Volume 6
Number 4

ISSN 0730-9295

Information Technology and Libraries

December 1987

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ITLBDC 6(4) 249–344 (1987); Inf Technol Libr

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Information Technology and Libraries

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:* Linda J. Knutson. 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 1987 issue.

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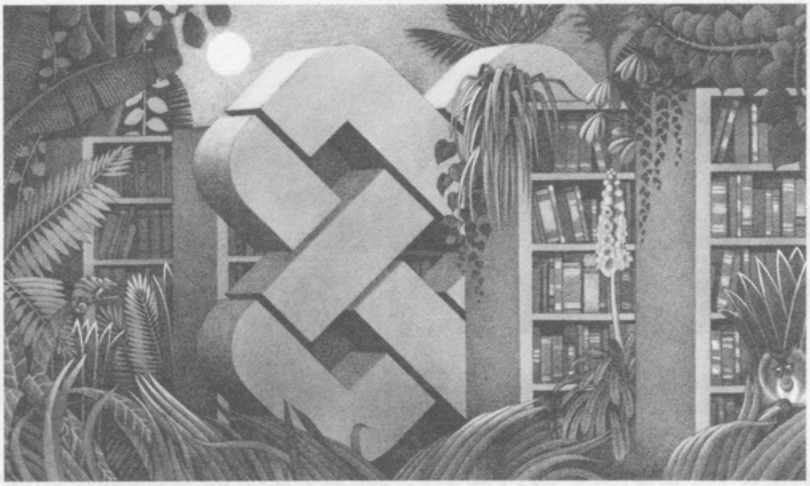
Information Technology and Libraries is a prerequisite of membership in the Library and Information Technology Association. Subscription price, $17.50, is included in membership dues. Nonmembers may subscribe for $35 per year. Single copies, $9. Second-class postage paid at Chicago, Illinois, and at additional mailing offices. *Postmaster:* Send address changes to *Information Technology and Libraries*, 50 E. Huron St., Chicago, IL 60611.

Circulation and Production: Central Production Unit, American Library Association, 50 E. Huron St., Chicago, IL 60611.

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, Otdyelnyi Vypusk,* and *Science Abstracts Publications.* Indexed in *CompuMath Citation Index, Computer Contents, Computer Literature Index, Current Contents/Health Services Administration, Current Contents/Social & Behavioral Sciences, Current Index to Journals in Education, Education, Library Literature, Magazine Index, NewSearch,* and *Social Sciences Citation Index.* Microfilm copies available to subscribers from University Microfilms, Ann Arbor, Michigan.

The paper used in this publication meets the minimum requirements of American National Standard for Information Sciences—Permanence of Paper for Printed Library Materials, ANSI Z39.48-1984. ♾



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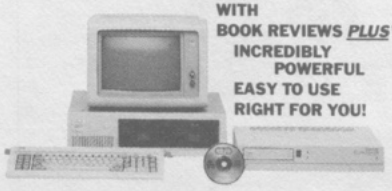

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A Technical Evaluation of the Linked Systems Project Protocols in the Name Authority Distribution Application

Michael J. McGill, Larry L. Learn, and Thomas K. G. Lydon

OCLC Online Computer Library Center, Inc.'s implementation of the Linked Systems Project (LSP) protocols in the Name Authority Distribution Application has enabled these protocols to be technically evaluated in actual operation. This paper reviews establishing the protocols and the requirements they were designed to meet and reports on OCLC implementation-specific experience using the protocols. The purpose of this evaluation is to examine the operational characteristics of LSP at one installation. Since one implementation may differ significantly from another, it is not safe to generalize to all system implementations; however, similarities among various implementations are expected. The results focus on improving performance and reinforce the need to bring the LSP protocols into compliance with the Open System Interconnection (OSI) protocols.

The Linked System Project (LSP), formally under way since 1980, has two components, according to Sally McCallum: (1) the Authorities Implementation and (2) the Standard Network Interconnection. The "Authorities Implementation, the first of the LSP applications, involves the development and maintenance of a consistent, replicated database of name authority headings. Standard Network Interconnection encompasses the development, coordination, and implementation of the LSP protocols."[1]

In 1977 the Network Advisory Group (NAG) at the Library of Congress (LC) echoed the words of the National Commission on Libraries and Information Science (NCLIS), which recommended establishing a network in the study *Resources and Bibliographic Support for a National Library Program*.[2] According to this report, the network would consist of three coordinated goals:

1. Design a resource system that will provide guaranteed access to all needed materials by designating or developing libraries and other information facilities that will provide such access and by coordinat-

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ing collection development support to ensure that needed materials are collected and available.

2. Design a bibliographic system that will provide a unique authoritative bibliographic description for each item held in guaranteed access and its location. This system should also provide related technical processing services aimed at reducing duplicate library functions to permit greater cost effectiveness in processing library materials and better staff utilization in local libraries.

3. Design a communication system that will provide online bibliographic data and requests for data and services between levels of the network. The system should facilitate communications among the multiple components of the national library network and include educational and training programs for staffs and users.

These goals translated into a series of tasks that provided a blueprint for developing the library bibliographic component of a national information and library service network. The tasks identified were to be carried out by three groups: a network coordinating agency, operational units of LC, and other network organizations. The tasks for the network coordinating agency included

> Design the technical network configuration or architecture. This includes the functional specifications and system design for hardware, software, and communication equipment that meets the local, regional, and national networking requirements. Included too were message transmission, the identification of standard protocols, computer and communication requirements, and search query normalization.[3]

Also in 1977, NCLIS and the National Bureau of Standards (NBS) Task Force on Computer Network Protocols issued a publication entitled *A Computer Network Protocol for Library and Information Science Applications*. This task force, with representatives from the library and information science community, was to develop a computer-to-computer protocol for the bibliographic component of the National Library and Information Science Network. Meeting several times over a twelve-month period, these members established a generalized, application-level, computer-to-computer protocol. In this report they noted that "initially, the Network probably will consist of the interconnection of the computers operated by: (1) bibliographic service centers such as BALLOTS, OCLC, and WLN; (2) the regional networks, such as NELINET and SOLINET; (3) the large libraries such as the Library of Congress and the New York Public Library; (4) members of the private sector."[4] The task force recommended a five-level protocol suite including a hardware level, a link level, a network level, an end-to-end level, and an application level. This was consistent with the OSI architecture assuming that the bottom hardware layer is the lower three layers of the existing OSI protocols.

In a 1978 study on LC's role in the evolving national network, it was concluded that "nearly everyone in the library community also recognizes that while the Library of Congress has been the leader in the acquisition of resources and in providing services on a broad scale, it has not been a leader in the application of computer technology to bibliographic services. The library community realizes that LC has not had the required machine and manpower resources, either in quantity or type, to meet the demands for computer services and to support national network needs. . . . All networks interviewed said that LC should also lead in standards development."[5] Some said that LC should do more to encourage the use of standards by the library community and to promote their use through closer association with the American National Standards Institute (ANSI). This role was recommended because LC has (1) an excellent record in the work done thus far, (2) a national and international prominence, (3) a need for flexible standards likely to suit a broad range of problems throughout the community, and (4) the staff to devote to standards development tasks.

These activities are synthesized by Henriette Avram and David Hartmann who describe the priority recommendations for a coordinating agency.[6] This group was to establish a task force made up of technical staff from library networking organizations with operational automated systems. The task force charge was to de-

sign a network configuration/architecture that included an analysis of technical networking problems, identification of projects, and preparation of task proposals that would lead to a general specification for hardware, software, and communication configurations. This communication configuration would be efficient and cost effective, meeting local, multistate, and national networking needs. It was at the mandate of this group that the NCLIS/NBS applications level protocol was created.[7] The intention was that the protocol would be built upon standard data communication protocols established by national and international standards organizations.

As the organization evolved, it was determined that the network should be divided into two distinct parts: (1) the message delivery system to transmit messages reliably between computer systems on the network and (2) the message processing system composed of the application programs and services to reside on each host computer system. Among the questions to be resolved were the search query and response formats. Since the various host systems used different queries, structures, and response formats, a protocol was needed, creating a structure for identifying and transmitting data to support the queries, responses, error messages, etc., of these systems. These activities culminated in a five-year plan supported by the Council on Library Resources (CLR). The plan had a projected budget of approximately $6 million, and as of 1979, the Council had committed approximately $2 million to the project. Since 1980, CLR has made nearly $2.5 million available in grants for LSP-related efforts.[8]

In 1983 Wayne Davison described the current state of the Linked Systems Project, as it then became known, as the development of "an online communications link and intersystem data retrieval and maintenance facility to support the shared authority file. The communications link [was to] enable heterogeneous computer systems to exchange data."[9] Davison was careful to note that the LSP project was supporting the Name Authority File Service (NAFS) and that this would help to overcome the barrier to effective exchange of bibliographic data. According to Davison, "the NAFS and the retrieval facilities would serve as the basis for future sharing of bibliographic data. Thus, the LSP will provide the foundations for a national bibliographic network." Davison went on to explain that the computer-to-computer communications link would eventually be used for the "sharing of full catalog records, location in holdings data, the transmittal of interlibrary loan requests, communication of book vendors, et al." At that point LSP was divided into three segments identified as Project 1, which was the requirements definition segment; Standard Network Interconnection (SNI), which was the telecommunications component; and Authorities Implementation, which was the applications activity to prove the feasibility of LSP.

According to Davison, the possible solutions included the criterion that the telecommunications link design should follow the OSI reference model. He stated that "the preferred solution was one based on the ISO [International Standards Organization] Open Systems Interconnection Basic Reference Model. . . . Each institution will use a minicomputer to interface with the Telenet public data networking using the CCITT [International Consultative Committee for Telegraphy and Telephony] Recommendation X.25. Software support for the X.25 protocol will be supplied by the minicomputer vendors. The three participants will jointly develop minicomputer software to implement the end-to-end Transport protocol being adopted by ANSI, CCITT, and ISO."[10]

Ray Denenberg and Sally McCallum noted that "a linked systems approach was a realistic and cost-effective alternative to a single network."[11] They correctly note that this approach of not changing systems with differing environments but connecting them in an open manner was highly desirable. The approach taken by the LSP and the standards community was to develop the OSI model. Two systems using OSI communicate with each other following a well-established communication procedure. Denenberg and McCallum expected that librarians, long supportive of the use of standards, would regard the OSI model as a welcome solution. In the LSP approach to

establishing computer-to-computer communications, an individual sitting at a terminal connected to one system asks that system to communicate with a second system on which there is presumably desirable information. When the first computer interacts with the second computer via the computer-to-computer protocol, the answer is received at the first computer and transmitted back to the user. Thus, the user makes a request to a remote system by interacting with an application at the local system. The local system, in turn, interacts with the remote system. The local system then communicates the results of this interaction back to the user. While the logic is very similar to that of early batch systems, the new technology may allow users to believe that they are communicating directly with the remote system. However, it is equally possible, given constraints on the processing power, communication lines, etc., that the users will view this process as a batch-oriented system. These user/performance data are not available.

Denenberg notes that "the choice of OSI as a network architecture to be used was a pioneering decision. . . . LSP was perhaps the first major networking project in the world to commit to OSI. When this commitment was made, only a draft version existed of what later was to become the OSI reference model."[12] He further states that a document (SNI.30) was developed for LSP implementors. According to Denenberg, SNI.30 serves three purposes:

1. The ISO protocol documents do not support implementation; that is not their purpose. SNI.30 presents the protocol formats and procedures consistently, concisely, and clearly.

2. For protocols lacking in international standards, the SNI protocols, in lieu of standards, are documented.

3. Even when an international standard exists, protocol choices must be made. The SNI.30 document presents these choices for SNI.

From this document, LSP protocol implementations have been developed. The protocols and their individual implementations have now been installed for the distribution of the Name Authority Records at the Library of Congress, the Research Libraries Information Network (RLIN), and OCLC. The rest of this paper will present OCLC's experience with the use of the LSP protocols in this distribution facility.

EVALUATION

The purpose of this evaluation is to examine the operational characteristics of LSP at one installation. Since implementations may differ significantly, it is not safe to generalize to all systems' implementations. However, since the OCLC implementation of the LSP protocols is the most recent of the three organizations, we have the experiences of the Library of Congress and the Research Libraries Information Network upon which to build. Thus, many similarities are expected in the individual evaluations.

Areas of Evaluation

The evaluation of any computer-based information systems should consider the following levels: functional—this includes a consideration and a comparison of the implemented system with the stated requirements of the system; performance—this measures the efficiency of a functionally satisfactory system; operational—this decides the operational characteristics of the system in comparison to the previous operational processes.

Functional Evaluation

The functional requirements for the LSP are given perhaps most comprehensively in the *Name Authority Cooperative/Name Authority File Service* (*NACO/NAFS*) published by the Council on Library Resources in May 1984.[13]

The stated purposes of the original Name Authority File Service (1981) were modified and issued as the requirements for the Name Authority Cooperative (1984). These purposes were:

1. to collect and maintain authority data for names, titles, and series;

2. to record and maintain the relationships among headings for names, titles, and series, including relationships (a) among established headings and (b) between variant headings in established form(s);

3. to ensure integrity of heading forms;

4. to provide query access to authority data.

These purposes were translated into a series of functions that included such basic activities as permitting the addition of an authority record and both the change and deletion of an existing authority record (LC only); ensuring integrity of heading forms and other authority data; enabling access to authority data; and facilitating maintenance activities on authority data.

Since the current OCLC distribution facility does not yet directly address adding an authority record or either changing or deleting existing authority records, there are not appropriate functional requirements to consider in this evaluation. These requirements, however, make up the largest body of those stated in this NACO/NAFS document. The document sets forth the following important and relevant requirements:

1. NACO [Name Authority Cooperative]/LSP will be designed to utilize data from other systems through computer-to-computer interconnection, following national and international standards for communication protocols, data content, and content designation (e.g., U.S. MARC communication format).

2. A copy of a NACO [Authority] file not more than twenty-four hours out of date from the NACO [Authority] master file must be available to all contributors.

3. Data security for all files and data will be provided so that only authorized personnel from authorized institutions using authorized commands (language) may activate the system.

The NACO/LSP design was to follow national and international standards. The use of the OSI model was focused on exactly that goal. However, as currently implemented and defined, the LSP protocols are not fully compatible with the international standards for communications protocols. The LSP Technical Committee understands this and is taking definitive action to allow the transition of the LSP protocols to internationally accepted standards. Thus, LSP's goal of following national and international standards for communicating protocols is met in spirit, if not in the letter. It is important that this compliance with international standards be complete.

The requirement that the NACO file not be more than 24 hours out of date is similarly being met in spirit. New and corrected records in the LC Name Authority file are available for distribution to both RLG and OCLC six days a week, excepting holidays. Therefore, on a Monday morning a user may see a file that was updated on the previous Saturday afternoon. The files are essentially in synchronization, though there are details that impinge upon full synchronization. For example, it is possible that records exist in the LC file that are, for one reason or another, not convertible into MARC communication format for distribution. In this instance, records exist in the distribution queue at the Library of Congress but will not be transmitted to RLG or OCLC. It is also possible to have communication failures, e.g., an aborted session between the LC and OCLC. In this instance, OCLC's implementation seeks to reestablish automatically the communication and to "pull" the records that were not received. Also during a communication a record may become garbled. In this instance, OCLC's implementation has built an internal response file modeled on the response file established in the LSP protocols.

Successfully received records undergo extensive edit checks by OCLC before being added to the database. In some cases a warning message is generated, but the record is loaded. In other cases, the error is so serious that the record is rejected by OCLC. In both instances an online report is generated that is then examined by LC, and the corrected records are redistributed. Thus, during the interim, records may exist in the LC files that are not present in the OCLC file, or the record may not be the most current version. In this instance, these records will not be in synchronization between the databases.

The security for all files and data is not explicitly provided by the LSP protocols. However, because of the peer-to-peer nature of LSP, it is OCLC's implementation-specific characteristic that users are not allowed access to our files or data without appropriate authorization. In every instance, the authorized commands and activities conform to the LSP protocols. Thus,

while no specific data security requirements have been placed within the protocols, the specific implementation assures a reasonable level of security on communications between systems.

Performance Evaluation

LSP is designed to provide an efficient transfer of information between systems. OCLC has developed a series of reports that record the operational efficiency of the link. An example of these reports is given in figure 1. The Link Status Report shows specific data for each session between LC and OCLC and provides the times that each session begins and ends and the time elapsed. This report also identifies the specific device number (OCLC internal coding) and the number of discrete protocol data units (PDU) received. Figure 1 shows that not all sessions result in the transfer of PDUs. In these instances, elapsed time and other data are not collected. The current maximum PDU size is 10,000 bytes. The times collected for this report are the minimum time, the maximum time, the mean or average time, and the standard deviation. The times measured are from the time of the original request for the transmission of the PDU until the next request is submitted. In other words, this is exactly a user response time measure. The average response time for a PDU has been measured for a recent one-month period, i.e., May 1987. This was selected as a typical month of operation that suffered neither the initial implementation pains nor any peculiar difficulties that would make it stand out as an atypical month. Based on data collected during this month, the average time for transmission of the PDU was 2 minutes, 7 seconds. This is summarized from a total of 2,132 PDUs that were received in this time frame. Standard deviation of the PDU time was 38.4 seconds. Based on the above data, the current effective rate for the LSP link during May 1987 was in the order of approximately 630 Bps. The physical data link is rated at 9,600 Bps. Thus, the LSP capability is now using 6½ percent of the available capacity.

A significant portion of the time, using the OCLC implementation of the LSP protocols, appears to be due to one or the other of the systems waiting for an acknowledgment of the receipt of a PDU prior to sending more data. The processing and transmission of data across the LSP linkages will not be significantly increased by higher speed links, given the need for the wait states to acknowledge receipt of data. An analogy may be made to driving a car be-

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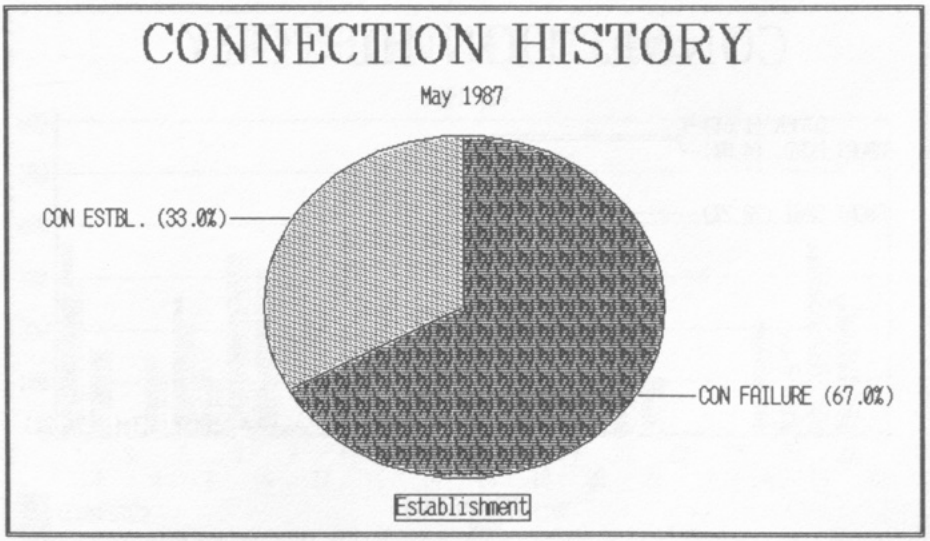
                          LINK STATUS REPORT                          PAGE (40)
                        THU JUN 11, 1987 1:45 PM

  START     LAST     ELAPSED   DEV PDU  MIN   MAX   AVG   VAR      STATUS     TYPE
-------------------------------------------------------------------------------------
DATE: 870501
21:00:05 21:00:05              15   1                              ABORT RECEIVED  DQ
18:00:55 20:01:56 02:01:01     25  56 01:27 02:26 01:52 00:16      ABORT SENT      DQ
17:00:06 17:00:06              15   1                              ABORT RECEIVED  DQ
16:00:06 16:43:54 00:43:48     25  17 01:31 02:27 01:37 00:17      ABORT SENT      DQ
15:13:17 15:13:17              15   1                              ABORT RECEIVED  DQ
15:00:57 15:00:57              25   1                              ABORT RECEIVED  DQ
14:00:08 14:20:34 00:20:26     15   7 01:36 02:23 01:46 00:18      ABORT RECEIVED  DQ
12:07:23 13:14:33 01:07:10     25  25 01:22 02:21 02:00 00:14      ABORT SENT      DQ
11:00:05 11:00:05              15   1                              ABORT RECEIVED  DQ
08:36:20 10:28:25 01:52:05     25  48 01:37 02:13 01:58 00:14      ABORT SENT      DQ
08:00:04 08:00:04              15   1                              ABORT RECEIVED  DQ
07:00:05 07:00:05              25   1                              ABORT RECEIVED  DQ
DATE: 870430
21:00:04 21:00:04              15   1                              ABORT RECEIVED  DQ

