pike's Peak Library District, or Northwestern University. Note that the purchased software may be mounted and run on library hardware, or the library can use the hardware of a service bureau like a campus computing center. If a service bureau computer is used, the cost characteristics for computing equipment resemble those for the *Service Bureau* option discussed previously. The following discussion assumes that the library mounts purchased software on its own computer.

This approach has the potential of requiring a substantial initial financial outlay on the part of the library in that the library will be responsible for providing all of the hardware cost elements discussed above. Some of these expenses may be moderated if much of the hardware necessary already exists in house in some other application. However, the addition of an online catalog application will probably require at least some additions to existing hardware, most notably in the area of storage devices and terminals. Having in-house hardware also involves many of the personnel problems discussed above, including operations and system programming staff to support the computer center.

The other major cost element in this configuration will be the purchased application program package. Along with the purchased program it will probably be necessary to have at least one staff member who is responsible for installing the program, acting as liaison with the software vendor and applying any updates and maintenance that the vendor may supply. Depending on what is included with the purchased catalog software it may also be necessary to acquire other support software such as programs to monitor performance and provide statistics, and programs to backup and protect the database. Also it may be necessary to acquire new telecommunications software if the purchased application is not compatible with already existing telecommunications programs. In this case, additional support staff may also be needed.

The same cost problems for training and local documentation that exist in the previously mentioned configurations are present in this approach.

The principal cost elements for the *Local Hardware, Purchased Software* approach are:

#### 1. Hardware

- a) *Initial cost*: Purchase of computer(s), mass storage (disk and tape drives), and related peripheral equipment (printers, communication controllers, etc.). Purchase of terminals and associated telecommunications equipment. Provisions for physical security (computer room and remote terminals). Some of these costs may be avoided if the library already owns a large general purpose computer on which the online catalog application can operate without upgrading.
- b) *Annual cost*: Annual hardware maintenance (including terminals). Additional terminals. Upgraded equipment. Additional storage for expanding database. Additional storage for data security (backup files).

#### 2. Software

- a) *Initial cost*: Software for computer operating system, applications, telecommunications and database management. Software to backup the database. Management information and statistical monitoring software. Some or all initial outlays can be avoided if software is leased rather than purchased.
- b) *Annual cost*: Annual software maintenance agreement (if any). Software upgrades, if not included in software maintenance contract or lease. Additional software for new features or functions.

#### 3. Personnel

- a) *Initial cost*: Systems and applications programmers to mount, test, and deliver the software product, and perhaps to modify the purchased software system if required. Database creation (if keyed directly). System training for operating and management staff. Recruiting and training computer operators.
- b) *Annual cost*: Programmers to maintain and upgrade system and applications software (unless these services are provided on lease or contract). Additions to the database. Staff training and retraining. Computer operations staff. Maintenance and repair personnel for computer equipment and terminals, if services not obtained on contract.
4. Other expenses
- a) *Initial cost*: Terminal installation and connection, including site preparation. Charges for acquiring and loading database records. Initial telecommunications installations and arrangements. Installation of computer equipment, including site preparation, air conditioning, power, etc. Initial inventory of operating supplies.
- b) *Annual cost*: Operating supplies. Remote storage of backup data (data security). Charges for acquiring database records. Communications costs.

These characteristics of the *Local Hardware, Purchased Software* approach are reviewed in Table 3.

### 3.2.4 Local Software, Service Bureau Hardware

In this approach the institution is responsible for the specification, development, and implementation of the online catalog software which may include the catalog proper and the database management system. Also included may be programs for loading the institution's data into the catalog. The institution purchases computer time on a computer that is not within their direct control, and this computer center is responsible for maintaining the proper operating environment to run the institution's catalog.

In this approach the library's choices of catalog characteristics are limited only by the available hardware and computer charges. The institution will need a specialized staff for specifying and developing the catalog.

Alternatively, the library may purchase online catalog software to mount on the service bureau computer, in which case the software cost picture will resemble that of the *Local Hardware, Purchased Software* approach. In the following discussion, we assume the library chooses to write its own software.

Table 3. *Cost Characteristics: Local Hardware, Purchased Software.*

	Initial	Annual	Notes
Computer			
Hardware	H	H	Computer may be shared or already on site
Software	S,P	S,P,O	Modifying purchased software may require skilled local staff
Terminals	H	H	
Installation	P,O	O	
Operations	P	P,O	
Security	H,S	H,P,O	Includes physical security
Maint. and Repl.		H,P,O	
Database	P,O	P,O	Depends on method of input
Telecommunications			
Lines	O	O	
Equipment	H	H	

KEY: H = Hardware (equipment) expense  
 S = Software expense  
 P = Personnel expense  
 O = Other expense (purchased services, etc.).

# With MINISIS, Database Management isn't a hit or miss proposition.

Database management (the exacting art of finding things in the Information Age) is becoming increasingly important to all manner of organizations that have to maintain, manipulate and retrieve large volumes of information.

The famous Cranshaw Method (pictured on the left) is fast becoming a thing of the past. But, there are a lot of database systems out there that can make you feel like Cranshaw - with a keyboard instead of a dartboard.

MINISIS, from Systemhouse, is an extremely powerful, extremely easy way of finding things. It doesn't matter what things you want on your database - journals, books, real estate listings, videotapes, people, case histories, reports, machine parts, companies, legal cases, racing tips - anything. Because MINISIS is a "relational" database system, it will let you use data in ways you may not even have had in mind when you started. Without any computer background, MINISIS users can create new applications, often in a single day. And if what you get isn't exactly what you wanted or if you've changed your mind, you simply change the database.

Moreover, MINISIS has everything you need to develop your own records management system or information retrieval application, including a very powerful query capability with keyword and text searching and a super report generator that can produce anything from a catalog card, to a form letter, to a telephone directory. It even has processors to convert your existing databases into MINISIS format.

Running on the HP3000 family of minicomputers, MINISIS is being used by 80 organizations in 24 countries to manage their information. Universities, special libraries, major corporations, museums, documentation centres and more.

So if you're looking for a comprehensive, cost-effective, proven method of finding things, we think that your search, unlike Cranshaw's, is over.

Call us.

## SYSTEMHOUSE

We don't make computers...  
We make them work.



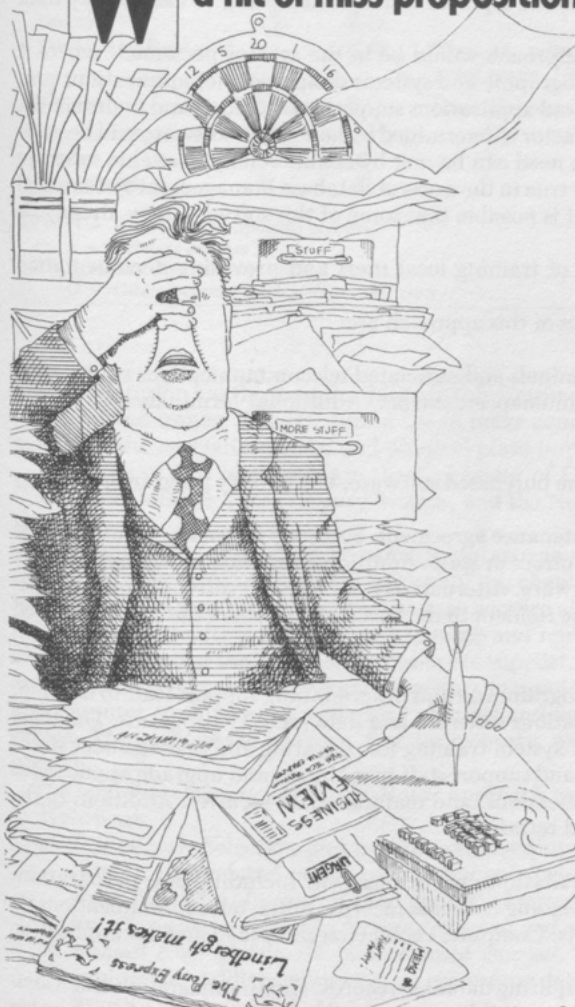
MINISIS Product Managers

Systemhouse Inc.\*  
1655 North Fort Myer Drive  
5th Floor,  
Arlington, Virginia 22209  
703-276-0500

Systemhouse Ltd.  
2827 Riverside Drive  
Ottawa, Ontario  
K1V 0C4  
613-596-0670

Los Angeles • San Francisco • Chicago • Washington, D.C. • New York • Boston  
Vancouver • Regina • Winnipeg • Toronto • London • Ottawa • Montreal • Halifax

\*d/b/a SHL Inc. in Connecticut, Illinois, New Jersey, Texas and Massachusetts, and Systemhouse Computer Services Inc. in New York



An example of this approach is the Minnesota State University system, developed at Mankato State University, which runs on a general campus computing system on which the library purchases computer time, and the Dallas Public Library system, which uses a city computer. This approach requires much less initial capital expense than the one discussed immediately above since hardware costs will be paid for on a pay as you go basis. However, there may be some hardware expenses necessary if the service bureau chosen does not have the capacity to meet the needs of the online catalog. This situation would be especially true in situations where the library was attempting to use an already existing computer center that belonged to its parent organization, such as a university library using the main university computer center or a public library attempting to use the city data processing center.

One of the major costs of this approach would be in the area of personnel, where it would be necessary to obtain bibliographic and systems design people, applications programmers to program the system, and applications support staff to load and maintain the database. Another important cost factor is determined by how much software will be written in-house and how much of the need can be met by commercially available software packages. This would be especially true in the areas of database management systems and support utilities and text editors. It is possible that some of this software may already be available at the service bureau.

Again, the same cost problems of training local users and providing documentation must be considered.

The principal cost characteristics of this approach are:

1. Hardware
  - a) *Initial cost:* Purchase of terminals and associated telecommunications equipment.
  - b) *Annual cost:* Terminal maintenance contract. Additional terminals and related equipment.
2. Software
  - a) *Initial cost:* Optionally, some purchased software, e.g., utility programs, software to backup the database.
  - b) *Annual cost:* Software maintenance agreement. Software upgrades, if not included in software maintenance contract or lease. Additional software as needed. Licence fees for some purchased software. Alternatively, all relevant software may be written by library staff and/or be resident in the host system, where the cost is included in use charges.
3. Personnel
  - a) *Initial cost:* Applications programmers and programming support staff to develop, test, and deliver the applications software and data security programs. Database creation (if keyed directly). System training for operating and management staff.
  - b) *Annual cost:* Programmers and support staff to maintain and upgrade applications software, develop new applications, and maintain data security. Additions to the database. Staff training and retraining.
4. Other expenses
  - a) *Initial cost:* Terminal installation and connection, including site preparation. Charges for acquiring and loading database records. Initial telecommunications installations and arrangements. Computer center charges to load and test application and database.
  - b) *Annual cost:* Charges for acquiring database records. Communications costs. Computer center charges for storage, adding new database records, use of application programs.

The cost characteristics of the *Local Software, Service Bureau Hardware* approach are recounted in Table 4.

### 3.2.5 In-House Approach

In this approach the institution specifies, programs and implements the catalog on hardware procured and maintained by the institution.

Table 4. Cost Characteristics: Local Software, Service Bureau Hardware.

	Initial	Annual	Notes
Computer			
Hardware		O	
Software	S,P	S,P,O	
Terminals	H	H	
Installation	O	O	Initial costs for terminal installation; Bureau costs amortized and incl. in regular billing
Operations		O	
Security	S,P	P,O	
Maint. and Repl.		H,O	Term. & software maint. local responsibility; Computer maint. incl. in reg. billing.
Database	P,O	P,O	Depends on method of input
Telecommunications			
Lines	O	O	
Equipment	H	H	
KEY: H = Hardware (equipment) expense S = Software expense P = Personnel expense O = Other expense (purchased services, etc.).			

The institution has the most flexibility in this approach, limited only by funds, imagination, and endurance. The institution has to make considerable investments in hardware and software, specialized staff, and physical plant improvements.

Examples of this approach are the University of California's MELVYL system, the Claremont Colleges Total Library System, and the Northwestern University's LUIS system.

This approach requires both extensive initial expenses and continued financing, because every factor discussed in the initial sections of this chapter becomes a cost element that has to be accounted for. It becomes necessary to acquire all of the hardware discussed above with all of the resultant ongoing maintenance and replacement costs, all of the software discussed, and all of the personnel necessary to support, operate, and program the various aspects of the system. It also becomes necessary to provide for the physical environment for the computer equipment as well as for physical and data security in order to protect the system. The problems of backups, disaster recovery, and alternate sites must also be considered.

The cost characteristics of the *In-House* approach are:

1. Hardware
  - a) *Initial cost*: Selection and purchase of computer(s), mass storage (disk and tape drives), and related peripheral equipment (printers, communication controllers, etc.). Purchase of terminals and associated telecommunications equipment. Provisions for physical security (computer room and remote terminals).
  - b) *Annual cost*: Hardware maintenance charges. Additional terminals. Upgraded equipment. Additional storage for expanding database. Additional storage for data security (backup files).
2. Software
  - a) *Initial cost*: Optionally, some purchased software, e.g., utility programs, software to backup the database.
  - b) *Annual cost*: Software maintenance contract. Software upgrades, if not included in software maintenance contract or lease. Additional software as needed. Alternatively, all relevant software may be written by library staff.
3. Personnel

- a) *Initial cost*: Applications programmers and programming support staff to develop, test and deliver the applications software and data security programs. Database creation (if keyed directly). System training for operating and management staff. Systems programmers to set up and maintain operating system. Recruitment and training of computer operators.
  - b) *Annual cost*: Programmers and support staff to maintain and upgrade applications software, develop new applications, and maintain data security. Additions to the database. Staff training and retraining. Systems programmers. Computer operators.
4. Other expenses
- a) *Initial cost*: Terminal installation and connection, including site preparation. Charges for acquiring and loading database records. Initial telecommunications installations and arrangements. Installation of computer equipment, including site preparation, air conditioning, power, etc. Initial inventory of operating supplies.
  - b) *Annual cost*: Software maintenance and upgrading, if provided on lease or contract. Operating supplies. Remote storage of backup data (data security). Charges for acquiring database records. Communications costs.

The cost characteristics of the *In-House Approach* are summarized in Table 5.

### 3.2.6 Examples of Various System Configurations

Table 6 provides examples of existing systems representing each of the five configurations. It should be noted that the table is not exhaustive: many well-known systems are not included here. The table is intended only to show that all of the generic forms of systems discussed above are indeed available and viable, and therefore worth consideration by the library manager.

## SECTION 4: FEATURES AND COSTS OF ONLINE CATALOGS: THE STATE OF THE ART

Previous sections have discussed:

- The components of the online catalog system, and the characteristics of the system that significantly affect cost;
- The factors that are important in financial planning and management for the online catalog, and the way that these factors are reflected in various approaches to developing and implementing an online catalog.

In this section the available evidence about how much it costs to acquire and operate an online catalog and the cost premiums that appear to be associated with aspects of system size and system features are presented.

### 4.1 Approaches to Cost Analysis

There are basically two ways to develop a generalized estimate of the cost of online catalog systems. The first is to collect and analyze data about actual systems now in place in various libraries, that is, to base our estimate on the real cost *experience* of libraries with online catalogs. The second method is to identify the parts of an online catalog, estimate the cost of each component according to the needs of the library, and total the cost of the parts, that is, to assemble a cost estimate from our knowledge of the size and cost of the *building blocks* of the online catalog.

#### 4.1.1 Actual Cost Experience

Surely the most reliable and realistic estimate of the cost of an online catalog would come from analysis of the real costs experienced by libraries that already have online catalog systems. Unfortunately, analysis of this sort requires two things:

1. Reliable, consistent, and standardized reports of actual costs in various categories from a large number of libraries; and
2. Sufficient information to control for variations among the online catalog systems and the libraries in which they are used.

Table 5. Cost Characteristics: In-House Approach.

	Initial	Annual	Notes
Computer			
Hardware	H	H	
Software	S,P	S,P,O	Some software may be purchased
Terminals	H	H	
Installation	P,O	O	
Operations	P	P,O	
Security	H,S,P	H,P,O	
Maint. and Repl.		H,P,O	
Database	P,O	P,O	Depends on method of input
Telecommunications			
Lines	O	O	
Equipment	H	H	

KEY: H = Hardware (equipment) expense  
 S = Software expense  
 P = Personnel expense  
 O = Other expense (purchased services, etc.).

Table 6. Examples of Five System Configurations.

Configuration	System
Service Bureau	Infornics, [Carlyle], Avatar ILS
Turnkey Vendor	[Bibliotechniques], CLSI, Geac, Avatar ILS, etc.
Local Hardware, Purch. Software	WLN, NLM/ILS (NTIS) <sup>1</sup> , Ohio State <sup>2</sup> , [Carlyle]
Serv. Bur. Hdwe., Local Software	Minnesota State University, Ohio State, Dallas Public
In-House System	University of California, Northwestern University, Claremont, Pike's Peak

NOTES: <sup>1</sup>Software for NLM/ILS is in the public domain and available from NTIS; requires extensive in-house staff effort. <sup>2</sup>As exported to, and modified by, e.g. University of Illinois. Brackets denote proposed configurations or services, not yet implemented.

At the present time, neither condition can be met. Absence of generally accepted principles and practices for cost accounting in libraries means that the needed cost data are not readily available. *Ad hoc* studies designed to collect and organize such information from multiple and diverse institutions are difficult, expensive, and often of dubious validity.

Even if the requisite accounting data were available, it might not be possible to control for system and library variations sufficiently to develop reliable generalizations. Even a casual review of several recent publications comparing online catalogs<sup>15</sup> reveals a bewildering variety of characteristics, and the lack of agreed-upon definitions for a number of system capabilities and features.

Unfortunately it is necessary to conclude that, in the absence of reliable and comparable data on both system characteristics and library costs, the prospects for generalizing from the cost experience of today's online catalogs are none too promising.

#### 4.1.2 The "Building Block" Approach

Lacking verifiable and comparable cost data from actual installations, it might be possible to "build a catalog" from its component parts, and estimate and analyze costs from the prices of components. Section 2 defined the components of the online catalog:

1. The computer system
  - a) Hardware
    - i) Central processor
    - ii) Storage (disk and tape)
    - iii) Peripheral equipment (printers, consoles, etc.)
  - b) Software
  - c) Terminals, and associated equipment
  - d) Installation
  - e) Provisions for operations, security, maintenance, and replacement
2. The database
3. The telecommunications system

Section 2 also identified the factors associated with the cost of the system:

1. System size
  - a) Number of records in the database
  - b) Number of terminals
  - c) Number of functions (other than the online catalog) performed by the system.
2. System features

Section 3 identified the variables in financial planning and management: timing (initial and annual costs) and objects of expenditure.

The King Research study,<sup>16</sup> mentioned earlier, provides rough estimates of costs for many components of the online catalog, expressed in terms of system size, and including both initial and annual costs in some cases. The limitations of the King Research data include:

- No estimates for the cost of operating the computer system, excepting cost estimates for hardware and software maintenance.
- No estimates for telecommunications costs.
- No data permitting cost analysis of multiple functions or of various catalog features, two important aspects of system size.