                      Press <RETURN> To Continue
```

The Link Status Report shows specific data for each session between LC and OCLC, provides specific information on the time that the session began and ended, and the time elapsed. This report also identifies the specific device number (OCLC internal coding) and the number of discrete protocol data units (PDU) that were received.

Fig. 1. The Link Status Report.



In May, 376 sessions were attempted, and 124 were actually achieved.

Fig. 2. May Sessions.

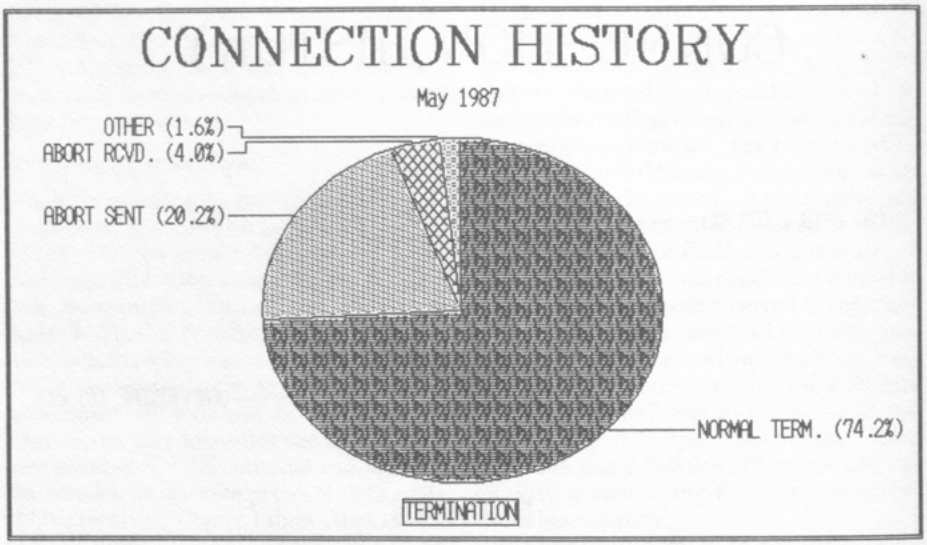
tween points A and B. If there are a number of stoplights between points A and B, it makes no difference if the speed limit on the road increases to infinity. The time to get from point A to point B will be determined by the ability to bypass the stoplights. Therefore, the total transmission time is not limited by the speed but by the number of wait states incurred between the two points. In May, 376 sessions were attempted, and 124 (33 percent) were actually achieved (see figure 2). Of those actual sessions, 92 (74.2 percent) resulted in the normal termination, 25 (20.2 percent), in an abort sent by OCLC to LC, and 5 (4 percent), in LC sending aborts to OCLC. Excluded in the above were 2 (1.6 percent) aborts of undetermined origin (see figure 3).

Operational Evaluation

Operationally, LSP has moved from a testing phase into a production environment at OCLC. Calls to LC are initiated automatically, and session handling has been automated. During May, on the five working days of each week and not including holidays, OCLC attempted to establish 218 sessions with LC. Of these sessions, 113 (51.8 percent) resulted in failure to establish successful communications (see figure 4).

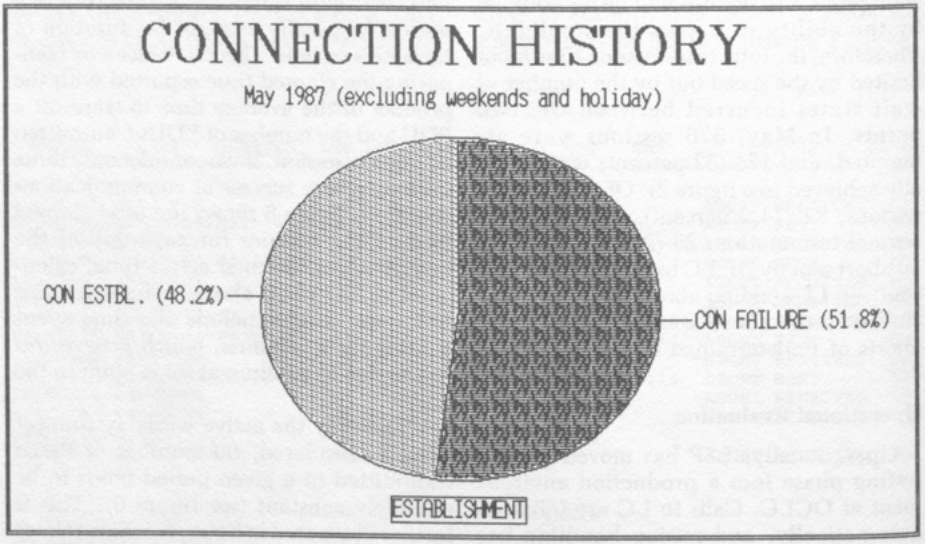
It is apparent from the Link Status Report (see figure 1) that the elapsed time of a session frequently exceeds the duration of the active session. This can be seen by comparing the elapsed time reported with the product of the average time to transmit a PDU and the number of PDUs transmitted during the session. If we consider only those sessions where successful communications occurred, figure 5 shows the total elapsed time of the sessions for each day of the month versus the total active time, calculated as described above. Causes for this difference might include the time spent waiting for a response, which is never received due to a failure at some point in the link.

When only the active weekday connect time is considered, the number of PDUs transmitted in a given period tends to be relatively constant (see figure 6). This is further illustrated in figure 7, which relates the average time per PDU. Since the LC system is not available on Sundays and holidays, there were no active sessions, and hence no PDUs were exchanged. Perfor-



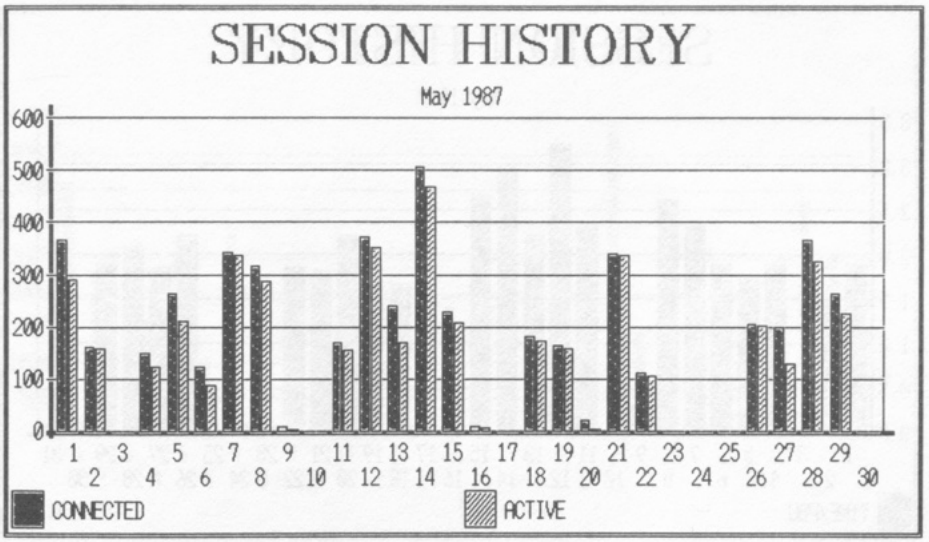
Of 124 (33 percent of total) sessions that were actually established, 92 resulted in normal termination, 25 resulted in an abort sent by OCLC to LC, and 5 resulted in LC sending aborts to OCLC. Excluded in the above were 2 aborts of undetermined origin.

Fig. 3. Results of Established Sessions.



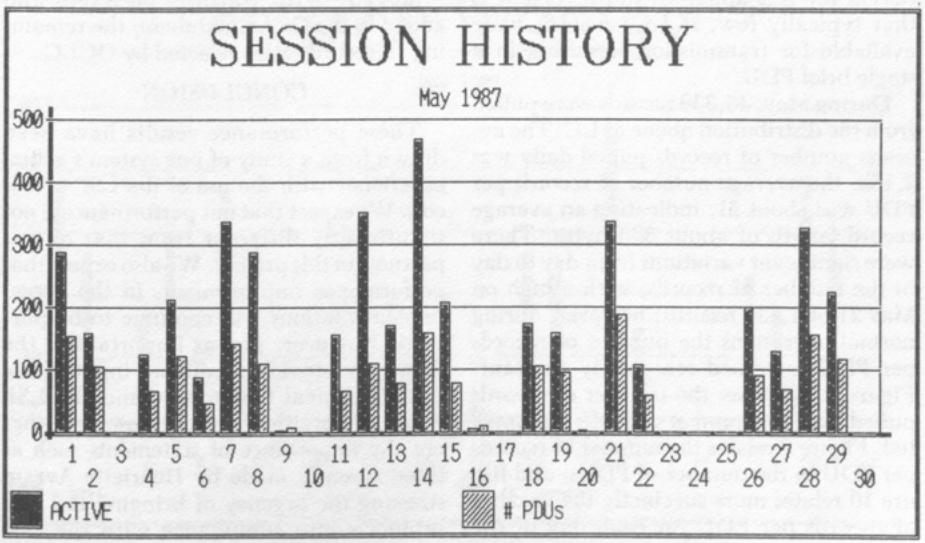
During May, on the five working days of each week and not including holidays, OCLC attempted to establish 218 sessions with LC. Of these sessions, 113 resulted in failure to establish successful communications.

Fig. 4. Failed OCLC Sessions.



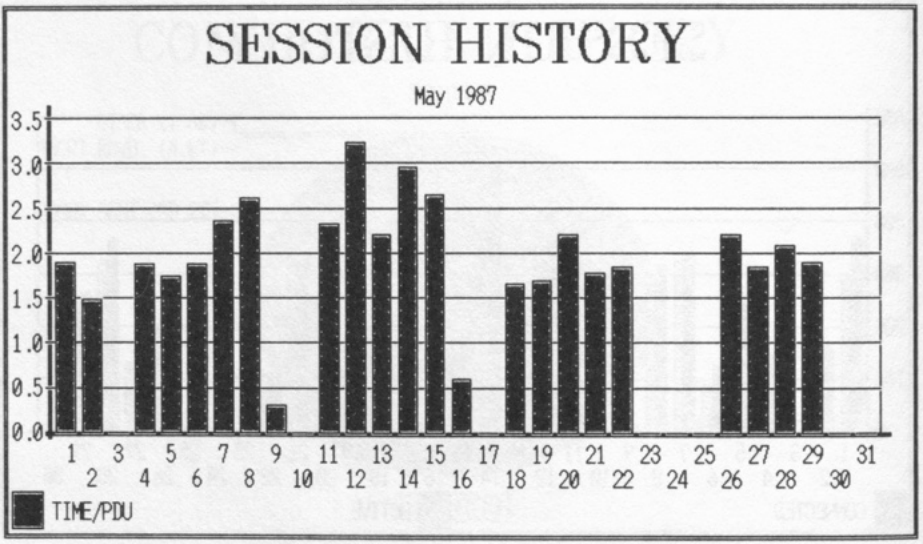
Comparison of the total elapsed time of the sessions for each day of the month with the total active time, calculated as the product of the average time per PDU times the number of PDUs sent. Causes for this difference might include the time spent waiting for a response that was never received due to a failure at some point in the link.

Fig. 5. Comparison of Sessions' Elapsed Time.



Comparison of active connect time with the number of PDUs. When only the active weekday connect time is considered, the number of PDUs transmitted in a given period tends to be constant.

Fig. 6. Comparison of Active Connect Time with PDUs.



Average time per PDU on a daily basis. Note the relatively constant time per PDU during weekday operations.

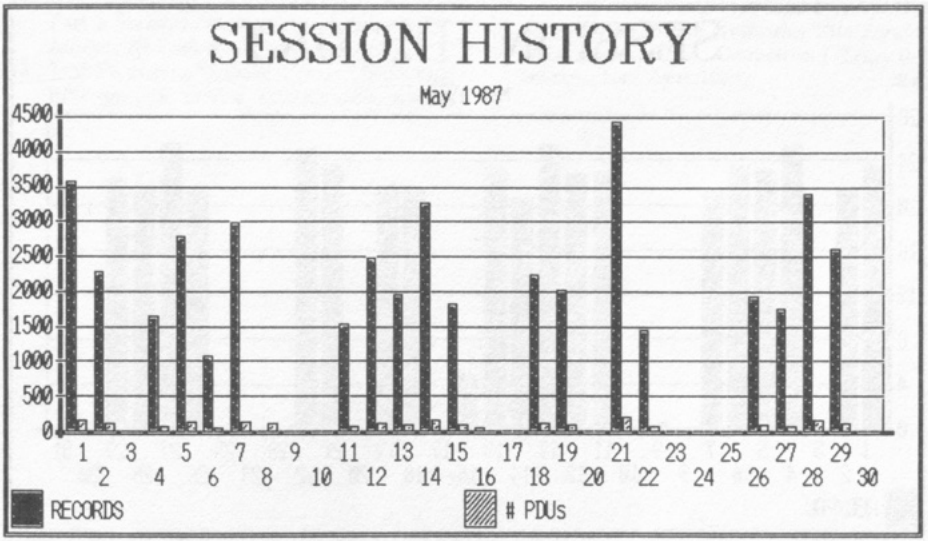
Fig. 7. Average Time per PDU.

mance on Saturdays, however, would appear to be considerably better, with a several-fold reduction in PDU times. The reason for this apparent improvement is that typically few, if any, records were available for transmission, resulting in a single brief PDU.

During May, 45,339 records were pulled from the distribution queue at LC. The average number of records pulled daily was 2,159; the average number of records per PDU was about 21, indicating an average record length of about 500 bytes. There were significant variations from day to day in the number of records, with a high on May 21 of 4,430 records; however, during normal operations the number of records per PDU remained reasonably constant. Figure 8 compares the number of records pulled with the number of PDUs transmitted. Figure 9 relates the number of records per PDU to the number of PDUs, and figure 10 relates more succinctly the number of records per PDU for each day of the month. As pointed out earlier, the OCLC implementation performs certain checks on records pulled from the LC distribution queue. Of the 45,339 records pulled, 114 (less than 0.3 percent) discrepancies were detected. Of these, 99 records were "flagged" with warning messages and added to the OCLC database; the remaining 15 records were rejected by OCLC.

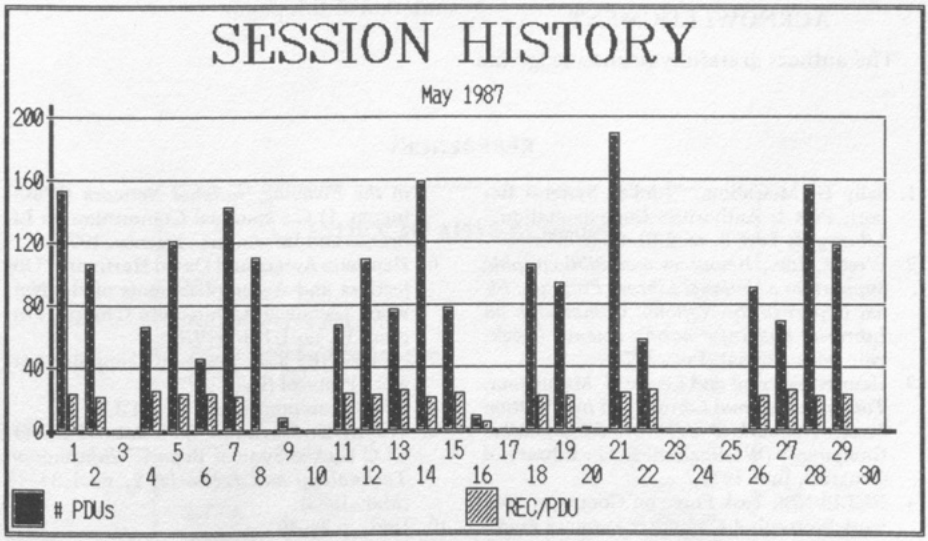
CONCLUSION

These performance results have been drawn from a study of one system's actual experience with the use of the LSP protocols. We expect that our performance is not significantly different from that of our partners in this project. We also expect that performance improvements in the actual implementations will continue to be pursued. However, just as importantly, the data may provide significant input to the LSP Technical Committee and the LSP Policy Committee. In addition, it brings out the importance of statements such as those recently made by Henriette Avram stressing the urgency of bringing the LSP protocols into compliance with the OSI protocols. It is important to take advantage of the many efforts under way to make communications protocols efficient, which



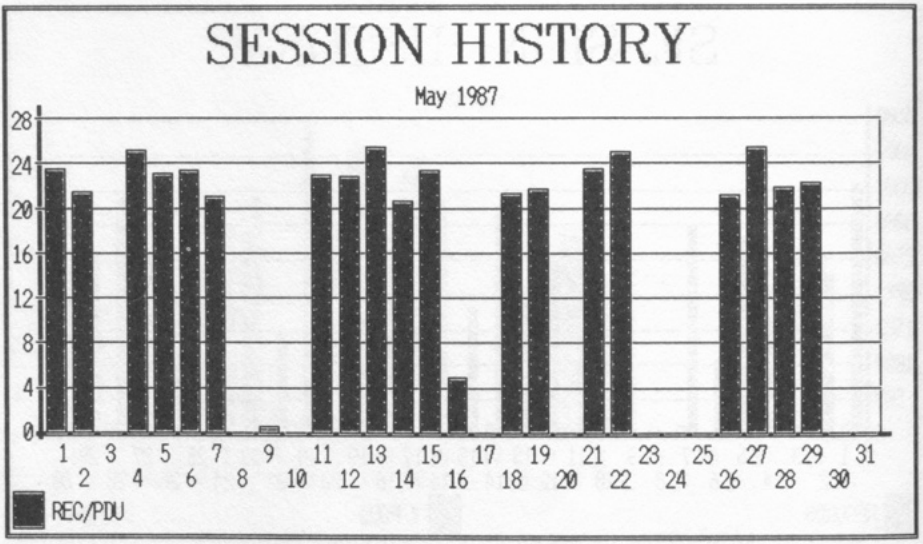
Comparison of records pulled with the number of PDUs transmitted. Significant variation in the number of records transmitted per day is observed.

Fig. 8. Records Variation.



Number of records per PDU versus number of PDUs on a daily basis. Note fairly constant relationship between the two quantities.

Fig. 9. Records per PDU versus Number of PDUs.



Average number of records per PDU on a daily basis. Relationship is nearly constant during normal working days.

Fig. 10. Average Number of Records per PDU.

endorses our collective efforts to make these protocols effective for our required functions.

ACKNOWLEDGMENT

The authors gratefully acknowledge the efforts and expertise of Glenn Patton, Support and Training Specialist at OCLC, for his able assistance and counsel in the formulation of this paper.

REFERENCES

1. Sally H. McCallum, "Linked Systems Report, Part 1: Authorities Implementation," *Library Hi Tech* 3, no.2:61–68 (1985).
2. Westat, Inc., *Resources and Bibliographic Support for a National Library Program: Final Report to the National Commission on Libraries and Information Science* (Rockville, Md.: Westat, Inc., 1974).
3. Henriette Avram and Lenore S. Maruyama, *Toward a National Library and Information Service Network: The Library Bibliographic Component* (Washington, D.C.: Library of Congress, June 1977).
4. NCLIS/NBS Task Force on Computer Network Protocol, *A Computer Network Protocol for Library and Information Science Applications* (Washington, D.C.: National Commission on Libraries and Information Science, Dec. 1977).
5. NCLIS, *The Role of the Library of Congress in the Evolving National Network* (Washington, D.C.: National Commission on Libraries and Information Science, 1978).
6. Henriette Avram and David Hartman, "Objectives and Accomplishments of the Network Technical Architecture Group," *Program* 13, no.1:1–13 (1979).
7. NCLIS/NBS Task Force on Computer Network Protocol (Dec. 1977).
8. Private communication from CLR.
9. Wayne E. Davison, "The WLN/RLG/OCLC Linked Systems Report," *Information Technology and Libraries* 2, no.1:34–46 (Mar. 1983).
10. Ibid., p.34–46.
11. Ray Denenberg and Sally McCallum, "RLG/WLN/LC Computer Ready to 'Talk': Three Disparate Bibliographic Systems Will Link Up This Fall," *American Libraries* 15, no.6:400–404 (June 1984).

12. Ray Denenberg, "Linked Systems Project, Part 2: Standard Network Interconnection," *Library Hi Tech* 3, no.2:71–79 (1985).
13. Task Force on a Name Authority File Service Bibliographic Service, Bibliographic Service Development Program, *Name Authority Cooperative/Name Authority File Service* (Washington, D.C.: Council on Library Resources, Inc., May 1984). ■■

Combining Electronic Mail with Online Retrieval in a Library Context

Michael K. Buckland

Electronic mail has developed for professional and administrative support as an aspect of office automation. Online information retrieval services have developed mostly in other contexts, e.g., online catalogs to facilitate library use. Networks and internetwork gateways extend access to both. In general, the linking of different functions can amplify the utility of each. As an example, using electronic mail for library purposes is explored, especially in conjunction with an online library catalog: for notes, broadcast news, and notification, and to facilitate specialized library services, such as interlibrary loan, and general communication.

In office automation, as elsewhere, individual functions can often be more useful if they can be used in conjunction. Two computer-based functions with different origins are electronic mail and online retrieval systems. The linking of these two can extend the benefits of each. As an example, the combining of electronic mail with a sophisticated example of online retrieval, the online library catalog, in order to improve library service is explored.

Electronic mail is the "sending" of notes by storing and reading short files in computer memories accessible by two or more people.[1] Strictly speaking, notes are not sent "to" individuals but rather written in "mailboxes" that the recipient can read. Although notes can be sent directly or in "store and forward" mode, electronic mail is ordinarily "store and retrieve." Since electronic mail is primarily a local activity, the exchange of mail with a distant correspondent requires special arrangements of which there are three forms.

- Each pair of users could decide that correspondence would be achieved by agreeing that one would use the local system of the other from a distance. This tends to be inconvenient because it requires individuals to learn the details of, and check, a multiplicity of different systems, often with different command languages.
- Both could agree to use a common regional or national electronic mail service (such as The Source, ALANET, CLASS-Ontyme, etc.). This means checking a minimum of two mailboxes: one local, the other broader. In practice it tends to mean more, since there are numerous regional and national electronic mail services.
- "Gateways" between electronic mail systems can be used so that a note from A to B would be transferred from the system of A through a gateway into the system used by B, where it can be stored in the mailbox of the electronic mail system that is

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local for B. This practice can be extended to have the note travel through multiple intervening networks and gateways to reach the destination mailbox, much as with international postal services. This requires standardization of internetworking protocols. A number of internetworking systems exist, notably BITnet and ARPANET.

Online library catalogs[2] can be accessed in more than one way:

- through dedicated terminals usually located in libraries;
- by telecommunications, as in the case of "dial-in" access from workstations that are not dedicated but that can be connected directly to the catalog by telephone or other local area network;
- by computer network as a "virtual terminal." In this case the workstation is connected to a remote network, which is connected by means of a "gateway" to the network of the online catalog with sufficient interoperability to allow the user to function more or less as though connected directly to the catalog—as a "virtual terminal";[3]
- and, in the future, as a database server.

These two systems—electronic mail and online library catalogs—have been developed separately for quite different purposes, by different groups, and in different contexts. One is viewed as "office automation," the other as "library automation." Little attention has been paid to using both in conjunction.

Experience with the implementation of office automation in an academic environment indicates that what is needed (and wanted) is not so much "office automation" but, rather, "professional support" in the sense of a coherent tool kit of computing support from which each individual could select and adapt whatever combination of tools is most helpful. One consequence of this is that traditional separations between sorts of computing, such as the traditional university division among academic computing, administrative data processing, and library automation, become hindrances. Another consequence is that the individual tools need to be compatible if both are to be used effectively and efficiently.

THE STRUCTURE OF ELECTRONIC MAIL

It is useful to distinguish five aspects of electronic mail: sending modes, populations, functionality, connectivity, and privileges.

Sending Modes

Electronic mail can be structured within a user population so that there is a single sender or many senders, a single recipient or many recipients. Logically this results in four modes:

- Mode A: One-to-one mail ("Notes"), whereby one user can send a note exclusively to any one other user;
- Mode B: One-to-many mail ("Broadcast"), whereby one user can send notes to all other users;
- Mode C: Many-to-one mail ("Comment"), whereby many users can send notes to just one individual, usually a system administrator; and
- Mode D: Many-to-many mail ("Bulletin board"), whereby many users can send notes that are readable by many other users. Computer conferencing can be considered a sophisticated form of "bulletin board" mode electronic mail.

Populations

There can be subpopulations with different characteristics. In the context of library service, library staff are ordinarily distinguished from readers and accorded different privileges. Consider, for example, the first mode: "one-to-one." Dividing the population into two populations results in four submodes:

- librarian to librarian;
- librarian to reader;
- reader to librarian; and
- reader to reader.

These four submodes exhaust the possible combinations within Mode A: one-to-one mail. In this case two subpopulations resulted in four submodes. More generally, n subpopulations results in n^2 submodes of each mode. Similar sets of submodes are possible for each mode when subpopulations are present.

Functionality

Electronic mail note has at least three elements: identification of addressee, text of the note itself, and identification of the sender. In practice it would be difficult to operate without also having the time the note was sent. The note itself is commonly a simple text, although multimedia notes featuring images and sound will doubtless become available. Numerous additional refinements can be added to electronic mail systems to make it easier to perform particular tasks with notes, such as replying, copying, forwarding, and discarding them, or verifying that they have been received. Automatic formats for specialized notes offer another array of options. For example, a special screen format for requesting interlibrary loans could be designed to encourage (even require) the user to remember to complete all relevant data fields. Some of these functions are features of the user interfaces of local systems; others are features of network delivery systems.

Connectivity

Each electronic mail system runs on a particular computer and serves those who have access to it. In the absence of connections between systems, one can correspond only with those who share the same system. Beyond one's local system, it is necessary to have a mailbox for each of several systems: each additional mailbox permits the exchange of mail with an additional population. The obvious inconvenience of this multiplicity of mailboxes to be checked for mail is exacerbated by the variations in design and command languages of the different mail systems. The inconvenience can be reduced by recourse to a combination of local system and national system (such as ALANET or The Source). However, much greater convenience can be achieved by linking local systems together much as local telephone switchboards are linked to each other. Examples of the linking of systems are BITnet and ARPANET, which permit the forwarding of electronic mail from one local system to another.

Privilege

Mail can be designed to provide gradations of sending privileges (to no one, to one, to several designated addresses, to everyone); receiving privileges (only authorized individuals have mailboxes); and combinations of the two. For example, a library service can be expected to provide librarian-to-librarian mail, might provide librarian-to-reader mail and/or reader-to-librarian mail, and could refuse to support reader-to-reader mail.

Privilege can also be varied with respect to individual functions. Perhaps only librarians, faculty, and graduate students could be allowed to use the interlibrary loan function by electronic mail, and, even then, interlibrary loan mail could be sent only to the library's interlibrary loan mailbox. Possibly only the interlibrary loan librarian would be authorized to send interlibrary loan mail to other libraries.

Privileges are assigned to individual users but would tend to apply to subpopulations as a class. In a public-service situation, as in a library, provision should be made both for anonymous messages and for self-identified library users who would like responses.

ELECTRONIC MAIL IN CONJUNCTION WITH ONLINE LIBRARY CATALOGS

Some uses of electronic mail in conjunction with online library catalogs will be reviewed, with examples of different modes, subpopulations, functions, and privileges. It is assumed for this discussion that different electronic mail systems are connected to each other through "gateways."

Our definition of "in conjunction with online library catalogs" is that notes can be sent or received as part of a session of online catalog usage. It does not have to be assumed that the software and hardware supporting the electronic mail functions are necessarily an integral part of the online catalog system, only that the function appears to the user to be a convenient part of the same service. The mail function itself (or at least some of it) might well be provided on a separate, linked system presented transparently to the user as if it were an integral part of the online catalog service.

A particularly desirable specialized elec-

tronic mail function where library catalogs are concerned is the ability to forward bibliographical records without the reader or librarian having to transcribe the record, an error-prone inconvenience. For complex, structured records (such as library catalog records), standard transmission formats are very useful (such as the MARC communications format for the transmission of catalog records). Similarly, a useful specialized function in the user interface in a library context is a form (template) displayed on the screen to facilitate the creation and transmission of bibliographical records when, for example, completing an interlibrary loan request to be forwarded to the library's interlibrary loan office or a recommendation for the purchase of a book to be forwarded to the library's acquisition department or collection development librarian.

Another set of useful specialized functions in a library context would be a set of standard notes for particular purposes, commonly in combination with a displayed or created bibliographical record. Examples include reporting errors in the records or requesting that a given title be sent to the reader through a local book-delivery system.

Mode A: One to One

The two principal subpopulations (librarian and reader) result in four principal submodes:

A.1. Librarian to Librarian

The routine exchange of notes between librarians (more generally, library employees) is likely to be the first library use of electronic mail, either as a subset of a wider, institutional electronic mail service or as a library-based service. There is obvious convenience if electronic mail can be exchanged using the same hardware and intermingled with use of that hardware for other library activities such as searching an online catalog, retrieving images (digitized photos, maps, etc.), or downloading text.

Requests for documents can be exemplified by the interlibrary loan service provided on the OCLC system, where the bibliographical data and holding library are already identified. In any multilibrary system where the online catalog serves as a union catalog, an interlibrary loan request function that could forward a copy of a record would be useful. Similarly, a suitable format for entering, then forwarding, interlibrary loan requests would also be useful.

A.2. Librarian to Reader

Librarian-to-reader mail would appear to be typically a matter of notification: that a book has been acquired, that a borrowed book is due back, that a book recalled or borrowed through interlibrary loan is available, or that these books are not yet or will not be available. Some of these could be generated automatically.

The selective dissemination of lists of materials new to the online catalog is a striking example of electronic mail in conjunction with online library catalogs. A reader's profile of interests, defined in terms of catalog search commands, could be automatically searched. The search results could then be placed in the user's electronic mailbox. (This assumes the catalog's ability to use "loaded since (date)" as a search command qualifier.) The effect would be personalized accessions lists at a very low marginal cost, since service could be provided at off-peak hours when both catalog and telecommunications are likely to be underutilized.

As online systems and telecommunications permit remote use of library services, one can expect increased use of electronic mail as a means by which librarians would answer readers' questions and provide help of one sort or another.

A.3. Reader to Librarian

Enabling readers who are electronic mail users to send notes to library employees, typically through a wider, institutional electronic mail service, makes the library employees more accessible, especially to readers based at a distance from the library. It is a convenient way for library users to forward requests for help to librarians.

As for librarians, providing readers with a template for entering bibliographical records or enabling them to forward existing catalog records should provide a basis for suggesting acquisitions, reporting errors, or

asking for interlibrary loans that would be more convenient, less error prone, and faster than using the traditional forms.

With the linking of catalog records to automated circulation systems, a dialogue of specialized electronic notes becomes very useful as the reader checks the circulation status, requests that a copy be recalled, and is notified by electronic mail when it becomes available.

Libraries providing a book delivery service are another case in which there is a clear advantage in encouraging users to forward, rather than transcribe, catalog records to the library. Forwarding unverified references and responding to readers by electronic mail has some advantages over telephone and paper. One form of this is when a reader requests that a book be paged and reserved.

Requests for the renewal of loans is another example of reader-to-librarian mail.

A.4. Reader to Reader

Libraries with online catalogs are uniquely placed to facilitate electronic mail because of the widespread availability of dedicated terminals. Not all readers have access to electronic mail. Even those who do are at a distance from their own workstation when in a library. Even in universities, not all faculty and certainly not all students have workstations. Enabling dedicated catalog terminals to support the sending of electronic mail should not be very difficult technically. The dedicated terminals could also be used to receive electronic mail to the extent that libraries are willing to assign (or to allow the self-assignment of) mailboxes to those who are otherwise disenfranchised. One practical consideration is that the additional amenity might prove so successful (or at least so popular) as to increase the number of terminals and computing support needed.

During the long hours that libraries are open, widespread access to dedicated terminals and connectivity between library systems and other networks constitute an amenity that lends itself excellently to enabling readers to exchange notes with each other. The issue is not the feasibility or the probable demand but rather the extent to which the library chooses to allow this use of its system.

The one-to-one mode would appear to be the commonest mode, but other modes can occur.

Mode B: One to Many (Broadcast Mode)

The online library catalog provides an excellent opportunity for electronic messages in "broadcast" mode in the form of messages on the "salutation" screen and messages that can be flashed to all current users. Librarians can broadcast through existing electronic mail systems, but the combination of online catalogs and electronic mail seems less likely to be used, except for the broadcast distribution of accessions information as a general-interest version of the selective dissemination of information (A.2. above).

Mode C: Many to One (Comments Mode)

The many-to-one mode can be seen where a "comments" function is provided, allowing catalog users to make suggestions and complaints. Such feedback can be of considerable value to those responsible for catalog provision. The comments are, in effect, electronic mail with only one permitted destination. Since no reply is expected the senders do not need mailboxes or even to identify themselves.

Mode D: Many to Many (Bulletin Board Mode)

The provision of a general purpose or a library-oriented bulletin board service accessible through catalog dedicated terminals would be an example.[4] Another is where comments received through a comments function are answered and displayed for all to see as an educational feature of the catalog. In a library context, one would envisage enabling readers to post comments on particular books and linking those comments to the catalog records for those books.

CONCLUSION

Electronic mail developed among programmers as an office automation function. Online library catalogs developed in the specialized context of library automation. The possibility for each function to enhance the benefits provided by the other

is a good example of the benefits to be derived as isolated examples of computing become compatible and linked.

ACKNOWLEDGMENT

This paper benefited from the comments of Clifford A. Lynch, Division of Library Automation, Office of the President, University of California, and from those of the author's colleagues in the Berkeley IBM Joint Office Utility (BIJOU) joint study between IBM and the University of California, Berkeley, 1982–85.

REFERENCES AND NOTES

1. For an introduction to electronic mail see Peter Vervest, *Electronic Mail and Message Handling* (Westport, Conn.: Quorum Books, 1985).
2. For an introduction to online library catalogs, see Charles Hildreth, *Online Public Access Catalogs: The User Interface* (Dublin, Ohio: OCLC, 1982).
3. For discussion of extended access to automated library systems, see Clifford A. Lynch and Edwin B. Brownrigg, "Beyond the Integrated Library System Concept: Bibliographical Networking at the University of California," in *Second National Conference on Integrated Online Library Systems, Atlanta, September 1984. Conference Proceedings*, ed. David C. Genaway (Canfield, Ohio: Genaway Associates, 1984), p.243–52.
4. Patrick R. Dewey, "Electronic Bulletin Boards: Applications in Libraries," *Library Journal* 111, no.18: LC10-LC19 (Nov. 1, 1986). ■■

A Gateway Approach to Library System Networking

David A. Anderson and Michael T. Duggan

For those automated libraries that exist in the milieu of a larger organization with a local area network, remote access to library resources is feasible. A valuable technique for accessing a library system with limited interconnectivity is to connect the system to a gateway machine that is a host in the local area network. A method for achieving this and an existing prototype based on this pinciple are described in detail.

The interconnectivity of library systems is an important issue for institutions having local area networks (LANs) and planning to make library services available over these networks. The automated library catalog, for example, represents a valuable support resource for library operations. But it is also an extremely important tool for the library's remote-client base, especially in research-oriented institutions. The technique described here is a straightforward means of making automated library resources available to remote clients by using a host machine in a local area network as a gateway for the library computer.

PROBLEM CHARACTERISTICS

Los Alamos National Laboratory acquired a Geac Integrated Library System for the automation of its library functions in 1984. The strategic plan for library access included making the following services available to the remote user:

- Access to the library's catalog of materials for bibliographic searching.
- Electronic checkout of library materials.
- Electronic placement of purchase requests for library materials.

These services were to be made available to the remote user through the laboratory's local area network called the Integrated Computing Network (ICN).[1] The ICN, described below, comprises a number of different network technologies.

Another dimension of the problem involves the nature of the Geac computer. It is a proprietary system with its own operating system, file structure, and terminal protocols. Consequently, it cannot easily be made a host in the laboratory's local area network. A major positive development in the accessibility of the Geac has been the creation of a special interface that allows the Geac Online Public Catalog (OPC) to communicate with terminals operating in the TTY mode. This service is referred to as VuCAT.

The first requirement listed above, an online catalog, is available through VuCAT. This simply requires a series of ports configured to use the VuCAT interface at the required baud rate and parity for communication with an external environment. The second requirement allows the user to locate a book in the OPC and check it out.

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The bibliographic citation is captured from the catalog, and the user either enters his or her internal laboratory address manually, or, if an address directory file is available, the user's address is captured automatically. The combined information is electronically routed to the library circulation department. Circulation then sends the library item to the user through internal laboratory mail. The third requirement allows the user to locate a library item in the OPC and then submit a purchase request electronically to the acquisitions librarian for this item. Once again, a bibliographic citation is captured from the OPC. The user is prompted for required purchasing information, such as accounting information. This system-generated information is then communicated to the acquisitions department. Also as a part of the third requirement, an ancillary service allows the user to enter an entire purchase request, including a user bibliographic citation, rather than a citation captured from the OPC, for electronic submission to the acquisitions department.

The logical design of this system is straightforward and is illustrated by the data flow diagram in figure 1. The boundary of automation for this system includes all the bubbles on the DFD except bubble 1.0. Bubble 1.0 and its associated file and data flows represent the Geac OPC. The Geac master bibliographic file is indicated by the abbreviation MBIB.

The physical implementation of this design, however, is quite problematic. Software must be developed to allow access to the data transmission from the Geac. The data needed to implement the second and third requirements above must be extracted from this transmission. Also, the entire system would have to be user-friendly and ergonomic.

INTEGRATED COMPUTER NETWORK

The ICN, as the name implies, is an integration of many different network technologies. In essence, it is a store-and-forward packet switching network in a star configuration. It was developed in the early seventies to fill the laboratory's need to separate computing into several security partitions. For this reason, the center of the star is a group of PDP-11 computers referred to locally as Synchronous Communications Concentrators (SYNCs). A SYNC receives data in packets. The header of each packet includes source data, destination data, and

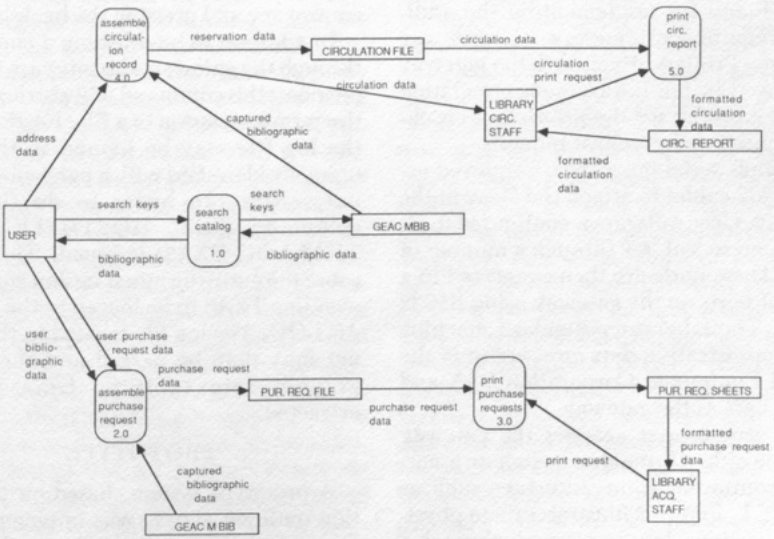

Fig. 1 Data Flow Diagram.

security flags. The SYNC establishes logical channels for data transmissions and assures that data remains within its proper security partition. The SYNC also runs software that prepares data for specific machine types. To this basic star architecture, other networking technologies have been attached. For instance, there is a DECNET portion of the network and also an ETHERNET portion. Burst rates for data transmission vary along the various links. Some burst rates may be as high as 40 megabits and as low as 150 kilobits. Also, some links are asynchronous, and others are synchronous. Likewise, parities vary in different parts of the network. The SYNCs exert a leveling influence on this diversity, making possible the needed integration.

The client base at the laboratory will have access to some portion of the ICN through a variety of terminal types. Access to a host in the lowest security partition is possible, therefore, for most of the client base. The route to a given host may be simple or circuitious, depending upon where one enters the network.

A SOLUTION

A physical design that easily supports the logical requirements of this system consists of using a host in the LAN to serve as a gateway to the Geac. Software for controlling VuCAT and for implementing the additional requirements resides on this gateway machine. Printers attached to the gateway are placed in the library near circulation and acquisitions for the printing of checkout requests and purchase requests.

A simple serial interface is employed using RS232 cables to attach the Geac to the gateway. Geac software is configured to allow access to VuCAT through a number of ports. These ports are then connected to a series of ports on the gateway using RS232 cables. The laboratory standard machine for administrative data processing is the Digital Equipment Corporation VAX and is used here as the gateway.

The remote user accesses the gateway machine either through a switch or a network communications interface such as DECNET. Figure 2 illustrates these physical connections. If access is made through a switch, two RS232 ports on the gateway machine are required by each terminal session. One port connects the gateway to Geac, and one port is dedicated to the terminal of the remote user.

The problems of how to control VuCAT and implement the additional mandated capabilities remain. Fortunately, the VAX/VMS Operating System software can accomplish these tasks.

SET HOST/DTE

The SET HOST/DTE command is the Digital Command Language (DCL) command that envokes the VAX Operating System module called RTPAD.EXE. This command connects a VAX/VMS system to a remote system through an outgoing terminal line.[2] Unlike the SET HOST command, this command does not connect through the DECNET networking interface designed by Digital Equipment Corporation. Essentially, SET HOST/DTE links an incoming port with an outgoing port.

For example, if port 25 on the Geac processor is a VuCAT port and is attached to port TXA5 on the gateway, one may issue the command SET HOST/DTE TXA5: from the gateway and establish a connection with VuCAT. The connection, once made, may be broken at any time by typing a special key sequence: holding down the control key and pressing the backslash key.

In addition to establishing a connection through the gateway, the software that implements this command will also log the entire terminal session to a file. Furthermore, the log file may be named so that it is uniquely identified with a particular terminal session. In order to do this, the command SET HOST/DTE/LOG=TXA5.LOG TXA5: is issued. This would cause the entire terminal session conducted over line TXA5 to be logged to the file TXA5.LOG. The log file created in this manner may then be parsed and the bibliographic data captured from VuCAT extracted.

PROTOTYPE

A prototype system, based on the solution outlined above, was implemented in December 1986 at Los Alamos National Laboratory. All of the software was written

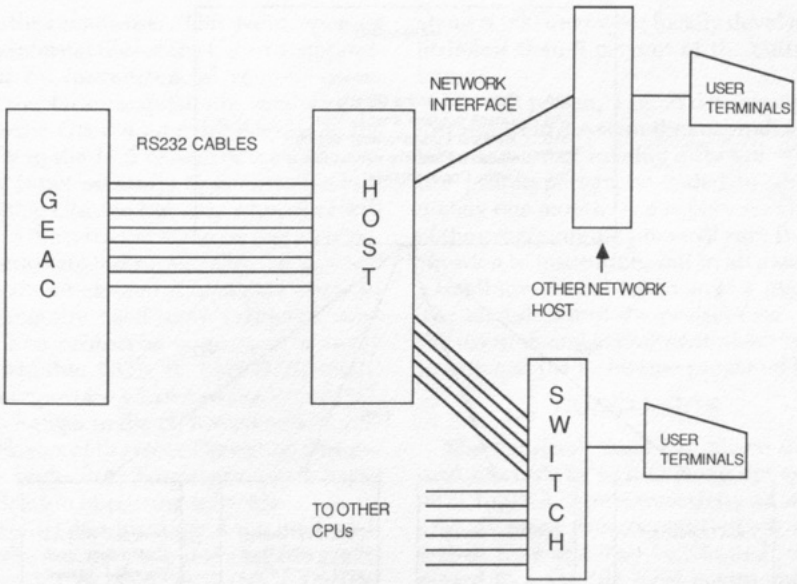

Fig. 2. Access to the Gateway Machine.

in COBOL and DCL and currently resides on a MicroVAX II in the library computer room. The MicroVAX, used here as the gateway, is not a host in the LAN, so the communications configuration for the prototype differs from figure 2 for the present. However, the MicroVAX II has the same operating system as the VAXes, which are hosts in the network. Consequently, the software developed on the MicroVAX may be easily transported to a larger VAX hooked into the LAN in the future. A machine of the size of the MicroVAX will adequately support this application if the user community to be served is not too large.

A site-specific constraint disallowed use of full-screen addressing. Many different terminals are present in the user community, and the application had to support the least capable terminal type, a terminal that operates only in line mode. Consequently, the application software was implemented using COBOL DISPLAY and ACCEPT statements and DCL. A second consideration was that VuCAT supports line-mode terminals. A screen-formatted front end on the gateway would have resulted in a hybrid system, using full-screen addressing in part and line-mode displays in part.

USER OPERATION

A typical use for this system is locating a book in the library collection through VuCAT and checking it out electronically. After logging onto the gateway machine, the user is presented with the main menu illustrated in figure 3. The user selects option SEA, and this executes a command procedure, transparent to the user, that contains the SET HOST/DTE/LOG command. The user then has access to VuCAT and can search the library catalog. After finding the desired item to check out, the user holds down the control key and presses the backslash key. This terminates VuCAT access, and the user is presented with the main menu again. Next, the user selects option CAS. At this point the log file generated by the SET HOST/DTE/LOG command is parsed, and the extracted bibliographic citation is displayed onscreen; the user is asked for an identification number and an institutional address. After the user verifies the entered data, the circulation request is printed at the library circulation desk and simultaneously written to a file. The file makes it possible to reconstruct the data if

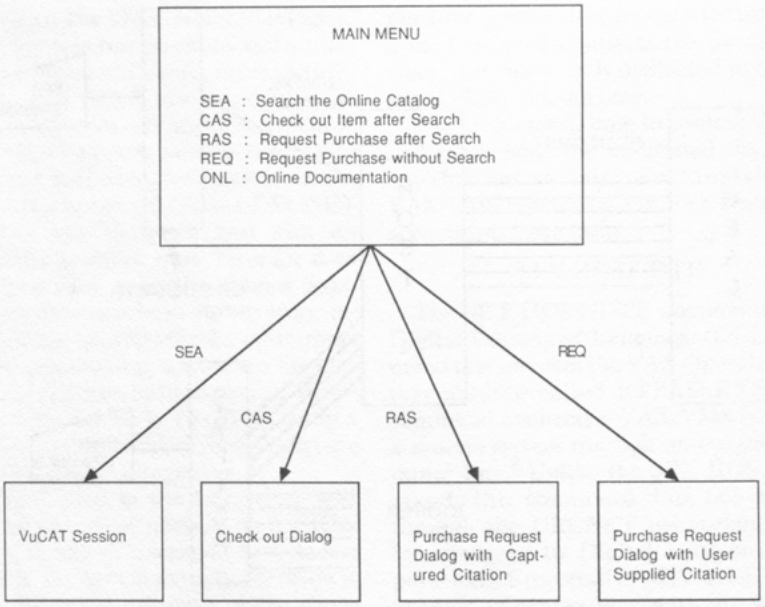

Fig. 3. Main Menu.

the request is lost or fails to print. If the item is available, the circulation staff sends it to the user by internal mail channels.

SOME TECHNICAL PROBLEMS AND THEIR SOLUTIONS

A problem with the ports on the gateway connected to the Geac was encountered early in the implementation of the prototype. These ports could receive unsolicited input, resulting in the VuCAT service initiating execution of log-in procedures on the gateway. Monitoring of the system revealed transient log-in executions continuously while both machines were in operation. This also resulted in the contamination of the Geac transaction logging file for the OPC with meaningless data from the gateway. When the Geac logging file became full, it resulted in an error when the OPC was accessed by library staff.

Changing the characteristics of these ports remedied this problem. The default condition for these ports was set to NOTYPE-AHEAD. With this characteristic set, log-ins for these ports were disabled, and the transient log-in problem was solved. But it became evident that SET HOST/DTE would not establish a connection through ports set to NOTYPE-AHEAD. So immediately before issuing the SET HOST/DTE command, the selected port was set to TYPE-AHEAD. When access through the port was finished, the port was reset to the default of NOTYPE-AHEAD. TYPE-AHEAD and NOTYPE-AHEAD are both qualifiers for the SET TERMINAL command in DCL.[3]

Another problem was the size of the type-ahead buffer on the VAX. Frequently, when accessing VuCAT, a data overrun error occurred, caused by the buffer receiving data from VuCAT being too small. To accommodate a VuCAT screen of 1,920 characters, the type-ahead buffer was expanded to 2,000 bytes using the SYSGEN utility for VAX/VMS.

ADVANTAGES AND DISADVANTAGES

A number of advantages result from this technique. Implementation is simple and inexpensive. Printing circulation and acquisitions requests allows professional librarians to examine and validate data in-

put by the remote user. This avoids opening up the internal files of the Geac to contamination by inexperienced remote users. Since the Geac acquisitions module will search the Geac master bibliographic file directly in the 11.5 release of the Geac system, it is not necessary to re-enter the bibliographic citation but only a key that will result in the retrieval of the correct citation. The data elements supplied by the user will have to be re-entered. These data elements will generally need some validation anyway. The prototype is written in easily maintainable COBOL and DEC DCL. This is important when it comes to responding to changes in the OPC screens with further releases of the Geac Operating System. These high-level languages allow rapid modification of parsing software.

The chief disadvantage of this methodology is the necessity to parse a log file generated by SET HOST/DTE/LOG. If the user conducts a lengthy catalog search that generates a large log file, more time for parsing will be required. This would be construed by the user as a slow response time at the moment in the user-terminal session when the parsing is done. To discourage the generation of inordinately large log files, the prototype allows only the last bibliographic citation examined to be eligible for further processing. This approach induces the user to find a citation in the OPC and then process it. This will mean typically a small log file.

It is feasible, however, to allow the user to find a number of citations, up to a fixed limit, and then select which of these he wishes to process. This approach, however, encourages a larger log file. Which approach is more workable depends on criteria for user-friendliness and the resources available in the system environment.

LEVERAGED SOFTWARE DEVELOPMENT

Enormous leverage is obtained in this type of development because only a small amount of code must be developed locally. VuCAT consists of about 94,000 lines of code and RTPAD.MAR, about 3,000 lines; about 5,000 lines were locally developed, a little less than 5 percent of the entire system.

For this reason, a small development effort results in a system that capitalizes on a large amount of existing software. The entire prototype can be coded in approximately one month by one person. The cost of the programming time will vary from institution to institution, but in all cases, it is a small investment for so large a payback. The largest cost of the project overall was the research and experimentation required to arrive at the technique presented here.

CONCLUSION

The approach described above may be used successfully to link computer systems with limited interconnectivity to a local area network. Interconnectivity is a contextual term and may be "limited" only in regard to a specific local environment. A requirement for this type of access is that the computer system offer some service that will support the TTY category of terminal. Another requirement is that the gateway machine have the capability to trap the data pertaining to a given terminal session. Data made available through this service may then be extracted for further processing by parsing the trapped terminal session. The development effort to produce this connection is inexpensive and straightforward yet will take advantage of much existing software. Moreover, this represents only one access technique. Many others will surely be developed as library automation and networking proliferate.

REFERENCES

1. Los Alamos National Laboratory, Computing and Communications Division, *A Glossary for the Users of the Integrated Computing Network* (Los Alamos, N. Mex.: National Laboratory, 1985), p.21.
2. Digital Equipment Corporation, *VAX/VMX DCL Dictionary* (Maynard, Mass.: Digital Equipment, 1985), p.589–90.
3. Ibid., p.655. ■■

Selection of an Online Public Access Catalog: A Checklist Approach

Victoria O'Rourke

Selecting an integrated automated library system can be facilitated by using a checklist to evaluate online public access catalogs. Development, field testing, and evaluation of this approach are described, and recommendations for using a checklist are outlined. The checklist, divided into five main sections of catalog functions and features, is appended.

Each year more librarians are faced with selecting or reselecting an integrated automated library system. Not all librarians approach the selection process from the same perspective, though. For some it is a time of frustration, indecision, and uncertainty; for others, a time of expectation, anticipation, and determination.

But whatever the differences in perspective, there are similarities in the selection methods. Many librarians still take the traditional approach, involving some combination of literature review, vendor demonstrations, site visits, and the preparation of Requests for Information (RFIs) and/or Requests for Proposals (RFPs). However, this approach does not guarantee that librarians will be able to identify the system that best meets their own, as well as their users', needs.

In selecting an integrated system for the Menasha Public Library, a medium-sized facility in Wisconsin serving a community of 25,000 people, we found ourselves trodding the traditional path. We attended vendor demonstrations at state, regional, and national library conference exhibits; we visited automated libraries; and we issued a RFI. However, at the conclusion of this process, we were no closer to deciding which automated system was most appropriate for our particular circumstances.

Our indecision was based primarily on a lack of confidence about the information we had gathered on the various systems' public access catalogs. The majority of the data was technical or functional; little of the information addressed the issue of the catalogs' suitability for the end user (i.e, user-friendliness).

To evaluate a system's user-friendliness we decided to reexamine the public access catalogs in terms of our users' needs. Earlier experience underscored the necessity of a systematic and methodical manner that would produce complete and comparable sets of data for the purposes of evaluation. These requirements led to the development of a checklist emphasizing users' needs (appendix A). We then used the checklist to inventory public access catalogs at seven different library sites.

For the purpose of evaluating online catalogs, the checklist/site-visit approach was very successful. The checklist itself provided a systematic method of gathering in-

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formation and, ultimately, allowed us to reexamine and revise our library's public access catalog requirements to reflect our specific needs more precisely. The site visits provided us with valuable hands-on experience and enabled us to measure a catalog's suitability for our library's users. The end results of this process were a tool and a methodology that allowed us to identify the integrated automated system that came closest to meeting the needs of Menasha Public Library.

We offer both the checklist and our approach in the hope that they will be of use to other librarians who have encountered, or are about to encounter, the same dilemmas and indecision we faced in the difficult process of system selection.

THE TRADITIONAL APPROACH

At the beginning of our search for an integrated automated library system, conferences and professional literature were our primary sources of information. We collected reams of literature that ranged from introductory material to detailed system specifications. Vendor demonstrations highlighted the attractive qualities of each system, and, in a number of cases, we had the opportunity to briefly test drive a particular system. In addition, we made it a point to talk with people who had installed or were installing an automated system. Talking to the customers of vendors provided us with personal reactions to and impressions of a variety of systems.

Initially we concentrated our evaluation of integrated systems on the circulation and cataloging components. However, early in the search it became evident that the online public access catalog would play a major role in our selection of a system. While the differences between the circulation and cataloging components of most integrated systems were minor, this was not the case with electronic catalogs. The online catalog tended to be the most distinctive feature of an integrated automated system, and the technical sophistication of electronic catalogs varied widely.

At one end of the spectrum was the simple catalog that had all the traditional limitations of the card catalog. At the other end was the technically enhanced catalog that offered functions searchers usually only dream about. Such a wide range of capabilities called for close inspection.

After a year of examining different public access catalogs, the various features and capabilities of the systems blended together in our minds. It was difficult to keep the distinct features of each catalog straight. A detailed documentation of catalog requirements did not guarantee that we would be able to recall the characteristics of each catalog.

At this point, we issued a RFI secretly hoping that the responses would put an end to our confusion. They did not. More literature equalled more confusion.

By now, though, we had identified three primary needs in the process of gathering catalog-specific information. First, we needed a method that would allow us to inventory the details of catalogs without writing a RFP and analyzing the responses. At this time, we had no systematic means of inventorying and comparing public access catalogs. The RFI had been a step in the direction of systematizing information, but it wasn't a large enough step.

The second need was for a method allowing us to examine catalogs at any given moment in time. Recognizing that data on public access catalogs were going to be out-of-date soon after they were collected, we needed some means of dealing with catalogs regardless of their developmental stage when inventoried.

The third need we identified was for a method that would allow us to focus our attention on users' needs while examining various online catalogs. In the course of our search, we had noticed that vendors' demonstrations and the systems' literature emphasized what a particular system could do for the library and the librarians. Little emphasis was placed on a system's suitability for library clientele. As a publicly funded library with a strong service tradition, we were accustomed to selecting library equipment with an eye to users' needs, capabilities, and expectations. Since the taxpayer would encounter the library's computer system primarily through the online catalog, we felt obliged to select the "best" public access catalog in terms of our patrons' needs.

DEVELOPMENT OF THE CHECKLIST

An examination of ways to meet these needs led us to select a checklist approach as the most feasible. A checklist would provide a systematic method for collecting information; it would allow us to address a catalog at any particular stage of its development; and it would enable us to focus on our users' needs.

A review of the literature failed to turn up any checklists of catalog features specifically compiled for inventorying public access catalogs. Convinced of the need, we decided to compile our own list, concentrating on those catalog features most important to our users' needs and capabilities. Our review of the literature defined the features most appropriate to our circumstances.

Most of the points incorporated into our checklist were selected from two tables in Charles Hildreth's *Online Public Access Catalogs: The User Interface*.[1] These two tables itemized characteristics of the user-oriented interface and system command capabilities. Material was also selected from the works of Karen Markey, particularly *Subject Searching in Library Catalogs*,[2] and from a number of studies sponsored by the Council on Library Resources.[3]

These listings combined with our own ideas and requirements produced a checklist of ninety-five questions divided into five categories: operational features, access points, search features, display features, and user assistance features.

Applying the checklist to our accumulated notes for various public access catalogs, we were unable to answer all the questions on the list for any single catalog. At best, we could answer little more than half of the questions. The checklist clearly indicated features and functions about which we had not gathered adequate information. Using the checklist to review the data merely pointed out what we already knew—that we did not have enough information to decide which catalog best met the needs of the Menasha Public Library. Whether or not the checklist itself was an effective tool with which to survey and evaluate the public access catalog market remained unanswered.

FIELD-TESTING THE CHECKLIST

Clearly there was a need to field-test the checklist to determine its usefulness as a survey and evaluation tool. Three methods presented themselves: gathering data from vendors at library conventions, requesting vendor demonstrations at our library, or conducting on-site visits to libraries with operational public access catalogs.

The first alternative, data collection at professional library conventions, had two primary drawbacks: limited time and control. The very nature of library conventions imposes a time limit on both the vendor and the visiting librarian and restricts the amount of information that can be imparted to any one potential customer. Since the checklist contained a large number of questions, some of which were fairly complex or technical, we expected that the person testing the checklist would need a sizable block of time in which to work through it. It would be inconsiderate, as well as impractical, to expect vendors to allow us to monopolize their equipment long enough to answer all ninety-five questions.

Even if a vendor were willing to devote the time and attention necessary to answering all of the questions, the fact remained that we were not in control of the process; the vendor was. Since it is the vendor's job to highlight the strong points of the company's system, we could hardly expect conference exhibits to provide a neutral testing ground for the checklist. Thus, field-testing the checklist at conventions appeared to be possible, but not ideal.

The second option for field-testing the checklist was to have vendors demonstrate their catalogs at our library. This had the advantage of allowing us to review the specifics of a catalog free of the time and people constraints characteristic of conventions. However, such demonstrations would still be a form of sales presentations with the vendor in control.

The biggest drawback to on-site visits, though, was the expense. On-site demonstrations are very expensive for the vendor. Most libraries are in no position to request such demonstrations unless they have secured the necessary financial commitment for the purchase of an automated system

and are in the final stages of system selection. In our case, funding for the automation project had not yet been approved, so this method of field-testing was not an option.

The third alternative was to visit libraries that had operational online catalogs. This method of field-testing the checklist had a number of advantages. First, it would allow us to circumvent the built-in biases typical of vendor demonstrations. Libraries with installed online catalogs offered low-pressure, neutral testing grounds. Second, this method would put us in control and allow us to proceed according to our own agenda. We would be able to visit as many sites as we thought necessary and, at the same time, gain extensive hands-on experience with a variety of public access catalogs. For these reasons then, the site-visit approach was selected for field-testing the checklist.

Seven different catalog installations in the area were selected for visitation within a six-week period. The planned method of operation was to go to a library unannounced, select a terminal in some out-of-the-way spot, spend a short period of time exploring the catalog through a trial-and-error procedure, and then work our way through the checklist. We estimated that this could be accomplished in approximately two to three hours at each site.

Prior to the first visit we established a list of authors, titles, subjects, and keywords that were to be used in searching the various catalogs. It was expected that using the same terms to conduct searches on a variety of catalogs would provide a useful basis for comparison as well as save the time of the searcher. In order to assure that the terms on this list would be applicable to a wide variety of libraries, we selected well-known authors and classical titles. We chose subjects and keywords that would guarantee a large number of hits as well as some that were expected to retrieve no or few responses. In anticipation of encountering a variety of search features, we included examples of pseudonyms, joint authors, subtitles, known cross-reference terms, and subjects for Boolean *and* and *or* searches.

The first part of each visit was a relatively unstructured trial-and-error period. This approach gathered information about the user-friendly specifics of a particular catalog as experienced by an "average" patron. The object was to discover firsthand what it meant to be a patron using a particular catalog by simulating the experience of a new user. This included not reading online tutorials or written user aids, trying to lock the system, pressing unexplained keys on the keyboard, and a variety of other behaviors we felt would be characteristic of our library's users.

We were primarily interested in knowing if a patron could walk up to a terminal and find enough information on the screen to begin a search. Once started, would the searcher be able to understand the information presented? How long would it take to successfully complete a search? Would the user feel in control?

In most of the site visits, a half-hour provided enough time to develop an accurate feel for a system's friendliness. In one case, ten minutes had passed, and we had not yet discovered the secret to performing a successful search. Our impression of this system as unfriendly, based on the trial-and-error method, was later verified by the data systematically gathered by way of the checklist.

The exploration period served two purposes. First it provided us with an opportunity to view each catalog from a patron's perspective. This provided an overall impression of a catalog's friendliness as judged by the criteria of user suitability. Second, it allowed us to develop some familiarity with the basics of each catalog. This familiarity was instrumental in the next step of the process, which was to proceed systematically through the points on the checklist.

At each site, the exploratory period provided answers to a number of the points on the checklist. These were recorded as we worked our way through the list. The unanswered questions were pursued through further exploration. While it was easy to be sidetracked by interesting features that appeared while exploring certain points on the checklist, the list tended to keep us on the track. In those instances where the interesting feature proved irresistible, the list

served to remind us where we had left off and set us back on course.

At each site there was one or more questions on the checklist that we were unable to answer satisfactorily. These points were marked so that at the end of the session, staff members of the visited library could be asked for further information. If the staff was unable to clarify a point, and if the point was critical to the assessment of that catalog, a note was then made to contact the vendor. In most instances, staff members were able to provide the needed information.

After the first visit we found that the checklist was in need of further refinement. The original list did not cover such functions as saving search sets, stacking commands, or using relational or proximity operators. It made no provisions for locking keyboards, interrupting output, or placing a hold or reserve on an item. Some of these functions and features we had simply not anticipated. Some had purposely been excluded because they were too complex or technical; others, because they were too elementary.

These miscalculations were corrected before the second site visit and resulted in a version that was used with the next two systems. At the third site, we encountered sophisticated screen displays that resulted in enhancements to the "Display Features" section of the checklist. This revision of the checklist was then successfully used with the remaining four systems.

FIELD-TEST EVALUATION

The field-test allowed us to conclude that the checklist was an effective survey tool. The list allowed us to inventory public access catalogs systematically and methodically. It provided us with a standard means of gathering and recording information on a variety of features characteristic of seven different catalogs. It allowed us to cover the same ground with each catalog, and it kept us on the track, forcing us to answer every question for every catalog. Furthermore, the checklist enabled us to deal with a variety of catalogs in different library settings, regardless of the version or developmental stage encountered.