Aside from these limitations, the King Research data permit us to use the following "building block" estimates:

1. Initial Costs
  - a) *Central processor.* The cost estimates for Central Processing Units (CPU's) given by King Research are dependent only on the number of terminals to be supported, and not by other aspects of system size. Costs quoted in the King Research report include necessary peripheral devices. The costs are as follows:<sup>17</sup>
    - i) *Less than 16 terminals:* \$60,000
    - ii) *16 to 64 terminals:* \$75,000
    - iii) *64 to 256 terminals:* \$95,000
    - iv) *Over 256 terminals:* \$95,000 plus \$105 per terminal over 256<sup>18</sup>
  - b) *Database storage.* Estimates presented below use the King Research estimates for storage of full MARC records. These estimates are based on the assumption that bibliographic records use only 50 percent of the available space on magnetic disk storage, so that the remaining space will be available for the indexes to the records. This estimate is not necessarily sensitive to the storage requirements for keyword indexes as opposed to full-heading indexes (see section 2.2.2.3 above), the number of access points provided (which affects the number of indexes), or the storage requirements, if any, for various searching features of online catalogs (e.g., temporary working storage space for Boolean searches). Storage costs are estimated in terms of the number of bibliographic records to be stored:
    - i) *Up to 100,000 records:* \$33,000
    - ii) *100,000 to 500,000 records:* \$73,000
    - iii) *Over 100,000 records:* \$73,000 plus \$0.108 per record<sup>19</sup>
  - c) *Software.* According to King Research, software costs for a mini-computer-based

online catalog range from \$50,000 if purchased from a turnkey vendor to \$250,000 if developed in-house. For a mainframe system, King Research estimates that purchasing and adapting software from another mainframe system costs \$350,000, and complete in-house development costs \$1,000,000. Thus Wiederkehr posits a range for initial software acquisition from \$50,000 to \$1,000,000 depending on the source of the software and the size of the system. We feel that most academic libraries that have not already committed themselves to software development for large-scale systems are unlikely to do so. For the purposes of this analysis, then, we believe that software costs are likely to range between \$50,000 and \$350,000.

- d) *Terminals.* King Research suggests that for planning purposes, terminal costs be estimated at \$2,600, plus \$400 for associated furniture. We feel that this estimate is fairly high for most library applications, but will use the King Research recommendation for demonstration purposes.
  - e) *Installation.* King Research estimates installation costs for CPU's and for terminals. CPU-based costs vary with the size of the system. For terminals, they suggest budgeting \$50 for each terminal in excess of the first 10, to provide for electrical wiring. Apparently no additional provision is made for the costs of cabling, installation of telecommunications equipment, and the like. The cost of CPU-based installation is:
    - i) *Under 16 terminals:* \$7,500
    - ii) *16-64 terminals:* \$9,500
    - iii) *64-256 terminals:* \$13,000
    - iv) *Over 256 terminals:* \$35,000<sup>20</sup>
  - f) *Database loading.* Although adding to the database is an ongoing activity, it will be necessary to load a substantial number of records initially, and we will treat the initial load as an initial cost for the purpose of this analysis. For present purposes, we will assume that all records to be loaded come from the archival tape of a bibliographic utility; therefore, neither direct keyboarding costs nor costs of retrospective conversion will be included here. King Research provides an estimate of the cost to process archival tapes in order to prepare them for loading into the online catalog database. The cost of acquiring the archival tape is apparently not included in this estimate. The King Research cost recommendation is \$3,000 per 100,000 records processed, or \$0.03 per record.
2. Annual Costs
- a) *Hardware Maintenance.* King Research recommends budgeting 5 percent of the total initial cost of equipment for equipment maintenance. We apply this percentage to the cost of the central processor, storage devices, and terminals. There is no indication that this estimate provides for equipment replacement and upgrading. Note also that the cost of maintenance for additional storage devices (see below) is not included. Note also that at least one industry advisor suggests that hardware maintenance should be budgeted at 9-12 percent of cost.<sup>21</sup>
  - b) *Software Maintenance.* King Research suggests three cost levels for annual maintenance of software: \$14,000 for turnkey vendor systems, \$40,000 for software purchased from or written by a commercial software vendor, and \$50,000-100,000 for software developed in-house (the range is generated by the size and architecture of the computer involved). For purposes of this analysis, we assume that software maintenance charges will range from \$14,000 to \$50,000 per year.
  - c) *Added Storage.* As new records enter the database each year, disk storage space must be added to accommodate the records. Although disk space is added in "chunks," we have assumed here that additional storage can be costed on a per-record basis, at a cost of \$0.108 per record (see 1.c, above).
  - d) *Record Processing.* New records must be processed into the catalog database. We use the previous estimate of \$0.03 per record.
- Table 7 summarizes the "building blocks" drawn from the King Research study.

Table 7. Costs of "Building Blocks" for an Online Catalog.

Initial Costs		
Determined by Number of Terminals (Including installation)		
Terminals	Equipment	Other
0-16	\$60,000	\$ 7,500
16-64	75,000	9,500
64-256	95,000	13,000
256 +	95,000 + 105x(terms-256)	35,000
Determined by Number of Records (Incl. bibliographic processing)		
Records	Equipment	Other
0-100,000	\$33,000	0.03 per record
100-500,000	73,000	0.03 per record
100,000 +	73,000 + 0.108 per record	0.03 per record
Software		50,000-350,000
Terminals	2,600 per term.	400 per term. + 50x (terms-10)
Annual Costs		
Hardware Maintenance		5% of initial equipment cost
Software Maintenance		14,000-50,000
Added Storage		0.108 per record
Added Processing		0.03 per record

#### 4.2 A Baseline Estimate

In this section we will apply the "building block" estimates to two "average" academic libraries:

- The "average" American academic library, holding 166,500 volumes, and with annual acquisitions of 6,900 volumes per year.<sup>22</sup> We estimate that this average library will have between 64,500 and 84,100 items circulate per year.<sup>23</sup> We estimate that it will need between four and six online catalog terminals for public access.<sup>24</sup>

- An "average" university-based research library, with 1,869,000 volumes and annual acquisitions of 57,700 volumes.<sup>25</sup> This library will circulate between 723,700 and 944,200 items per year,<sup>26</sup> and will require between 48 and 62 public access terminals.<sup>27</sup>

For the purposes of this analysis, we assume that:

1. Machine-readable records for the entire collection of the library are available for loading from archive tapes at no marginal cost to the library.
2. Additional bibliographic records for prospective acquisitions will be produced at no marginal cost.
3. The library chooses to take one of the management approaches that involves the installation of the catalog system in the local library, i.e., the turnkey vendor, local hardware/purchased software, or in-house approaches.
4. The online catalog is a separate system, independent from other library systems supporting technical processing and cataloging, circulation, and other functions.

Using the building-block estimates from Table 7, the "building-block" costs for an online catalog for the average academic library are shown in Table 8. Estimates for the large academic research library are presented in Table 9.

It should be repeated here that the cost estimates in Tables 8 and 9 do *not* include:

- The cost of converting records to machine-readable form
- The annual costs associated with operating the catalog computer center, including staff, utilities and supplies
- The initial cost of telecommunications equipment and installation of communications services

Table 8. "Building Block" Cost Estimates for an Average Academic Library.

	Volumes	166,500	
	Terminals	4 to 6	
	Annual acquisitions	6,900	
	Annual circulation	64,500-84,100	
	Initial Costs		
	Equipment	Other	Total
CPU, 0-16 Terminals	\$ 60,000	\$ 7,500	\$ 67,500
Storage, 0-100,000 Records	33,000	4,995	37,995
Software (min.)		50,000	50,000
Software (max.)		350,000	350,000
Terminals (min.)	10,400	1,600	12,000
Terminals (max.)	15,600	2,400	18,000
Total (min.)	\$103,400	\$ 64,095	\$167,495
Total (max.)	\$108,600	\$264,895	\$473,495
	Annual Costs		
Hardware Maintenance (min.)		\$ 7,170	
Hardware Maintenance (max.)		\$ 7,430	
Software Maintenance (min.)		14,000	
Software Maintenance (max.)		50,000	
Added Storage		745	
Added Processing		207	
Total (min.)		\$22,122	
Total (max.)		\$58,382	

Table 9. "Building Block" Cost Estimates for an Average Academic Research Library.

	Volumes	1,869,000	
	Terminals	48 to 62	
	Annual acquisitions	57,700	
	Annual circulation	723,700-944,200	
	Initial Costs		
	Equipment	Other	Total
CPU, 16-64 terminals	\$ 75,000	\$ 9,500	\$ 84,500
Storage, 100,000 + records	274,852	56,070	330,922
Software (min.)		50,000	50,000
Software (max.)		350,000	350,000
Terminals (min.)	124,800	21,100	145,900
Terminals (max.)	176,800	30,100	206,900
Total (min.)	\$474,652	\$136,670	\$611,322
Total (max.)	\$526,652	\$445,670	\$972,322
	Annual Costs		
Hardware Maintenance (min.)		\$23,733	
Hardware Maintenance (max.)		\$26,333	
Software Maintenance (min.)		14,000	
Software Maintenance (max.)		50,000	
Added Storage		6,232	
Added Processing		1,731	
Total (min.)		\$45,696	
Total (max.)		\$84,296	

- Annual costs for communications lines

#### 4.3 Vendor Estimates: Verifying the Baseline

In this section, we will present some estimates provided by online catalog vendors for systems designed to meet the capacity needs of our two "average" libraries. The presentation is in two parts: basic estimates for "plain vanilla" systems, roughly comparable to the "building block" estimates discussed above, and estimates for enhanced systems, which will allow us to examine to an extent the "price" associated with some advanced system features.

##### 4.3.1 "Plain Vanilla" Systems

We have asked three major vendors of automated library systems with explicitly designed public access catalogs to provide us with cost estimates for basic systems for our two average libraries. Tables 10 and 11 compare their estimates with the "building block" estimates in Tables 8 and 9, respectively. Note that:

- The vendors were given very specific definitions for the characteristics of the systems and libraries involved. The specifications are recounted for each library in the top block of the table.
- "Building block" estimates were revised to agree with the exact number of terminals specified. For the average academic library in Table 10, this specification is equivalent to the "building block" estimate for the maximum number of terminals in Table 8. For the large research library in Table 11, however, the 60-terminal specification caused us to recalculate the "building block" terminal cost using the rules specified in Table 7. Therefore, the terminal costs for the "building block" estimate in Table 11 do not correspond exactly with the estimates in Table 9.
- The vendors did not supply estimates for the installation of terminal equipment; therefore, the "building block" costs in Tables 10 and 11 do not include "other" costs for terminals from Tables 8 and 9.
- The vendors did not supply information on the cost of processing bibliographic rec-

Table 10. "Building Block" and Vendor Cost Estimates for an Average Academic Library.

Volumes .....	166,500	Titles .....	166,500	
Terminals .....	6	Patrons .....	10,000	
Annual acquisitions .....	6,900			
	Initial Costs			
	"Building Blocks"	Vendor 1	Vendor 2	Vendor 3
CPU	\$ 67,500	\$118,684	\$119,033	\$111,021 <sub>1</sub>
Storage	33,000	43,770	17,000	
Software (min.)	50,000	45,000	65,000	27,500
Software (max.)	350,000			
Terminals	15,600	9,900	7,140	11,160
Total (min.)	\$166,100	\$217,354	\$210,173	\$149,681
Total (max.)	\$466,100			
	Annual Costs			
Hardware				
Maintenance (min.)	\$ 7,170	\$17,424	\$ 9,588	\$ 7,980
Hardware				
Maintenance (max.)	\$ 7,430			
Software				
Maintenance (min.)	14,000	1,800	15,000	4,800
Software				
Maintenance (max.)	50,000			
Total (min.)	\$21,170	\$19,224	\$24,828	\$12,780
Total (max.)	\$57,430			

NOTES: <sup>1</sup>Cost of disk storage equipment included in CPU cost.

Table 11. "Building Block" and Vendor Cost Estimates for an Average Academic Research Library.

Volumes . . . . .	1,869,000	Titles . . . . .	1,500,000	
Terminals . . . . .	.60	Patrons . . . . .	.30,000	
Annual acquisitions . . . . .	.57,700			
	Initial Costs			
	"Building Blocks"	Vendor 1	Vendor 2	Vendor 3
CPU	\$ 84,500	\$155,820	\$395,397	\$160,025
Storage	274,852	209,950	100,000	233,000
Software (min.)	50,000	45,000	65,000	27,500
Software (max.)	350,000			
Terminals	156,000	84,120	57,900	111,600
Total (min.)	\$565,352	\$494,890	\$618,297	\$564,072
Total (max.)	\$865,352			
	Annual Costs			
Hardware				
Maintenance (min.)	\$23,733	\$49,644	\$43,548	\$43,392
Hardware				
Maintenance (max.)	\$26,333			
Software				
Maintenance (min.)	14,000	1,800	15,000	4,800
Software				
Maintenance (max.)	50,000			
Total (min.)	\$37,733	\$51,444	\$58,548	\$48,192
Total (max.)	\$76,333			

ords for inclusion in the database. Therefore, initial storage costs in the "other" category, and annual costs for "added processing," appearing in Tables 8 and 9, are not included here.

- The vendors did not provide cost estimates for incremental disk storage. Therefore the annual costs for "added storage," appearing in Tables 8 and 9, are not included here.
- Some vendors requested estimates of the number of unique titles in our average libraries, as well as the number of volumes. The estimates shown in Tables 10 and 11 are for the purpose of estimation only, and are not necessarily representative of typical volume/title ratios in academic libraries.

Although the "number of observations" is small (only three vendors), the data in Tables 10 and 11 suggest the following observations:

1. Total costs for initial acquisition and annual maintenance as reported by the vendors are not greatly different from the "building block" estimates developed from the King Research study. On the whole, vendor quotations lie close to the bottom of the "building block" ranges for total costs (and in some cases are below the minimum "building block" estimate), but the differences are not large, and in only two cases out of six for initial costs and two cases out of six for annual costs are the vendor quotations below the "building block" range. Remembering that the King Research analysis was conducted in 1980, this comparison involves at least three years of price inflation on the one hand and three years of technological change on the other. The relatively close agreement among these estimates, considering the factors involved, is rather striking.
2. While total costs are somewhat in agreement, the distribution of those costs among the components of the system varies widely, both as between the "building block" estimates and the vendor quotations and among the three vendors. In general, vendors quote prices for storage and software that are generally (although not always) lower than "building block" estimates. By contrast, vendor quotations for CPU's and associated equipment are higher than the "building block" costs. Vendor quotations for terminals are universally lower than the King Research estimates; the most expensive terminals, quoted by Vendor 3, feature the full ALA character set. Annual cost quotations parallel these trends; vendor quotations for hardware maintenance are higher, and for

software maintenance lower, than estimates derived from King Research. These systematic differences between the "building blocks" and the vendor quotations suggest that the "building block" approach, although roughly valid for the comparisons used here, is not very robust, and may yield erroneous results when applied to significantly different configurations of equipment.

The vendor quotations themselves show a considerable degree of variability, and it is instructive to further analyze variations in total costs. Table 12 displays the deviations from the median total cost estimates (both initial and annual) for both libraries.

Table 12 suggests that:

1. Variations in vendor quotations for the same service can be quite high, sometimes as much as 30 percent more or less than the median quotation.
2. Variations in annual maintenance costs appear to be larger than variations in quotations for initial costs.
3. The variation is more symmetrical, and perhaps somewhat smaller, for larger systems than for smaller ones.

The overall consistency of the cost estimates in Tables 10 and 11 suggests the possibility that these estimates could be useful in demonstrating the kind of financial commitment that our "average" libraries would have to make to acquire and operate their online catalogs. The data sources used to define the "average libraries" (see section 4.2, above) were used to estimate the "average" annual operating budgets and expenditures for salaries and wages for the two libraries.<sup>28</sup> Table 13 presents these budget and expenditure estimates, and compares them with the median vendor quotations for initial expenditures and annual maintenance (from Table 12).

As Table 13 shows, initial costs for an online catalog are far from trivial in comparison to operating budgets; annual costs appear relatively manageable. However, the analysis suggests strongly that smaller libraries may be at a significant disadvantage, perhaps having to spend close to half of one year's operating budget (or all of the personnel budget) to acquire a system, and about five percent of the annual operating budget to maintain the equipment and software. Although this analysis is by no means conclusive, it is consistent with the widely held belief that automation is less affordable for small libraries. The analysis also suggests that it may be particularly important for smaller libraries to explore financial management techniques that can help avoid large initial outlays for equipment and software.

#### 4.3.2 *Systems with Enhancements*

Vendors were asked to develop cost estimates for two kinds of enhancements to their "plain vanilla" systems:

*Table 12. Cost Variations in Vendor Estimates for Online Catalogs.*

	Average Academic Library		
	Vendor 1	Vendor 2	Vendor 3
Total Initial Cost	\$217,354	\$210,173	\$149,681
Deviation from Median	7,181		60,492
Percent Deviation	3.4%		28.8%
Total Annual Cost	\$ 19,224	\$ 24,828	\$ 12,780
Deviation from Median		5,604	6,444
Percent Deviation		29.2%	33.5%
	Average Academic Research Library		
Total Initial Cost	\$494,890	\$618,297	\$564,072
Deviation from Median	69,182	54,225	
Percent Deviation	12.3%	9.6%	
Total Annual Cost	\$ 51,444	\$ 58,548	\$ 48,192
Deviation from Median		7,104	3,252
Percent Deviation		13.8%	6.3%

Table 13. Budgets and Online Catalog Costs for Two Average Libraries

	Average Academic Library	Average Academic Research Library
Annual Operating Budget	\$481,000	\$6,047,500
Expenditures for Salaries and Wages	\$227,500	\$3,277,000
Median Initial System Cost	\$210,173	\$ 564,072
As a Percent of Operating Budget	43.7%	9.3%
As a Percent of Salaries and Wages	92.4%	17.2%
Median Annual Maintenance Cost	\$ 19,244	\$ 51,444
As a Percent of Operating Budget	4.0%	0.9%
As a Percent of Salaries and Wages	8.5%	1.6%

- Additional system functions, specifically circulation control and acquisitions support.
- Additional online catalog features, such as searching on keywords, Boolean searching, and authority control.

#### 4.3.2.1 Additional System Functions

All three vendors supplied estimates of the cost to add acquisitions and circulation control to the online catalog. These estimates are presented in Table 14.

It should be pointed out here that the quotation from Vendor 1, the most expensive enhancement both absolutely and on a percentage basis, includes provisions for keyword searching as well as for the acquisitions and circulation functions. With this point in mind, we might draw the following inferences from Table 14:

1. The incremental cost of initial hardware and software for these added functions is between about 10 and 20 percent of the base cost of the "plain vanilla" systems.
2. Annual maintenance costs can increase by 2 to 20 percent for these added functions.
3. Keyword searching capabilities can add between 5 and 40 percent to the initial cost of the system, and 40 to 50 percent to annual maintenance costs; the substantial cost increments for keyword searching are associated with additional disk storage, and disk maintenance, as opposed to added software, upgraded CPU's and additional terminals for the circulation and acquisitions functions.
4. The percentage cost increments for the added functions are about the same for both small and large systems; for keyword searching capabilities, however, the incremental percentage cost may be greater for large systems.

Table 14. Incremental Cost of Adding Acquisitions and Circulation Functions to Three Online Catalogs.

	Average Academic Library		
	Vendor 1	Vendor 2	Vendor 3
Base Initial Cost	\$217,354	\$210,173	\$149,681
Incremental Initial Cost	49,916	36,651	15,277
Percent Deviation	22.97%	17.44%	10.21%
Base Annual Cost	\$ 19,224	\$ 24,828	\$ 12,780
Incremental Annual Cost	11,652	566	1,968
Percent Increase	60.61%	2.28%	15.40%
	Average Academic Research Library		
Base Initial Cost	\$494,890	\$618,297	\$564,072
Incremental Initial Cost	258,221	63,468	73,407
Percent Increase	52.18%	10.26%	13.01%
Base Annual Cost	\$ 51,444	\$ 58,548	\$ 48,192
Incremental Annual Cost	35,184	895	8,964
Percent Increase	68.39%	1.53%	18.60%

#### 4.3.2.2 Added Features

The foregoing analysis of vendor quotations for added functions sheds some light on the marginal cost of adding keyword searching. Unfortunately, most vendors do not assemble systems like the auto industry assembles cars, with a wide range of mix-and-match options. Our invitation to provide price quotes for a variety of searching features received a positive response from only Vendor 1, from whom the inferences about keyword searching were also drawn. This vendor estimates that the incremental initial cost to add Boolean searching and authority control for names is \$13,301 for the average academic library (6.12 percent of base initial cost), and \$51,409 for the average academic research library (10.39 percent of base initial cost). Annual maintenance costs are increased by \$1,488 (7.74 percent of base annual cost) and \$5,820 (11.31 percent of base annual cost) respectively. We might conclude that:

1. The cost of adding Boolean searching and name authority control is less than the cost of adding the acquisitions and circulation functions, and less than the cost of keyword searching, both absolutely and on a percentage basis.
2. As with keyword searching, enhanced features are more expensive on a percentage basis when added to large systems than small ones.
3. On both points, and especially the second, we note that the findings depend critically on the responses of a single vendor, and therefore should not be taken as generally valid at this time.