The checklist also provided a means of comparing the seven sets of data, each arranged and formatted in approximately the same manner. The standard arrangement of data made locating information for the purposes of comparison and evaluation fast and easy. Evaluation of the seven sets of data was accomplished by taking each of the five major categories of the checklist and reviewing the information recorded. Decisions were made in each category as to the importance and weight of each characteristic in terms of Menasha Public Library's users. The checklist made it easy to identify the various functions as indispensable, desirable, undesirable, or unnecessary.

The strong point of the checklist approach is that by systematically examining catalog characteristics, a library comes to define its own catalog requirements more accurately and adequately. Instead of a "wish list" of requirements, the library has a realistic list of expectations. By examining what does and does not work, the desirable characteristics can be quickly singled out from the undesirable. The firsthand experience of catalog traits provided by the checklist approach allows librarians to have confidence in stating their catalog characteristic preferences, since they are well aware of what does work and what is available.

The checklist allowed us to analyze catalog characteristics and to restructure our requirements in light of what we had observed. It permitted us to assess a variety of online catalogs according to the criteria of user suitability, and it enabled us to construct a composite picture of the public access catalog that was most likely to meet the needs and demands of Menasha Public Library's users.

The obvious advantages to the site visit approach are those of freedom of time and movement in a low pressure environment. However, an unanticipated benefit of the site visits was observation of actual catalog users. Even though we tended to use terminals that were not centrally located, other users were never completely out of sight. Although such observations do not qualify as scientific inquiry, they did provide us with some interesting reactions to electronic catalogs. Facial expressions, ges-

tures, and conversations furnished a commentary on users' attitudes and feelings. The rate of turnover at terminals, as well as the number of instances in which users sought staff assistance with the catalog, contributed to our overall impression of the catalogs.

Admittedly, there are drawbacks in the checklist/site-visit approach to surveying online catalogs. First of all, it is a very time-consuming method. Any library contemplating using this approach is advised to set aside two days for each site visit—one day for the visit itself and another for the summarization and organization of information gathered.

Recording answers to the questions on the checklist did not allow us to record all the information we felt it necessary to include. The checklist makes no provision for recording personal impressions, thoughts, or ideas as they evolve during the process of inventorying each catalog. In order to accommodate this need, we found it necessary to keep a log in which we could jot down the various bits of information that we felt might supplement the data gathered by way of the checklist.

While reviewing the data collected at the first site, we found that, although the completed checklist and its associated notes did indeed provide a wealth of information, they did not permit immediate identification of the most significant features of a particular catalog. Every time we needed to review the most important points of a system we had to wade through all of the data gathered at the site visit.

To avoid this, we decided to compile a list of the positive and negative points of each catalog. Using a word-processing program, we set up a form on a microcomputer that listed the five categories on the checklist. We then entered the most important or significant features of a catalog into the appropriate category. Positive points were highlighted on one sheet, negative points on another. These lists concisely summarized the main features of each catalog. In addition, we constructed a list of recommended improvements for each system. Thus, the paperwork entailed by the summarization and evaluation of each catalog typically demanded another two to four hours of our time.

Another disadvantage of the checklist approach is that it is difficult to perform a complete inventory of a catalog's points in just one visit. Many of the catalog's finer points may be discovered only through regular daily use. Particularly complex or technical aspects may require considerable hands-on experience to become familiar with certain characteristics. In the interests of time and accuracy, it may be necessary for the visiting team to ask staff members about those features and functions they are unsure of or uneasy with.

The fact that a site visit only permits a view of a system in one setting and at one specific moment in time is another drawback of this method. Depending upon the library visited, the visiting team may be exposed to the newest version of a vendor's public access catalog, or to out-of-date technology. Therefore, the team must take into account the facts concerning each system in the setting in which it is encountered. If, after a site visit, some question remains regarding the degree to which the system viewed is representative of current technology, then the vendor should be contacted.

RECOMMENDATIONS

To realize the greatest benefits from the checklist/site-visit approach, we recommend that the visiting team plan to spend at least one day at the site and another organizing the data gathered. Collating and organizing the data gathered are best done on the day following the site visit. For this same reason, we also recommend visiting only one site per day. Spacing out the visits will allow the visiting team time to reflect on each catalog before proceeding on to the next one.

We also recommend that at each site the visiting team select out-of-the-way terminals. This will allow them to work undisturbed for long periods of time, and it will also insure the site library that its more heavily used, centrally located terminals are not tied up. The visiting team may find the *ALA Directory* helpful in determining the number of public access catalog terminals available at each site.

In those cases where there is some doubt

as to whether or not the library can afford to have one or more terminals tied up for a significant block of time, we recommend that the team call the library and state the nature of their project. In each of the three cases in which we needed to follow this procedure, our project was graciously and enthusiastically received, and every effort was made to provide us with access to the number of terminals we needed.

We also suggest that the visiting team not hesitate to identify themselves to the staff of the visited library. Our project was greeted with interest and enthusiasm at all sites where it was necessary for us to identify ourselves. Staff members were valuable sources of information. Many were eager to answer questions about their system and were willing to share their experiences. Others demonstrated or explained their favorite catalog features and functions. We were impressed with the honesty with which librarians were willing to discuss their catalog. There was little attempt to gloss over a catalog's deficiencies, and there was a prevailing optimism for the next "soon to be released" version that would correct present inadequacies. Not surprisingly, everyone agreed that any online catalog was better than no online catalog.

CONCLUSION

While some libraries may be reluctant to commit the time and money necessary to the site-visit approach, we would argue that both the time and the expense are justified by the importance of selecting a public access catalog that is best suited to the needs of the library and its users. In comparison with the cost of electronic catalogs, the cost of the site visits are minimal and the rewards large. There is no better way to obtain firsthand knowledge than to sit at a terminal, free of outside influences, and put a particular catalog through the paces that are important to you and your library. The checklist/site-visit approach is a step toward moving system selection out of the realm of chance and into the realm of certainty.

For those libraries wishing to use the checklist in situations other than site visits, perhaps the best suggestion we can make is that librarians shorten it to a "mini" checklist. This could be done by concentrating on those questions that will carry the greatest weight in making the final catalog decision.

For the most effective checklist, librarians should analyze the needs of their own particular library and its clientele and document those needs in writing. Tailoring the checklist to an individual library will allow librarians to recognize the catalog that is best suited to their own particular set of circumstances.

Finally, the checklist is not suitable for the complete amateur. Librarians need to be well versed in the vocabulary of automated systems and specifically in the jargon of public access catalogs. A basic understanding of the architecture of automated systems is also useful.

The checklist may not provide librarians with all of the information that the library as a buyer must know. Only vendors can provide the information on specific system details that is instrumental to making justifiable purchasing decisions. However, the checklist balances out the vendor's perspective by allowing librarians to examine a system for themselves according to criteria they have established. It provides librarians with the opportunity to be in control of the catalog "interview" process.

The purpose of the checklist is not to eliminate or replace any of the traditional steps in evaluating integrated automated library systems. Rather, we see it as a supplement to the overall process that could actually be used at any step of the process. The checklist offers an additional means of systematically gathering data about the most distinguishing feature of automated systems—the online public access catalog.

Whether librarians decide to use the information gained from the checklist to make direct purchasing decisions, or whether they use it to write the specifications for an RFI or RFP, using the checklist approach to evaluating online public access catalogs will enable them to feel confident in their ability to select the system most appropriate for their circumstances.

REFERENCES AND NOTES

1. Charles R. Hildreth, *Online Public Access Catalogs: the User Interface* (Dublin, Ohio: OCLC, 1982), p.14, 59.
2. Karen Markey, *Subject Searching in Library Catalogs: Before and After the Introduction of Online Catalogs* (Dublin, Ohio: OCLC Online Computer Library Center, 1984).
3. Paul Evan Peters, ed., *Command Language and Screen Displays for Public Online Systems: Report of a Meeting sponsored by The Council on Library Resources, March 29–30, 1984, Dublin, Ohio* (Washington, D.C.: Bibliographic Service Development Program, Council on Library Resources, 1985); Carol A. Mandel, *Subject Access in the Online Catalog: A Report Prepared for The Council on Library Resources* (1981); Keith W. Russell, ed., *Subject Access: Report of a Meeting Sponsored by the Council on Library Resources, Dublin, Ohio, June 7–9, 1982* (Washington, D.C.: Council on Library Resources, 1982); Joan Frye Williams, ed., *Online Catalog Screen Display: A Series of Discussions: Report of a Conference Sponsored by The Council on Library Resources at the Lakeway Conference Center, Austin, Texas, Mar. 10–13, 1985* (Washington, D.C.: Bibliographic Service Development Program, Council on Library Resources, 1986); Davis B. McCarn, ed., *Online Catalogs: Requirements, Characteristics, and Costs: Report of a Conference Sponsored by The Council on Library Resources at the Aspen Institute, Wye Plantation, Queenstown, Maryland, Dec. 14–16, 1982* (Washington, D.C.: Council on Library Resources, 1983). ■■

APPENDIX A. CHECKLIST

Operational Features

1. Catalog requires user to log-on or follow "begin" procedure?
2. Catalog requires user to log-off or follow "end" procedure?
3. Catalog offers command dialogue mode?
4. Catalog offers menu dialogue mode?
5. Catalog offers combination command/menu dialogue mode?
6. Catalog allows input by touch screens?
7. Catalog allows input by keyboard?
8. Catalog allows input by function keys?
9. Command names or abbreviations understandable? Rememberable?
10. Command entry procedures consistent?
11. Catalog allows users to move forward through screens/displays?
12. Catalog allows users to move backwards through screens/displays?
13. Can user lock the system?
14. Can user easily unlock the system?
15. User can stop or interrupt output at any point?
16. Catalog allows users to stack commands?
17. Catalog allows users to print a copy of selected records?
18. Catalog allows users to place a hold or reserve on an item?

Access Points

1. By Personal Author?
2. By Corporate Author?
3. By Author/Title?
4. By Title?
5. By Series?
6. By Subject Heading?
7. By Keyword?
8. By Call Number?
9. By Standard Numbers (i.e., ISBN, ISSN, OCLC, etc.)?
10. Other additional access points?

Search Features

1. Lists of subject headings available for browsing?
2. Do headings include subject subdivisions?

3. Catalog has name authority control?
4. Catalog has subject authority control?
5. Catalog displays cross-references on screen?
6. Catalog allows user to access records directly from cross-reference listings?
7. Catalog allows users to browse the indexes?
8. Catalog offers use of the Boolean operator "and"?
9. Catalog offers use of the Boolean operator "or"?
10. Catalog offers use of the Boolean operator "not"?
11. Catalog prompts users in the use of Boolean operators?
12. Catalog accepts truncated search terms?
13. Catalog requires special truncation symbol?
14. Catalog has lower limit on number of characters to be truncated?
15. Catalog offers use of proximity operators?
16. Catalog offers use of relational operators?
17. Catalog allows user to begin new search at any point?
18. Catalog limits search results?
19. Limits by what criteria?
20. Catalog prompts users through limitation process?
21. Catalog suggests ways of increasing search results?
22. Catalog allows users to save searches?
23. Catalog allows users to combine saved searches?
24. In menu mode, how many levels of screens before answer reached?
25. In menu mode, how many screens at each level?

Display Features

1. Catalog has a one-line format for multiple record listings?
2. Catalog indicates number of postings per listing?
3. Catalog allows users to select more than one record for display purposes?
4. Catalog allows users to select a range of records for display purposes?
5. Catalog provides brief bibliographic record display?
6. Catalog provides a full bibliographic record display?
7. Catalog provides a MARC bibliographic record display?
8. Catalog provides different bibliographic record formats for different types of materials (i.e., records, serials, etc.)?
9. Records retrieved in subject searches contain lists of subject headings?
10. Do multiscreen record displays list the total number of screens?
11. Do multiscreen record displays tell the user how to get to the other screens?
12. Catalog automatically displays a record when it is the sole response to a search term?
13. Catalog displays bibliographic records in catalog card format?
14. Catalog displays bibliographic records in tagged tabular format?
15. Catalog offers users a selectable record display format?
16. Tags are self-explanatory in tagged record displays?
17. Tags are capitalized in tagged record displays?
18. Tags are left-justified in tagged record displays?
19. Record displays are free of abbreviations, codes, jargon?
20. Record displays make use of upper and lower case letters?
21. Brief record displays contain item status reports?
22. Full record displays contain item status reports?
21. Catalog automatically displays item status for each record?
22. Catalog requires a separate command to display item status reports?
23. Catalog allows users to change display order of records (i.e., chronological, alphabetical)?
24. Catalog provides a guide or index for multiscreen record listings?

User Assistance Features

1. Catalog provides a screen explaining what materials are in the catalog?
2. Helpful introductory display?
3. Initial instructions clear?
4. Catalog is case insensitive?
5. Catalog makes allowances for missed/incorrect punctuation?
6. Catalog provides prompts with each screen?

7. Brief or full prompts on each screen?
8. Prompts are clear and helpful?
9. Catalog has understandable error messages?
10. Error messages are specific and/or corrective?
11. Catalog provides help screens?
12. Help screens are clear and concise?
13. Help screens are context specific?
14. Help screens are easy to get to and back from?
15. Library can design and input their own help screens?
16. Catalog provides a list or directory of help screens?
17. Catalog provides a list of all available commands?
18. All screen displays are free of computer jargon?
19. Catalog informs user of processing activity?
20. Catalog provides an online tutorial?
21. Response time is consistent?

Note: The checklist was also used to evaluate a public access catalog on CD-ROM. While we were satisfied that the checklist is suitable for evaluating this technology, we would suggest a number of additions to, and deletions from, the checklist as it appears here in order to ensure the effectiveness of this approach to the microcomputer-based technology. ■■

Online Catalogs and Shelflist Files: A Survey of ARL Libraries

Margie Epple and Bernice Ginder

A survey of 87 ARL libraries that have online catalogs or were planning for one was conducted in fall 1986 to determine the status of three interrelated library files: the public card catalog, the shelflist file, and the capabilities of online systems in relation to traditional shelflist functions. Overall responses revealed that online public access catalogs provide sufficient functionality to allow public card catalogs to be closed, but the online systems currently operational or planned for in most of the ARL libraries surveyed do not provide a viable substitute for the shelflist functions of inventory control, collection assessment, holdings (copy) information location, and call number assignment.

As online public access catalogs (OPACs) become more commonplace in university and college libraries, the attention surrounding their implementation has focused on public services concerns—user needs and satisfaction—with much less detail on the impact of the new technology on two major technical services concerns—maintenance of the public card catalog and shelflist. Although many technical services operations center around maintaining these paper files, the role of the OPAC in the changing environment of technical services has yet to be defined.

It is generally assumed that once an OPAC capable of processing, storing, and displaying library bibliographic records and item status is operational, the card catalog and auxiliary files will, at the very least, be frozen (all activity stopped). In predictions as early as 1975 about the impact of the online catalog, public card catalogs were targeted for total elimination, closure (with or without ongoing maintenance), or freezing, depending on the percentage of bibliographic records represented in machine-readable form.[1] In 1979 Malinconico and Fasana identified and defined the range of problems that a library should evaluate before deciding to close a card catalog and also described the kinds of options and alternatives to paper card catalogs available at that time.[2] In 1985 Matthews discussed what to do with the existing card catalog, and in 1986 he described the considerable implications of the online catalog for technical services, grouping them into five areas of concern: bibliographic records, authority control records, creation of indexes, maintenance of the catalog, and organizational issues.[3] The possible survival of the card shelflist, however, and the traditional library functions associated with it have been given little attention.

The public card catalog organizes the library's or a group of libraries' holdings alphabetically by author and/or title and

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subject. Users are able to find materials by author, title, or broad subject areas. The shelflist, a classified catalog, is traditionally defined as the record of all the cataloged material in a library, arranged in the same sequence as the materials appear on the shelves. While establishing a master bibliographic record, the shelflist has also been used to maintain holdings (copy) information, allow for shelf inventory, assign unique call numbers, and analyze collection strengths and weaknesses.

To explore and assess further the impact of automation on card catalog and shelflist maintenance and to determine if libraries are closing their paper files in response to the installation of an OPAC, a survey of Association of Research Libraries (ARL) members (118 major research libraries in the United States and Canada) was conducted to determine:

1. If the online catalogs and records management systems currently operating provide the data necessary to perform typical technical services operations;
2. What factors affect the continued maintenance of paper card files after the implementation of an online catalog;
3. What criterion determines when to stop producing cards and maintaining shelflists and to close public card catalogs.

METHODOLOGY

Since 1985, ARL has conducted an annual survey of the status of automation in its member libraries.[4] Libraries respond to a detailed questionnaire that asks if they are planning for or already have an operational online catalog. The 87 libraries that responded affirmative formed the basis for this study.

Surveys were sent to the libraries in fall 1986 requesting information on the status of three interrelated library files: the public card catalog, the shelflist file, and the current capabilities of an online system in relation to traditional shelflist functions.

Respondents were asked to describe the level of maintenance for the public card catalog and the shelflist files, the criteria used to establish closing dates for either of these files (or the anticipated criteria for closing them in the future), and the functions incorporated into their online system that would allow them to discard or close the shelflist.

This article analyzes the data collected from the surveys returned by 84 participating ARL libraries (a 96% response rate to the survey). Of these libraries, 45 had operational online catalogs, and 39 were in the planning stages. A summary of the responses to each section of the survey follows. Overall patterns and conclusions appear at the end of the report, and a copy of the complete survey is included as appendix A.

PUBLIC CARD CATALOG

Maintenance of Card Catalog

Responses from the institutions surveyed indicated that cards are still being filed at 55% of the libraries (46 out of 84 sites), and another 6 reported that some filing was taking place for special formats or branch libraries. Conversely, 36 libraries have closed, frozen, discarded, or stored their public card catalog. In 6 of the locations, the catalog or some portion of it has been moved to a storage area or discarded entirely (see table 1).

Timing of Card Catalog Closing in Relation to Online Catalog Implementation

Timing of the card catalog closing vis-à-vis the implementation of an online catalog

Table 1. Public Card Catalog Activities

	Yes	No	Partial
Filing cards	46	32	6
Holdings maintained on cards	35	49	
Cross reference cards filed	34	50	
Closed except for withdrawals or recataloged titles	20		
Frozen, no activity	17		
Discarded/in storage	6		

varied substantially among respondents who had closed their catalogs (see table 2). Four institutions closed the card catalog before the online catalog was available (from 3 to 18 months prior); 8 sites reported closings simultaneously with the implementation of the online catalog; 9 closed only after implementation (from 3 months to 3 years later).

Factors of Criteria Determining Catalog Closing

The determining criteria used by institutions that had closed their catalogs also varied. Some responded that money spent on catalog card maintenance was needed to support the implementation of the online catalog, while others reported that they could not afford to maintain parallel systems. The percentage of the collection in the online catalog, filing and authority backlogs, and stability of the online catalog were all mentioned as contributing to the selection of a closing date, but issues relating to funding were most prevalent, as evidenced by the summary in table 3.

Plans for Card Catalog Closing and Anticipated Timing

Similar questions were asked of those institutions who had not yet closed their catalog. According to the responses received, the majority of libraries were planning to close their card catalog, and only 4 libraries indicated that they had no plans to close. As illustrated in table 4, almost half (23) of the 48 institutions anticipated their closings would take place by 1988.

Anticipated Factors or Criteria for Closing the Catalog

For those institutions planning to close catalogs, the anticipated criteria for establishing a closing date were also examined. Two issues most frequently identified were stability of the online catalog and retrospective conversion. Of the 48 institutions planning to close, 26 listed a stable online catalog as one of their criteria for closing. The second most commonly mentioned factor was retrospective conversion. Ten institutions referred to retrospective conversion and the need to increase the percentage of

Table 2. Timing of Card Catalog Closing to Online Catalog Implementation

Before (3 to 18 months)	4
Same time	8
After (3 months to 3 years)	9

Table 3. Factors Determining Catalog Closing (libraries with closed catalogs)

Drain on resources	6
COM or book catalog	6
AACR2	5
Filing backlogs	3
Portion of collection online	3
Stability and functionality of online catalog	2
Currency of online catalog	2
Administratiive approval	1
Little use of card catalog	1

Table 4. Closing the Card Catalog

If Not Already Closed, Do You Anticipate Closing the Card Catalog?	
No Plans to Close	4
Plan to Close	48
Anticipated Timing	
Between 1987 and 1988	23
No date established	11
When online catalog available	4
As soon as possible	1
Six months after online catalog	1
1988–89	1

Table 5. Anticipated Factors for Closing the Catalog (libraries planning to close)

Stability	26	
Retrospective conversion	10	(5 aiming for 100%)
As soon as online is available	8	
Sufficient number of terminals	8	
Online authority control	4	
Not determined	3	
Lack of space	2	
Available backup	2	
Clean database	1	
Available link to networks	1	
Simultaneous database and index updating	1	
Currency of online catalog	1	
Wide area access to catalog	1	
Faculty acceptance	1	

bibliographic records contained in the online catalog. Half of these libraries indicated that a full retrospective conversion would be completed before they close the card catalog.

Other factors mentioned, as detailed in table 5, were a sufficient number of terminals, availability of online authority control, faculty acceptance, and the availability of a backup to the online catalog.

SHELFLIST CATALOG

Maintenance of Shelflist Catalog

In describing the status of their paper shelflist file, 77 of the libraries indicated that they were filing cards for new materials, with 65 responding that they were also maintaining holdings on the shelflist. Conversely, 5 libraries were no longer filing shelflist cards, and 2 had limited their card filing in some fashion (i.e., filing for branches only, filing for collections that were not fully converted, etc.), while 19 had discontinued adding holdings or copy information to their shelflists. As can be seen in table 6, the 5 libraries that no longer file cards have closed, frozen, or discarded their shelflist files.

Timing of Shelflist Closing in Relation to Online Catalog Implementation

Table 7 details the responses of libraries that have closed their shelflist file, indicating at what point they closed these files in relation to the date the online catalog was implemented. As can be seen, the majority of libraries waited until the online catalog was operational before closing all or part of their paper shelflist.

Factors or Criteria Determining Shelflist Closing

These same libraries were also asked to provide the criteria used as a guideline for the closures. Some libraries listed more than one factor, but most of the criteria centered on the availability of the traditional shelflist functions online and the proportion of bibliographic records converted to machine-readable form (see table 8).

Plans for Shelflist Closing and Anticipated Timing

The libraries that had not closed their shelflist catalogs were asked whether they planned to close the shelflist and, if so, at what point in the future closing would occur. As can be seen in table 9, these libraries were evenly distributed between those with no plans to close and those who plan to close. Although most of the libraries planning to close the shelflist had not decided when the closing would take place, they had established some basic criteria to be met before the closing (see table 10). The second largest number of libraries, however, anticipated closing their shelflist within the next year or two.

Anticipated Factors or Criteria for Closing the Shelflist

The primary criterion established for closing catalogs in the future was the availability of shelflist functions online. As can be seen in table 10, 7 libraries would not close their shelflist until complete retrospective conversion had taken place, and 5 libraries reported that their online system would have to perform true call number searches, including subcollection designa-

Table 6. Shelflist Catalog Activities

	Yes	No	Partial
Filing shelflist cards	77	5	2
Holdings maintained on shelflist	65	19	
Closed except for withdrawals or recataloged titles	1		
Frozen, no activity	3		
Discarded/in storage	1		
Cards for converted titles are pulled	1		

tions, and have improved browsability before they would consider closing the paper files.

Table 7. Timing of Shelflist Closing to Online Catalog Implementation

Same time	1
After (2 to 4 months)	2
After (8 months to 1 year)	2
After (gradually over 6 years)	1
After (as sections of the shelflist are converted)	1

Table 8. Factors Determining Shelflist Closing

Functions available online	2
Partial shelflist functions online	2
Percentage of shelflist converted	2
Availability of in-process records	1
Catalog module availability	1
After smooth overlap	1
System could not produce an acceptable shelflist card	1

Table 9. Closing the Shelflist Catalog

If Not Already Closed, Do You Anticipate Closing the Shelflist Catalog?	
No plans to close	36
Plan to close	33
Anticipated Timing	
No decision on date	19
Between 1987 and 1988	10
Between 1990 and 1992	3
Two years after online catalog	1

Table 10. Anticipated Factors for Criteria for Closing the Shelflist

Shelflist function available online	16
Complete retrospective conversion	7
True call number search and browsability	5
Stability of system	3
Criteria not established	3
Complete conversion of holdings	2
As classifications are converted	1
Real time updating of database	1
Greater percentage of collection represented in online catalog	1
Duplicate call number checks	1
Ability to merge circulation holdings with bibliographic records	1

CAPABILITIES OF THE ONLINE SYSTEM FOR TRADITIONAL SHELFLIST FUNCTIONS

Survey participants were asked to describe the capability of their current online systems to perform four shelflist-related functions: inventory control, assignment of call numbers, maintenance of holdings information, and assessment of collection strengths and weaknesses.

Inventory

Of the libraries that had operational online systems, most interpreted the question regarding inventory as referring to material status (i.e., missing, on order, withdrawn, etc.), which most circulation systems are capable of providing. However, of the libraries that do perform physical inventories of their collections, the majority indicated that they were using a combination of paper shelflist and printed lists from online systems. In some libraries, where the collection had been completely converted, portable barcode scanners were used to scan barcodes in books while on the shelf and compare that information with the circulation database. Others rely solely on printed call number lists from the system bibliographic database. It was clear from the responses, however, that few systems are capable of producing printed lists in true shelf order.

Assigning Call Numbers

One of the key functions of the shelflist is to assist in assigning call numbers by displaying existing materials in a particular classification range. The survey responses revealed that in virtually all online systems it was possible to search and browse the database by call number. However, 4 institutions qualified this by pointing out that the online index arrangement is not presently in true shelflist order. Another 4 indicated that the online system would not be used for assigning call numbers until retrospective conversion was completed. Nine libraries reported either using their online system solely or in combination with the shelflist when assigning call numbers. A

few also mentioned the ability of their system to detect duplicate call numbers.

Holdings

Nineteen of the 84 libraries surveyed responded that they were maintaining partial or complete holdings online. In most cases, monographic holdings—copies, volumes, parts—were no longer added to the card shelflist but serial holdings continued to be added to the shelflist or kardex.

The maintenance of holdings appears to be the easiest shelflist function to replace. In circulation systems implemented before an OPAC, item-specific records are created to allow for circulation of library material, and these records form the basis for holdings statements in the OPAC for some libraries.

Collection Assessment

The shelflist is often also used as a tool in assessing collection strength. When asked if this capability had been incorporated into the online system, 22 institutions answered affirmatively. Six reported that their online system was capable of producing various reports and listings for assessing collection strength. Specific types mentioned included extracts by classification range, call number, format, language, and imprint. The ability to assess collections through the use of circulation activity data was also noted by 5 of the libraries, and 4 others reported that simple statistical reports by classification number were possible. A combination of the shelflist and online system was being used by 2 institutions in assessing collection strengths. "Just beginning to investigate" or "will be available in the future" were terms used by 6 respondents.

FINDINGS AND CONCLUSIONS

As previously described, the survey was undertaken to explore the impact of automation on card catalog and shelflist maintenance and more specifically to determine: (1) if the online systems in use are able to perform typical technical service operations, (2) what factors are affecting the continued maintenance of paper card files after the implementation of an online system, and (3) what criteria institutions are using to determine when to close the card catalog and shelflist.

Overall, responses revealed that online public access catalogs are indeed able to provide sufficient functionality to allow public card catalogs to be closed. Malinconico and Fasana reported in 1979 that few research libraries had actually closed their catalogs.[5] In 1984 Freedman stated that the overwhelming number of North American libraries, including public and university/college libraries, still had card catalogs.[6] However, this current survey of ARL libraries reveals a visible shift from reliance on paper card catalogs to a use of online systems. Almost half of the libraries surveyed have closed their card catalogs, and by 1988 this figure will rise to more than 72%. Moreover, the typical activities of maintaining holdings and filing cross references seems to be diminishing even for those libraries still filing cards. Only 34 of the 46 libraries filing cards are filing cross reference cards, and 35 of the 46 are maintaining holdings in the catalog.

Interestingly enough, the timing and criteria cited by those institutions who had closed their catalogs and those planning to close were not consistent. If we disregard those institutions who closed their catalogs and went to COM or started a secondary catalog as a result of AACR2, then the primary factors influencing the timing of the closing were the drain on resources in connection with operating two systems and large filing backlogs. The portion of the collection in the database was cited third and stability and functionality fourth. It is also worth noting that 12 of the 21 libraries that have closed their card catalog and gone to an online catalog did so either before the OPAC was available or at the same time it was installed.

Libraries who were just planning to close had a very different list of factors determining their anticipated closing. In this case, the top two factors were stability and retrospective conversion; these accounted for half the responses. The third and fourth items mentioned with equal frequency were the availability of the online catalog and the availability of a sufficient number of terminals to support patron demands. Eight libraries indicated that they would

close their card catalogs as soon as the online catalog was available, and another 8 indicated that an adequate number of terminals was one of their main criteria. The funding aspect and the drain on resources involved in operating two systems were not directly mentioned as factors determining the closing of the catalog by any of the institutions just planning to close. Libraries in this category seemed to be much more demanding in their criteria and requirements than the libraries who had already closed.

It appears that before the shelflist can be replaced by an online system, most libraries want a system that provides the same information and can perform the same functions as the paper file. But it is also evident that systems currently operational in the ARL libraries surveyed are not able to satisfy these requirements.

An examination of survey responses reveals that 31 of the 77 libraries maintaining paper shelflists have operational online catalogs. These 31 libraries report the failure of online systems to provide traditional shelflist functions as the major reason for not closing the shelflist catalog.

Although libraries had different priorities for what functions were most needed in an OPAC before closing the shelflist, the most cited functions needed in an OPAC were the ability to search, browse, and sort in complete call number order by shelf arrangement and/or separate collections; the updating of all indexes in real time; and the ability to detect duplicate call numbers. These functions were deemed essential for assigning call numbers and using the database for inventory purposes.

Secondary reasons for maintaining parallel systems included the need to complete retrospective conversion projects, and several libraries elected to overlap the systems to test reliability and stability and to build staff confidence in the new system.

A separate group of respondents indicated that they had no intention of closing the shelflist and that they would continue to produce and file cards even after the closing of the public card catalog, because filing in the shelflist is not labor-intensive. However, these same libraries indicated that holdings would be maintained online rather than in the shelflist.

Because shelflist functions, importance given to individual functions, and the rate of retrospective conversion varies from library to library, the transition from manual card files to online files is typically a gradual process. Most libraries have taken, or plan to take, interim steps toward closing their shelflist by maintaining holdings for monographs online while continuing to maintain serials holdings on shelflist or kardex, closing the shelflist for collections fully converted while continuing maintenance for other collections, and/or filing cards for branch libraries or remote sites that are not fully converted.

The ability to inventory library collections physically has been linked directly to the accuracy of the paper shelflist file. In recent years, with a gradual shift to maintaining partial or complete holdings online, libraries have looked for this same capacity in online systems. Online systems must either have the ability to arrange and print lists of call numbers in true shelf order so that a manual inventory of the collection can be performed, comparing the list to the shelf, or the system must be able to incorporate the use of a barcode scanner to accomplish the same task more efficiently by allowing for direct access to the bibliographic database and/or the circulation files.

A comparison of libraries that have not closed their public card catalog or shelflist shows that 92% plan to close their card catalogs, but only 48% have made the decision to close their shelflist files, even after implementing online systems. It is obvious from the data collected that an OPAC can provide the same, and in most cases, more access to library collections than the traditional paper card–based catalog, but the functions that the shelflist serves seem to be more difficult to replicate in an online environment. Could it be the case, however, that we have not clearly defined the system requirements for an online shelflist and that this has simply taken a back seat to the OPAC development?

REFERENCES

1. Kenneth Bierman, "The Future of Catalogs in North American Libraries" in *The Nature and Future of the Catalog: Proceedings of the ALA's Information Science and Automation Division's 1975 and 1977 Institutes on the Catalog*, ed. Maurice J. Freedman and S. Michael Malinconico (New York: Oryx, 1979); "Beyond '1984': The Future of Library Technical Services," *Technical Services Quarterly* 1, no.1/2:8 (Fall/Winter 1983).
2. S. Michael Malinconico and Paul J. Fasana, *The Future of the Catalog: the Library's Choices* (New York: Knowledge Industry Publ., 1979).
3. Joseph R. Matthews, *Public Access to Online Catalogs*, 2d. ed. (New York: Neal-Schuman, 1985), p.100; "The Online Catalog and Technical Services," in *The Impact of Online Catalogs*, ed. Joseph R. Matthews (New York: Neal-Schuman, 1985), p.15–20.
4. Association of Research Libraries, Office of Management Studies, *The Automation Inventory of Research Libraries, 1985* (Washington, D.C.: ARL, 1985).
5. Malinconico and Fasana, *The Future of the Catalog*, p.100.
6. Maurice J. Freedman, "Automation and Future of Technical Services," *Library Journal* 109:1197–1203 (June 15, 1984).

APPENDIX A. CARD CATALOG SURVEY

Please return completed survey to: Margie Epple
Head, Technical Services
Kilmer Area Library
Rutgers University
New Brunswick, NJ 08903

Name of Institution:

_____

Contact person/phone:

_____

Please check if interested in receiving a copy of the survey results. _____

I. Public Card Catalog Status

1. Which of the following describes the main public card catalog in your library? Check as many as apply:
   _____ Cards are filed for new materials
   _____ Holdings maintained on cards
   _____ Authority cards being filed
   _____ Closed, but maintained for withdrawals and recataloged titles
   _____ Frozen—no activity of any kind
   _____ Discarded/in storage
   _____ Cards for converted titles are pulled from the catalog
2. If the public card catalog is closed, continue with question 2; otherwise go to question 3.
   a. At what point after the online catalog was implemented did catalog close:
      _____ Same time _____ Years (number)
      _____ Months (number) _____ Do not know
   b. What criteria was used for establishing the closing date? (Example: % of holdings in database, stability of the online catalog, etc.) *Please describe:*
3. If the public card catalog is not closed, do you anticipate closing it at some point in the future?
   _____ No plans to close
   _____ Plan to close on _____ (date)
4. If you are planning to close the catalog, what will the criteria be for closing? (Example: reaching a certain % of holdings in database, stability of online catalog, etc.) *Please specify:*

II. Shelflist Status

1. Does your institution still maintain a card shelflist? Check as many as apply:
   _____ Shelflist cards are filed for new materials
   _____ Holdings are maintained on the shelflist
   _____ Shelflist is closed, but maintained for withdrawals and recataloged titles
   _____ Frozen, no activity of any kind but available for consultation
   _____ Discarded/in storage
   _____ Cards for converted titles are pulled from the catalog
   _____ Other (please describe)
2. If the card shelflist is no longer maintained, continue with question 2; otherwise go to question 3.
   a. At what point after the online catalog was implemented did shelflist maintenance stop?
      _____ Same time _____ Years (number)
      _____ Months (number) _____ Do not know
   b. What criterion or measure was used for establishing a closing date? (Example: shelflist functions available online, % of titles in the database, etc.) *Please describe:*
3. If the card shelflist is still fully maintained, do you anticipate this changing at some point in the future?
   _____ No plans to cease maintaining the shelflist
   _____ Plan to stop maintaining the shelflist on _____ (date)
4. If you are planning to close or no longer maintain the card shelflist, what will be the criterion for this change? (Example: shelflist functions now available online, all titles are converted to machine-readable form, etc.) *Please describe:*

III. Automated Systems Status

Traditionally, the shelflist has served as a tool for inventorying, assigning call numbers, holdings statements, and for collection strength assessment. Have any or all of these functions been incorporated into your online system:

_____ Inventory (explain below)

_____ Assigning call numbers (explain below)

_____ Holdings (explain below)

_____ Collection assessment strength (explain below)

Thank You for Your Time!

■■

Indexing for the Online Catalog

A. B. Chitty

The proliferation of online public access catalogs (OPACs) requires some systematic rationale for the comparative evaluation of their designs. Considered as an indexing application, the OPAC can be analyzed by three features: the varieties of bibliographic data processed, the kinds of indexes constructed, and the ways in which the indexes are searched. No one configuration applies to every library research project with equal efficacy or likelihood of satisfying queries. However, the rationale proposed can compare and evaluate alternative library computer catalogs in terms of the library's understanding of the relationship between the library's collections and their use.

The online public access catalog (OPAC) is fundamentally an indexing application, yet the sheer novelty of online access to machine-readable records of library holdings often masks important issues in developing and implementing this application. The various OPACs developed over the last few years exhibit different approaches to providing ready and effective online access to library holdings, and the range itself suggests some of the confusion and miscomprehension involved in this aspect of library systems development.

Rooted in the unexamined contradictions of historical development, this confusion hinders the construction of any rationale more substantial than a checklist of features for the comparative evaluation of online public access catalogs. While much effort has been invested in the theory and practice both of indexing and of the manipulation of machine-readable bibliographic records, the online public access catalog itself has been a haphazard, even opportunistic, though not irrational, development. Commercially driven development, answering as it must to the vendor's perception of market acceptability (and the vendor's cash flow), is mostly a recursive process, proposing and disposing as ideas are implemented, sent out into the marketplace, and returned for review and revision. Considering the central role of collecting, cataloging, and circulating books in the library's organization and work and confronted with the proliferation of paperless media in the distribution of information, the failure to address this lack of rationale is at least risky and potentially subversive of the effectiveness of the library's most precious (at least most costly) possession, its catalog. This paper proposes a rationale for the comparative evaluation of the effectiveness of an online catalog's design for the retrieval of citations relevant to the patron's query from a MARC database.

HISTORICAL ISSUES

The historical dimension of the confusion is an irony of the chronology of library automation. The first great automation project was the machine-readable cataloging (MARC) effort initiated by the Library of Congress more than two decades ago. Its crowning achievement was the standard LC/MARC format for bibliographic data, the basis of the great bibliographic utilities, OCLC, RLIN, and WLN. Even as this project came into final flowering with the

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elaboration of LC/MARC formats for nonbook materials (most recently the completion in 1986 of standards for serial holdings), its functional context shifted. The LC/MARC format is a communications format; it provides standards for the communication, capture, and recognition of bibliographic data. The shift follows from a change in the "recipient" of the communication, defined on both machine and human levels.

The original machine recipient of this communication was a catalog card printer; the target is now the online bibliographic database of local library holdings to which the OPAC provides access. In the context of OPAC development, many LC/MARC features are irrelevant or even misleading: in retrospect the LC/MARC format is littered with printing and pseudo-printing instructions. The paradigmatic example is the "main entry," coded in the LC/MARC 1XX tag series, a cataloging concept that has evolved from its origins as the basis for ordering entries in catalogues raisonnees, through its use as a means of controlling reproduction costs in book and card catalog, to its present position as a source of considerable complexity (and confusion and heartbreak) in the rules promulgated by the second edition of the *Anglo-American Cataloguing Rules (AACR2)*, with the attending controversies over imposition, superimposition, and finally desuperimposition.

The communication's human recipient, the "user," has changed more profoundly, from using machine-readable bibliographic records to support copy cataloging to using them in library reference work as sources of topical citations. In copy cataloging, the user of the bibliographic database wants to know if a title actually inhand at the terminal has already been cataloged. The online record of libraries' participation created in OCLC, RLIN, and the large, shared circulation systems permitted an extension of this use of the database, the online union catalog (OLUC) of holdings. This utilitarian extension has been a vast, profound enhancement of the librarian's reach, but the improvement is quantitative rather than qualitative: the searcher must still have previously identified the citation sought. In front of the reference desk or the catalog, the would-be user of the database usually does not yet know the relevant titles and certainly does not yet have them at hand. The answer demanded from the database has changed from "yes/no" to "try this, and this, and this."

Despite the shift, the development of online catalogs of local library holdings rests on the LC/MARC format for bibliographic data. The economies of copy cataloging are too deeply embedded in library funding and budgets, and the utility of online access to large collections of holdings of known items is too important to library service for the MARC format to become obsolete. The question for OPAC development is not how the format might be improved but how best to use it. Indexing is the key to its use.

Indexing cannot be considered in isolation. The utility of any indexing technique depends both on the way the index manipulates the data and how the index is searched.

BIBLIOGRAPHIC DATA

The LC/MARC record contains various data encoded in various ways: the record identification and control data, the identification of the bibliographic entity, printing instructions, and a variety of data elements designed to allow the bibliographic record or the item to which it refers to be juxtaposed to records or items similar in some significant feature. These "relational" data elements are "headings" or "access points," so-called from their use in filing and finding cards or entries in a catalog or list. Headings are identified in the LC/MARC record format by type: the LC/MARC three-digit tags specify who was involved in the production of the text cited by the record, the various "names" (titles) given to the text, and what the text is about.

The headings data in the LC/MARC record, aside from control codes of various kinds, can be analyzed according to their content and arrangement. Some data are essentially arbitrary numeric codes; others are textual. Some are composed of "free" elements taken from the material described; others are assigned from controlled vocabularies. Some are arranged in more-or-less logical hierarchies; others follow natural language grammar. Any heading will fall into one category or the other along each of

these three dimensions, though not all headings are equally pure examples of the category. Decimal classifications are purely numeric, but alphanumeric classifications like Library of Congress use letters mainly as extensions of the cardinal decimal numbers. The alphabetic logic of subject (and institutional author) heading arrangement is conventional, though the subdivisions can be either grammatical or hierarchical, depending on whether or not the subfield code is processed as part of the text. Since these subfield codes specify certain logical relationships between the subdivisions and the head term—chronological, geographical, and the like—they permit the deployment of some filing or display order other than strictly alphabetic. The "grammar" of personal authors is highly conventional (witness the variations in filing rules according to the "nationality" of the name). Uniform titles are an especially complex hybrid.

The facility with which LC/MARC bibliographic data is manipulated can be summed up in whether the indexing process recognizes the various demarcations and codes within the data—fields, subfields, indicators—and how the codes are processed. Not all logically potential categories of access points have members (hierarchical free text is hard to imagine), nor are all LC/MARC access points relevant to the OPAC (ISNs and CODENs, for example). LC/MARC data elements other than traditional library catalog headings can be topically significant, serving as access points to bibliographic citations, as parameters for refining a retrieved set of citations, or as alternative index structures accessing the database. In contrast to the "precoordinated" controlled vocabulary headings, contents and abstracts can provide "postcoordinated" vocabularies. For topical indexing purposes (as opposed to bibliographic identification), these elements resembles titles. Format, imprint, date, edition or issue, and language data likewise can be topically significant, though rarely at the initial headings level. In the case of two types of bibliographic data elements, a new possibility is created by the use of the LC/MARC record as input to an OPAC. In both classifications (at the 0XX tag level) and in subjects (at the 6XX second indicator level), the MARC record preserves an option not readily available to the library that relies on a card or printed catalog: the creation of multiple alternative catalogs. The OPAC can provide a Dewey-classed catalog of a collection shelved in LC class order by building an 082 index. It can provide a MeSH (650–2) index to an LSCH collection. At a rudimentary level, this is accomplished merely by annotating headings from different sources with a print constant derived from the indicator. More sophisticated approaches involve segregating the indexes, with perhaps the ability to transfer among them at cross-referenced points, and in the case of alphanumeric indexes such as classifications, providing an indexed textual description of the subject.

INDEX STRUCTURES

There are two basic types of indexes to bibliographic records, and a third that

Table 1. Taxonomy of MARC Data Elements

Classifications (ABC)	Numeric, Controlled, Hierarchical
Institutional authors (aBC)	Textual, Controlled, Hierarchical
Subject headings (aBC)	Textual, Controlled, Hierarchical
Uniform titles (aBc)	Textual, Controlled, Grammatical
Personal authors (abc)	Textual, Free, Grammatical
Titles (abc)	Textual, Free, Grammatical
Series (abc)	Textual, Free, Grammatical
Contents (abc)	Textual, Free, Grammatical
Abstracts (abc)	Textual, Free, Grammatical

Key: A = Numeric; a = Textual; B = Controlled; b = Free; C = Hierarchical; c = Grammatical

NOTE: *Controlled* refers not to the use of authority to control variations in appearance, as in authors and series, but to the control of the vocabulary itself, as in subjects and classifications.

Table 2. Taxonomy of Index Structures

Structure	Access points	Context
Heading	Few	Present
Permuted	Many	Present
Keyword	Many	Absent

combines elements of both: heading, keyword, and permuted. The three vary in the ways in which they combine the number of entries (access points) generated with the extent to which the entry preserves the context from which it was extracted. The heading index closely mimics the card or book catalog: the bibliographic data element is treated as a single character string and filed once, in alphanumeric ASCII or ALA filing order left to right. The keyword index treats each identifiable component of the bibliographic data element as a single unit, filing an index term for each component identified, usually word-by-word as identified by blank spaces or field delimiters. The permuted index, like the keyword index, files an entry for each identifiable "word" but, like the heading index, preserves and displays the context in which the word has been found. Keyword indexes are also called KWOCs (KeyWord Out of Context); permuted indexes are also called KWICs (Key Word In Context) or "rotated headings." The permuted index is in principle the richest of the three structures.

SEARCH TECHNIQUES

Online searching can use two techniques: browsing and selection, and any particular search may combine both in some sequence. Browsing is quite familiar; selection is less well understood, and even the terminology is unsettled.

Browsing permits the searcher to review an alphabetically or logically ordered portion of an index. Selection permits the searcher to review a set of citations that have common features. The techniques differ chiefly in the demands they make of the user. Browsing is "error tolerant"; that is, rigid keystroke and lexical accuracy are less crucial to the search's success, while the success or failure of a selection search depends on both mechanical and conceptual accuracy. Browsing takes more time but requires less forethought, an equation reversed in selection. (Browsing, of course, may be used to aid forethought, and selection may be used to speed up browsing.) In general, browsing produces fuller retrievals, while selection retrievals are more narrowly relevant. (Of course, relevance and comprehension are also directly determined by the index vocabulary and structure.) On the other hand, selection can use some sophisticated methods to refine the retrieval, such as Boolean combinations of features.

Table 3. Taxonomy of Search Techniques

Feature	Technique	
	Browsing	Selection
Error tolerance	High	Low
Sophistication	Low	High
Retrieval relevance	Low	High
Comprehensiveness	High	Low

ASSESSMENT

While searching techniques are the most visible elements of the entire indexing configuration, their effectiveness directly follows from the way in which the technique takes advantage of the index's structuring of the bibliographic data. Not every combination of search technique, index structure, and bibliographic data responds equally to every kind of query or every kind of need for library information, nor does each combination manipulate with equal effect the bibliographic data available in the database derived from LC/MARC format records.

Some general principles can, however, be proposed. To the extent that they permit different approaches to online catalog design to be laid out side by side, they can be used to construct a comparative evaluation of various OPAC structures. Of course, no library is exactly like any other library, either in actual operation or in ambition, and there remain many other features of an online catalog that enhance or detract from its overall utility. Still, the flexibility of any particular OPAC in manipulating various kinds of bibliographic data into a responsive structure to be used by a technique appropriate to the query must be a crucial consideration.

Consider the various kinds of biblio-

graphic data. Numeric data are more arbitrarily coded than textual data and can be juxtaposed more comprehensively in logical arrangements than an alphanumeric order of controlled or free natural language terms can achieve. Likewise hierarchically structured terms permit more orderly arrangements than grammatical terms. Such arrangements are designed to be browsed and support more comprehensive retrievals. On the other hand, the effective assignment of controlled vocabulary terms of whatever content and structure to a text depends ultimately on the sophistication and finesse of the cataloger, while free or natural language text indexing permits the searcher more direct access to the terminology applied to the text by its author and undoubtedly follows trends in specialized terminology and technical jargon more closely than any controlled vocabulary. It does, of course, risk eliminating from the searcher's consideration those other citations accessible only through the intervention of a trained cataloger assigning standardized terminology to the text's bibliographic description.

Indexing structures are easier to assess. The heading index, for all its long service in card and book catalogs, is extremely limited in utility except as it juxtaposes terms that have been hierarchially structured. Its best use is probably in classification and shelflist arrangements. The keyword index is likewise limited except as it exposes terms embedded in larger terms whether structured logically in a hierarchy or naturally according to grammatical conventions. Its best use is probably in free text indexes. The permuted index combines the strengths of heading and keyword indexing but is not uniformly useful, or even feasible, for all kinds of bibliographic data.