#### 4.4 Concluding Observations

Although it is not easy to draw valid generalizations from the limited, and perhaps incommensurable, data presented here, the convergence of several estimates using two different techniques ("building blocks" and vendor quotations) lends confidence to the following observations. These points should, however, be interpreted with the understanding that the cost estimates reported in this chapter do not include several important cost categories, notably (a) creating and maintaining the bibliographic database; (b) operating costs for telecommunications lines; and (c) added storage for database expansion over time.

- For most academic libraries, basic systems will cost something on the order of \$200,000 to acquire, and about \$20,000 per year to maintain.
- For large academic libraries, basic systems will cost around \$500,000 to \$600,000 to acquire, and about \$50,000 per year to maintain.
- Financing automated systems appears to be a greater budgetary burden for smaller academic libraries.
- Starting from the online catalog as a system base, added system functions increase cost about 10 percent each, both initially and annually.<sup>29</sup>
- The cost of adding various features to the online catalog itself cannot presently be determined, but appears to be at minimum somewhat less than the cost of adding new functions, but at most (e.g. keyword searching) may be much greater than the cost of adding functions.

### SECTION 5: CONCLUDING COMMENTS

#### 5.1 Two Characteristics of Cost Management for Online Catalogs

The decision to implement an online catalog (and finding a way to pay for it) is not the end of the matter; it involves a commitment to a method of library operation that will, in and of itself, be subject to constant and competing pressures for change. It may be that the heart of the management problem for the online catalog is not the initial decision, but managing these pressures and coping with their consequences as the library moves to the second, third, and fourth generations of automated bibliographic computing systems. The

If your library needs terminals,

# Check out the Telex 476L.



The Telex 476L. The library terminal designed for automated library systems such as cataloging, catalog referencing, and circulation. It will operate economically in either clustered or single-station environments. Special features allow it to be ideally configured for use by staff or patrons. And it features the ALA/MARC Character set as well as optional support for Cyrillic and Hebrew.

The Telex 476L can operate on any computer system that can support IBM 3270 Bisynchronous communications. Bar code or OCR readers may be attached for rapid and efficient entry of circulation control information. And Telex's low cost printer options provide hard copy output.

The Telex 476L. Field proven by many university and college libraries as well as other library institutions. Telex has over 100,000 terminals installed nationwide. With a field service staff of over 750 customer engineers and over 175 service locations.

For more information about the Telex 476L Library Terminal call Bill Riddick toll free at 800-334-4380 or 919-834-5251 in North Carolina.

TELEX COMPUTER  
PRODUCTS, INC.  
6422 EAST 41ST STREET  
TULSA, OKLAHOMA 74135  
(918) 627-1111

*The Innovation Continues...* **TELEX**



pressures that are intrinsic to the online catalog are of two sorts: pressures for growth of the system, and pressures arising from technological and economic change.

#### 5.1.1 *Growth of the Online Catalog*

It is evident that online public access systems will grow: users want them to, and experience indicates that this is true of librarians as well. Moreover, there are at least five independent *directions* in which the catalog can grow, and some evident pressure to expand on all five fronts:

1. Bibliographic records.
2. Terminals.
3. Access points.
4. Catalog features.
5. System functions.

##### 5.1.1.1 *Added Records*

The fact that database growth must be planned to match library growth has already been mentioned. We have also mentioned the importance of planning for retrospective conversion: users are strongly disinclined to use other (non-automated) bibliographic files to gain access to unconverted material. Users themselves attest to the importance of retrospective conversion: among all libraries in the CLR public access study, over 25 percent of respondents placed a priority on including more of the library's older books in the online catalog, and confusion about what materials were included in the computer catalog was one of the top three problems experienced by users.<sup>30</sup>

The problem of "knowing what's included" has another dimension as well: the *forms* of material to be included in the catalog. When users were asked what additional material they wanted included in the online catalog database, only 11 percent said "None."<sup>31</sup> There appears to be substantial demand to include many formats of material in the online catalog, and libraries might be wise to plan to include records for all their holdings, regardless of physical form.

##### 5.1.1.2 *Added Terminals*

The demand for additional terminals was discussed earlier. *At least* half of the respondents to the CLR questionnaire want more terminals, in more places than they are presently available. Demand for additional terminals is substantial even in "mature systems" that already provide substantial numbers of terminals for public access.

##### 5.1.1.3 *Added Access Points*

Basic access points are currently provided by most online catalogs, and those without them (especially those without subject access) are working to add them. As the catalog becomes a familiar tool to more users, and finds more applications, demand for additional access points may increase. It was surprising, for example, to discover that over 17 percent of the CLR respondents wanted the "ability to search for illustrations and bibliographies."<sup>32</sup> Public service librarians, using the catalog as a reference tool, may want access points that are not now explicitly provided, like series name. For technical processing and interlibrary loan functions, data like LCCN, ISBN or ISSN, or bibliographic utility record number may prove useful.

Of special interest was a substantial demand by CLR respondents for the "ability to search a book's table of contents, summary or index": about 42 percent of users expressed a desire for this capability. Note that providing this feature may lead to the establishment of new indices. It would most certainly increase the size of the database, requiring the storage of information not now available in most bibliographic records.

##### 5.1.1.4 *Added Features*

When online catalog users were asked what features they wanted a computer catalog to

have, only five percent could think of nothing to add to their current catalog.<sup>33</sup> Among the features mentioned by more than 20 percent of the respondents were:

- Ability to search an index or thesaurus for terms related to their search terms.
- Circulation status and availability information.
- Ability to print their search results (a feature that also has an effect on terminal demand and telecommunications requirements).
- Keyword searching for both subjects and titles.
- Online instruction in use of the catalog.
- Locational information on books (e.g., department, floor, stack location, perhaps in-process information).

Demand for additional features appears substantial, despite the fact that the CLR questionnaire limited the users' choices. Casual evidence suggests that many users are surprised that they cannot search journal indices (e.g., *Reader's Guide*) or obtain the full text of a journal article on the catalog terminal.

#### 5.1.1.5 Added Functions

Some aspects of the demand for added functions arise from the foregoing discussion. Book availability information, for example, requires access to a circulation system or subsystem. The ability to search journal indices requires access to the commercial search services, the capability to mount the index files on the local catalog, or the willingness to have in-house staff index journals for the online catalog. Demand is likely to arise from inside the library as well. If the online catalog is not part of the integrated system, there will surely arise a desire to add functions or interface with systems providing automated support for acquisitions, serials control, ordering, fund accounting, circulation, and cataloging support. When catalog records are loaded from bibliographic utility tapes, librarians discover that using the utilities to maintain and update existing records is time-consuming and expensive: expect a demand for online editing systems.

#### 5.1.1.6 Public Access: the New Dimension

When contemplating the nature of demand for such growth, it is helpful to remember that about 90 percent of online catalog users like the online catalog, regardless of the size, type, or sophistication of the system they use, and about three-quarters of those users clearly prefer the online catalog to the card catalog.<sup>34</sup> The overwhelming acceptance of the online catalog found in the CLR project is echoed in independent findings from the University of Guelph, where in a local survey of online catalog users, "88 percent indicated that the online search had been successful, and the most serious deficiency in the Guelph online catalog was an insufficient number of terminals."<sup>35</sup>

At the same time, the CLR project discovered that even "satisfied" users show no hesitation in asking for improvements (see Sections 3.2.1 to 3.2.4 above), and that they frequently express strong concerns about the problems they experience. Thus, public demand for improvements, new features, and enlarged databases is likely to be great, and may even grow over time.

The fact that the new demand for growth is *public* demand adds a new dimension to the library's problems in managing bibliographic automation. Prior automation experience so far has been with "librarian's systems" for circulation control, acquisition, and cataloging support. It has always been possible to balance the demand for system improvements against the supply of system services by administrative action: adopting laborious manual backup procedures when the circulation system fails, adding extra shifts in the technical processing department to make the best use of a limited number of terminals, and so on.

One wonders how library users might react to the same approach: "Come back at night, when fewer people are using the terminals," or "We can't afford to convert our non-print media records—please check the three card files over here to find what you need." Fortunately, the profession as a whole is not well disposed to ignoring the needs and demands of library users. The alternative, however, is to accede to these demands as much as our re-

sources allow, and in the case of the online catalog, this appears to mean one thing: plan for growth, for the users will surely demand it. Note also that demands for additional terminals will come both from users who want to use the catalog at various places within the library, and from users who want access from outside the library, such as from the office or home, through dialup ports, local area networks, or gateways from other systems, such as the campus computer system.

### 5.1.2 *Technological and Economic Change*

Because the online catalog is a computer product, its design and cost characteristics are affected by the general technological trends in the computing industry. Large changes are occurring in four critical areas: computer performance and capacity, storage technology, software, and telecommunications.

#### 5.1.2.1 *Computing Capacity*

The historic reduction in the cost of computing capacity is by now so well documented that it has become something of a truism in the computing industry. Over the last 20 years or so, the cost of computing capacity has fallen by an order of magnitude every seven or eight years. In 1958, the cost to use a machine capable of executing 300,000 instructions per second was about \$10,000 per hour; by 1980, the cost had dropped to about \$10 per hour.<sup>36</sup> Using different data, another author estimates that the average cost to execute 100,000 instructions fell from \$1.26 in 1952 to \$0.005 in 1977, roughly confirming the trend.<sup>37</sup> In 1959, the purchase price for most computers exceeded \$1 million; at present, it is possible to choose among a number of mainframe computers that can execute over 1 million instructions per second, access up to 16 million bytes of main memory, and handle 6 or more data channels (performance characteristics that, by and large, were not available in 1959 at any price) for less than \$400,000.

#### 5.1.2.2 *Storage Capacity and Cost*

As with computing capacity, the cost of auxiliary storage equipment is declining, although less rapidly. It would appear that the time required for online disk storage costs to fall by an order of magnitude is about 14 years (as opposed to 7 years for computation). Still, it is reported that the cost per bit stored on disk has gone from \$0.001 in 1950 to about \$0.00005 in 1980, a trend that can be expected to continue.<sup>38</sup> The history of price/performance improvement in storage technology and its implications for bibliographic computing are reviewed in a useful article by S. Michael Malinconico.<sup>39</sup>

#### 5.1.2.3 *Software*

Just as it is widely recognized that the cost of computing equipment is falling, it is also generally held that the cost of developing and maintaining computer software is rising. One author reports that the average cost per computer instruction to design and program software has risen from about \$4.00 in 1953 to almost \$8.00 in 1975. In 1955, software accounted for less than 20 percent of total hardware/software costs for existing systems. By 1975, this proportion had risen to 60 percent, and might rise to 90 percent by 1985.<sup>40</sup>

The reason for the increasing cost of software, of course, is that program development and maintenance is labor-intensive; people program computers. The problem of software cost is exacerbated by the fact that the number of computers is growing at a much greater rate than the number of people. One author notes that in 1979, "the United States was delivering more computers per year than it was producing science and engineering graduates per year."<sup>41</sup> The logic of this problem is inexorable:

In the next 10 years computers will increase in speed by a factor of at least 10, perhaps much more. As they plunge in cost, many will be sold. It is estimated that the number of computers used for scientific and commercial applications will continue to grow at 25% per year at least. It is growing faster than that now . . . If we assume no increase in programming productivity, the figures above indicate that in 10 years' time the industry will need 93.1 times as many programmers as now. There are approximately 300,000 programmers in the United States today [1982]. That suggests about 28 million pro-

grammers in 10 years' time. Before long the entire American work force would be needed to program its computers.<sup>42</sup>

In the long run, this trend is clearly intolerable, and will no doubt be dealt with by the industry. In the short run, however, the trend creates significant scarcities in qualified programming staff, further increasing software costs. This can be a particular problem for libraries and other public agencies, who cannot afford to enter the bidding in this labor market and therefore may find themselves unable to recruit qualified staff to develop, operate, and maintain their systems.

#### 5.1.2.4 Telecommunications

The cost trend for hardware is down; the cost trend for software is up; the cost trend for telecommunications is both and neither. One industry analyst reported that costs for terminals, communications lines, modems, and multiplexors grew by 12 to 14 percent in 1976 alone.<sup>43</sup> Lurking inside this overall rate of growth in cost are several somewhat independent factors. Part of the trend relates to communications *equipment*: modems, multiplexors, front-end computers, and the like. To some extent, outlays for this kind of equipment have risen simply because more such devices are being installed to support rapidly growing computer-communications traffic. The equipment itself is changing and improving rapidly, and improving price/performance ratios in this area may be as typical as for computing and mass storage equipment.<sup>44</sup>

Trends are less clear and the situation more volatile in the area of data *transmission*, however. Improved technology promises significant benefits, and the technology advances apace, with such offerings as AT&T Dataphone Digital Service (DDS), the value-added networks (VAN's) like Telenet and Tymenet, satellite communications systems like Satellite Business Systems, and numerous forms of Local Area Networks (LANs) designed to connect equipment for high-speed operation in small areas that can be wired directly by cable. On the other hand, the communications industry is subject to numerous non-technical influences, chiefly economic, legal and regulatory. Perhaps the best indicator of the strength and unpredictability of non-technical and non-market forces in this area is the recent federal decision requiring AT&T to divest itself of its local telephone company operations. It is generally believed that the divestiture will increase local telephone rates by 50 to 100 percent, because it will no longer be possible for AT&T to subsidize local service from long-distance revenues.

It seems likely that improvements in communications technology could provide order-of-magnitude improvements in price/performance ratios. It is unclear whether the legal and regulatory environments will permit these improvements to be realized; it is perhaps as likely that communications costs will *increase* by an order of magnitude.

The nature and operations of new computer systems, including those for libraries, will be significantly affected by the telecommunications problem. Rising transmission costs are a spur to the development of distributed systems; if more of the processing can be moved to the point of use, less data must be exchanged with a central processor. High transmission costs could accelerate development of communications processing equipment too, because there will be a great incentive to make more efficient use of expensive transmission channels.

High prices for use of the public net could also increase reliance on special-purpose carriers, especially satellite systems (assuming that they are not also afflicted by economic or regulatory problems). This latter development could have interesting and perhaps adverse effects for libraries. Because the cost of satellite transmission is not dependent on distance, it costs the same amount to transmit across the country or across the block. Satellite is therefore particularly attractive for long-haul communications; it may not be particularly cost-effective for connecting the terminals in a city's branch libraries to the central online catalog computer. A significant industrial emphasis on satellite systems could slow development of improved methods of local communications, raising the cost of many library applications. The same effect could occur if the AT&T divestiture, which will raise the

cost of local communications, results in lowering long-distance costs. Libraries might find it much less expensive to communicate with OCLC or Dialog, but considerably more expensive to connect its own online catalog terminals.

We should recognize that the converse effect is equally likely. If the cost of using the terrestrial common-carrier network were to decline significantly through the use of new technology (e.g., the widespread installation of fiber optic media to replace wires and cables), a substantial investment in distributed processors, multiplexors and concentrators might be economically unjustified, and library systems designed around these features unnecessarily expensive.

## 5.2 Planning for Growth, Coping with Change: Some Suggestions

Previous sections have shown that online catalogs can be quite expensive, but that there are numerous alternative methods by which the library can plan and manage its financial outlays. This section has discussed the evidence that the initial online catalog installation is only the beginning of the management problem, and planning for growth and change should begin immediately. Such planning, however, is made exceptionally difficult by the conflicting and uncertain trends in computer and communications technology and cost. While hardware prices drop, software prices rise: can we be sure that the next generation of library computer systems will be less expensive than the present ones? And what effect will communications regulation (and deregulation) have on the features and costs of systems five years from now?

The factors to be considered in online catalog planning are many and complex; decision-making is likely to be difficult, and wrong decisions are likely to be very costly. Especially in small libraries, a significant share (approximately one-half) of the annual operating budget hinges on the decision to install an online catalog. A recent paper by Baumol and Blackman documents many of the organizational and economic characteristics of library automation, and argues persuasively for the possibility that declining computation costs may have reached an end, both for the computing industry in general and, most particularly, for libraries.<sup>45</sup> In the midst of all this uncertainty, is it possible to do the right thing?

Consider some of the points raised in this paper:

- Equipment capabilities and costs changed radically from the time that Weiderkehr wrote the King Research report in 1980 and the time we surveyed vendors of library systems in 1983.
- During the same period, inflation has had its effect. As a result, the quoted costs for delivered systems in 1983 are generally within the cost ranges estimated by Wiederkehr in 1980 (although at the bottom of those ranges). Costs for delivered systems in the future may depend on which of the two trends, technological improvement or monetary inflation, gains the upper hand.
- Computer performance improves by a factor of 10 every seven to eight years.
- The telecommunications industry is going through major technical, regulatory, and economic changes that will leave the direction of communications cost trends unclear for some time to come.

From these facts alone, we can draw one conclusion with major import for library decision-making:

*Any decision that commits the library for a period longer than about seven years is a wrong decision.*

Let us consider some of the implications of this decision rule.

- Be prepared to completely depreciate your equipment and software every seven years. Expect to buy a new system from the ground up. If the system lasts longer, and still fulfills the library's service needs, bank the money and buy some extra books with the interest. If the worst happens, you will be prepared.
- Be prepared to abandon your vendor at the end of the depreciation period. Cordial and long-standing relationships with a vendor can be beneficial, but remember the issue of

rising software prices, and consider this lesson: the longer a vendor can keep selling and upgrading existing systems and software, the longer the vendor can stay price-competitive and profitable. The vendors who sold you your system seven years ago may have little incentive to start again from scratch with new equipment and new software, unless the market forces them to do so. The state-of-the-art system that takes advantage of the order-of-magnitude improvement in computer performance may be more likely to come from a relatively new firm, rather than from an established company with a large sunk investment in previous-generation systems. This is not intended as a blanket indictment of existing vendors; however, the vendor's desire to do good is often overshadowed by the forces of the marketplace, a fact that library managers must keep in mind.

- Protect your bibliographic data: it may be your most important investment. In particular, be aware that many vendors translate MARC-format records to internal formats during database loading. Delimiters and tags may be lost, and can only be recovered by "matching" against LC MARC data or reconstructing the database from bibliographic utility archive tapes (perhaps losing any local catalog maintenance changes in the process). Hidden limitations imposed by internal processing of the database can severely constrain a library's freedom to change vendors (even when the library outgrows the vendor's top of the line system), and may limit the system's capability to provide searching and display enhancements.

This seems like extreme advice. Most public agencies do not depreciate equipment, nor do they typically hold funds in reserve for equipment replacement. Public agencies value stability; the idea of changing vendors may be difficult to contemplate, even if well-justified. In many cases, the "vendor" has special status (for example, the campus computer center) and changing vendors may be politically impossible even if financially mandatory.

The fact remains, however, that growth and change are the hallmarks of bibliographic computing. The online catalog is a new development, and one for which the nature, direction, and difficulty of growth cannot be easily predicted. Likewise, the rapid change in the nature and cost of relevant technology makes forecasting difficult. Today's decisions affect tomorrow's services and costs, but in ways that cannot be foreseen with assurance.

Because the online catalog is not an inexpensive development, the pressure to make the "right" decision can be intense. Because the online catalog can involve major capital investments, the "right" decision may be viewed as one that will be correct ten or fifteen years into the future, because public agencies, including libraries, are accustomed to making capital investments sparingly, and to expect them to last for a long time.

Library decision-makers are therefore faced with a significant dilemma: to make decisions about large investments that must stand up to the requirements of the future, when the future is inherently uncertain and subject to rapid change. We may find that there are few means to escape this dilemma given current methods of budgeting and finance in the public sector. Library managers will be pressed to develop new and creative methods of finance and planning. Planning strategies that ignore the facts of rapid change and uncertainty may be doomed to failure. Successful strategies, however, can open up exciting new ways for libraries to enhance and transform their services through the first major development in automation that directly reaches the library's users: the online library catalog.