Searching techniques differ in their ability to utilize various combinations of index structure and bibliographic data. Browsing is close to pointless in a free-text keyword index except as a memory aid or a way to eliminate irrelevant homographs. Selection can be applied to controlled term heading indexes, but the results are quite haphazard unless a fully automatic and well-developed cross-reference structure or thesaurus underlies the index. Both search techniques work well enough in a permuted index, but browsing is more effective if the index permutes hierarchical terms, and selection does not use the permutation's preserved context to advantage unless Boolean combinations are used. The various possible configurations begin to make sense in the context of a particular library's collections, services, and patrons. Selection from a free-text keyword index provides a quick search for any relevant item. Browsing a controlled term permuted index provides a systematic review of library resources on a topic.

Subjects and titles pose particular problems. The extent of a keyword selection can be easily expanded by including controlled-term keywords from subject headings in the index, though the dissolution of controlled-term hierarchies may be a high price to pay for the convenience. Likewise title keywords are useful topical descriptors, but the value of title browsing cannot easily be dismissed: permuted titles are undoubtedly a convenience for the searcher who cannot quite remember the name of the text desired (a case of "almost known item" searching). Collections for which LC/MARC access data is quite inadequate might also be taken into account. Materials using term descriptors, such as ERIC, need keyword indexes made of controlled terms and searched by Boolean selection, while other materials using concatenated headings, such as *Art and Architecture* terms, require permuted indexes searched by browsing. The effectiveness of any particular configuration of bibliographic data manipulation, index structure, and search technique depends on the patron's information and patience and the relative importance of relevance versus comprehensiveness in the retrieval's satisfaction of the query. These vary from library to library and indeed from patron to patron within a library and from time to time for any patron. However, the fundamental issue for the design of the OPAC is whether the search exploits the index to expose the appropriate bibliographic data to retrieval and, we hope, to intellectual use.

VARIETIES OF OPACS

Current OPACs show considerable vari-

Table 4. Summary Comparison of Selected OPACs

	ATLAS	BLIS	DOBIS	GLIS	INLEX	LIBS	LS2K	NOTIS	PALS	TOMUS
Bibliographic data manipulation										
Fields	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Plus Subfields	(1)	YES	YES	(1)	NO	(1)	(1)	(2)	(1)	NO
Plus Indicators	NO	(3)	YES	(3)	(3)	NO	(3)	(3)	NO	NO
Indexes										
Heading	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO
Keyword	YES	YES	YES	YES	NO	YES	YES	NO	YES	YES
Permuted	NO	YES	YES	NO	NO	NO	NO	NO	NO	NO
Searches										
Browsing	YES	YES	YES	YES	YES	YES	YES	(4)	NO	NO
Selection	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES

NOTES: (1) Use of the keyword index gives, in effect, access to subfields, though browsing is difficult. (2) Since NOTIS customers can specify and program how bibliographic records are to be loaded, within the heading logically ordered subdivisions can in theory be created. (3) Source indicators in 6XX tagged fields can be used as print constants to distinguish different kinds of terms. (4) Selections are presented to be browsed.

ety in their indexing configurations: the summary chart reflects the state of the art circa December 1986. The selection is somewhat fortuitous: these systems were proposed to Queens College of the City University of New York during 1985 and 1986. At least one (BLIS) is no longer readily available, and several others (IBM's DOBIS, Geac's GLIS, Sperry's PALS) have not made much market headway since 1985.

Even in this arbitrary selection, there are substantial variations. INLEX and TOMUS are mirror images. Only INLEX browses headings only, in effect mimicking the card catalog. Only TOMUS selects keywords only, the most radical departure from the card catalog. NOTIS is much closer to INLEX than to TOMUS: although local or bespoke programming can extend the range within which NOTIS manipulates MARC data, and although the initial entry into a NOTIS index is in fact selection of a key term, without either permuted or keyword indexes and fully realized selection searching, the interior of the heading remains accessible only indirectly and serendipitously. PALS is much closer to TOMUS than to INLEX, though unlike TOMUS it preserves the headings from which the keywords can be selected.

A keyword selection search, provided as an alternative to a headings browsing search, does give direct access to the interior terms of the headings in several systems (DRA's ATLAS, Geac's GLIS, CLSI's LIBS, OCLC's LS-2000, Sperry's PALS). At least one (LIBS) permits browsing near-homographs selected by a truncated keyword. However, the logical and hierarchical relationships are lost in the keyword selection search.

BLIS and DOBIS cover the range of features, though each has its problems. BLIS had developed only the very rudimentary "print constant" technique of marking variant topical terminological systems from the 6XX second indicator contents. DOBIS has not yet developed a uniform solution to filing order for permuted terms, though several solutions are implicit in the various DOBIS/MARC processing options.

OPAC development tends toward more rather than fewer options. Within certain limits, the marketplace demands it, and the history of CLSI's OPACs illustrates the direction. CLSI's first OPAC, the SEARCH process, imposed a selection technique on a headings index. Their second OPAC, then called PAC, browsed headings. Their third and current OPAC, once called PAC II, now CL-CAT, selects keywords or browses

headings. With the addition of a print constant distinguishing among various kinds of subject authority systems, this configuration is likely to become standard. Even NOTIS and INLEX—the two least fully developed OPACs—will surely soon catch up, if development capital continues to be available to them.

However, the major variations coincide with machine differences. The radical departures are based not on minicomputers, but on cascaded microcomputers (TOMUS) or mainframes (BLIS and DOBIS). Since machine capacity (in both memory and storage) is only a momentary constraint on computer system development, this standard is likely also to be momentary. So far as the use of the LC/MARC bibliographic record for the local OPAC goes, the permuted index structure and segregated topical indexes glimmer fitfully on the near horizon.

APPENDIX A. GLOSSARY

1XX tag: In the LC/MARC record, the main entry tagged fields.

AACR2: *Anglo American Cataloguing Rules*, 2d edition.

Access point: In a catalog record, text that serves as a filing element.

ASCII: American Standard Code for Information Interchange, a seven-bit-plus-parity code established by the American National Standards Institute (ANSI) to achieve compatibility between data services.

ATLAS: A Total Library Automation System, developed by Data Research Associates (DRA).

Biblio-Techniques: A software-only vendor with connections to WLN. The Biblio-Techniques system runs on IBM and lookalike machines, using ADABAS and COMPLETE system software from Software AG.

BLIS: Bibliotechniques Library Information System.

Boolean: George Boole (1815–64) developed the use of algebraic notation to express logical relationships, where the variables stand for statements and the connectives refer to the logical operations used in truth tables. Since all Boolean statements can be reduced to a binary number, Boolean logic is peculiarly adapted to computer processing. In library automation, a tiny part of the theory of Boolean algebra is used to define and modify by combination/exclusion sets of citations having common features.

Browsing: In OPAC searching, reviewing entries in an index forward and backward from a starting point.

Carlyle: Developer of TOMUS, an online catalog mounted on cascaded, dedicated microcomputers. The system and vendor have roots in the University of California CLASS project.

CL Systems: The largest of the turnkey local library systems vendors; located in Newtonville, Massachusetts. *CL* originally stood for Computer Library. The library automation system is called the LIBS-100 and runs under CLSI's proprietary operating system, FLIRT, on DEC PDP machines.

CL-CAT: The current name for the OPAC application in CLSI's LIBS system.

CLSI: C-L Systems, Incorporated.

DOBIS: DOrtmunder BIbliotheks-System, the library automation system developed by IBM Corporation for the University of Dortmund and enhanced at the University of Leuven. Also known as DOBIS/LIBIS (Leuven Integraal BIbliotheek System) or as DOBIS/Leuven.

DRA: Data Research Associates, a library automation vendor in Saint Louis, Missouri, long known primarily for library automation systems designed for the blind and physically handicapped. DRA's system is called ATLAS and runs on DEC VAX machines under VAX/VMS.

Free text: In information retrieval, unformatted or "natural language" text.

Geac Computers: A Canadian computer services vendor specializing in banking and library automation. *Geac* has no particular meaning. The library system is called GLIS (Geac Library Information System).

Heading: In library usage, a string of letters and numbers used as a filing element for a bibliographic entry.

Inlex: A software house in Monterey, California; developers of the INLEX/3000 library automation system. Inlex used to be called Electric Memory (EMI), has developed other applications besides library automation, and now uses mainly Hewlett-Packard HP/3000 machines and operating system software.

Keyword index: In library automation, an index with entries derived from individual words identified by machine in free or formatted text.

KWIC: Key-Word In Context, a keyword index that preserves, uses, and displays the words surrounding the individual word that has become an index entry.

KWOC: Key Word Out of Context, a keyword index that preserves, uses, and displays only the individual word that has become an index entry.

LC/MARC: Library of Congress Machine-Readable Cataloging, a standard format for communicating cataloging copy.

LIBS: "LIBrary System," CLSI's library automation system.

LS-2000: The Local System for the year 2000, developed by OCLC Local Systems. Runs on Data General equipment provided and supported by OCLC in a turnkey package under the MIIS/MUMPS operating system.

Main entry: In cataloging, the heading under which the fullest bibliographic description of the title is filed. The concept originally developed as the proper name of a text (usually literary), under which versions, editions, adaptations, and commentaries might be collated for convenient reference. Scholarly bibliographical description sometimes still uses the idea in its original sense.

MARC: Machine-Readable Cataloging. The original MARC project was undertaken by the Library of Congress, and MARC usually refers to cataloging copy recorded in the communications format developed by the Library of Congress and used by the major bibliographic utilities such as OCLC, RLIN, WLN, and Utlas. The main defects of LC/MARC follow from its history as a record for communicating instructions to a card set printer; its main virtues are its ubiquity and use as a standard copy cataloging format.

Natural language: Language spoken or written by real people, as opposed to computers and their minions.

NOTIS: NOrthwestern Total Information System, developed by Northwestern University in Evanston, Illinois, and now marketed as a software package for IBM and lookalike computer systems.

OCLC: Originally named the "Ohio Conference on Library Computing," OCLC is the largest of the online bibliographic utilities. OCLC Local Systems is OCLC's local library automation systems division, and OCLC's local system is called the LS-2000.

OPAC: Online Public Access Catalog.

PALS: The integrated system developed at Mankato State University and marketed by the Sperry Corporation.

Permuted index: A KWIC index.

Postcoordinated and precoordinated: In searching terminology, an index that embeds in its terms the logical relationships among descriptors is precoordinated. A retrieval system in which the searcher specifies any logical relationships is postcoordinated. Library catalog headings are precoordinated; a Boolean combination of free-text keywords is a postcoordinated search.

RLIN: Research Libraries Information Network, sponsored by the twenty-six-member Research Libraries Group (RLG), an OCLC clone which serves large academic research-oriented libraries.

Selection: In OPAC searching, retrieving a list of citations that are indexed by a specified term or combination of terms.

Sperry Corporation: A computer company known mainly for defense contracts, but also in the library automation market with the PALS system running on Univac machines.

TOMUS: The Online Multiple User System, developed by Carlyle; the most radical of the OPAC designs.

UTLAS: A Canadian bibliographic utility sometimes used by U.S. libraries.

WLN: Once the Washington Library Network, now the Western Library Network; the youngest, smallest, and most sophisticated of the big three bibliographic utilities. ■■

Incremental Costs of Library Service Policies for Online Catalog Access

Raymond G. Taylor, Jr.

The study reported here compares the costs of various library service policies and the conditions under which a library may adopt a highly service-oriented policy at minimum additional cost. Based on arrival rates, service rates, and queueing calculations, this study shows that libraries will face only minor incremental costs when adopting strong service policies for online public access, unless their high arrival rates are combined with low service rates.

One of the basic problems encountered by library planners when converting to an online catalog system is determining the minimum number of online terminals needed to satisfy a specific service policy. The queueing model from operations research has become the most widely accepted approach to this problem, although other less elegant methods have been employed.[1] The queueing model requires three inputs: an arrival rate, a service rate, and a service policy. This paper deals primarily with the third input: the library's desired service policy and its cost.

ARRIVAL AND SERVICE RATES

An arrival rate is simply the average number of patrons that can be expected to arrive at and use a catalog facility in a typical peak-use minute. This rate will depend upon the size of the patron pool and the extent to which those patrons make demands on the facility.

A service rate is only slightly more complex. It is the fractional number of patrons a single terminal can accommodate in one minute. Stated in more practical terms, it is the reciprocal of the average amount of time a patron can be expected to stay on a terminal. For example, if patrons stay on a terminal for five minutes on the average, then the service rate is the reciprocal of five (.20). Because one would normally think in terms of an average amount of terminal time used per patron rather than an average rate of patron service per terminal, it is useful to keep this reciprocal relationship in mind.

Although the service rate might be expected to vary from one library to another, particularly between types of libraries, the range of rates reported in the literature is surprisingly small: from about .10 to .50.[2] As a single confirmation of this range, the author participated in a study of several thousand online transactions within a single facility.[3] Service rates were computed, averaged on a daily basis, and found to range from .15 to .22.

SERVICE POLICY AND COST

In an earlier study, Raymond Taylor calculated the minimum number of terminals needed by libraries that had average peak

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arrival rates from 0.50 to 5.00 and average service rates from .10 to 1.00.[4] These calculations were repeated for sixteen different service policies. The policies ranged from "Ninety-nine percent of the time our patrons shall wait for a terminal one minute or less" to "Eighty percent of the time our patrons shall wait five minutes or less." In the first and most service-oriented policy, chances are only one in a hundred that a patron would have to wait more than sixty seconds for an available terminal even in a peak period. By contrast, with the least service-oriented policy, the patron would wait up to five minutes, one out of every five times.

The present study was undertaken to determine which of these sixteen policies a library ought to adopt based on cost, political factors, and a particular set of facility-specific arrival and service rates.

When the writer first became aware of the literature on queueing as it related to the "number of terminals" problem, the Ohio State University (OSU) policy struck him as extravagant. OSU reportedly chose to install enough terminals to assure that 90 percent of the time during peak periods their patrons would need to wait only one minute or less.[5] However, after computing the number of terminals needed to satisfy many policies over a broad range of service and arrival rates, it was discovered that such service policies are not extravagant and that the most service-oriented policy can be adopted by acquiring relatively few additional terminals. The following comments explain the conditions under which a highly service-oriented policy ought to be adopted and the conditions under which an upgrade in policy might be comparatively expensive.

The sixteen policies used in the earlier study by Taylor (1987) can be clustered into four groups of four each. Typical of such a cluster is the group formed by his policies 5, 8, 11 and 14 as given below.

- Policy 5: Patrons shall wait for a terminal one minute or less 99 percent of the time during peak periods.
- Policy 8: Patrons shall wait for a terminal two minutes or less 99 percent of the time during peak periods.
- Policy 11: Patrons shall wait for a terminal three minutes or less 99 percent of the time during peak periods.
- Policy 14: Patrons shall wait for a terminal five minutes or less 99 percent of the time during peak periods.

The other twelve policies from Taylor's study could be arranged into three clusters of four policies each which would have interrelationships similar to the above set. The analysis explained below pertains equally well to these other clusters.

There is a sense in which the first policy above provides five times the service of the fourth policy. One might therefore expect that many more terminals would be needed to satisfy the first policy than the fourth. This turns out not to be true for almost all combinations of arrival and service rates. For example, at North Carolina State University, where the arrival rate is 2.5 during peak periods and where the average service rate is .18, the most service-oriented policy requires twenty-two terminals while the least service-oriented policy requires sixteen.[6] The cost of six additional terminals amounts to less than 1 percent of the total project cost.[7] Yet, no other single minor expenditure in the online system budget is likely to have as great an impact on user satisfaction as the availability of terminals and the reduction of waiting time.

There are, however, combinations of arrival and service rates for which an upgrade in policy will require a much greater increase in the number of terminals. These combinations are formed by high arrival rates and low service rates. They appear in the lower left corner of the tables previously published by Taylor in *Information Technology and Libraries*.[8] One of those tables is reproduced here for the reader's convenience as table 1. Note how the number of terminals increases in a curvilinear fashion as the arrival rate increases and as the service rate decreases. In the bottom left-hand corner the number of terminals rises dramatically. (Numbers over twenty-five have not been computed.)[9]

Figure 1 shows the graphic relationship between arrival rate, service rate, and policy. Each "leaf" is one policy. The first leaf above the grid represents the least service-oriented policy, such as the five-minute commitment of policy 14 stated above. The

Table 1. (Policy 14)

Mean Arrival Rate	Mean Service Rate									
	.1	.2	.3	.4	.5	.6	.7	.8	.9	1
0.5	10	6	4	3	3	2	2	2	2	2
1.0	15	8	6	5	4	3	3	3	2	2
1.5	21	11	8	6	5	4	4	3	3	3
2.0	NFS	14	9	7	6	5	4	4	4	3
2.5	NFS	16	11	9	7	6	5	5	4	4
3.0	NFS	19	13	10	8	7	6	5	5	4
3.5	NFS	21	15	11	9	8	7	6	5	5
4.0	NFS	24	16	12	10	8	7	7	6	5
4.5	NFS	NFS	18	14	11	9	8	7	6	6
5.0	NFS	NFS	20	15	12	10	9	8	7	6

Minimum number of terminals, given 99% probability of waiting five minutes or less.

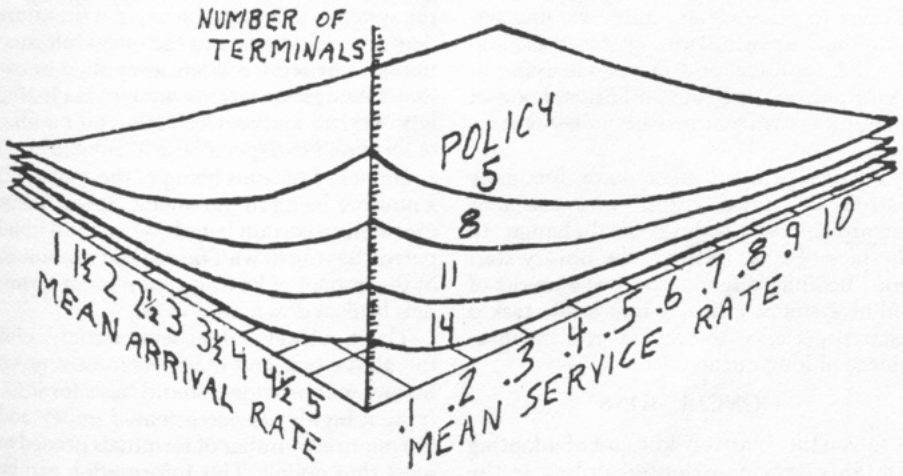

Fig. 1. Relationship among arrival rate, service rate, minimum number of terminals and policy.

next leaf ascending represents the three-minute target of policy 11, the next the two-minute target of policy 8, and the top leaf the one-minute target of policy 5. Note that over most of the area of the figure, each of the four leaves is only elevated slightly above another. The figure demonstrates how the four policies require a similar number of terminals in the middle range of combined arrival and service rates, as well as across the entire range of low arrival rates and the entire range of high service rates. It is only for a high arrival rate coupled with a low service rate that the leaves are widely separated.

If the number of terminals represented by figure 1 had been determined by simulation or by experimentation rather than mathematically, the researcher would have wanted to identify the area of the leaves that produced statistically significant differences among number of terminals required. If such a researcher had chosen to use chi square to "drill through" the four leaves of figure 1 at each combination of arrival and service rates, it would have been discovered that the differences in numbers of terminals required among the four policies were usually insignificant.[10]

Most likely, the experimenter would have raised the issue of significance as a prelude to speculating about the importance of the observed differences. Once he determined that the observed differences in number of terminals across the four policies over most of the range of arrival and service

rates was not significant, he would have concluded that those differences could have occurred by chance and should not, therefore, be regarded as important.

The present approach, however, is mathematical and is not based on simulation or experimentation. All differences in required number of terminals are precise and real; statistical significance is not an issue. However, even within the present mathematical approach, one has to be circumspect about arguing importance. Minor differences, no matter how precisely obtained, may be trivial in practice. Given the substantial commitment of resources needed to generate an online catalog system, the decreasing price of terminals, and the high political cost of not satisfying library patrons, the small additional cost of meeting a stringent service policy is merited.

Further, it is not uncommon for many patrons to express hostility and resistance toward imposed technological change. In the face of such feelings, the library staff must be able to demonstrate the merits of online systems, a nearly impossible task if users experience the delays and inconvenience of long queues.

CONCLUSIONS

Given the relatively low cost of adopting a highly service-oriented policy is the "number of terminals question" moot? That is, why not simply install as many terminals as space or finances allow and bypass the determination of arrival rates, service rates, and queueing calculations?

There are several important reasons why a careful examination of system requirements should be undertaken. First, the *minimum* number of terminals needed to meet a certain policy must be known in order to avoid the embarrassment and high political price of having the catalog inaccessible to a significant number of users during peak periods. Although a highly service-oriented policy may cost little more than a moderate policy, the library administrator needs to know the *range in number of terminals* required to accommodate all policies under consideration.

Second, without an arrival-service study and without reference to queueing solution tables or other calculations, the library administrator has no accurate means of anticipating the performance and adequacy of the system. Although the current literature does not yield sufficient technical information on queueing models as applied to online catalogs, a systems analyst beginning with arrival and service rates and number of terminals can specify the likelihood of: 1) x number of patrons being in the system, 2) x number being in the queue, 3) the queue exceeding a certain length, 4) an individual patron having to wait more than x minutes, 5) the impact of having x number of terminals broken down, and so on.

Third, a local arrival-service study, plus the above text and other references given below, will provide a sound basis for justifying a highly service-oriented policy and the required number of terminals needed to meet that policy. This information can be used for planning and budgeting.

Fourth, although the most service-oriented policy will be justified for most libraries, it is pointless to install an excessive number of terminals beyond those required by the adopted policy. Thus, a local arrival-service study and associated queueing solutions will help to assure good stewardship of resources.

REFERENCES AND NOTES

1. John E. Tolle, *Public Access Terminals: Determining Quantity Requirements* (Dublin, Ohio: OCLC, 1984); American Library Association, "Determining Terminal Requirements for Online Catalogs," *Library Systems Newsletter* 6:1 (Jan. 1986).
2. A. Whitney Knox and Bruce A. Miller, "Predicting the Number of Public Computer Terminals Needed for an Online Catalog: A Queuing Theory Approach," *Library Research* 2:95–100 (Spring 1981); see also Carole Weiss Moore, "User Reactions to Online Catalogs," *College and Research Libraries* 42:295–307 (July 1981) and Jerry Specht, "Patron Use of an Online Circulation System in Known-Item Searching," *Journal of the American Society for Information Science* 31:335–46 (Sept. 1980).

3. "Report of the NCSU Catalog Transition Committee," North Carolina State University, unpublished report (Mar. 1987).
4. Raymond G. Taylor, "Determining the Minimum Number of Online Terminals Needed to Meet Various Library Service Policies," *Information Technology and Libraries* 16, no.3:197–204 (Sept. 1987).
5. John E. Tolle, Nancy P. Sanders, and Nea K. Kaske, "Determining the Number of Online Catalog Terminals," *Information Technology and Libraries* 3:261–64 (Sept. 1983).
6. "Report of the NCSU Catalog Transition Committee."
7. The estimated cost of conversion from card to online catalog at NCSU, based on a preliminary examination of labor, contract, and capital costs between 1976 and 1986, was $390,000 for labor and $530,000 for equipment plus other contracted services including programming. Total exceeded $1.3 million. Twenty-two terminals with associated cables and switches, purchased in 1987, would cost about $10,000.
8. Taylor, p.197–204.
9. Taylor's original tables, referenced in note 4 above, do not include entries for more than twenty-five terminals. This constraint arose due to the limitation of PC-type microcomputers to process numbers in excess 10E + 38 and the author's commitment to make PC programs for this application available to interested library administrators. The constraint was acceptable on the assumption that most library administrators would not plan to provide more than twenty-five terminals in a *single* public service location.
10. However, if the high-end limit of arrival rate were extended beyond 5.0 and if the low-end service rate were extended below .10, significant differences would appear. Chi square with three degrees of freedom, with a significance level of .05, was used to test differences in number of terminals required among Taylor's policies 5, 8, 11, and 14. ■■

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, $17.50. American Library Association, owner; William Gray Potter, editor. Second-class postage paid at Chicago, Illinois. Printed in U.S.A. As a nonprofit organization authorized to mail at special rates (Section 423.12, *Domestic Mail 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 average number of copies printed each issue during the preceding twelve months; "Actual" figures denote actual number of copies of single issue published nearest to filing date—the June 1987 issue.) *Total number of copies printed:* Average, 7,497; Actual, 6,928. *Paid and/or requested circulation:* not applicable (i.e., no sales through dealers and carriers, street vendors and counter sales). *Mail subscriptions:* Average, 6,439; Actual, 5,985. *Total paid and/or requested circulation:* Average, 6,439; Actual, 5,985. *Free distribution by mail, carrier or other means, samples, complimentary, and other free copies:* Average, 170; Actual, 194. *Total distribution:* Average, 6,609; Actual, 6,179. *Copies not distributed: office use, left over, unaccounted, spoiled after printing:* Average, 888; Actual, 749. *Returns from news agents:* not applicable. *Total (sum previous three entries):* Average, 7,497; Actual, 6,928.

Statement of Ownership, Management and Circulation (PS form 3526, Dec. 1985) for 1987 filed with the United States Post Office Postmaster in Chicago, September 30, 1987.

Communications

Remote Interactive Online Support

S. F. Rossouw and C. van Rooyen

INTRODUCTION

Searching of remote online databases has become well entrenched over the last ten to fifteen years.[1] The growth in online usage in the U.S. and in most European countries can largely be ascribed to an abundance of training courses offered in most major cities, the availability of toll-free help desks, and the existence of online user groups. In other parts of the world, where vast distances separate relatively isolated users of database systems, a practical and inexpensive alternative had to be improvised. The development of so-called simultaneous remote searching is an ideal application to attain this objective.[2]

BACKGROUND

Medical researchers, in their ongoing quest for relevant and up-to-date information, have long relied on indexes such as *Index Medicus* and the assistance of medical librarians. With the development of online databases such as Medline, greater dependence on so-called search intermediaries became evident.

The major reason for this shift was due to the complexities of the search systems. The U.S. National Library of Medicine initially required mandatory attendance at a three-week intensive training course before anyone could obtain a password to access their MEDLARS databases.

In spite of the subsequent development of more user-friendly systems, formal training is still seen as a prerequisite to successful online searching. Where a newly trained but inexperienced searcher returns to his native location without having ongoing assistance immediately on call, difficulties experienced soon lead to frustration and dissatisfaction.

The introduction during the last two to three years of end-user systems will result in many more individuals requiring remote assistance with online searching.[3]

Various methods of providing remote assistance by means of teleconferencing to inexperienced searchers have been investigated and reported on.[4] Various enhancements have subsequently been reported.[5] Medical applications of simultaneous remote searching have been favourably reviewed.[6] Current procedure uses two modems and a transfer switch instead of the telephone conference call facility.[7]

SIMULTANEOUS REMOTE SEARCHING

The basic components of SRS are the telephone network, a "master" terminal and a "slave" terminal, modems at both terminals, and a terminal master-slave (TMS) switch.

The TMS switch is used to make a three-party connection between two terminals and a remote vendor computer. This enables an individual who wants to conduct a search of a remote database but does not have the expertise to do so effectively to contact a third party to do the search for him or, alternatively, to do the search himself under guidance of the third party. All of the interaction during the search will be displayed simultaneously on both terminals.

The TMS switch has three positions: terminal-to-terminal (TTT), where only the two terminals are in contact; master

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switch (MS), where the master terminal interacts with the host computer, but the slave terminal also receives the data; and the slave switch (SS), where only the slave interacts with the host, but with the master also receiving the data.

An arrangement must be made so that the equipment needed can be set up at the master site—for instance, a port on a PAD (packet assembler-disassembler) in the case of X.25 packet-switched networks, or an extra modem on networks that do not use the packet protocol. In addition, a terminal can be reserved for hotline assistance on which incoming calls would be automatically received.[8] To get attention, if the master terminal is unattended, control-G can be sent by the remote terminal to sound the bell on the master terminal.

The TMS switch, in the waiting mode, is set to the terminal–to–terminal (TTT) position and connected to the PAD. As soon as a call is received from the remote terminal, communication is possible. In TTT mode, the master terminal must be set to half-duplex, as the PAD is configured not to echo the characters from the remote terminal.

Between the two terminals, a complete "conversation" can now be carried out, e.g., questions put and replied to, search strategies worked out, etc. When procedures have been worked out, the connection to the remote database can be made.

To make the connection to the vendor, the master terminal is set to full duplex, the switch is set to the MS position, and the packet-switched network is then dialed through the modem. When the connection is made, the Network User Address (NUA) of the vendor is entered, and the interaction can commence. The slave terminal will receive all the transmitted data.

The remote computer can be put on "hold" at any time for direct interaction between the two terminals by switching back to the TTT setting, for example, to answer queries or to redefine the search strategy.

To enable the slave or novice terminal to take over the interaction with the host computer, the switch is set to the SS position, with the master terminal now in the "watching" mode.

Thus either the master or the slave can do the search while the other one also receives the data. However, only the master can control which of the two can interact with the host computer. A radio ham procedure is used to control this procedure.

CONSTRUCTING A SWITCH

Although a switch can be bought off the shelf for about $200, lack of foreign currency and/or unfavourable exchange rates may make it unattractive to developing countries. The Systems and Development Division of the Institute for Biomedical Communication constructed a switch that can be assembled with standard components at a very low cost.

To construct an SRS switch, the following is needed:

- a rotary two–way switch that can switch five points simultaneously
- three twenty-five–pin D–type connectors (or the connectors needed to connect two modems and a terminal)
- about three meters of six–strand cable with screen and earth wire
- a suitable base on which to mount the switch.

Total cost for the equipment should not exceed $30–50, thus meeting a prime requirement of providing inexpensive hotline assistance vastly superior to conventional

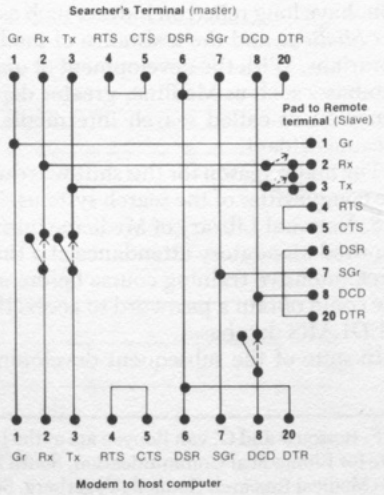

Fig. 1. Simultaneous Remote Searching Switch.

over-the-phone backup. The switch can be assembled as indicated in figure 1.

SUMMARY

The needs of the emerging end-user segment of the online searching community in areas with meager support can be met inexpensively, but very effectively, by the availability of simultaneous remote searching facilities at a few strategic locations.

REFERENCES

1. R. Marchisotto and J. A. Walsh, "A Comprehensive Biomedical Information System-II," in J. H. Van Bemmel and others, eds., *MEDINFO 83: Proc. 4th World Conf. Med. Informatics* (Amsterdam, North Holland, 1984), p.917-920.
2. Verl H. Anderson, "Simultaneous Remote Searching: The System and the Reality," *Library Hi Tech* 2, no.2:61-64 (1984).
3. S. Clancy, "BRS-Saunders COLLEAGUE Information Service for Medical Professions," *Database* 8, no.2:108-21 (1985).
4. Joanne L. Witiak and others," Online Database Searching via Telephone Conferencing," *Online* 3, no.2:21-23 (1979); Kathleen Shenton and M. K. Landsberg, "Conference Searching at 1200 Baud," *Online* 5, no.1:42-43 (1981); Fran Brown and J. Welsh, "New Wrinkles in Conference Call Searching," *Online* 6, no.2:30-33 (1982).
5. Deborah L. Graham, "Simultaneous Remote Searching: A Technique for Providing MEDLARS Services to Remote Locations," (Medical Library Association Annual Meeting, Washington, D.C., June 1980); Deborah L. Graham and Rodes Trautman, "Make Your Own Transfer Switch for Interactive Simultaneous Remote Searching via Telephone Conference Calling" (Proc. ASIS 10th Midyear Meeting, Durango, Colo., May 1981).
6. Deborah Graham and others, "Simultaneous Remote Search: Online Bibliographic Library Services for Practicing Physicians," *JAMA* 246:1115-1116 (1981): J. G. Llaurado, "Remote Search of Bibliography for Practicing Physicians," *Int J Bio-Med Computing* 13, no.2:95-96 (1982).
7. Rodes Trautman and C. King, "Interactive Simultaneous Remote Searching: Evolution of Conference Call Searching to a Reliable Procedure," *Online* 7, no.5:90-97 (1983).
8. Verl H. Anderson, p.61-64.
9. Personal Communication, TGM Communications Inc., Box 7344, Eugene, OR 97402-0014. ■■

Form Design Simplifies Online Search Services Procedures

Malcolm P. Germann, Elizabeth L. Nowak, and Janet Stoeger Wilke

Online search services entail a number of record-keeping chores that can consume a fair amount of time. In the understaffed library many, if not all, of these clerical tasks can fall to the search professional, adding greatly to the total time spent on a search.

DEFINITION OF OBJECTIVES

When online searchers in the reference department at Wichita State University's Ablah Library evaluated and then revised online search policies and procedures, the existing search request form became obsolete. Prior to the revision, librarians at WSU used a number of separate forms for processing search requests. A double-sided photocopied sheet served for search requests, a three-part carbonless form was used for computing costs and billing, and a separate logbook was kept by searchers and used by the departmental secretary for compiling reports and statistics. It was apparent that a better vehicle for record keeping might be devised that would accomplish two important goals: (1) reduce paperwork and cut time by incorporating necessary billing information and statistical data into the search request form; and (2) provide the patron with a copy of the search request, particularly useful since most search interviews are conducted by phone after the form has been submitted.

A form designed with these goals in mind could more adequately serve the needs of the three or more parties involved in each search transaction. The searcher would no longer need to complete a billing form and keep a separate statistical logbook; the pa-

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tron would be provided with a signed copy of the search request, incorporating a reminder to call the appropriate searcher, and a copy of the library's charging policy; the library clerical staff would have a copy of the form to use in entering data into the departmental computer for reports, analysis, and statistics.

DESIGN AND USE OF FORM

A survey of the literature on search request forms and a look at a variety of sample forms provided some ideas but yielded no usable form. It was apparent that WSU's specific needs would be met only by developing a totally new form. A determination was made of the various types of information needed by the patron, the online searcher, and the library, along with an analysis of the way in which search requests are processed. This information was used to group appropriate data on the form. The result is an 11-by-14-inch four-part carbonless form. The reverse side of the form displays the library's charging policy for WSU students and faculty and for nonuniversity patrons (figure 1).

The Wichita State University
Students, Faculty and Staff

Total Cost of a Search		
Search Fee	Citation Charges	Other
$8.00 for each database searched	1 - 30: 20¢ each 31 + : offline ¢ per citation, as charged by vendor (20¢ min.)	Vu/Text: Specific Citation search (3 cites max.) $2.00; 24-hr. turnaround time. Subject search: same charge as a regular search.
		SDI: full update cost ($5.00 min.)

Off-Campus Requestors

Total Cost of a Search			
Surcharge	Royalty, Connect Time to Database, Telecommunication Costs	Citation Charges	Other
$5.00 Students & Faculty from other institutions.			
$15.00 General public; public sector or non-profit organization.	as charged by vendor ($8.00 minimum)	offline ¢ per citation (20¢ minimum)	Vu/Text: charge as for a regular search.
$25.00 Private sector, profit-making organization.			SDI: full update cost plus $5.00

Fig. 1. Back of Search Form: Price Chart.

The front of the form is used by the patron, by the reference librarian accepting the request, by the searching librarian, and by clerical staff recording statistical data and notifying patrons when the search is ready (figure 2).

Forms are available at the public reference desk. The two shaded sections are completed by the patron. The reference librarian then provides the patron with the name of the appropriate subject specialist (online searcher). The librarian gives the patron the last page of the four-part form, which serves as a reminder for the patron to call the designated searcher to discuss details of the search prior to its being executed; it also serves as a written record of the patron's responsibility to pay for the search. The top three copies of the form are routed to the designated searcher.

The patron is responsible for contacting the appropriate search analyst. During the search interview the "searcher's use" area serves as a checklist for questions to be asked of the patron. Later, during the actual search, this checklist serves as a reminder of search parameters.

After completing the search, the searcher computes the cost and fills in the appropriate area on the form. The design of this area is necessarily a reflection of the unique charging policy in place at WSU. The searcher also provides the data in the "official use only" area. The searcher retains one copy of the form; two copies are given to the departmental secretary for transfer of the data to the reference department's microcomputer using Lotus 1-2-3. One copy of the form serves as an official receipt of payment and goes with the search results to the patron; one copy remains in the reference office files for the current fiscal year.

EVALUATION OF FORM

The revised online policies and procedures along with the revised request form

APPLICATION FOR A COMPUTERIZED BIBLIOGRAPHIC SEARCH
THE WICHITA STATE UNIVERSITY LIBRARY REFERENCE DEPARTMENT

NAME _____
(include name of alternate contact person if applicable)

WSU Department;
Company or Agency _____

ADDRESS _____ DAYTIME PHONES _____

CITY _____ ZIP _____ _____

___U-GRAD STUDENT ___FACULTY/STAFF CAMPUS ACCT. NO.: _____
___GRAD STUDENT ___OTHER

I understand that computer searching;In no way guarantees results. I agree to pay for this search. Failure to pay can result in legal action (e.g. transcript or registration holds, payroll deduction by university). Cost structure is on the back page.

TODAY'S DATE: _____

_____
SIGNATURE

The maximum amount I want to spend is: $_____

_____
OFFICE USE ONLY

Date of Search: _____

WSU Dept.: _____

STATUS: U G F N L

NAME OF SEARCH: _____

NO. OF DATABASES USED(NOT CROS OR DIAL): _____

HOW TO BE PAID: A C N

Date Bibliography received: _____

Date Patron Informed: _____

___Mail ___Phone

VENDOR	DATABASE	SEARCH FEE PER DATABASE	CITATION CHARGES ONLINE NO. X ¢	CITATION CHARGES OFFLINE 1 - 30 NO. X ¢	CITATION CHARGES OFFLINE 31 + NO. X ¢	TOTAL CITATION COST	TOTAL PER DATABASE

TOTAL COST OF SEARCH:

SEARCH TOPIC.
Write a short statement describing your search. Include all important concepts and key words. Give any variant spellings or terminology if applicable.

List indexes already consulted and any known articles or authors of particular relevance to your topic.

SEARCHER'S USE

EXCLUSIONS: List any terms concepts, or aspects that should be excluded.

PUBLICATION TYPES:

journal articles	Y	N
books/monographs	Y	N
PhD dissertations	Y	N
conference papers	Y	N
A/V items	Y	N
gov doc/technical rpts	Y	N
ERIC docs	Y	N

_____
_____

___English language only
___All languages
___Specific foreign language(s): _____
_____
_____

___Infant ___Animal
___Child ___Human
___Adolescent
___Adult ___Male
___Aged ___Female

YEARS: _____

AN INTERVIEW, by phone or in person, is required PRIOR TO SEARCH BEING RUN.

Reference Dept.
Phone Number: 689-3491

_____ _____
LIBRARIAN SUBJECT SPECIALTY

Fig. 2. Front of Search Form: Patron, Reference Librarian, Searcher and Clerical use areas.

have been used at WSU for two semesters. A survey of the reference department's online searchers elicited suggestions for only minor modifications of the new form. For example, the science librarian suggested that "chemical registry number" be added to the "searcher's use" area. Two searchers regretted the lack of space to complete search strategies but did not find using a separate sheet of paper, when necessary, to be a major inconvenience. Reactions of the searchers to the streamlining of the search process were consistently positive. Time saved by not duplicating procedures such as filling in patron information on two separate forms was particularly appreciated. Patrons now provide needed information once when filling out a search request form. The ability to provide the patron with a copy of the completed form at the time of the request was also useful. Equally convenient was having all billing and statistical information on one form for the secretary to transfer the information directly to the departmental computerized log.

The departmental secretary noted that the form works—if all areas are filled in properly by the patron and searcher! Overall, the initial time spent transferring information from each request form to the log has been more than offset by the ease and speed of retrieving statistics for monthly and yearly departmental reports.

Finally, the slightly higher cost for printing a four-part carbonless form is negligible when compared with previous time and costs involved in maintaining a three-part billing form, a search request form, and a logbook.

CONCLUSION

WSU's experience proves that time and thought put into development of a search form reflecting the unique needs of a given institution, as well as a library department, can and will result in documentation that will immeasurably enhance efficiency. No one form can be expected to satisfy all the needs of all parties, but thoughtful evaluation, compromise, and a sprinkling of trial and error should result in a workable form. The Wichita State University Ablah Library search request form has proven to be a useful tool for the searcher, patron, and library staff alike. Periodic changes to keep the form up-to-date as policies and procedures evolve or change will ensure its continued usefulness for the library.

BIBLIOGRAPHY

Carlson, David and P. Grady Morein, comps. *Online Bibliographic Database Searching in College Libraries.* Clip Note, no. 4–83. Chicago: Assn. of College and Research Libraries, American Library Assn., 1983.

Computer Search Service Group. Policy Manual. Amherst: Massachusetts Univ. Libraries, 1977. ERIC, ED 144 557, 1978.

Daniels, Linda. "A Matter of Form." *Online* 2:31–39 (Oct. 1978).

Hoover, Ryan E., ed. *The Library and Information Manager's Guide to Online Services.* White Plains, N.Y.: Knowledge Industry, 1980.

Jackson, William J. *Policy Manual for a Computerized Search Service in an Academic Library.* ERIC, ED 174 221, 1979.

Maloney, James J., ed. *Online Searching Technique and Management.* Chicago: American Library Assn., 1983.

McKinney, Gail. "Forms and Record Keeping for Online Searching." *Online Searching Technique and Management.* Ed. by James J. Maloney. Chicago: American Library Assn., 1983. ■■

News and Announcements

Telefacsimile Directory

C B R Consulting Services announces the immediate availability of the third edition of *Telefacsimile Sites in Libraries in the United States and Canada*. Initially begun in 1985 with support from the Fred Meyer Charitable Trust of Portland, Oregon, the directory has grown from about 150 entries to nearly 700. The directory is organized by state and institution, with indexes by city, telefacsimile phone number, and institution. Each full entry includes name and address of the institution, the name of an appropriate contact person, phone numbers for both the contact person and the telefacsimile unit, and an indication of the type of fax equipment used.

Copies can be ordered from C B R Consulting Services, P.O. Box 248, Buchanan Dam, TX 78609-0248. Price is $18, including shipping and handling. Orders must be prepaid. Special subsets, either by geographic area or by type of library, of the database can be prepared on contract. Please contact C B R Consulting Services at (512) 793-6118.

Work on the fourth edition has already begun. If your library has a telefacsimile unit and you are not in the third edition, please contact C B R at your convenience. We will make arrangements to include your institution at no cost. ■■

NOTIS Becomes Separate, For-Profit Corporation

NOTIS (Northwestern Online Total Integrated System), a division of Northwestern University Library, has been restructured as a separate, for-profit corporation owned by the university.

NOTIS will serve its client-group from new offices in the Shand Morahan Building, 1007 Church St., Evanston. Jane Burke, director of NOTIS since 1983, will become president and chief operating officer of the new corporation. The NOTIS system, developed at Northwestern in the late sixties, has been installed in eighty-five libraries in the United States, Canada and Latin America.

University Librarian John P. McGowan, who was instrumental in directing development of NOTIS, said the university library was no longer able to provide the space and administrative resources to accommodate the system's rapid and extensive growth. He said that a significant number of additional libraries will install NOTIS in the near future.

Under the direction of NOTIS developers James Aagaard, director of information systems development, and Velma Veneziano, systems analyst, the university library implemented a circulation module that kept track of the books, journals, and other materials borrowed from the Northwestern University Library by students, faculty, and staff. A year later, additional modules were developed to provide computer control over the purchase of new materials for the library and the cataloging of materials in its collections.

The Library User Information Service (LUIS), the NOTIS online catalog, was unveiled in 1980. Two years ago, an enhanced circulation module was introduced to replace the original one developed 15 years earlier. ■■

Clean Up of Government Printing Office Bibliographic Tapes

The university libraries of Rice, Texas A & M, and Louisiana State, together with MARCIVE have embarked upon a project to clean up the bibliographic tapes generated by the Government Printing Office. The project is headed by Barbara Kile of

Rice. Judy Myers of the University of Houston is a consultant.

The GPO tapes, which were not originally designed to serve cataloging purposes, have come under criticism for some time.

MARCIVE has loaned the participating institutions microcomputers and copies of its Cataloging Input System software for use in manipulating the records. The company is contributing its extensive data-processing facilities and experience in cleaning up GPO tapes, and the libraries are providing expert intellectual and manual resources. Together they plan to accomplish the following goals:

(1) make corrections and changes noted in the *Monthly Catalog* (this part of the project has already begun);

(2) code missing control numbers (SuDocs, Stem, OCLC, and Technical Report numbers) into the appropriate fields;

(3) change or delete duplicate and availability records, including serials, supplement titles, infrequent serials, and monographs in parts;

(4) correct inaccurate fixed fields and indicators;

(5) correct spelling and indexing errors;

(6) provide a means for inserting a holding library code and/or location code for materials distributed in microfiche; and

(7) automatically process all records against the Library of Congress subject and name authorities files.

The project should be completed by May 1988. ■■

University of Minnesota Receives a Grant From the Council on Library Resources to Design a Model Academic Information Center

The University of Minnesota has received a $117,000 grant from the Council on Library Resources and matched that with equal funding to investigate the behavioral, technological, organizational, financial, and political factors that need to be addressed in designing and managing academic information centers. The outcome of the yearlong project will be a model information center for the Humphrey Institute of Public Affairs based on the research investigations. The model information center will provide a set of integrated information delivery systems and services that will support the interdisciplinary research and teaching programs of the institute.

The project, coordinated by George D'Elia, associate professor, management sciences, is designed to execute five related research programs to serve as the basis of the model information center. Faculty and staff from the university libraries, the management sciences department of the Carlson School of Management, and the Hubert H. Humphrey Institute of Public Affairs will form the research teams for these programs.

The model information center and its accompanying documentation will provide a basis for the planning process for information services at the university and could serve as a prototype for the development of information centers at Minnesota as well as other universities. It is also expected that this project will stimulate a continuing interdisciplinary research program that will allow university faculty to investigate the impact of the information revolution upon research libraries, universities, and society. ■■

Update on Illinois LCS

Since its inception in the summer of 1980, the statewide Library Computer System (LCS) has grown into a successful automated resource-sharing system, representing the largest pool of currently held library materials in any state. The system provides member libraries with both local and interlibrary known-item searching and circulation capabilities. In the middle of its seventh full year as a statewide system, membership in the LCS community now stands at twenty-nine libraries, including the libraries of each state-supported university, two community colleges, and fourteen private colleges and universities. In addition to academic library membership, LCS terminals are in place at the headquarters of each of the state's eighteen regional library systems, effectively extending access to LCS to all types of libraries.

Three New Libraries Added to LCS

Three new libraries have been added to the system during calendar year 1987. Columbia College (Chicago) was added in January. Illinois Benedictine College (Lisle) and Rosary College (River Forest) were added during August.

Statewide LSC to Receive Extra Funding

During the November 11, 1986, Illinois Library Computer Systems Organization (ILCSO) meeting, ILCSO library directors endorsed a multiyear proposal to expand and enhance LSC. The proposal would also extend the University of Illinois at Urbana–Champaign's Full Bibliographic Record (FBR) system to other libraries, for use as a local online catalog and as a statewide union catalog for resource sharing. The proposal was subsequently endorsed by the Illinois Board of Higher Education (IBHE) and the Illinois State Library (ISL).

Through a combination of LSCA funds, funding from the Illinois Board of Higher Education through the state's Higher Education Cooperation Act, additional support from the Illinois State Library's state appropriation, and prorated contributions from each LCS member library, LCS funding will be increased by some $850,000 during the present fiscal year (FY 1988). This is the equivalent of a 36 percent increase in funding and represents the first in many annual installments that will generate at least $6,000,000 in additional funding over the next six to seven years.

New Online Catalog to be Implemented

During the second half of the current fiscal year, LCS users will see a new online catalog implemented for access via their LCS terminals. ILLINET Online (IO) is a dual-purpose online catalog based on the Western Library Network (WLN) software and modified for the University Library at the University of Illinois at Urbana–Champaign and the River Bend Library System. IO will serve as a local online public access catalog for each LCS library and will also serve as a statewide online union catalog, with records representing the OCLC cataloging activity of 300 OCLC member libraries in Illinois.

Record Activity Levels in Fiscal 1987

Fiscal 1987 has been another record year for LCS:

Total system activity (bibliographic searching, circulation, etc.) was up 5.6 percent over fiscal 1986 record levels.

LCS holdings were up 5.4 percent by the end of the fiscal year. As of June 30, 1987, the holdings count in the LCS database stood at 16.8 million volumes.

Interlibrary circulation activity continued to increase at a rate surpassing that of most other indicators. Nearly 330,000 interlibrary circulation transactions were initiated during FY 1987, an increase of 8 percent over the previous fiscal year. That total included 38,517 transactions during a single month (March 1987). LCS users have now initiated more than 1.7 million interlibrary circulation transactions since the system first went statewide in July 1980.

LCS usage by the regional library systems has also increased, with total activity for the 18 systems reflecting an increase of 9 percent over FY 1986. ■■

Beaumont and Hatvany Win LITA/Gaylord Award

Dennis Beaumont of Information Design and Bela Hatvany of SilverPlatter are recipients of the 1987 Library and Information Technology Association (LITA) Gaylord Award for Achievement in Library and Information Technology.

The $1,000 cash award and citation recognizing achievement in library and information technology are donated by Gaylord Brothers of Syracuse, New York. Administered by the LITA/Gaylord Award Committee, the award is given in recognition of distinguished leadership, notable development of application of technology, superior accomplishment in research or education, or original contribution to literature in the field.

The 1987 award was presented in recognition of Beaumont and Hatvany's pioneering efforts in the development of local automated library systems.

"At a time when library systems required highly specialized environments and sophisticated personnel to implement and operate, Beaumont and Hatvany created a model based on minicomputer hardware that could be housed in libraries," said Dale Flecker, chair of the LITA/Gaylord Award Committee.

They began working together in 1969 in Boston on an entrepreneurial effort to develop a minicomputer-based automated library system, according to Flecker. Their vision and early success led the way in the development of an active "turnkey system," which included hardware, software, and ongoing maintenance. This made it possible for libraries to contract with a single agency who has total responsibility for working the system and for libraries to automate themselves without sophisticated staff to install and operate it.

Thousands of libraries currently use systems developed out of the early CLSI systems created by Beaumont and Hatvany. The intensity of automation found in all sizes of libraries is largely a result of the turnkey system market's success.

"It is for being the successful pioneers in this market that Hatvany and Beaumont were chosen for this award," said Flecker. The award was presented by LITA President Ray DeBuse and Mary Ghikas, representing Gaylord Brothers, at the LITA President's Program during the American Library Association's Annual Conference in San Francisco. ■■

CLR Awards Grant for Study of LC Subject Headings in Online Systems

The Council on Library Resources (CLR) has awarded a $47,925 grant to the University of Michigan School of Information and Library Studies and a $93,700 grant to OCLC Online Computer Library Center for research into "Increasing the Accessibility of the Library of Congress Subject Headings in Online Bibliographic Systems."

The research project will explore automated techniques to guide online users from their search terms to the subject headings and term relationships in the machine-readable Library of Congress Subject Headings (LCSH-mr). OCLC is contributing computing facilities and overhead valued at $142,673, and the University of Michigan is contributing overhead valued at $26,359. With the CLR grants the total research project is budgeted at $310,657. The four-phase project began September 1, 1987, and runs through December 1988.

Karen Markey, assistant professor at the University of Michigan School of Information and Library Studies, and Diane Vizine-Goetz, OCLC research scientist, will be the chief investigators. According to the investigators, the initial phase will be a statistical analysis of LCSH-mr records. The second phase will analyze subject headings in authority records and in bibliographic records to determine how these two sets of headings can be effectively linked together and manipulated by users of online bibliographic systems. The extent to which users' search terms can be linked to the library catalog's controlled vocabulary through the application of automated matching techniques will be explored in the project's third phase.

In view of the usefulness of the results of the project to the subject cataloging division of the Library of Congress (LC), CLR has asked the investigators to present preliminary findings midway through the project to an advisory group of LC and CLR staff. Vizine-Goetz and Markey will share the tasks of analyzing data and interpreting and presenting findings in a final report in the project's fourth phase.

Libraries participating in the project are Syracuse University; University of California–Los Angeles; and the University of Kentucky. ■■

Geac Shareholders Approve Helix Investment

At a special meeting held July 15, 1987, shareholders of Geac Computer Corporation approved an investment offer by Helix Investments Limited.

Under the terms of the agreement, Helix has invested $16.2 million—through the purchase of 9 million common shares from treasury at $1.80 each—representing 49 percent of shares outstanding, is providing