#### REFERENCES AND NOTES

1. The proceedings of this meeting are recorded in Council on Library Resources, Inc., *Online Catalogs: Requirements, Characteristics and Costs*, Washington, D.C.: the Council, March 1983.
2. See, for instance, Robert R. V. Wiederkehr, *Alternatives for Future Library Catalogs: A Cost Model* (Final report of the Library Catalog Cost Model Project, Prepared for the Association of Research Libraries), Rockville, Md.: King Research, Inc., June 1980.
3. See, for example, any issue of *Advanced Technology/Libraries*.
4. One method of providing operational backup is to replicate the entire catalog system, database, and telecommunications system. This method of backup, of course, automatically doubles the "size" of the system, but this aspect will not be considered here.
5. In fact, most "menu" systems at least require users to type in the words (author names, titles, etc.)

- to be searched. Exceptions include the touch-screen system offered by CLSI, where there isn't even a keyboard on the terminal.
6. We assume that the catalog in question creates an index for each access point (i.e., uses an "inverted file structure"), and that the indexes are created when the records are first entered into the database. Techniques other than indexing of records exist, but are not in common use in bibliographic computing; also, these techniques might not be suitable or affordable for large bibliographic data files.
  7. See, for example, Charles Hildreth, *Online Public Access Catalogs: The User Interface*, Dublin, OH: OCLC, Inc., 1982, Stephen R. Salmon, "Characteristics of Online Public Catalogs," *Library Resources and Technical Services* 27 (January/March 1983), 36-67, or Joseph R. Matthews, Gary S. Lawrence, and Douglas K. Ferguson, eds., *Using Online Catalogs: A Nationwide Study*, New York: Neal-Schuman, 1983.
  8. Between 12 and 25 percent of users conduct searches involving more than one access point. See Matthews, Lawrence and Ferguson, pp. 147-149. Also, see University of California, Division of Library Automation and Library Research and Analysis Group, *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, California: University of California Systemwide Administration, November 16, 1982, pages 47 to 57. This report will be referred to hereafter as "University of California."
  9. Fourteen to 20 percent of searches in MELVYL's Command Mode involve Boolean combinations of multiple indices. A recent study of transaction logs from four online catalogs, conducted as part of the Public Access Project, showed that most searches involved more than one search word (Ray R. Larson, *Users Look at Online Catalogs, Part 2: Interacting with Online Catalogs*. Berkeley, CA: Division of Library Automation and Library Studies and Research Division, University of California Systemwide Administration, April 5, 1983, Section 3.3).
  10. Matthews, Lawrence and Ferguson, pp. 123-126, 130. Also, the computer transaction logs from the University of California system for a 40 week period show that between 10.5 and 15.6 percent of all searches result in the retrieval of 100 or more records, in a static prototype database of limited size representing a small proportion of UC monograph holdings.
  11. In the CLR study, respondents from systems not featuring keyword searching of subjects ranked "Ability to search by any word or words in a subject heading" third among the improvements they want. (University of California, Table 66, page 105).
  12. Martha E. Williams, et al., "Summary Statistics for Five Years of the MARC Database," *Journal of Library Automation* 12 (December 1979), pages 314-337.
  13. Richard W. Boss, *Library Technology Newsletter* 2 (March 1982), page 18.
  14. See, for example, Hildreth, *op. cit.*, Salomon, *op. cit.*, or Matthews, Lawrence and Ferguson, *op. cit.*
  15. See, for example, University of California, Table 39; Matthews, Lawrence, and Ferguson, *op. cit.* Hildreth, *op. cit.* or Salmon, *op. cit.*
  16. Robert R. V. Wiederkehr, *Alternatives for Future Library Catalogs: A Cost Model*, *op. cit.*
  17. Wiederkehr, p. A-23.
  18. The estimate of \$105 per terminal was derived as follows. A CPU costing \$75,000 supports up to 64 terminals. Upgrading to 256 terminals (i.e., adding 192 terminals) requires a \$95,000 CPU, an additional cost of \$20,000. The estimated marginal cost per terminal for this upgrade is \$20,000/192, or \$104.17 per terminal. In fact, according to Wiederkehr, the next step up from a \$95,000 minicomputer CPU is a large mainframe computer costing about \$1,000,000. Because recent developments in minicomputer architecture and falling mainframe costs make Wiederkehr's 1980 analysis questionable, we have assumed for the purpose of this analysis that additional CPU capacity can be purchased in reasonably small increments at Wiederkehr's estimated cost for a large minicomputer.
  19. Wiederkehr (page A-24) assumes that the maximum capacity of a minicomputer system is four 300 megabyte disk drives, sufficient for 500,000 full records; to store more records requires a mainframe computer, where disk storage costs are estimated at \$27,000 per 250,000 records (\$0.108 per record) plus \$50,000 for a disk controller. To relax this constraint on minicomputer applications, we have assumed that additional disk space can be added at the marginal cost quoted for mainframe disk storage equipment, \$0.108 per record.
  20. This estimate corresponds to Wiederkehr's estimate of \$35,000 to install a mainframe computer, regardless of the number of terminals it supports.
  21. Letter from Michael Monahan, Geac Computers International, Inc., to Lee Jones, Council on Library Resources, Inc., July 20, 1983.

22. U.S. Department of Education, National Center for Educational Statistics, *Library Statistics of Colleges and Universities: 1979 Institutional Data*, Washington, D.C., National Center for Educational Statistics, October 1981. These estimates were derived by dividing aggregate data for all reporting libraries (Table A, page 2) by the number of libraries reporting.
23. In the *Library Statistics of Colleges and Universities: 1979 Institutional Data*, academic libraries circulated 201,306,592 items from aggregate holdings of 519,895,257 volumes, for an average of 0.3872 circulations per volume; this ratio is used to estimate the lower boundary, 64,500 circulations per year. To check this ratio, we referred to another standard statistical source, California State Library, *California Library Statistics and Directory 1982*, Sacramento, CA: California State Library, 1982, where we found that reporting academic libraries, with holdings of 42,703,956 volumes, circulated 21,573,775 items (page 50), for a ratio of 0.5052 circulations per volume. This ratio was used for the higher estimate, 84,100 circulations per year.
24. This estimate is derived from a "rule of thumb" calling for one terminal per 15,000 items circulated. We do not necessarily advocate this rule for terminal planning purposes; rather we use it here as a convenient means to provide estimates for this example. The author can discuss with interested parties the derivation of this rule. Other rules in common use are reviewed in Joseph R. Matthews, *Public Access to Online Catalogs: A Planning Guide for Managers*, Weston, CT: Online, Inc., 1982.
25. Median values for university libraries that are members of the Association of Research Libraries, from Association of Research Libraries, *ARL Statistics 1981-82*, Washington, D.C., Association of Research Libraries, 1982, p. 18.
26. Estimated from the circulation-per-volume ratios above. The ARL does not report circulation statistics.
27. Using the 1/15,000 rule discussed above.
28. Note that these estimates are averages of budgets and expenditures for all libraries included in each data source. The "average" expenditure for all libraries is not necessarily the same as the expenditure for the "average" library. The procedure is used here only to illustrate some financial considerations in planning for online catalogs, and not to indicate the expected budgetary condition or experience of any specific library.
29. Starting from some other functional base, say circulation, adding more functions may be more expensive, and adding public access may be the most expensive enhancement of all. Stephen R. Salmon explores the ramifications of this point extensively in his presentation, "Alternatives for Moving Beyond Circulation," *Automated Circulation and Beyond: An Examination of Choices*, a Preconference Institute sponsored by the Library Administration and Management Association, Circulation Services Section, at the 102nd Annual Conference, American Library Association, Los Angeles, California, June 23, 1983.
30. Matthews, Lawrence and Ferguson, Table 16, p. 120.
31. Matthews, Lawrence and Ferguson, Table 16, p. 120.
32. Matthews, Lawrence and Ferguson, Table 20, p. 134.
33. Matthews, Lawrence and Ferguson, Table 20, p. 134.
34. Matthews, Lawrence and Ferguson, Table 27, p. 153.
35. Margaret M. Beckman, "Online Catalogs and Library Users," *Library Journal* 107 (November 1, 1982), page 2045.
36. James Martin, *Application Development Without Programmers*, Prentice-Hall, 1982.
37. Charles P. Lecht, *The Waves of Change: A Techno-Economic Analysis of the Data Processing Industry*, Advanced Computer Techniques Corporation, 1977.
38. Lecht, *op. cit.*
39. "Mass Storage Technology and File Organization," *Journal of Library Automation*, June 1980, pp. 77-87.
40. Lecht, *op. cit.*, p. 16 and 32.
41. Martin, *op. cit.*, p. 4.
42. Martin, *op. cit.*, pp. 1-2.
43. Lecht, *op. cit.*, p. 85.
44. For a useful, if somewhat technical, review of the state of telecommunications equipment, see John Seaman, "Picking the Right Data-Comm Pieces," *Computer Decisions*, November, 1981, pp. 93-116. Also, see Joseph R. Matthews and Joan Frye Williams, "Basic Guide to Telecommunications Technologies For Libraries," *Library Technology Reports* (forthcoming).
45. William J. Baumol and Sue Anne Batey Blackman, "Electronics, the Cost Disease, and the Operation of Libraries," *Journal of the American Society for Information Science* 34 (May 1983), pp. 181-191.

APPENDIX A. CHECKLIST OF  
MANAGEMENT ISSUES AND QUESTIONS

On-Line Catalogs

Academic Library Manager Issues

I. *Staff*

1. Planning and preparation, setting realistic schedule of deadlines
2. Participation: input and impact; decisions
3. Training: professional and support staff
4. Specialists: analysts, programmers, machine operators, technicians

II. *Users and Use Patterns*

1. Impact and planning input
2. Expectations and needs, current and future
3. Faculty
4. Administrators: obtaining funds and other resources
5. Students
6. Instructional aids and user guides
7. User evaluation, initial and on-going
8. Balance complexity of capabilities and simple procedures for use
9. Queuing and length of time waiting for access

III. *Facilities*

1. Amount of space
2. Environment control: heat problems, humidity
3. Location
4. Relationship to other functions
5. Safety and security
6. Power and telecommunications

IV. *Database*

1. Format, points of access, display details
2. Completeness of record
3. Updating and maintaining currency, retrospective conversion
4. All types of materials
5. Standard and non-standard headings

V. *Software Program*

1. Evaluation and selection, features desired versus "affordability"
2. Develop in-house or acquire outside
3. Utilize or modify an existing program
4. Share development cooperatively with other institutions
5. Schedule; attainability of
6. Authority control, indexing, access points

VI. *Costs*

1. Database building; initially and continuing
2. Machine costs, initial; add on
3. Operating costs: supplies and maintenance, utilities
4. Terminals: number, type, quality
5. Printers
6. Dial up capability
7. Backup systems
8. Main frame or mini
9. Storage costs
10. Comparison of present cost to on-line catalog costs
11. Methods of financing, leasing or lease-purchasing versus outright purchases
12. Features
13. Communications lines
14. Use of central university computer centers

VII. *Equipment*

1. Type, capability, standards compliance
2. Future, upward capability
3. System linkage, telecommunications

VIII. *Physical Access*

1. Locations of terminals
2. Number of terminals and printers needed, writing surface with terminals
3. Types of terminals
4. Dialup, direct

Questions

1. What are the essential elements of information to be included in database?
2. Will the format chosen satisfy users?
3. Can we afford to offer a complete record format? What degree of fullness is required?
4. How do we determine costs?
5. Which costs currently incurred will be eliminated? will remain?
6. How does one convince budget authorities that the on-line catalog is needed?
7. How does one get users involved in related decision making, planning, funding support, and changing from manual card catalog?
8. Can one support an on-line catalog with existing mini-computer technology?
9. Are on-line turnkey systems available that will satisfactorily meet requirements?
10. How does one go about comparing software and hardware to determine best possible?
11. Should an institution build its own system? Try sharing mainframe with the University's computer service?
12. Will the users accept an on-line catalog (OLC)?
13. What will the relationship be between the national utility and the local OLC?
14. How will the use of an OLC impact Technical Services staff? Public Service functions? Users of the library?
15. How much involvement should staff and users have in planning for an OLC? (See also #7)
16. What features should the OLC system include?
17. What types of OLC systems are available and which is the best for my institution?
18. Can I buy a system today and be confident it will satisfy our needs for five to ten years? Allow for growth? Permit utilization of new developments in software and hardware add-ons?
19. If hardware and storage costs are going down, should we wait to acquire a system and if so, how long?
20. Is there a minimal level of investment that one can enter into an OLC system and then expand as funds become available?
21. What role can consultants play in helping us decide which system to acquire and how does one choose the consultants?
22. How should the OLC be interfaced with other existing library systems? Should it be interfaced?
23. How do I know how many terminals we will need?
24. What features can an OLC system offer economically? Ideally? Which are essential?
25. Is there a need and or desire for commonality with other institutions in a consortium or university system?
26. Regarding costs versus features in rapid changing technology, can we set a reasonable time frame of 3-5 years? Should we venture to project a system design beyond 7-10 years?
27. Regarding access via dial up ports: what is minimal need? Policy? How many ports? Use of password, etc.?
28. Linkage to circulation and acquisitions functions, is this critical?
29. How does one obtain a guarantee of vendor performance? Bonding, benchmarks, track record?
30. What is the probability that one can meet a schedule? Consequence of credibility of managers with funding agencies?
31. Should one strive for an OLC as a component of an integrated system?
32. Should one plan for input from the OLC to a library management information system?
33. How will the OLC affect management of other services and systems?
34. How does a library prepare its database for loading? Methods? Procedures? Costs? ■■

## News and Announcements

### BaTaPhone

BaTaPHONE is a new electronic ordering system from Baker & Taylor offered to libraries as of September 1. The system utilizes a hand-held data terminal that is used for ordering titles by keying in the ISBN and quantity desired. This order information is then transmitted to Baker & Taylor via toll-free telephone lines.

A printed acknowledgment verifying the chronological line entry of each order is mailed to the library on the day following the order placement. Optional order slips may also be mailed the day following order placement or included with book shipments.

Pricing is set at \$325 per year with order confirmation slips and \$275 per year without slips. Printed acknowledgment of orders is standard with both price levels. The lease of the portable data terminal is included. ■■

### BLIS Installations

A BLIS Purchase Agreement has been signed with the University of California, San Diego (UCSD) for a vendor-supported hardware and software installation. BLIS will provide an integrated database for acquisitions, cataloging, authority control, and circulation control functions for UCSD libraries.

BLIS will be installed in early 1984 on a Magnuson M80/42 central processing unit (compatible to an IBM 4341) with a network of Telex 476L library terminals. Online interfaces are planned to link BLIS at UCSD to the University of California MELVYL system. MELVYL and BLIS use the same database management system, ADABAS, and both operate using Magnuson CPUs. The UCSD libraries conducted a six-month online evaluation of BLIS before making a final selection.

BLIS has also been selected by the Columbia University Libraries to implement a local online public access catalog system. Plans are being made to begin a six-month demonstration installation at Columbia University in early 1984. Pending successful completion of the demonstration and successful fund-raising efforts by Columbia, a production version of BLIS is planned for July. BLIS will operate on the university's central IBM computer system and is seen as an initial step toward the establishment of a universitywide scholarly information center. The primary database will be created from RLIN MARC tapes. An online interface to RLIN is planned with development of the CLR-sponsored Linked Systems Project, linking WLN, LC, RLIN, and Northwestern University with provisions for local, distributed system nodes.

During the demonstration period, library staff will design and test public access searching screens, and online help and instructional aids. Upon completion of the BLIS demonstration at Columbia University, visitors will be welcome to view the library system. During the demonstration period, information can be obtained by writing: Paul Peters, Assistant University Librarian for Systems, Columbia University Libraries, 535 W. 114th St. New York, NY 10027. ■■

### Faxon and GEAC

GEAC Computers International, Inc., and the Faxon Company have announced a series of cooperative efforts that will link GEAC's integrated systems with Faxon's LINX Network for online searching, tape exchange, and communications. The following textures are planned:

- Transfer of holdings and other selected data from the LINX online serials

check-in system (SC-10) into the GEAC local catalog.

- A tape interface that will allow Faxon subscription invoicing information to be loaded into GEAC's online fund accounting system for local manipulation.

- Using GEAC equipment already installed at the library, GEAC users will have online access to the LINX Network files and databases, including bibliographic, price, and publisher information for two hundred thousand serials, as well as the complete file of MARC-S cataloging data from the Library of Congress.

- LINX COURIER, Faxon's electronic mail system, will link GEAC users to one another, to Faxon, and to all LINX users for interlibrary loan, online subscription ordering/claiming, and online sharing of ideas and resources. ■■

#### Faxon Database of New Serials Titles

Faxon has announced the creation of a database designed to provide librarians with current information on new serial titles. Among its features are:

- A database of the world's new serial titles and title changes going back three years.

- Full-text searching of new serial titles by keyword, with additional access by subject area, publisher, editor/affiliation, price range, and date of first issue.

- Multiple-screen descriptions of several new titles provided by the publisher and designed to present, in full, the scope and character of the new publications.

- Online ordering of new serial titles directly from the new title screen.

- Online requests for sample copies or additional information.

- Future enhancements will include a profile alerting system for regular dissemination of new titles to users in designated subject areas.

- Users of Faxon's LINX Network can access the database free of charge from the same dedicated terminals provided for searching SC-10, DataLinx, Route, and Union List files. In the future, the database will be available through Telenet to non-LINX users as well. ■■

#### A & I Info to be Added to Conser

Julia C. Blixrud has been appointed to head a joint Association of Research Libraries/National Federation of Abstracting and Information Services Project to enrich the CONSER database with information about coverage by abstracting and indexing (A & I) services. Ms. Blixrud assumed her position on November 1, 1983; the project is scheduled to last eighteen months.

The CONSER (Conversion of Serials) database contains more than 350,000 records for serials titles contributed by U.S. and Canadian libraries. The project will provide a link between A & I service citations and library catalogs, enabling researchers to learn quickly where serials of interest are indexed, and facilitating access to high-demand serials. The goals of the project are: (1) to ensure that the CONSER database contains records for *all* serials titles covered by a selected core group of the most widely used A & I services in the U.S.

### Library Automation? ILIAS Is The Answer To A Total Service

#### Monographs

- On-line MARC II cataloging
- Professional cataloging to your specs  
On-line, book, COM and card catalogs

#### Journal data

- On-line or printed catalogs of library holding, binding, personal subscription and routing data
- Binding and routing slips
- Union lists for multi-location systems

#### Private Files

- On-line data base management for report or special collections
- Simplified input format easily adapted to your needs

### INFORONICS, INC.

550 Newtown Rd. Littleton, MA 01460  
617/486-8976

and Canada; (2) to add to those records information describing where each serial is indexed or abstracted; (3) to provide to the participating A & I services standardized bibliographic data (e.g. ISSN, key titles, library entries) for each serial title they cover, enabling them to cite the serials they index in standardized library form; (4) to develop the capability to produce machine-readable serials lists for use by participating A & I services; and (5) to keep the A & I information in the CONSER database up-to-date.

The project will be based at the National Serials Data Program, Library of Congress. Funding for the project has been received from the National Endowment for the Humanities, the Council on Library Resources, and the H. W. Wilson Foundation. The funds raised to date will allow for complete processing of a substantial core group of A & I services, covering more than 105,000 serials titles (approximately 52,500 unique serials). As additional funding is received, the core group will be expanded so that as many as 100,000 unique serials can be processed. ■■

### ILS Users Group Formed

The Integrated Library System Users Society (ILSUS) has been formed to provide a forum for exchange of ideas and information and to enhance cooperation among ILS users. Organizations that have acquired a license or that have ILS operational in their libraries are full members; other interested organizations may join as associate members. ILSUS holds quarterly meetings to exchange ideas and further the purposes of the group. To receive an information packet containing charter, bylaws, list of officers and participants, and other information about the group please contact Ms. Ruth Mullane, ILSUS Chair, Pentagon Library, ANR-AL, Room 1A518, Washington, DC 20310. Telephone (202) 695-5346. ■■

### RLIN Database Expanded by Close to Four Million Bibliographic Records

The Research Libraries Group has enlarged the central database of the Research

Libraries Information Network (RLIN) by more than 42 percent. This database now numbers over 12 million records in six bibliographic files (books, films, maps, sound recordings, musical scores, and serials). The books file, the oldest and most heavily used, went from 7,135,582 records in early July to 10,464,918 on July 25, when additions to this file were completed—an increase of 46.7 percent. All of these newly added records are now available for acquisitions, shared cataloging, interlibrary loan, and searching to all users of RLIN.

This expansion and enrichment of a primary resource for RLG programs and library processing was the culmination of the "archive load" project. The project consisted of reformatting, matching, and loading machine-readable bibliographic records from nineteen sources into a database already comprising more than 8 million records from the Library of Congress and RLIN user libraries. The records added were predominantly those created in machine-readable form by RLG member libraries prior to their use of RLIN. Sixteen members contributed records; most of these were added to the books file, but all the files received additional member records in this project.

To support the East Asian enhancements to RLIN, which enable catalogers and public services librarians for East Asian collections to enter and search for records containing Chinese, Japanese, and/or Korean vernacular, the 89,000 machine-readable records representing the East Asian collection of the University of Toronto Library were added.

In addition, cataloging records from the Government Printing Office (GPO) for the period from April 1, 1976, through December 31, 1982, were added to books and serials; these contain cataloging as it appears in the GPO *Monthly Catalog*. The National Library of Medicine (NLM) "Catline" records from mid-1965 through mid-December 1982 were added to the books and serials files, as well. RLG has the update tapes from both these agencies for the period since December and will continue adding GPO and NLM books and serials records to keep the database current.

Part of the work involved in the archive

load project was the "clustering" of the new books file records with those already in the file. Users of RLIN retain their unique versions of cataloging online, and in the books file all user records for each edition of a work are grouped together—so that when one searches for a title it is possible immediately to see both the best bibliographic citation available for each edition and the libraries that are acquiring or have cataloged it. Before the archive load, the books file represented about 3.5 million unique bibliographic entities; it now represents about 4.5 million.

In addition to the six bibliographic files, RLIN includes an authority file of 2.2 million records from the Library of Congress (Names and Subjects) and the New York Public Library, plus four "special databases" totaling over 166,000 records: the On-line Avery Index to Architectural Periodicals; the Eighteenth-Century Short Title Catalog; SCIPIO, an Art Sales Catalogs database; and the RLG Conspectus Online. ■■

### **Electronic Business Magazine Updated Fifty-five Times Daily**

BIZDATE, an electronic business magazine that is updated fifty-five times during the working day, has been added to the services provided to members of the Source, a communication and information service for personal computer owners.

BIZDATE is created by the thirteen-member staff of Source Telecomputing Corp.'s electronic newsroom in McLean, Virginia. Its first "edition" is available at 8:30 a.m., and updates are made continu-

ously throughout the weekday until 7:00 p.m.

The news offered in BIZDATE is assembled much like the financial pages of a major metropolitan daily newspaper, only more frequently and with information more current than a print product can deliver.

Some of the news actually is written by the newsroom staff from industry and government announcements. Other crucial reports are drawn from the United Press International newswire, the Commodity News Service, the U.S. News Washington Letter, and the U.S. Department of Agriculture. All information is edited and consolidated into an easy-to-read format. ■■

### **On-Line Audiovisual Catalogers**

Everyone who catalogs audiovisual material is invited to join On-Line Audiovisual Catalogers, Inc., a national association of audiovisual catalogers. The quarterly newsletter answers questions, explains how to handle cataloging problems, and serves as a general medium of communication. Most of the members use one of the bibliographic utilities (OCLC, RLIN, WLN) for cataloging, and these are also discussed in columns and articles.

The group, which has more than five hundred members, meets twice yearly during ALA Conferences and is planning a national meeting and workshop at OCLC April 30–May 1, 1984.

Dues are \$5 (personal) and \$10 (institution).

To join, or for further information, contact: Catherine Leonardi, 3604 Suffolk, Durham, NC 27707. ■■

## Recent Publications

*Bibliographic citations were produced by Maria Clark, Yale University Library, New Haven, Connecticut, in accordance with the American National Standard for Bibliographic References. New York: American National Standards Institute; 1977. 92p. (American national standards on library work and documentation; ANSI Z39.29-1977).*

### Reviews

**Carter, Ruth C.; Bruntjen, Scott.** *Data Conversion*. White Plains, N.Y.: Knowledge Industry Publications; 1983. 169p. (Professional librarian series) Bibliography: p. 161-66. Includes index. ISBN: 0-86729-047-1, hardcover, \$34.50. ISBN: 0-86729-046-3, softcover, \$27.50.

As for covering the procedures for doing bibliographic data conversion, this work comes nowhere near the quality and scope of Brett Butler, Brian Aveney, and William Scholz' "Conversion of Manual Catalogs to Collection Data Bases" in *Library Technology Reports*, V.14, no.2: 109-201 (Mar./Apr. 1978). However, Carter, who is head of cataloging for the University of Pittsburgh Libraries, and Bruntjen, executive director of the Pittsburgh Regional Library Center, are not addressing the person familiar with the technical processes of data conversion, but rather the library administrator who must make the decision whether or not to undertake a conversion project and by what means. Arguments given for automating bibliographic record control include improved collection management, collection development, and resource sharing. But the authors' main concern or caveat is that the decision maker not be overly preoccupied with looking for short cuts and cost-cutting measures. The position Carter and Bruntjen convincingly take is that if a conversion project is worth doing, it is

worth doing well, and if it is not done well, it will prove not to have been worth the effort.

The first one hundred pages are devoted to issues involved in the planning and implementation of a data conversion project. Here the authors discuss methods of conversion and compare the advantages and disadvantages of the options in each alternative. Carter and Bruntjen, no doubt biased by their backgrounds, take for granted that a library will be doing conversion via a bibliographic utility. The three methods of conversion compared are: in-house, using present library staff; in-house, hiring temporary project staff; and contracting the conversion to an outside agency. The resources required—bibliographic tools, personnel, and finances—are also outlined. One of the better features of this book is a two-page "Data Conversion Cost Analysis Worksheet" (with four pages of instructions on "how to use the worksheet") on which 290 categories are to be evaluated for each alternative considered. This chart was designed to be adaptable to microcomputer spreadsheets.

To their credit, the authors go beyond the conversion of catalog records to also discuss updating of name, subject, and series entries, the conversion of patron identification files and circulation and acquisition records, as well as other areas of database maintenance after conversion. Special consideration is given to the difficulties involved in serials cataloging conversion and online serial union listing.

In addition to the bibliography and index, the book concludes with three appendixes prepared by Elaine Rast, head of the automated records department of the Northern Illinois University Library. The first is a directory, arranged by state, of 213 libraries experienced in conversion projects with a description of the project, problems encountered, name of the vendor and/or

consultant employed, and the name and telephone number of a contact person at the library. The second appendix gives the name, address, telephone number and past clients of twenty-nine conversion consultants. The final appendix list thirty-six vendors who have done data conversion and their clients.

Although this book may seem costly, a conversion project is a big investment of time and money. Using this book as a resource in such a project could save a library a great deal of time and money even if only a small portion of the book proves of practical local application.—*Richard E. Asher, Indiana State Library, Indianapolis, Indiana.* ■■

**Dougherty, Richard M.; Heinritz, Fred J.**  
*Scientific Management of Library Operations.* 2d ed. Metuchen, N.J.: Scarecrow Press; 1982. xii, 274p. Includes bibliographies and index. ISBN: 0-8108-1485-4, hardcover, \$15.

For over fifteen years now the first edition of *Scientific Management of Library Operations* has served as a near-standard text for graduate courses in library administration and systems analysis. Much change has come about in libraries since the first edition of this work appeared in 1966. What we have here is not simply a warmed-over, casual modernization of a standard work; rather we are presented with a new edition aimed at both students and practitioners, accurately reflecting contemporary attitudes and approaches to librarianship. The new edition gives readers detailed information on how to prepare, plan, and analyze procedures that will result in improved cost economies and better systems performance.

In comparing the first with the second edition, we found that the update offers much in the way of significantly fresh new material on systems design; examines in more detail the relationships between workers and their environments; and offers some cogent advice on planning for and implementing in-house library studies. Like the earlier edition, the present one deals in timely fashion with various approaches to cost analysis, time study, statistics, and

standards. All chapter bibliographies, study questions and problems, illustrations, and graphs have been updated and enlarged upon. All serve to enhance the text of a very attractive and visually appealing work.

The chapter on flowcharting is well written and illustrated as is the fine chapter on forms analysis, design, control, and production. In each chapter scientific management is presented in a logical, clear-cut manner, eschewing highly technical language and employing no higher math save simple arithmetic and elementary algebra. The commonsense principles and techniques found in this book will prove both powerful and timely in solving a host of library management problems.

It is obvious that library management performs a more active function as the systems design phase of a project winds down and the more involved—often sensitive and controversial—implementation phase begins. Dougherty and Heinritz note this and expand upon the implications in their cleanly written chapter on systems implementation and the process of change. Again we are confronted with no idle speculation, but with suggestions derived from strong, practical experience in the administration of library systems. Shying away from any hint of didacticism, their suggestions for steering a clear course to success, with little staff resistance, should be taken to heart by all library managers.

Scientific management has been around for a long time now. Unfortunately one can encounter library after library where few of its principles have been adequately applied. Yet, the rewards of a more scientifically based managerial posture are transparently clear. Those rewards will begin to nudge us beyond our normal routines only if meaningful long-range planning becomes a vital part of any attempt to introduce specific scientific management approaches within the library, and if carefully preplanned reinforcement schedules contribute to the adoption of the results of scientific inquiry. Finally, it is even more evident that long-range institutional support and commitment must be present if the results and benefits of such scientific inquiry are not to be short-lived.

A review of the first edition of *Scientific Management of Library Operations* noted that "any library could profit from the application of these methods to its operations" (*Library Quarterly*, Apr. 1967). The same goes now—the more so—the second time around.—Edward D. Garten, *Tennessee Tech University, Cookeville, Tennessee*. ■■

**Information and Innovation.** Stern, Barrie T., ed. *Proceedings of a Seminar of ICSU-AB on the Role of Information in the Innovative Process*; 1982 May 24–25, Amsterdam. Amsterdam, New York: North Holland Pub. Co.; 1982. viii, 191p. (Contemporary topics in information transfer; 1) Available from: Elsevier Science Publishers, P.O. Box 211, 1000 AE Amsterdam, The Netherlands. Distributor in the U.S. and Canada: Elsevier Pub. Co., 82 Vanderbilt Ave., New York, NY 10017. ISBN: 0-444-86496-2, hardcover, \$41.75 (U.S. and Canada), Dfl 90 (elsewhere).

As we steeped in the topmost pool of the hot springs, watching the tall firs sway, the young German noted that "pragmatism" was the principal lesson he would take back from his stay in the U.S. Here, he said, people discuss what to do, how, and when. In Europe, they talk long into the night about theory and policy.

*Information and Innovation* contains ten major papers with discussions, a transcript of a concluding panel session, and notes on the speakers and the International Council of Scientific Unions Abstracting Board (ICSU-AB). It is the report of a three-day seminar held by the ICSU-AB, a sort of quasi trade association for scientific and technical abstracting and indexing services.

For the first session, "The Innovative Process: Technological and Sociological Aspects," Willem Dijkhuis, senior editor at North-Holland, opens with a far-ranging, delightfully playful, erudite, and witty historical essay on innovation. Professor H. Krupp follows with a well-reasoned review of implications of "the Third Technological Revolution" for full employment, the quality of work, education, culture, and indus-

trial innovation. Krupp suggests that "History has shown that *culture* has to rely on Maccenas or the government and *cannot be left entirely to the market place*." (Italics are Krupp's.)

The second session focuses on "Requirements for Specialized Information in an Innovative Process." Sixten Ljungberg, head of the information and documentation center of a Swedish pharmaceutical company, discusses the role, organization, and activities of a corporate I & D center and how it contributes to innovation. R. van Houten reviews information requirements for innovation, alternative innovation strategies with cost implications of each, and the role of R & D, and closes with three case studies of the role of information in innovation.

Dieter Schumacher provides a quite basic introduction to groups involved in innovation: scientists, technologists, managers, consultants, and information brokers for session 3, "The Innovative Process and Various Information Channels." A. K. Kent follows with a rather feeble encomium for the primary research journal.

"Scientific and Technical Information as an Aid to Innovation" was the title of session 4. Daniel U. Wilde offers an interesting description of the operation of the New England Research Application Center (NERAC), a NASA-sponsored center for promotion of technology transfer, which functions largely as a "matchmaker" between scientists or engineers and businesses, schools, or governments. Michael W. Hill of the British Library reviews findings of few dozen studies of the innovation process in a rather rambling but interesting piece.

The final session was on "Economic Information as an Aid to Innovation." Jean-Michel Treille provides a very abstract and French view of the types of information used for decision making and some thoughts on problems with existing information systems. Peter Martin of Predicasts closes with a brief but challenging piece on problems in getting the right information to the right decision makers at the right time, with interesting observations on serendipity.

It is not clear who would find the proceedings, as a whole, useful. Dijkhuis'

**Announcing an outstanding series  
on library systems evaluation**

# Library Systems Evaluation Guides

Vol. 1	<b>Serials Control</b>	Vol. 5	<b>Management Services</b>
Vol. 2	<b>Circulation Control</b>	Vol. 6	<b>Interlibrary Loan</b>
Vol. 3	<b>Public Service</b>	Vol. 7	<b>Cataloging</b>
Vol. 4	<b>Acquisitions</b>	Vol. 8	<b>System Integration</b>

**Purpose** Each GUIDE is complete in itself, and provides a comprehensive, up-to-date method of evaluating automation support for serials control, public service, and other library applications. The Guides also provide valuable insight for the system designer, since the comprehensive list of Functions and Features contained in each Guide exceeds the specifications and capabilities of any existing system.

**Design** Each volume is designed to facilitate evaluation of existing automation support for all major library applications at the individual library level, without the need for outside consultants or protracted and expensive internal studies. The Guides are designed for easy access to the wealth of information they contain. A tabular format is used to make each guide a practical, working document, not a theoretical construct. The Guides are meant to be **used** in library system evaluation.

**Contents** The contents of each guide include:

- Introduction (purpose and use of the Guide)
- Application description (flow and scope of each major application)
- Methodology for evaluation of major library system applications
- Functions and Features list with numerical weights
- Data element checklist (keyed to MARC where applicable)
- Data element definitions
- Inventory of available systems
- Bibliography
- Index

Each volume contains 200-250 pages.

**Availability** Volumes 1-4 are available now. The subsequent volumes in the set will become available at approximately two month intervals, through 1984 May.

<b>Pricing</b>	<b>Prepaid*</b>	<b>Invoiced*</b>
Single volumes	\$ 59.50 ea.	\$ 64.50 ea.
3-7 Volumes	54.50 ea.	57.00 ea.
All 8 Volumes	395.00 set	410.00 set

(Write for multiple copy discounts.)

\* All prices subject to change without notice. Prices quoted apply to the United States and its territories, Canada, Mexico, Central America, the Caribbean, Colombia and Venezuela. For all other countries, there is an additional charge for postage. Orders from individuals must be prepaid. All others please include purchase order number. Shipping and handling charge included in price. Ohio residents add appropriate sales tax. Ohio tax exempt organizations please furnish copy of Ohio sales Tax Exemption Certificate with initial order. Payment must be in U.S. dollars.

**Jera**  
**James E. Rush Associates, inc.**

2223 Carriage Road, Powell, Ohio 43065  
(614) 881-5949

opening piece will be of interest to anyone who has read and thought seriously about the information revolution. On the other hand, Schumacher's and Hill's papers would tend to bore anyone who had ever read word one on their subjects. The strong European orientation of many pieces will somewhat limit utility for North American readers. American libraries may find \$41.75 rather steep for 191 pages of single-spaced typescript. Recommended for exhaustive information science, engineering, or business management collections.—*Brian Aveney, Blackwell North America, Lake Oswego, Oregon.* ■■

*Information and the Transformation of Society.* Sweeney, G. P., ed. Papers from the 1st Joint International Conference of the Institute of Information Scientists and the American Society for Information Science; 1982 June 28–30, Dublin, Ireland. Amsterdam, New York: North Holland Pub. Co.; 1982. ix, 367p. (Contemporary topics in information transfer; 2) Available from: Elsevier Science Publishers, P.O. Box 211, 1000 AE Amsterdam, The Netherlands. Distributor in the U.S. and Canada: Elsevier Pub. Co., 82 Vanderbilt Ave., New York, NY 10017. ISBN: 0-444-86505-5, hardcover, \$51. (U.S. and Canada), Dfl 120 (elsewhere).

*Information and the Transformation of Society* contains twenty-one papers and six "posters" from a joint meeting of ASIS and the Institute of Information Scientists. It shares the usual problems of conference proceedings: somewhat fuzzy focus, and great unevenness in treatment and quality. Still, there are a number of good papers worth reading for themselves.

G. P. Sweeney, editor of the proceedings, contributes a stimulating essay on the effects of information technology on organization of the economy. V. Slamecka's piece on deep-rooted causes of disinclination to use information resources in developing nations is thought-provoking. P. Gibbins of Pergamon Infoline offers interesting perceptions on technological directions in information publishing.

An interesting historical review of

CEEFAX development is provided by I. R. Royce, chief sub-editor there. H. R. Brinberg of Aspen Systems reviews the development of the information economy and maps the historical development of information products on the axes of services versus products and conduit versus content in elegantly concise logical analysis with provocative insights for anyone involved in the information transfer process. Sam Beatty of ASIS contributes a solid paper on the changing information sector and the role of professional societies.

Each of the above papers leaves one wishing for a bit more development of the material, surely a sign of quality rather than deficiency.

For the large part, the remainder of the papers and the posters will be of interest primarily to small segments of the profession. There are papers by politicians on a variety of continents justifying their existences, enumerations of linguistic and political barriers including justifications for both, and reports on Japan's Emergency Medical Information System, standardization in Yugoslavia, Irish legal databases, and technical information needs of Brazil. At their worst, a few contributions suggest the authors' principal motivations in preparing them were to get organizational support for a trip to Dublin; but then this is not atypical of conference proceedings.

American libraries will find the \$51 price tag a bit high for 367 pages of double-spaced typescript. Recommended for comprehensive information science collections.—*Brian Aveney, Blackwell North America, Lake Oswego, Oregon.* ■■

Kesner, Richard M. *Information Management, Machine-Readable Records, and Administration: An Annotated Bibliography.* Chicago, Illinois: Society of American Archivists; 1983. 168p. Includes index. ISBN: 931828-57-0 [sic], softcover, \$8 SAA members, \$11 all others.

One does not generally expect a call to action in an annotated bibliography, but, here and there, Richard Kesner predicts that the archivist will necessarily evolve into a member of the information management team and, if not, he "will find himself

supplanted much in the same way that the corporate MIS (manager of information services) officer is coming to replace the records manager." One need only reflect on the way in which the records manager largely replaced the archivist in the corporate world during the past decade to appreciate his point. Archivists, observes Kesner, do not represent a significant constituency in the world of computers, but automation will very likely redefine the role of archivists. "The profession must therefore do whatever it can to remain informed of developments." Not satisfied with a jeremiad, Kesner has provided a valuable means for meeting this challenge.

There is no denying the rapid changes occurring as a result of automation, witness the threefold increase to nine hundred in the number of citations in this revised version of his *Automation, Machine-Readable Records, and Archival Administration*, published only three years ago. Forty-four percent of all of the citations pertaining to electronic data processing in archives and 42 percent of all citations pertaining to data archives fall within the last three years of his survey. More indicative of the rapid developments in automation occurring in archives is the important work proceeding at a number of institutions, such as, Yale, Stanford, Cornell, and Princeton, which has not been recorded in the literature and therefore is not and perhaps could not be mentioned in this edition.

For the novice, however, and even for the computer-literate archivist, this book contains a wealth of informed and critical evaluations of the literature. We learn, for example, that *ADPA*, a journal published irregularly, "is unique in that it is the only publication of its kind devoted entirely to the uses and implications of computer technology for archival administration and information management." *Information and Records Management*, on the other hand, although it is reported upon "as if it were up and running, this is not always the case. Pursue leads found in *IRM* with care."

This revised edition has a good index, a helpful introduction with several charts depicting the growth in computer literature for archives, and a more structured format than the previous edition. Eight chapters

cover periodicals and reference tools, bibliographies, electronics data processing applications in archives, machine-readable records and archives, records management and automation, library automation, information theory and systems, and a concluding chapter on future directions for archival automation.

The chapter on records management and automation contains descriptions of articles on micrographics, COM, as well as automatic scheduling and disposition of current records.

While archivists may not turn first to the chapter on library automation, they should, given the many current developments that will inevitably bring archives closer to library systems, e.g., the move by the Society of American Archivists National Information System Task Force (SAA NISTF) toward a MARC tagging structure, the approval by the ALA MARBI committee of a new MARC format for archival control, and steps being taken both at RLG (for RLIN) and at OCLC to improve support for archives. Kesner contends that the future in archives lies in the effective use of microcomputers. Perhaps so, but there is also the danger, already occurring, that the world of archives will be populated by fully independent and totally incompatible systems. However, the development of an archival program by RLIN, which will apparently also serve as a model for RLIN's attempt to devise a program for museum artifacts, and interest by OCLC in developing a similar program, and, finally, the work of NISTF may provide an antidote to this danger. In fact, the elusive dream of a national information network for manuscripts and archives may, ironically, come from archival and manuscript repositories hitching their wagon to existing library networks. Certainly, this is a likely path for college and university archives.

The chapter on information theory and systems tackles the vexing problem of processing and description of infinitely varied archival records. Early experiments with SPINDEX attempting to build guides from folder descriptions were not very successful, and archivists are still debating the problem of how to establish both physical and intellectual control over collections uti-

lizing the obvious indexing capabilities offered by automation. The author is not encouraged that processing, except perhaps for machine-readable records, will move very far from a manual system. Still, he correctly argues that providing intellectual access through indexing is essential and can be made far more effective if archivists are instructed in systems theory and applications. Thus, while this chapter is the least specific in terms of archival practice, it is perhaps the most important chapter in the book because it addresses the heart of the archivist's concern about how to provide intellectual control over masses of unique materials. There are seventy citations pertaining to general and theoretical works about indexing, thesaurus construction, query systems, automatic indexing, keyword-in-context indexing, keyword-out-of-context indexing, information retrieval systems, systems administration, evaluation, and implementation. Hence, the value of these citations, as well as those on records management and machine-readable records, indeed, the value of this book, is to fuel the imagination, while introducing the practicing archivist to the opportunities provided by automation.—*Lawrence Dowler, Harvard College.* ■■

*The Management of Serials Automation: Current Technology & Strategies for Future Planning.* Gellatly, Peter, ed. New York: Haworth Press; 1982. 295p. "A monographic supplement to the Serials librarian (volume 6, 1981/1982)." Includes bibliographical references and index. ISBN: 0-917724-37-2. \$45.00

*Serials Management in an Automated Age: Proceedings of the First Annual Serials Conference, October 30-31, 1981, Arlington, Va.* Melin, Nancy Jean, ed. Westport, Conn.: Meckler Publishing; 1982. 93p. ISBN: 0-930466-48-9. \$35.00

Taylor, David C. *Managing the Serials Explosion; the Issues for Publishers and Libraries.* White Plains, N.Y.: Knowledge Industry Publications; 1982. 156p. (Professional librarian series). Bibliography: p.141-149. Includes index. ISBN: 0-914236-94-6, hardcover, \$34.50. ISBN:

0-914236-54-7, softcover, \$27.50.

In these three books the leading serialists of the library world attempt to provide up-to-date assessments of serials management. Gellatly's collection of essays and case studies and Melin's conference papers concentrate on the management of automated activities related to serials. Taylor concentrates on managing the interface that is always present between publishers of serials and librarians. The three titles and a few other book-length works published recently may enlarge the meaning of "serials explosion" to the point where it includes books about serials.

The work edited by Peter Gellatly is by far the most substantive of the three. *The Management of Serials Automation* includes papers by approximately thirty individuals, the large majority of whom are prominent practitioners of the serials art (or the science of serials). Its 293 pages contain papers covering the literature, data conversion systems in specific institutions, developments in serials cataloging, union lists, network offerings, and peripheral matters such as computer applications by serial agents. It is likely that most papers were written in the 1979-80 period, and this no doubt means that the status of many developments described has changed considerably. It is also a sad commentary on the continuing problem of publication delay for much of what is considered scholarly communication. And if the reader of this review is only now learning of the existence of this collection, it may well mean that a period of four years will have passed between the time the papers were first written and the point of use by the reader.

The primary value of such a collection as this lies in the broad overview it provides in some detail of technological developments. Such documentation is essential if practitioners and educators are ever to develop a proper theoretical base to support the education of future librarians and information scientists. After reading the several papers about serials automation developments at the University of Illinois, one can not only understand the resolution of certain technical problems but also begin to visualize how the institution as a whole responds to such

developments. Likewise, by reading of some of the widespread concerns about implementing AACR2 in both automated and manual environments, one can more accurately assess the impact of past and future developments in library automation.

*Serials Management in an Automated Age* contains the papers presented at the first annual serials conference, October 30-31, 1981 in Arlington, Virginia. (The proceedings of the second conference, *Serials and Microforms*, will also be available. The third annual serials conference was held November 3-4, 1983, and was integrated with the fourth annual government documents conference and the ninth annual microforms conference. Presumably, in a year or so, the proceedings of these conferences will be made available.) It is interesting to note that earlier in 1981 (May 21-22) the University of Oklahoma sponsored a conference on "The Impact of Serials on Collection Development." Sul Lee, director of the Oklahoma conference, indi-

cated to the participants that he anticipated that an annual serials conference would result. While this was not to be, at least under the sponsorship of the University of Oklahoma, Lee did later edit the papers that appeared as *Serials Collection Development: Choices and Strategies* (Pierian Press, 1981).

The above background is given merely to identify the milieu that gives birth to publications like *Serials Management in an Automated Age*. This milieu had its early precursors in a 1969 Allerton Park Institute and a 1973 institute at Boca Raton, Florida. David Kaser is kind, but candid, when he says that invited papers are usually less exciting than papers volunteered to an editor (*The Bookmark*, nos. 51 & 52, 1982, p.9) and explains that there is a qualitative difference because of a difference in motivation. The contributions may have been quite worthwhile in the conference environment and the interaction which that provided. As published papers they are

## SPEED READERS

On-line systems are slow learners. That's why our COM Catalog Readers continue to receive such excellent reviews from librarians and patrons alike, particularly in libraries which have both on-line and COM.

With just a flip of a switch and the push of a button, our user-friendly reader offers a welcome alternative to the frustrations of using a keyboard.

For more information on why COM terminals are compatible with on-line catalogs, both now and in the future, call Cherry Cox toll free at 800-892-5159.



Information Design Incorporated



1300 Charleston Rd. • Mountain View • CA 94043-1397  
(415) 969-7990 • Telex No. 172157

insignificant—at least in retrospect. Thomas Hickey's predictions of revolutionary changes in journal publishing are old hat now. The recent ALA teleconference, "Blood, Toil, Tears, and Sweat: Rules and Formats," pointed out how some of the concerns expressed by Ruth Carter about implementing AACR2 can be accommodated. Milo Nelson, editor of the *Wilson Library Bulletin* provided a "Summary & Reaction" for the conference, and his remarks are included in the proceedings. Perhaps his conclusion says best why this volume is so unexciting:

As the afternoon wore on, it became apparent that Nelson, although a librarian, editor, and husband of a serials librarian, could pretend no extraordinary knowledge about the management of serials in an automated—or any other age. He ended by telling those present that, by the time of their 50th annual conference in 2031, things would be clearer and that, with any luck at all, perhaps some of the present perplexities would simply go away. He returned to his seat to scattered applause (p.93).

*Managing the Serials Explosion* is the only book of the three representing the work of one person. David Taylor provides a basic introduction to the nature and history of serials that is understandable and interesting. Taylor admits that publishers don't pay much attention to the attempts of librarians to define and otherwise control serials—for the publishers are "inventive, imaginative, and creative." This represents quite a concession from the former editor of *Title Varies* (1973–80), which had as its most prominent reason for existence the battle against "unnecessary" title changes. In another chapter, Taylor considers the economics of serials and gives evidence of his thorough knowledge of this most important of serials issues. He concludes that the economics of journal publishing, and presumably of journal acquisition by libraries, offers ample justification for describing economics as the "dismal science." There are chapters on networking, automation, and new trends in publishing—all demonstrating Taylor's familiarity with serials issues. Two more chapters cover issues, recommendations, and implications and really offer little in addition to what is pre-

sented earlier. The value of Taylor's book rests in its current and practical information relevant to managing serials work. His clarity in writing and a selective use of references make it useful to librarians not involved with serials work and to students and administrators.

The price of all three books is relatively steep. The publishers are familiar with the market, but such prices will certainly reduce the number of copies sold to practitioners and for reserve reading in library schools. Such prices, the availability of much of the same material in journals, and more recent publications like Marcia Tuttle's *Introduction to Serials Management* (JAI Press, 1983) all point to a very limited utility in the future.—Don Lanier, *Founders Library, Northern Illinois University*. ■■

Sager, Donald G. *Public Library Administrators' Planning Guide to Automation*. Dublin, Ohio: Online Computer Library Center; 1983. ix, 133p. (OCLC library and information science series; 2) Bibliography: p.125–27. ISBN: 0-933418-35-3 (series). ISBN: 0-933418-43-4, softcover, \$12.50.

Drawing from his research while serving as an OCLC Distinguished Visiting Scholar, Don Sager presents library managers with a planning guide to automation that is at once comprehensive and practical. The second work in OCLC's Library and Information Science series, the guide begins with a closely reasoned, provocative discussion of problem-centered responsibilities. Illuminating this discussion is a highly valuable prioritization table useful as an aid in assigning priorities to automation strategies. Sager properly notes the broad influence of automation in shaping the future of public libraries of all sizes. Clearly, automation is providing both a concrete foundation and a gateway in the creation of an environment that will exploit the benefits of modern technology.

Perhaps the most useful section of this book, and one in which Sager is unabashedly straightforward, is that portion dealing with cost analysis. The section is intended to help administrators determine

costs for automation and it offers clear-cut advice in planning for effective use of automation. It goes nearly without saying that unless a library manager knows the cost of maintaining a manual system he cannot make valid comparisons with automated system costs. While Sager highlights critical cost factors, he does not forget that there are many tangible benefits to be gained through automation that often do not fit neatly into cost-benefit formulas. Sager recommends that library administrators not seek to identify individual procedures costs. Rather, they should attempt to determine total costs of an operation or service, thus allowing the total impact of a library's standards, policies, and error factors to be driven into the cost. In his analysis he offers a number of formulas for gaining an understanding of costs attached to the cataloging, acquisitions, serials, circulation, and central office functions. He acknowledges, quite correctly, that the wide variety of business services (i.e., word processing, accounting, and payroll) and the number of automated applications available for the administrative offices of a library make cost comparisons difficult simply because one configuration of equipment may offer a number of different business functions through its software.

Sager views the decision to automate as a participatory decision. He observes that solid automation planning necessitates an administration that recognizes its responsibility to marshal all of its people resources in a democratic fashion.

This is a much needed book and will be readily consumed by library managers serving small and medium-sized public library systems. It offers helpful advice at every page; it is honest about some of the hurdles that often attend the process of planning for automation; and it is well organized from cover to cover. We fully expect that forthcoming books in OCLC's series will be just as helpful and instructive. *Edward D. Garten, Tennessee Tech University, Cookeville, Tennessee.* ■■

Development Inc., 30 High St., Norwalk, CT 06851. ISSN: 0271-0951. Issued 24 times each year. Annual subscription: U.S. \$180 North America, U.S. \$215 overseas airmail. [The citation is based on the specific issue shown; the review is based on a perusal of several issues.—DLW]

*VideoPrint* is described on its masthead as "a twice monthly newsletter covering technology, user, product and legislative trends in home information systems, videotex and teletext systems and services." Each issue has a half-dozen brief essays on news events in the areas mentioned, a dozen or two brief news items, and a three- to four-month calendar of relevant seminars and conferences.

*VideoPrint* goes beyond mere reporting and reprinting of press releases, and provides knowledgeable and, at times, witty interpretation of the events discussed. For example, under a heading "Teletext's Cold Slap of Reality," one issue discusses how many uncoordinated efforts in this area overlook the fact that teletext is a system "and like all systems since time immemorial, it won't work worth a darn unless all parts are in place and operational when the switch is pushed over into the 'ON' position."

One of the reasons for *VideoPrint's* willingness to freely offer interpretation may be that it is produced by consultants, not journalists. International Resource Development (IRD) is a consulting firm specializing in market research and product/service planning in high technology areas such as telefacsimile, simulation, voice switching, artificial intelligence, and robotics.

The newsletter is recommended for students of librarianship, communications, or business; corporate libraries for firms with stakes in video communication technologies; and library managers who see a future for their libraries in these areas. The frequency (twenty-four issues/year) and quality justify the \$180 price tag for those with serious interest in the videotex/teletext industry. Because of the substantive interpretation contained, back files are worth acquiring. *Brian Aveney, Blackwell North America, Lake Oswego, Oregon.* ■■

*VideoPrint*. 4(6): 1983 March 22. 17p.  
Available from: International Resource

## Other Recent Receipts

Listed here are books and other publications of potential interest to members of LITA, received for review. Some of these materials may be reviewed in later issues of ITAL.

*Information Technology in 1982*. Proceedings of the Annual Conference of the STATUS Users Group; 1982 September 19-20; University of Loughborough. London: Library Association; 1983. 115p. (LA conference proceedings series in library automation; 1) Includes bibliographical references. Available from: Oryx Press, Phoenix, Arizona. ISBN: 0-85365-626-6, softcover, \$12.50.

*Information Technology on Screen: New Approaches in Viewdata, Teletext, and Cable*. Proceeding of the Joint One Day Seminar held by Aslib/Institute of Information Scientists/Library Association; 1982 November 8; Polytechnic of the

South Bank. London: Library Association; 1983. v, 63p. (LA conference proceedings in library automation; 2) Available from: Oryx Press, Suite 103, 2214 North Central, Phoenix, AZ 85004. ISBN: 0-85365-736-X, softcover, \$12.

*Microcomputers for Libraries: How Useful Are They?* Beaumont, Jane; Krueger, Donald; eds. Ottawa: Canadian Library Association; 1983. 123p. Includes bibliographical references. ISBN: 0-88802-170-4, softcover, \$12.

Rohrlick, Paula. *Exploring the Arts: Films and Video Programs for Young Viewers*. New York, London: R. R. Bowker Company; 1982. xviii, 181p. Includes indexes. ISBN: 0-8352-1515-6, softcover, \$24.95, plus shipping and handling.

Teskey, F. N. *Principles of Text Processing*. Chichester: Ellis Horwood; New York: Halsted Press; 1982. 164p. (Ellis Horwood series in computers and their applications; 19) Bibliography: p.146-50. ISBN: 0-85312-264-4, Ellis Horwood library edition. ISBN: 0-85312-446-9, Ellis Horwood student edition. ISBN: 0-470-27335-6, Halsted Press, hardcover, \$49.95. ■■

### Statement of Ownership and Management

*Information Technology and Libraries* is published quarterly by the American Library Association, 50 E. Huron St., Chicago, IL 60611. Annual subscription price, \$10. American Library Association, owner; Brian Aveney, editor. Second-class postage paid at Chicago, Illinois. Printed in U.S.A. As a nonprofit organization authorized to mail at special rates (Section 132.122, *Postal Service Manual*), the purpose, function, and nonprofit status of this organization and the exempt status for federal income tax purposes have not changed during the preceding twelve months.

### Extent and Nature of Circulation

("Average" figures denote the number of copies printed each issue during the preceding twelve months; "Actual" figures denote number of copies of single issue published nearest to filing date—the September 1983 issue.) Total number of copies printed: Average, 8,158; Actual, 9,029. Paid circulation: not applicable (i.e., no sales through dealers, carriers, street vendors, and counter sales). Mail subscriptions: Average, 7,053; Actual, 7,273. Total paid circulation: Average, 7,053; Actual, 7,273. Free distribution by mail, carrier, or other means, samples, complimentary, and other free copies: Average, 475; Actual, 487. Total distribution: Average, 7,528; Actual, 7,760. Copies not distributed: Office use, left over, unaccounted, spoiled after printing: Average, 630; Actual, 1,269. Returns from news agents: not applicable. Total (sum previous three entries): Average, 8,158; Actual, 9,029.

Statement of Ownership, Management and Circulation (PS 3526, July 1982) for 1983 filed with the United States Post Office, Postmaster in Chicago, September 30, 1983.

## Letters

To the Editor:

A small, but significant typographical error could confuse readers of my letter on re-distribution of LC-MARC records, which appeared in the September issue of *ITAL*. In the final paragraph, the sentence referring to DOBIS users should read:

“. . . translation to DMARC and re-distribution in that format . . .”

DMARC stands for Dobis Machine Readable Cataloging, and is the communications format used by DOBIS installations.—*Selden S. Deemer, Library Systems Analyst, University of Michigan, Ann Arbor, Michigan.*

To the Editor:

Mentioned in the article on online catalogs by E. B. Brownrigg and C. A. Lynch (March 1983, p.110) is a story “Electronic publishing will be the death of copyright law” in the *Wall Street Journal* of December 7, 1982.

In fact, the *Wall Street Journal* of December 17, 1982 had a 20-line news item with this heading. Reference is made to an article published by I. de Sola Pool in *Daedalus. Proceedings of the American Academy of Arts and Sciences*. The Pool article appears in vol. 111, No. 4, Fall 1982. This is a thematic issue on ‘Print Culture and Video Culture’. The Pool article has the title ‘The Culture of Electronic Print,’ pages 17–31. This is a very well considered presentation, though the problem of ‘footnotes and copyright’ is only dealt with on pages 27–29. This issue of *Daedalus* has a number of other articles well worth reading. It seems that this journal is not covered by the abstracting and indexing services in the field of library and information science but the readers of *Information Technology and Libraries* might like to have their attention drawn to it.

The following issue of *Daedalus* again is a thematic issue on ‘Reading: Old and New’ (vol. 112, No. 1, Winter 1983). Here again the article by P. Starr ‘The Electronic

Reader’, page 143–156 is of great interest. ‘The electronic reader’ is not a new human species but another word the author uses for ‘computer’.—*Helmut Drubba, Universitätsbibliothek Hannover und Technische Informationsbibliothek, Hanover, West Germany.*

To the Editor:

I would like to comment on your guest editorial for March, 1983 in *Information Technology and Libraries*, titled “A Paradigm Shift in Library Science,” by Pauline A. Cochrane.

I and my library staff would certainly take issue with the statement that “. . . since Cutter’s time . . . most users of the library, want a catalog where they can find a particular item, a known item.” This may be true in a research environment, but in our experience in a two-year technical college, the subject approach to the catalog is absolutely a necessity for our students.

It is so important to us, that we carefully selected a vendor for our COM catalog project who would give us the author, title, and subject approach to our holdings. As a three-campus institution, we have long known that a union catalog with a subject approach is a necessity for us.

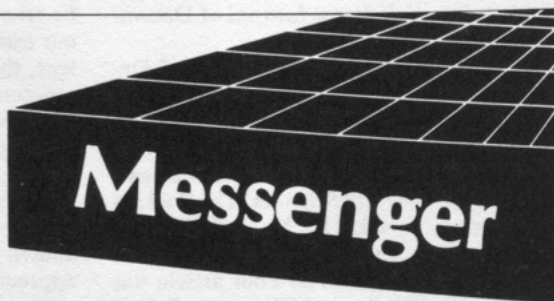
Therefore, we are eventually going to eliminate our card catalog for a microfiche catalog. We hope one day to be on line, but that is not in our immediate future.

In any case, we just find it hard to understand why the subject approach to the catalog should be such a “paradigm shift” in library science. To us it is a fact of life, and for me, personally, it has been the only approach for the fourteen years I have been in the two-year college library field. Is the gap between the practitioner and the professor that wide?—*Marion L. Vogel (Mrs. Harry Vogel), Dean of Learning Resources, Trident Technical College, Charleston, South Carolina.* ■■

### INDEX OF ADVERTISERS

American Library Association	page 476
Baker & Taylor	page 399
Blackwell North America	inside front cover
CLASS	pages 387, 466
Dataphase	inside back cover
EBSCO	page 349
Electric Memory, Inc.	page 388
Faxon	page 415
GRC	back cover
Information Design	page 461
Inforonics	page 451
JERA	page 457
Nova University	page 350
Research Publications	page 408
Systemhouse	page 425
Telex	page 439
TPS	page 392
UTLAS	page 363

**More  
Than a  
Modem**



### **An *Intelligent* Modem**

- Powerful text-editing capabilities
- Reduces connect time to online systems
- Autodial and redialing features
- Stores text and forms for repeated use
- Delayed transmission capability reduces phone charges
- Automatically answers and records incoming messages

**CLASS**

1415 Koll Circle, Suite 101 San Jose, CA 95112-4698  
ATTN: Online Services Coordinator (408) 289-1756

# Information Technology and Libraries: Index to Volume 2 (1983)

Compiled by Kieth C. Wright

- A & I Info to be Added to Conser* (N&A), 451-52
- Abstracting and Indexing Services. *A & I Info to be Added to Conser* (N&A), 451-52
- Access to Periodicals: Search Key versus Keyword*, Golden, Susan U. and Golden, Gary A., 26-32
- Acquisition Systems.
- BaTaPhone* (N&A), 450
- BISAC Transmission at Concordia Seminary* (Communication), Bielenberg, W. Larry, 173-76
- BISAC Variable Format* (R&WP), Book Industry Systems Advisory Committee, 191-210
- Dataphase Acquisitions Module* (N&A), 327
- Integrating Library and Book Trade Automation*, Bonk, Sharon C. 18-25
- Aguilar, William. *The Beginnings of LCS at Illinois*, 393-400
- American Chemical Society. *Chemical Research Journals Available Online* (N&A), 325
- American Library Association. *Library Technology Reports.*
- Grants to Develop Device to Protect Books When Photocopied* (N&A), 324-25
- Archival Automation. *Automated Bibliographic System for Manuscripts and Archives* (N&A), 122-23
- Information Management, Machine-Readable Records, and Administration* (Review), 458-60
- Online Manuscript Search Service* (Communication), Bland, Robert N. and Lloyd, James B., 295-300
- ASCLA. *ASCLA Offers Nonmembers Subscription to Interface* (N&A), 123
- Asher, Richard E. *Data Conversion* (Review), Carter, Ruth C. and Bruntjen, Scott, 454-55
- Association of Specialized and Cooperative Library Agencies. See ASCLA
- Attig, John C. *The Concept of a MARC Format*, 7-17
- Audio Recordings—Digital. *The Compact Disc: Library Application of an Audio Revolution* (Communication), Connolly, Bruce, 279-85
- Authority Files. *RLG's RLIN Authorities Subsystem Ready for Searching* (N&A), 218
- Shared. *The WLN/RLG/LC Linked Systems Project* (Communication), Davison, Wayne E., 34-46
- Automated Bibliographic System for Manuscripts and Archives* (N&A), 122-23
- Automated Systems—Security. *Security and Automated Library Systems: A Ticking Time Bomb?* (Communication), 265-71
- User Surveys. *Surveying Users of Automated Turnkey Systems* (Communication), Schwartz, Philip, 290-95
- Automation in a Special Library in Kuwait*, Khalid, Farooq A., 351-63
- Aveney, Brian.
- Editor's Notes: *Born-Ag' in Automation*, 4
- Editor's Notes: *Doctors*, 4
- Editor's Notes: *IBM Information Centers*, 245
- Editor's Notes: *Love of Cataloging*, 348
- Editor's Notes: *Moo Goo Gai Network*, 348
- Editor's Notes: *Next*, 348
- Editor's Notes: *Oldest Living Library Automation Systems?* 4
- Editor's Notes: *Refereeing*, 245
- Editor's Notes: *Thank You*, 348
- Editor's Notes: *Thanks*, 133
- Libraries and Librarians in an Age of Electronics* (Review), Lancaster, F. W., 245
- VideoPrint* [Newsletter] (Review), 463
- Videx Canada* [Journal] (Review), 126

- Avram, Henriette. *LITA/Gaylord*, 1983:  
Lawrence F. Buckland (Communication), 305-7  
*Status of Processing Services Automation in the Library of Congress*, 135-41
- BaTaPhone (N&A), 450
- BEACON: H. W. Wilson's *Computerized Information System*, McCarn, Davis B. and McCarn, Grace H., 142-50
- Bibliographic Databases. See also Online Catalogs.
- Microcomputers. *New BRS/DISC Database of Microcomputing Literature* (N&A), 217
- Monographic Literature Access. *Summary Recommendations from Subject Access Meeting* (R&WP), 116-19
- Searching. *Long Searches, Slow Response: Recent Experience on RLIN* (Communication), Crawford, Walt, 176-82
- Software. *BRS/SEARCH Information Retrieval Software Available* (N&A), 216-17
- Bibliographic Records—Computerized Systems. *The Bibliographic Record and Information Technology* (Review), Hagler, Ronald; Simmons, Peter, 331-32
- Conversion. *Data Conversion* (Review), Carter, Ruth C.; Bruntjen, Scott, 454-55
- Biblio-Techniques Acquires Circulation Software* (N&A), 325-26
- Bielenberg, W. Larry. *BISAC Transmission at Concordia Seminary* (Communication), 173-76
- BISAC Transmission at Concordia Seminary* (Communication), Bielenberg, W. Larry, 173-76
- BISAC Variable Format* (R&WP), Book Industry Systems Advisory Committee, 191-210
- Bishop, David F. *The CLR OPAC Study: Analysis of ARL User Response* (R&WP), 315-21
- BIZDATE [Electronic Journal]. *Electronic Business Magazine Updated Fifty-five Times Daily* (N&A), 453
- Bland, Robert N. *Online Manuscript Search Service* (Communication), 295-300
- BLIS Installations* (N&A), 450
- Block, David. *Selection of Word Processing Software for Library Use*, 252-60
- Bonk, Sharon C. *Integrating Library and Book Trade Automation*, 18-25
- The Book Club: Final Report* (Communication), Groseck, Pat, 285-88
- Book Industry Systems Advisory Committee. See BISAC
- Booktalking. *The Book Club: Final Report* (Communication), Groseck, Pat, 285-88
- Booktrade Automation. *Integrating Library and Book Trade Automation*, Bonk, Sharon C., 18-25
- To Boolean or not to Boolean?* (Guest Editorial), Hildreth, Charles R., 235-37
- Boss, Richard W. *Automating Library Acquisitions: Issues and Outlook* (Review), 222-23
- British Columbia Library Network* (N&A), 120
- Brownrigg, Edwin B. *Online Catalogs: Through a Glass Darkly*, 104-15
- BRS. BRS/SEARCH Information Retrieval Software Available* (N&A), 216-17
- New BRS/DISC Database of Microcomputing Literature* (N&A), 217
- BRS/SEARCH Information Retrieval Software Available* (N&A), 216-17
- Buckland, Lawrence F. (Award), *LITA/Gaylord*, 1983: Lawrence F. Buckland, Avram, Henriette D., 305-7
- Cable Television Programming. *The Book Club: Final Report* (Communication), Groseck, Pat, 285-88
- Carnegie Awards \$250,000 to RLG for Distributed Processing* (N&A), 217-18
- Carothers, Diane Foxhill. *The Beginnings of LCS at Illinois*, 393-400
- Carter, Nancy F. *Sheet Music Index on a Microcomputer* (Communication), 52-55
- Carter, Ruth C.; Bruntjen, Scott. *Data Conversion* (Review), 454-55
- Catalog Use Studies. *A Paradigm Shift in Library Science* (Guest Editorial), Cochrane, Pauline A., 3-4
- Cataloging Audiovisual Materials. *Online Audiovisual Catalogers* (N&A), 453
- Machine-Readable Data Files. *Machine-Readable Data Files*, Nasatir, Marilyn, 159-64
- Censorship or Selection: Choosing Books for Public Schools* [Videorecording] (Review), 223-24
- Checklist of Management Issues and Questions* (Appendix A), Miller, Charles E., 448-49
- Chemical Research Journals Available Online* (N&A), 325
- Chvtal, Donald P. *Automating Library Acquisitions: Issues and Outlook* (Review), Boss, Richard W., 222-23
- Circulation Systems. *The Beginnings of LCS at Illinois*, Carothers, Diane Foxhill and Aguilar, William, 393-400
- Biblio-Techniques Acquires Circulation Software* (N&A), 325-26
- Integrating Library and Book Trade Automation*, Bonk, Sharon C., 18-25
- [Old Circulation System] (letter), 342
- CITE NLM: Natural-Language Searching in an*

- Online Catalog, Doszkocs, Tamas E.  
364-80
- CLR. See Council on Library Resources
- The CLR OPAC Study: Analysis of ARL User Responses (R&WP), Bishop, David F., 315-21
- CLSI Demonstrates New Products at ALA Midwinter Meeting (N&A), 219-20
- CLSI Microcomputer Systems (N&A), 218-19
- Cochrane, Pauline, A. Guest Editorial: A Paradigm Shift in Library Science, 3-4
- The COINT\* Report \*Communications and Information Technology: A Multidisciplinary Approach [Journal] (Review), 224-26
- Collver, Randall L. Write, Edit & Print: Word Processing with Personal Computers (Review), McCunn, Donald, 334-35
- The Compact Disc: Library Application of an Audio Revolution (Communication), Connolly, Bruce, 279-85
- Computer-Assisted Instruction in an Academic Library, Wilson, Wayne, 389-92
- The Concept of a MARC Format, Attig, John C., 7-17
- Connolly, Bruce. The Compact Disc: Library Application of an Audio Revolution (Communication), 279-85
- CONSER. A & I Info to be Added to Conser (N&A), 451-52
- Convergence/Divergence: The Adolescence of Library Automation (Guest Editorial), Martin, Susan K., 347-48
- Corrections. DOBIS System (N&A) (Letter), 465
- Automating Library Acquisitions: Issues and Outlook (Review) Correction, 335
- Costs and Features of Online Catalogs: The State of the Art, Lawrence, Gary S., Matthews, Joseph R. and Miller, Charles E., 409-49
- Council on Library Resources. The CLR OPAC Study: Analysis of ARL User Responses (R&WP), Bishop, David F., 315-21
- Summary Recommendations from Subject Access Meeting (R&WP), Jones, C. Lee, 116-19
- Thus Spake the OPAC User, Markey, Karen, 381-87
- Using Online Catalogs: A Nationwide Survey (Review), 335-36
- Crawford, Walt. Long Searches, Slow Response: Recent Experience on RLIN, 176-82
- Data Communication Links. BISAC Variable Format (R&WP), 191-210
- UTLAS-Japan Communications Link (Communication), Gorsline, George Jr. and Powell, Wyley L., 33-34
- The WLN/RLG/LC Link Systems Project, Davison, Wayne E. 34-46
- Dataphase Acquisition Module (N&A), 327
- Davison, Wayne E. The WLN/RLG/LC Linked Systems Project, 34-46
- Deemer, Sheldon S. LC MARC Copyright Questioned (Letter), 340
- Desroches, Richard A. Shelf Space Management: A Microcomputer Application (Communication), 187-89
- Dewey Decimal Classification. MARC Coding of DDC for Subject Retrieval, Wajenberg, Arnold F., 246-51
- Distributed Processing. Carnegie Awards \$250,000 to RLG for Distributed Processing (N&A), 217-18
- The WLN/RLG/LC Linked Systems Project (Communication), Davison, Wayne E., 34-36
- Dodd, Sue A. Cataloging Machine-Readable Data Files: An Interpretive Manual (Review), 226-29
- Doszkocs, Tamas E. CITE NLM: Natural-Language Searching in an Online Catalog, 364-80
- Dougherty, Richard M.; Heinritz, Fred J. Scientific Management of Library Operations (Review), 455-56
- Dowler, Lawrence. Information Management, Machine-Readable Records, and Administration: An Annotated Bibliography (Review), Kesner, Richard M. (ed.) 458-60
- Eaton, Nancy. Vendor Support: Expectations and Realities (Guest Editorial), 132-33
- Electronic Business Magazine Updated Fifty-five Times Daily (N&A), 453
- Electronic Novel (N&A), 120-21
- Electronic Publishing. Chemical Research Journals Available Online (N&A), 325
- Drubba, Helmut. [Electronic Publishing] (letter), 465
- Electronic Business Magazine Updated Fifty-five Times Daily (N&A), 453
- Electronic Novel (N&A), 120-21
- EPB Newsletter (N&A), 326
- Multicomponent Electronic Encyclopedia (N&A), 325
- Engle, Mary E. Computing Resources for an Online Catalog, 58-72
- Epstein, Hank. MITINET/retro: Retrospective Conversion on an Apple (Communication), 166-73
- Ergonomic Guidelines—Terminals. Radiation, Ergonomics, Ion Depletion, and VDTs: Healthful Use of Visual Display Terminals, Miller, R. Bruce, 151-58
- Faxon and GEAC (N&A), 450-51

- Faxon Database of New Serials Titles* (N&A), 451
- Flecker, Dale. *The Bibliographic Record and Information Technology* (Review), Hagler, Ronald; Simmons, Peter, 331-32
- Fowler, Bonnie S. *Microcomputers for the Public in the Public Library*, 46-52
- Frost, Carolyn O. *Cataloging Nonbook Materials: Problems in Theory and Practice* (Review), 226-29
- Garten, Edward D. *Public Library Administrators' Planning Guide to Automation* (Review), Sager, Donald J., 462-63
- Scientific Management of Library Operations* (Review), Dougherty, Richard M.; Heinritz, Fred J., 455-56
- GEAC Computers International. *Faxon and GEAC* (N&A), 450-51
- Gellatly, Peter (ed.). *The Management of Serials Automation: Current Technology and Strategies for Future Planning* (Review), 460-62
- Old Systems* (Letter), 341-42
- Golden, Susan U. and Golden, Gary A. *Access to Periodicals: Search Key versus Keyword*, 26-32
- Gorsline, George Jr., *UTLAS-Japan Communications Link* (Communication), 33-34
- Graham, Vicki. *Monitoring and Evaluating MELVYL*, 93-104
- Grant to Develop Device to Protect Books When Photocopied* (N&A), 324-25
- Griffin, Hillis L. [Union List of Serials] (Letter), 342
- Groseck, Pat. *The Book Club: Final Report* (Communication), 285-88
- Hagler, Ronald; Simmons, Peter. *The Bibliographic Record and Information Technology* (Review), 331-32
- Hagyard, Alan E. *Using Online Catalogs: A Nationwide Survey* (Review), 335-36
- Hildreth, Charles R. Guest Editorial: *To Boolean or not to Boolean*, 235-37
- Hines, Theodore C. [Memorial]  
*In Memorium: Ted Hines*, Kollin, Dick, 323
- Huleatt, Richard S. *VIDACCESS* (Letter) 128
- IBM to Manufacture New OCLC Terminal* (N&A), 324
- ILS Users Group Formed* (N&A), 452
- In Memorium: Ted Hines*, Kollin, Dick, 323
- In-Depth: University of California MELVYL*, 2, 58-115
- Indexing.  
Computer Assisted. *BEACON: H. W. Wilson's Computerized Information System*, McCarn, Davis B., and McCarn, Grace H. 142-50
- Sheet Music. *Sheet Music Index on a Microcomputer* (Communication), Carter, Nancy F., 52-55
- Information Access Company Introduces Magazine Collection* (N&A), 328-29
- Information Science Collections. *Schultz Collection of Information Science Literature* (N&A), 214-15
- Information Society. *Information and Innovation* (Review), Aveney, Brian, 456-57
- Information and the Transformation of Society* (Review), Aveney, Brian, 458
- Information Technology and Libraries* [Journal].
- ITAL Authors Win OCLC Awards* (N&A), 324
- William Gray Potter Is Named New Editor of ITAL* (N&A), 212
- Integrated Systems. *BLIS Installations* (N&A), 450
- Integrating Library and Book Trade Automation*, Bonk, Sharon C., 18-25
- Northwestern to Offer NOTIS Service* (N&A), 326-27
- Integrating Library and Book Trade Automation*, Bonk, Sharon C., 18-25
- Intner, Sheila S. *Cataloging Machine-Readable Data Files: An Interpretive Manual* (Review), Dodd, Sue A., 226-29
- Cataloging Nonbook Materials: Problems in Theory and Practice* (Review), Frost, Carolyn O., 226-29
- Censorship or Selection: Choosing Books for Public Schools* [Videorecording] (Review), 223-24
- Nonprint Cataloging for Multimedia Collections: A Guide Based on AACR2* (Review), Rogers, JoAnn V. 226-29
- ITAL. See *Information Technology and Libraries*
- ITAL Authors Win OCLC Awards* (N&A), 324
- Jones, C. Lee. *Summary Recommendations from Subject Access Meeting* (R&WP), 116-19
- Kalyoncu, Aydan. *Selection of Word Processing Software for Library Use*, 252-60
- Kaplan, Denise. *Public Access to Online Catalogs: A Planning Guide for Managers* (Review), 332-34
- Kaske, Neal K. *Determining the Required Number of Online Catalog Terminals: A Research Study* (Communication), 261-65
- Katz, Bob. *Maggie's Place* [Videorecording] (Review), 230-31
- Kesner, Richard M. (ed.). *Information Management, Machine-Readable Records, and Administration: An Annotated*

- Bibliography* (Review), 458-60
- Kessler, Brett. *SOLOS: A Student-Oriented Information Retrieval System Using MARC Records* (Communication), 272-79
- Khalid, Farooq A. *Automation in a Special Library in Kuwait*, 351-63
- Kilgour, Frederick G. *Public Policy and National and International Networks*, 239-45
- Kollin, Dick. *In Memorium: Ted Hines*, 323
- Kuwait—Library Automation. *Automation in a Special Library in Kuwait*, Khalid, Farooq A., 351-63
- Lancaster, F. W. *Libraries and Librarians in an Age of Electronics* (Review), 229-30
- Lanier, Don. *The Management of Serials Automation: Current Technology and Strategies for Future Planning* (Review), Gellatly, Peter (ed.), 460-62
- Managing the Serials Explosion; the Issues for Publishers and Libraries* (Review), Taylor, David C., 460-62
- Serials Management in an Automated Age: Proceedings of the First Annual Serials Conference, October 30-31, 1981, Arlington, Va.* (Review), Melin, Nancy Jean (ed.), 460-62
- Larson, Ray R. *Monitoring and Evaluating MELVYL*, 93-104
- Lawrence, Gary S. *Costs and Features of Online Catalogs: The State of the Art*, 409-49
- Lazerow Memorial Lecture (Columbia University). *Public Policy and National and International Networks*, Kilgour, Frederick G., 239-45
- Library Automation—Kuwait. *Automation in a Special Library in Kuwait*, Khalid, Farooq A., 351-63
- Public Libraries. *Public Library Administrators' Planning Guide to Automation* (Review), 462-63
- Library Computer System (LCS). *Access to Periodicals: Search Key versus Keyword*, Golden, Susan U. and Golden, Gary A., 26-32
- The Beginnings of LCS at Illinois*, Carothers, Diane Foxhill and Aguilar, William, 393-400
- Library HI-Tech* [Journal] (N&A) 215-16
- Library Information and Technology Association. See LITA.
- Library Management. *Scientific Management of Library Operations* (Review), Dougherty, Richard M.; Heinritz, Fred J., 455-56
- Library of Congress. *Status of Processing Services Automation in the Library of Congress*, Avram, Henriette D., 135-41
- The WLN/RLG/LC Linked Systems Project* (Communication), Davison, Wayne E., 34-46
- LIBRIS II. *Integrating Library and Book Trade Automation*, Bonk, Sharon C., 21
- LITA. Vendor/User Discussion Group. *Vendor Support: Expectations and Reality* (Guest Editorial), Eaton, Nancy L., 132-33
- LITA/Gaylord Award 1983: Lawrence F. Buckland (Communication), Avram, Henriette D., 305-7
- Lloyd, James B. *Online Manuscript Search Service* (Communication), 295-300
- Long Searches, Slow Response Time: Recent Experience on RILIN*, Crawford, Walt, 176-82
- Lynch, Clifford. *Computing Resources for an Online Catalog*, 58-72
- Online Catalogs: Through a Glass Darkly*, 104-15
- Telecommunications for an Online Catalog*, 73-86
- Machine-Readable Data Files and Networks*, Nasatir, Marilyn, 159-64
- McCarn, Davis, B. *BEACON: H. W. Wilson's Computerized Information System*, 142-51
- McCarn, Grace H. *BEACON: H. W. Wilson's Computerized Information System*, 142-51
- McCunn, Donald. *Write, Edit & Print: Word Processing with Personal Computers* (Review), 334-35
- Maggie's Place* [Videorecording] (Review), 230-31
- Maps—Subject Access. *Subject Approach Important for Maps* (Letter), Post, J. B., 340-41
- MARBI (Committee on the Representation in Machine-Readable Form of Bibliographic Information.)
- The USMARC Formats—Underlying Principles* (R&WP), 309-15
- MARC Coding of DDC for Subject Retrieval*, Wajenberg, Arnold S., 246-51
- MARC Format. The Concept of a MARC Format*, Attig, John C., 7-17
- Machine-Readable Data Files and Networks*, Nasatir, Marilyn, 159-64
- MARC Coding of DDC for Subject-Retrieval*, Wajenberg, Arnold S., 246-51
- The USMARC Formats—Underlying Principles* (R&WP), 309-15
- The WLN/RLG/LC Linked Systems Project* (Communication), Davison, Wayne E., 34-46
- MARC Tapes—Copyright. LC MARC Copyright Questioned* (Letter), 340
- Markey, Karen. *Thus Spake the OPAC User*, 381-87

- Marks, Taube. *PERLINE at Risley* (Communication), 56-57
- Martin, Susan K. Guest Editorial: *Convergence/Divergence: The Adolescence of Library Automation*, 347-48
- Matthews, Joseph R. *The COINT\* Report \*Communication and Information Technology: A Multidisciplinary Approach* [Journal] (Review), 224-26
- Costs and Features of Online Catalogs: The State of the Art*, 409-49
- Public Access to Online Catalogs: A Planning Guide for Managers* (Review), 332-34
- Security and Automated Library Systems: A Ticking Time Bomb?* (Communication), 265-71
- Matthews, Sidney. [Old Circulation System] (Letter), 342
- Media Society Seminars. *Censorship or Selection: Choosing Books for Public Schools* [Videorecording] (Review), 223-24
- Melin, Nancy Jean. *Serials Management in an Automated Age: Proceedings of the First Annual Serials Conference, October 30-31, 1981, Arlington, Va.* (Review), 460-62
- Melvin, Sister M. Constance. *Profile Software Package* (Letter), 341
- MELVYL. *Computer Resources for an Online Catalog*, Lynch, Clifford A., Engle, Mary E., and Needleman, Mark H. 58-72
- In-Depth: University of California MELVYL*, 2, 58-115
- Monitoring and Evaluating MELVYL*, Larson, Ray R. and Graham, Vicki, 93-104
- Online Catalogs: Through a Glass Darkly*, Brownrigg, Edwin, B. and Lynch, Clifford A., 104-15
- Telecommunications for an Online Catalog*, Shaughnessy, David L. and Lynch, Clifford A., 73-86
- Terminals for a User-Friendly Library System*, Price, Bennett J., 87-92
- Microcomputer Applications. *Convergence/Divergence: The Adolescence of Library Automation*, (Guest Editorial), Martin, Susan K., 347-48
- Microcomputers for the Public in the Public Library* (Communication), Fowler, Bonnie S. and Smith, Duncan, 46-52
- The Personal Bibliographic System: A System for Creating and Maintaining Bibliographies*, (Communication), Rosenberg, Victor, 184-87
- Profile Software Package* (Letter), 341
- Sheet Music Index on a Microcomputer*, (Communication), Carter, Nancy F., 52-55
- Shelf Space Management: A Microcomputer Application* (Communication), Desroches, Richard A. and Rudd, Marie, 187-89
- Microcomputer Systems. *CLSI Microprocessor System* (N&A), 218-19
- Microcomputers in Libraries: Option or Necessity?* [audiocassette recording] *Proceedings of the CLASS Workshop, 1982 May 20-21, San Jose, Calif.* (Review), 125-26
- Microcomputers for the Public in Public Libraries* (Communication), Fowler, Bonnie S. and Smith, Duncan, 46-52
- Miller, Charles E. *Checklist of Management Issues and Questions* (Appendix A), 448-49
- Costs and Features of Online Catalogs: The State of the Art*, 409-49
- Minnesota Becomes First Tapeloading Member of OCLC* (N&A), 215
- National Scientific and Technical Information Center—Kuwait. *Automation in a Special Library in Kuwait*, Khalid, Farooq A., 351-63
- Needleman, Mark H. *Computing Resources for an Online Catalog*, 58-72
- Networks. See also Online Systems
- British Columbia Library Network* (N&A), 120
- Public Policy and National and International Networks*, Kilgour, Frederick, G., 239-45
- Study of Library Network Agreements* (N&A), 219
- The WLN/RLG/LC Linked Systems Project* (Communication), Davison, Wayne E., 34-46
- New BRS/DISC Database on Microcomputing Literature* (N&A), 217
- Ninety-four Percent of Users Prefer Online Catalogs over Card Catalogs* (N&A), 213
- Northwestern to Offer NOTIS Services* (N&A) 326-27
- OCLC. Awards. *ITAL Authors Win OCLC Awards* (N&A), 324
- Copyright. *OCLC Copyrights Database* (N&A), 212-13
- Local Systems. *OCLC Accelerates Development of Local System with Agreement with Online Computer Systems* (N&A), 213-14
- Statistics. *OCLC's Nine Million Record* (N&A), 121-22
- Tapeloading. *Minnesota Becomes First Tapeloading Member of OCLC* (N&A), 215
- Terminals. *IBM to Manufacture New OCLC Terminal* (N&A), 324
- OCLC Accelerates Development of Local System with Agreement with Online Computer Systems* (N&A), 213-14
- OCLC Copyrights Database* (N&A), 212
- On-Line Audiovisual Catalogers* (N&A), 453
- Online Catalogs. See also Online Systems

- Computing Resources for an Online Catalog*, Lynch, Clifford A., Engle Mary E., and Needleman, Mark H., 58-72
- Online Catalogs: Through a Glass Darkly*, Brownrigg, Edwin B. and Lynch, Clifford A., 104-15
- RLIN Database Expanded by Close to Four Million Bibliographic Records (N&A)*, 452-53
- Costs. Costs and Features of Online Catalogs: The State of the Art*, Lawrence, Gary S., Matthews, Joseph R. and Miller, Charles E., 409-49
- Evaluation. Monitoring and Evaluating MELVYL*, Larson, Ray R. and Graham, Vicki, 93-104
- Planning. Public Access to Online Catalogs: A Planning Guide for Managers (Review)*, 332-34
- RLIN. Long Searches, Slow Response: Recent Experience on RLIN (Communication)*, Crawford, Walt, 176-82
- Searching. To Boolean or not to Boolean?* (Guest Editorial), Hildreth, Charles R., 235-37.
- CITE NLM: Natural-Language Searching in an Online Catalog*, Doszkocs, Tamas E., 364-80
- Terminals. Touch-Screen versus Keyboard Terminals for Online Catalogs (Communication)*, Watson, Peter G., 182-84
- User Studies. The CLR OPAC Study: Analysis of ARL User Responses (R&WP)*, Bishop, David F., 315-21
- Ninety-four Percent of Users Prefer Online Catalogs over Card Catalogs (N&A)*, 213
- Thus Spake the OPAC User*, Markey, Karen, 381-87
- Using Online Catalogs: A Nationwide Survey (Review)*, 335-36
- Online Computer Library Center. See OCLC Online Systems. Automation in a Special Library in Kuwait*, Khalid, Farooq A., 351-63
- Dataphase Acquisitions Module (N&A)*, 327
- Northwestern to Offer NOTIS Service (N&A)*, 326-27
- Online Manuscript Search Service (Communication)* Bland, Robert N. and Lloyd, James B., 295-300
- SOLOS: A Student-Oriented Information Retrieval System Using MARC Records (Communication)*, Kessler, Brett and Shaw, Deborah, 272-79
- USB E and UTLAS (N&A)*, 327-28
- Information Access Company Introduces Magazine Collection (N&A)*, 328-29
- PERLINE at Risley (Communication)*, Marks, Taube, 56-57
- The Personal Bibliographic System: A System for Creating and Maintaining Bibliographies (Communication)*, Rosenberg, Victor, 184-87
- Post, J. B. Subject Approach Important for Maps (letter)*, 340-41
- Potter, William Gray. William Gray Potter Is Named New Editor of ITAL (N&A)*, 212
- Powell, Faye. Microcomputers in Libraries: Option or Necessity?* [audiocassette recording] (Review), 125-26
- Powell, Wyley L. UTLAS-Japan Communications Link (N&A)*, 33-34
- Price, Bennett J. Terminals for a User-Friendly Library System*, 87-92
- Price, Mary S. Status of Processing Services Automation in the Library of Congress*, 135-41
- Public Access Online Catalogs. See Online Catalogs.*
- Public Libraries—Automation. Public Library Administrators' Planning Guide to Automation (Review)*, Sager, Donald G., 462-63
- Microcomputer Use. Microcomputers for the Public in Public Libraries (Communication)*, Fowler, Bonnie S. and Smith, Duncan, 46-52
- Public Policy and National and International Networks*, Kilgour, Frederick G., 239-45
- Pulsifer, Josephine S. Status of Processing Services Automation in the Library of Congress*, 135-41
- Radiation, Ergonomics, Ion Depletion, and VDTs: Healthful Use of Visual Display Terminals*, Miller, R. Bruce, 151-58
- Research Library Group (RLG). Carnegie Awards \$250,000 to RLG for Distributed Processing (N&A)*, 217-18
- RLG's RLIN Authorities Subsystem Ready for Searching (N&A)*, 218
- RLG's RLIN Authorities Subsystem Ready for Searching (N&A)*, 218
- RLIN. Long Searches, Slow Response: Recent Experience on RLIN (Communication)*, Crawford, Walt, 176-82
- RLIN Database Expanded by Close to Four Million Bibliographic Records (N&A)*, 452-53
- Rogers, JoAnn V. Nonprint Cataloging for Multimedia Collections: A Guide Based on AACR2 (Review)*, 226-29
- Roland, Barbara, J. Status of Processing Services Automation in the Library of Congress*, 135-41
- A Paradigm Shift for Library Science (Guest Editorial)*, Cochrane, Pauline A., 3-4
- Periodical Collections—Microfilm Retrieval.*

- Rudd, Marie. *Shelf Space Management: A Microcomputer Application* (Communication), 187-89
- Salo, Annette C. *Special Report: ALA-TV* (Communication), 302-5
- Sanders, Nancy P. *Determining the Required Number of Online Catalog Terminals: A Research Study* (Communication), 261-65
- School Practices Information Network (SPIN). *Scott, Foresman & Company—SPIN Distributors* (N&A), 219
- Schultz *Collection of Information Science Literature* (N&A), 214-15
- Schwartz, Philip. *Surveying Users of Automated Turnkey Systems* (Communication), 290-95
- Scott, *Foresman & Company—SPIN Distributors* (N&A), 219
- Security and the Automated Library System: A Ticking Time Bomb?* (Communication), Matthews, Joseph R., 265-71
- Selection of Word Processing Software for Library Use*, Block, David and Kalyoncu, Aydan, 252-60
- Serials Systems. *A & I Info to be Added to Conser* (N&A), 451-52  
*Faxon and GEAC* (N&A), 450-51  
*Faxon Database of New Serials Titles* (N&A), 451  
*The Management of Serials Automation: Current Technology and Strategies for Future Planning* (Review), Gellatly, Peter (ed.), 460-62  
*Managing the Serials Explosion; the Issues for Publishers and Librarians* (Review), Taylor, David C., 460-61  
*Old Systems* (Letter), Corbin, Roberta A., 341-42  
*Serials Management in an Automated Age: Proceedings of the First Annual Serials Conference, October 30-31, 1981, Arlington, Va.* (Review), Melin, Nancy Jean (ed.), 460-61  
*Union List of Serials* (Letter), Griffin, Hollis L., 342
- Shaughnessy, David L. *Telecommunications for an Online Catalog*, 73-86
- Shaw, Deborah. *SOLOS: A Student-Oriented Information Retrieval System Using MARC Records* (Communication), 272-79
- Shelf Space Management: A Microcomputer Application* (Communication), Desroches, Richard A. and Rudd, Marie, 187-89
- Smith, Duncan. *Microcomputers for the Public in the Public Library* (Communication), 46-52
- SOLOS: A Student-Oriented Information Retrieval System Using MARC Records* (Communication), Kessler, Brett and Shaw, Deborah, 272-79
- Special Report: ALA-TV* (Communication), Salo, Annette C., 302-5
- Stern, Barrie T. (ed.). *Information and Innovation* (Review), 456-58
- Study of Library Network Agreements*, 219
- Subject Access. [Subject Access] (Letter), Vogel, Marion L., 465
- Monographic Literature. *Summary Recommendations for Subject Access Meeting* (R&WP), Jones, C. Lee, 116-19
- Maps. *Subject Approach Important for Maps* (Letter), Post, J. B., 340-41
- Studies. *A Paradigm Shift in Library Science* (Guest Editorial), Cochrane, Pauline A., 3-4
- Summary Recommendations from Subject Access Meeting* (R&WP), Jones, C. Lee, 116-19
- Surveying Users of Automated Turnkey Systems* (Communication), Schwartz, Philip, 290-95
- Sweeney, G. P. (ed.). *Information and the Transformation of Society* (Review), 458
- Taylor, David C. *Managing the Serials Explosion; the Issues for Publishers and Librarians* (Review), 460-62
- Teleconference Programs. *Special Report: ALA-TV* (Communication), Salo, Annette C., 302-5
- Terminals. *IBM to Manufacture New OCLC Terminal* (N&A), 324
- Environmental Factors. *Radiation, Ergonomics, Ion Depletion, and VDTs: Healthful Use of Visual Display Terminals*, Miller, R. Bruce, 151-58
- Selection. *Determining the Required Number of Online Catalog Terminals: A Research Study* (Communication), Tolle, John E., Sanders, Nancy P., and Kaske, Neal K., 261-65
- Terminals for a User-Friendly Library System*, Price, Bennett J., 87-92
- Touch-Screen versus Keyboard Terminals for Online Catalogs* (Communication), Watson, Peter G., 182-84
- Thus Spake the OPAC User*, Markey, Karen, 381-87
- Tolle, John E. *Determining the Required Number of Online Terminals: A Research Study* (Communication), 261-65
- Tonkery, Dan. *Tonkery Joins Faxon* (N&A), 123
- Touch-Screen versus Keyboard Terminals for Online Catalogs* (Communication), Watson, Peter C., 182-84
- USBE and UTLAS* (N&A), 327-28

*The USMARC Formats—Underlying Principles*  
(R&WP), 309-15

*UTLAS-Japan Communications Link*  
(Communication), Gorsline, George Jr.  
and Powell, Wyley L., 33-34

*Vendor Support: Expectations and Realities*  
(Guest Editorial), Eaton, Nancy, L.,  
132-33

*VideoPrint* [Newsletter] (Review), 463

*Videotex Canada* [Journal] (Review), 126-27

Vogel, Marion L. [Subject Access] (letter), 465

Wajenberg, Arnold S. *MARC Coding of DDC*  
*for Subject Retrieval*, 246-51

Washington Library Network (WLN). *Access to*  
*Periodicals: Search Key versus Keyword*,  
Golden, Susan U. and Golden, Gary A.,  
26-32

*The WLN/RLG/LC Linked Systems Project*

(Communication), Davison, Wayne E.,  
34-46

Watson, Peter G. *Touch-Screen versus*  
*Keyboard Terminals for Online Catalogs*  
(Communication), 182-84

*William Gray Potter Is Named New Editor of*  
*ITAL* (N&A), 212

Wilson, Wayne. *Computer-assisted Instruction*  
*in An Academic Library*, 389-392

WLN. See Washington Library Network  
(WLN).

*The WLN/RLG/LC Linked Systems Project*  
(Communication), Davison, Wayne E.,  
34-46

Word Processing. *Selection of Word Processing*  
*Software for Library Use*, Block, David  
and Kalyoncu, Aydan, 252-60

*Write, Edit & Print: Word Processing with*  
*Personal Computers* (Review), McCunn,  
Donald, 334-35

# Information management resources

# from the American Library Association

---

## Online Searching Technique and Management

Edited by  
James J. Maloney

All facets of reference service using online searching, from the reference interview to financial management, are treated in this collection of seventeen papers.

0-8389-3285-1 vii, 195p.  
\$25.00 paper 1983

---

## A Reader on Choosing an Automated Library System

Compiled and edited by  
Joseph R. Matthews

A series of forty key articles pertaining to the consideration, selection, and implementation of automated library systems.

0-8389-0383-5 Approx. 400p.  
\$35.00 paper November 1983

---

DISTRIBUTED BY THE ALA

## Directory of Information Management Software for Libraries, Information Centers, Record Centers

Compiled and edited by  
Pamela Cibbarelli, Carol Tenopir,  
and Edward John Kazlauskas

Basic information on available software options according to various criteria such as hardware, record format, size, and cost.

0-913203-00-9 133p. \$45.00 paper 1983  
(published by Cibbarelli and Associates,  
Inc., Studio City, Calif.).



Address orders and inquiries to  
**American Library Association**  
Publishing Services  
50 East Huron Street  
Chicago, Illinois 60611

# WHY WE WERE THE FIRST LIBRARY AUTOMATION COMPANY TO SUPPORT THE FULL MARC RECORD.



**D**ataPhase was the first to provide many currently accepted preferences for library automation software.

We were the first to design an integrated system with extensive interaction and information sharing among all online functions.

We were the first to provide a flexible parameterization capability that enables the library to change any systemwide parameter.

And we were the first to design a system that takes full advantage of the abundance of access points available in a MARC database. Access points that are critical for successful inquiry and online catalogs.

Sensitivity to present and future library

needs has made DataPhase the leader in library automation. And ALIS the most powerful library automation tool available today.

ALIS' integrated functions include Circulation, Technical Services, Acquisitions, Public Access Catalog, Materials and Film Booking, Authority, Inventory, Reserve Book Room and C.O.M. Support.

For more information, you can reach a marketing representative at 816-931-7927.



**DataPhase**

**YOU NEED TO KNOW THE DIFFERENCE.**

EXP 12-83 K MO03385001  
NANCY B OLSON  
BOX 863  
LAKE CRYSTAL MN 56055

# CONQUER YOUR CONVERSION



## Quality COM Catalogs and a Powerful Resource Database

- All 6 MARC formats
- Over 3.5 million records
- Local record modification
- Authority control

Contact: Vera Fessler  
Toll Free: 800-235-6788  
In California: 805-964-7724 (collect)

General Research Corporation P.O. Box 6770 Santa Barbara, California 93160-6770

**GRC.COM** **GRC.COM** **GRC.COM** **GRC.COM**