$3.8 million in loans, and has the option to purchase another 4.5 million common shares at $3.33 each.

At the same meeting, a motion was passed allowing debenture holders to exchange their investment for preferred shares convertible to common at $3.33 each, thereby increasing Geac's equity position by a further $15 million.

These events place Geac in a strong financial position once again with a net worth of over $45 million.

In response to a shareholder's question, D. C. Webster, president of Helix Investments, said, "The restructuring will soon be behind Geac, and they have a great future." When asked why Helix invested in Geac, Mr. Webster replied, "This is Canada's biggest computer company, the only computer company of any size. There is a core of marvelous people here. They just got carried away and expanded too fast. We have the opportunity to support a very good company and do well ourselves. We see steady improvement year by year. They have well-developed software and state-of-the-art hardware. They have a base from which they can go far."

Helix nominees were elected to four of the eight Geac directorships and have stated that they will take an active role in the company's affairs. ■■

CLSI Offers MicroLIBS System for Small Libraries

CLSI has announced the introduction of the MicroLIBS System, a compact library automation package for the small library. The MicroLIBS is aimed at libraries with 100,000 or fewer titles in their collection.

The MicroLIBS is a full-function incorporation of CLSI's LIBS 100 System architecture. The system uses microcomputer components. Two options are available for disk configurations: the MicroLIBS 120 with one 120 megabyte disk and the MicroLIBS 240 with 240 megabytes of disk storage on two 120 megabyte disks. Disk requirements are determined by number of titles, number of patrons, annual circulation, use of MARC records, and the CLSI software modules used.

All of CLSI's software applications are available for the MicroLIBS System, including the online catalog for public access, CL-CAT, circulation control, and book acquisitions.

The system is smaller than a two-drawer file cabinet and can operate in an office environment. CLSI's evolutionary architecture allows the MicroLIBS System to be installed today as a stand-alone system for a small library yet be utilized in a future configuration serving a large library network supporting hundreds of users. ■■

NELINET Signs Agreement with Blackwell North America for Authority Control

NELINET has announced the completion of an agreement with Blackwell North America, under which NELINET will broker Blackwell's authority control services.

Dan Miller, manager of sales and service in Blackwell's technical services division, said he believes the agreement will make it easier for NELINET members to contract for authority control.

Blackwell North America specializes in the supply of North American books and bibliographic support services worldwide. Their technical services division pioneered automated authority control in the early 1970's. Blackwell's service currently provides up-to-date authority control for name, uniform title, series, and subject headings. In addition, library-specific LC authority files are provided for use as cross-references in local online catalogs.

NELINET is a not-for-profit, multistate network of academic, research, public, and special libraries. NELINET staff provides New England libraries with training and education, technical assistance, and administrative support for library automation products and services. ■■

UMI Article Clearinghouse Chosen to Distribute Adonis Articles

UMI Article Clearinghouse recently announced that it has been selected as one of only two document distribution centers in

the U.S. for the ADONIS CD-ROM Biomedical Collection.

The collection consists of 219 frequently requested biomedical journals, predominantly published by the members of the ADONIS consortium: Blackwell Scientific Publications, Elsevier Science Publishers, Pergamon Journals, and Springer-Verlag GmbH. Six other publishers contributed titles to the project as well: Butterworth Scientific, Churchill Livingstone, C. V. Mosby, Munksgaard International Publishers, Georg Thleme Verlag, and John Wiley.

The collection is a two-year pilot project of the consortium. During that period, users can order photocopies of full-text articles through the clearinghouse. Copies will be produced on a high-resolution laser printer and sent to the user within twenty-four hours via mail, telefacsimile, or overnight courier. New discs will arrive at the clearinghouse each week to ensure the timeliness of the information. ■■

Carlyle in Nevada

The University of Nevada System has contracted with Carlyle Systems, Inc. to install automated systems in its libraries. Installations will be in Reno and Las Vegas, 450 miles apart. The Reno installation will serve the University of Nevada–Reno, Truckee Meadows Community College, Western Nevada Community College, and the Desert Research Institute libraries. The system in Las Vegas will include the University of Nevada–Las Vegas and the Clark County Community College libraries. Access to both systems will be available at either end of the state through the university system's telecommunications network; telecommunications within each campus will be provided by the Sytek campus cable networks.

The Las Vegas campus has contracted for circulation, online catalog, authority control, cataloging input/edit, OCLC interface, acquisitions, and serials control modules. Initially a system with a 50-terminal capacity will be installed; in a later phase, the system will be upgraded to handle up to 100 terminals.

The Reno system will include circulation, online catalog, authority control, and cataloging input/edit modules, as well as an interface to RLIN. The Reno campus elected to interface its system to Innovative Interfaces' INNOVACQ acquisitions and serials control systems. This interface, developed jointly by Carlyle and Innovative Interfaces, transfers data between the two systems, which will make INNOVACQ serials and acquisition data available to users of the Carlyle online catalog.

Using their existing terminals, most of the public libraries in the state will have access to the Carlyle systems through the statewide Doelz microwave network. ■■

Northwest Libraries Receive Grants for CD-ROM Database

Libraries in three states have received more than $220,000 in grants to purchase LaserCat, a new CD-ROM database from the Western Library Network (WLN) that provides subscribers with MARC bibliographic records showing the holdings of more than 250 libraries throughout the western United States and British Columbia.

In the state of Washington, thirty-five libraries were recently awarded grants totaling nearly $140,000; funds from the grants allow the libraries to purchase subscriptions to LaserCat and are also used to defray all or part of the cost of hardware for the CD-ROM database.

The grants were awarded by the Washington State Library Commission with funds from the federal Library Services Construction Act (LSCA) and from Fred Meyer Charitable Trust. Fred Meyer's Library and Information Resources for the Northwest (LIRN) project had earlier awarded WLN a $268,000 grant for development of LaserCat.

A total of twenty-nine Idaho libraries have received more than $50,000 in LSCA and LIRN grants: twenty-four libraries received assistance in buying LaserCat subscriptions and hardware through LSCA grants totalling $44,325; five more libraries made similar purchases thanks to a $7,500 LIRN grant. Meanwhile, the Oregon State

Library has announced that ten libraries in Oregon will be awarded $30,000 in LIRN grants.

LaserCat may be searched by author, title, subject, or standard book numbers and supports browsing, exact searches, and keyword searches. Searches may also be scoped by material format, publication date, language, government documents, large print, and juvenile materials. LaserCat can print bibliographies, cards, and labels; records can be downloaded for use in local systems. ■■

Recent Publications

Book Reviews

Auld, Lawrence W. S. *Electronic Spreadsheets for Libraries.* Phoenix, Ariz.: Oryx, 1986. 168p. spiralbound, $37.50 (ISBN 0-89774-245-1).

This volume consists of a series of spreadsheet templates useful for library managers. Each spreadsheet is presented twice—first with formulas and then again with actual data. The formulas are presented in a cell-by-cell fashion with columns and rows labeled, formulas fully displayed, and zeros indicating data entry. This very useful device allows one to see both the spreadsheet construction and its application. The introductory text for each spreadsheet includes basic information about the spreadsheet purpose and specific details on column widths, labels, and formulas used in the particular spreadsheet. Although the spreadsheets vary in difficulty, experience in setting up and manipulating spreadsheets is necessary to make sense of the examples. My knowledge of spreadsheets is such that I have not memorized the formula for an *if* statement; however, I had no difficulty understanding the examples. But this volume is not a "how-to" guide for someone unfamiliar with spreadsheet basics.

Auld moves beyond the usual annual-budget and circulation-statistics examples found in many spreadsheet volumes. He includes templates for estimating shelving capacity, producing genealogical charts, and determining retrospective conversion costs. The chapter dealing with selected statistical calculations treats correlation, regression, and chi-square tables, useful information for librarians without access to a mainframe or minicomputer.

There is a select bibliography and a short, although adequate index. The bibliography entries come from the chapter introductions and will provide interested readers with background information on many of the spreadsheets.

The only fault I find with this volume is its use of Perfect Calc in the templates. As the author admits, Perfect Calc is essentially a first-generation spreadsheet and therefore has certain limitations. Only one chapter gives examples using other popular software packages. A user of Lotus 1-2-3, for example, can easily transform the given templates into Lotus conventions. However, some of the power of the more sophisticated spreadsheet packages will be lost. The chapter that explains daily and year-to-date circulation statistics is unnecessarily complex due to the limitations of Perfect Calc.—*Pamela Snelson, Drew University Library, Madison, New Jersey.* ■■

Hendley, Tony. *CD-ROM and Optical Publishing Systems: An Assessment of the Impact of Optical Read-Only Memory Systems on the Information Industry and a Comparison between Them and Traditional Paper, Microfilm, and Online Publishing Systems.* Westport, Conn.: Meckler, 1987. 150p. paper, $39.50 (ISBN 0-88736-192-7). "Prepared at Cintech under a grant from the British National Bibliography Research Fund."

Meyers, Patti. *Publishing with CD-ROM: A Guide to Compact Disc Optical Storage Technologies for Providers of Publishing Services.* Westport, Conn.: Meckler, 1987. 98p. paper, $19.95 (ISBN 0-88736-181-1).

Information workers who have somehow escaped inundation from the current tsunami of conferences, seminars, work-

shops, newsletters, articles, market analyses, and study missions to Japan on CD-ROM may prefer to absorb the basics of this technology through the contemplative review of a good technical monograph on the subject. These two works are aimed at such people.

Meyers' work, though somewhat slight in content, is the better of the two volumes. *Slight* does not mean insufficient, however. The book conveys the essentials of CD-ROM technology, and its successful brevity suggests that longer works on CD-ROM may be too drawn out and perhaps needlessly embellished. CD technology is not really that complex, but the hyperbole accorded it of late may account for the more usual prolixity of other works. Meyers' book is extremely well organized; it is written in taut, declarative, and nonelaborated prose; and importantly, it shows the application of classical principles of good book design including very readable typography, good graphics, and the effective use of headings as guides to the structure of the book. The National Composition Association is listed as an associate in the publishing, and Meyers' knowledge of effective page composition is an apparent and important plus. CD-ROM screen designers please take notice.

Hendley's work, I regret to say, gives the impression of being a long internal company report published as an afterthought. It is printed in photo-reduced typescript with little thought to book design. Its prose is somewhat discursive, and it is burdened with belabored comparisons between CD-ROM and disparate media such as paper, microfilm, laser videodisc, and online systems. Most readers will not require a catalog of differentiae to distinguish the shiny little disc from other media. The Hendley book, however, does contain much more material on specific hardware, costs, applications, database creation, and data retrieval, much of it interesting and relevant, but not superbly organized.

Both works have minor errors and omissions, some of which seemingly result from a confusion of the original Philips/Sony CD digital audio system with that of the CD-ROM. Meyers reports the use of interpolation as an error correction and detection method used in Cross-Interleaved Reed-Solomon Codes (CIRC). This is not a component of R-S codes, but is an add-on by Philips/Sony in their so-called "super strategy" for error handling in the audio CD. This is fine for music but would exacerbate rather than correct errors in digital data on CD-ROM. Further, R-S codes can be designed to correct, not just two, but any selected number of errors per code word if check digits twice this number are included per code word. Hendley, in a similar vein, reports that 3/4-inch videotape is used in premastering CD-ROM. This is only one of several methods and is convenient for some producers who are already set up with pulse code modulation (PCM) equipment for producing audio CDs. Because CD-ROM starts with digital data, most producers recommend data submission on standard 1/2-inch computer tape, and the premastering is generally performed on a large capacity hard disk for reasons of error avoidance. But because computer tape drives and computer disk drives are expensive, several lower priced alternatives have been devised, including the use of WORM disk for the premaster. Another method, developed by JVC, is a low-cost system using an IBM PC/AT, PCM equipment, and a 1/2-inch VCR. A digital medium is preferable for premastering, so when digital audio tape (DAT) becomes available, it is certain to be used for CD-ROM premastering as well.

Both books lack an index, which is an inexcusable omission in a technical work, particularly since current word-processing programs make their creation so easy. Were these two works to be converted, as is, to CD-ROM, they would be considered "unsearchable files." Neither author would be likely to make such an omission in producing a CD-ROM, but they both made it in producing their monographs. Possibly in lieu of an index, Hendley includes a final chapter summarizing the other chapters. In context, this is a useful addition.

Both works are, as most monographs seemingly must be, about a year out of date. Among other things, this makes included pricing data unreliable, particularly in the case of Hendley's book where prices are frequently quoted in pounds ster-

ling. In some cases it appears that, since the time of his writing, prices have dropped even more than the dollar has dropped against the pound, but no generalizations are possible. The unavoidable publication delay also means that readers miss all the current and fascinating controversies concerning Sony's CD-V, GE/RCA's DVI, SOCS' ICVD, IVS' CVD, and other variants incorporating full-motion video in the CD format. This, of course, prepares the way for next year's crop of urgent CD books. If the subject books are intended for the newcomer to CD and optical storage, as they seem to be, they should have included references to the important newsletters and magazines we all read to keep current in this area. Such listings were included last year in Meckler's CD-ROM book by Judith Paris Roth, but perhaps it was deemed to be repetitive in this year's offerings. *ITAL* readers may recall that Roth's book was mildly criticized earlier this year for not including information on CD-I. The present books mention CD-I briefly, but in insufficient detail to preempt new and more complete works on the topic.

As to the two works being reviewed, I find it necessary to say that both appear to be significantly overpriced. Even with respect to the ever-increasing prices of other technology texts, a $40 paperback gives one pause and is more likely to be a corporate acquisition than a practitioner's purchase. In fairness, however, we must salute Hendley, Meyers, and other authors of books on optical storage whose labors are not lessened nor their royalties increased in consideration of the probable brief life span of their creations, occasioned by the rapid tempo of new developments. This is a fundamental problem in publishing on high-tech topics and is unlikely to be helped at all by publishing on high-tech media such as CD-ROM.—*William R. Nugent, Library of Congress, Washington, D.C.* ■■

Kilpatrick, Thomas L. *Microcomputers and Libraries: A Bibliographic Sourcebook*. Metuchen, N.J. and London: Scarecrow, 1987. 726p. $49.50 (ISBN: 0-8108-1977-5).

Microcomputers and Libraries: A Bibliographic Sourcebook is an extensive literature review. Although expert in information storage and retrieval, the library profession is poorly served by inadequate and incomplete indexing and abstracting services. Thomas L. Kilpatrick has done a great deal of work poring through the library science literature, both printed and online, to compile this extensive and quite useful annotated bibliography. As noted in his introduction:

> Sixty-one journals were scanned regularly since 1980 for items related to microcomputers and libraries. These were English language publications of national scope, concerning libraries, or libraries and microcomputers. Manual searches were performed periodically on such standard library science/information science indexes as *Library Literature*, and *Library and Information Science Abstracts*. Annual online searches were done in the ERIC, Dissertations Abstracts and Microcomputer Index databases. Finally, bibliographies, footnotes, and other references from the literature in hand were routinely checked for previously undiscovered items.

Bibliographies are often outdated as soon as they are published, and this one is no different. The cutoff date for citations is February 1986. In view of the rapid changes and developments in this field, not only are important articles missing, but entirely new periodicals are absent. This factor, however, does not diminish the utility of the work. Individuals must merely remember to update the information through current literature searches.

Kilpatrick's book is extensive in scope, thorough in coverage, extremely well formatted, and meticulously indexed. If all entries are unique, as they appear to be, there are 3,688 citations arranged in more than forty sections. The sections include types of libraries (such as government, special, etc.), library applications (word processing, cataloging, interlibrary loan, etc.), and microcomputer issues (such as networks, software, and technology, hardware, and operating systems). Entries in these sections include very useful descriptive annotations.

Four additional and useful sections of this bibliography include Software and Systems Reviews, Hardware Reviews, Book Reviews, and Serials Reviews. The soft-

ware and systems section is arranged in twenty parts, reflects various library functions, and lists citations for reviews of specific software for that function. (e.g., circulation, mailing lists, spreadsheets, interlibrary loans). Entries in the reviews sections are not annotated.

An important component of any bibliography is its access points. Kilpatrick has done an adequate job by providing both a detailed table of contents and a lengthy index. The index includes names of software programs, authors of articles, and subjects. In cases where subject entries are lengthy, subheadings are provided. This practice is inconsistent, however, and in those cases where no subheadings are provided, the entry is lengthy and time-consuming to check. For example, there are fifty-one entry numbers or range of numbers under the heading "Public Access Microcomputers." One would have to refer back to the table of contents to locate the section that each entry is in or check each entry to identify the specific aspect of the subject.

Another more disconcerting aspect of the index is its lack of cross references. There are no *see* or *see also* references. The absence of cross references is particularly noticeable because of the apparent policy to list each entry in only one location. For example, when one checks "Online Searching," there are many entires, including entries under subheadings. Yet none of these entries refers to the concept of *downloading*. Only after checking thirty-three entries would one discover that none of these access points refers to *downloading*. "Downloading/Uploading" is a separate subject entry in the index and there are no cross references, nor is the entry listed in more than one location. Thus, it is important that one use both the table of contents and the index to retrieve all desired articles.

Despite some of the shortcomings with the indexing and the timeliness of this publication, it is a valuable resource for libraries of all sizes and types concerned with microcomputer applications. Kilpatrick has compiled a great deal of bibliographic information on a topic of universal interest within the profession. This publication serves a valuable purpose as it saves us the tedious job of searching our own scattered literature on this topic. The price of the volume is certainly less than the cost of the computer searches alone, not to mention the aggravation of tracking down material in manual sources.—*Patricia Iannuzzi, Yale University Library, New Haven, Connecticut.* ■■

Public Access Microcomputers in Academic Libraries: The Mann Library Model at Cornell University. Ed. by Howard Curtis. Chicago and London: American Library Assn., 1987. 211p. paper, $14.95 (ISBN 0-8389-0464-5).

Patron access microcomputers in libraries is the new academic library service for the 1980s. The role of the libraries in providing this service varies greatly from one institution to another. Some libraries simply make space available for the campus computer center to provide microcomputers in the library, while others have become involved in providing the service. Funds may come from other units on campus, grants, or reallocated library resources. Libraries that get involved may follow a careful planning and implementation process or may face an overnight installation of microcomputers with virtually no preparation on the part of the library staff.

This book provides a narrative account of the decision to provide public access microcomputers in one library. It details the planning and implementation of the new service, its integration into the library's processes, and the continuing evaluation of the project. The detailed descriptions of each step in the process include the rationale for the decisions reached. The summary at the close of each chapter draws from the case specific descriptions to make generalities applicable to other library microcomputer centers.

The book describes the microcomputer center in the Mann Library at Cornell University. Mann Library is the largest "branch" library at Cornell, and it enjoys a great deal of autonomy. It serves both undergraduates and researchers in the agricultural, nutrition, and biological sciences. The nine staff members who contributed to the book represent collection development,

public services, and technical services departments of the library as well as the information technology section that administers the microcomputer section.

A central philosophy permeates the book. It holds that libraries should not discriminate against information because of its format. Machine-readable data are simply another form of information. Microcomputer technology will be central to future machine-readable information retrieval, storage, and control, and hence libraries should extend their services and expertise to include microcomputers. Many decisions were reached by the participants in the Mann Library project based on this philosophy.

A change of administration in 1982 brought new goals to the library including a focus on automation and innovative public service programs. This change set the stage for the development of the microcomputer center and also ensured that a strong advocate was available for the implementation and continued support of the project.

The Mann Library staff followed traditional planning and implementation processes. They established the need and identified and located the necessary resources: space, funds, and staff expertise. They focused on information access, retrieval, and manipulation as their area of concentration for software collection development and instruction, thus ensuring that their facility would be a library microcomputer center. The implementation process included selection of a pilot group of students who needed and would continue to need the information services of the center. Success with this group encouraged other patrons to use the information facilities of the center. Gradually, full implementation and evaluation followed. Changes in the design of the center as well as the instructional program have already taken place and these are detailed in the text.

The book is divided into three parts. Two chapters address providing access to microcomputers through the planning, design and staffing of the center and setting the operating policies. Five chapters are devoted to the software library and include the details on the collection policy, selection and acquisition, cataloging and classification, circulation and patron support, with one chapter on the copyright and legal considerations encountered in running a microcomputer center. The four chapters on library processes stress the ultimate integration of the software collection into the normal flow of the library work. The collection is classified with the Library of Congress system, described according to the *AACR2* and assigned Library of Congress subject headings although some modifications to normal procedures were necessary. Sufficient detail is provided in these chapters to guide libraries planning microcomputer centers to identify the decision issues. The chapter on copyright and legal matters is excellent although its author, Samuel Demas, states that it is not intended to be a legal guide. He balances the need for public access to information against the property rights of the author and publisher. He discusses the various mechanical and legal actions taken by authors and publishers to protect their rights and provides guidelines for library policy formulation to protect both the rights of the author and publisher and the library's need to provide access to information.

The third part of the book includes six chapters on instruction in information retrieval and management. Mann Library staff provide instruction in their area of focus: access, retrieval and manipulation of machine readable information. Programs of instruction included online searching, bibliographic file management and generic applications software (e.g., word processing, spreadsheet and database management). Their audiences included graduate and undergraduate students, faculty, library staff, administrators, and external groups, and presentations were modified to meet the needs and knowledge of the particular audience. Instruction was provided as either course-integrated instruction or workshops with an occasional one-on-one instruction session for a library staff member.

The chapter on administration of the program to teach users to search external databases deals with the nitty-gritty issues that need to be considered in the establishment of an end-user search service. These issues include the selection of vendors, online systems, hardware and software, staff-

ing, scheduling, statistics, costs, billing, and security, as well as thoughts about the new program's impact on established programs in the library. The chapter is well organized. Multiple headings help locate information quickly, and each issue deserves careful consideration by library staff members planning to provide end-user searching of external databases as a new service.

The microcomputer center provided an opportunity for all staff members in the library to learn about microcomputers. The staff development program is addressed in the final chapter.

The book is well organized and well indexed. There is a mite of redundancy expected in a joint effort by so many authors. It provides adequate details of the establishment and operation of the microcomputer center and the instructional program it supports. The book provides a framework of points to consider in the establishment of a library microcomputer center.

The Mann Library is not the only way and not necessarily the best way for other academic libraries to develop a public access microcomputer center, but each issue addressed should be considered seriously. The Mann Library facility is apparently first-rate. It has the support of the library administration and hence the continuing resources to supply, staff, and maintain it. Small libraries or those lacking this in-depth support should not be scared away by the apparent luxury and cost of the facility described in this book. A microcomputer laboratory may run on a much smaller scale and still make a valuable contribution to a library public service program.

Specific information that would have enhanced the text would include the floor plan of the center, more information about the printers used, more details about the selection, training and supervision of student assistants, and an appendix of supplies and equipment, etc. The book is most useful as a preplanning guide for libraries that are considering providing these services.—*Sally S. Small, Penn State–Berks Campus, Reading, Pennsylvania.* ■■

Public Access Online Catalogs. Ed. by Karen Markey. *Library Trends*, v.35, no.4. Champaign, Ill.: Univ. of Illinois Graduate School of Library and Information Science, 1987. 144p. paper, $10 (ISSN 0024-2594).

The title, "Public Access Online Catalogs," chosen for this issue of *Library Trends* is somewhat odd: these tools have become generally known as Online Public Access Catalogs (OPACs). However, terminology aside, this collection brings together several informative essays on the topic.

The first two articles by Margaret Beckman and Susan Logan tell how their institutions "got here from there." Beckman describes the path of automation development at the University of Guelph; she touches on a number of important concerns such as local control and cost considerations versus network commitments. Logan details the incorporation of subject access and authority control into Ohio State University's Library Control System (LCS). The writing is somewhat choppy as each of the authors attempts to compress a lengthy and complex subject.

The other articles in the compilation split into two groups: one addresses specific topics such as screen design or dial-in, while the other is composed of papers about a variety of projects and research moving us towards the third generation of OPACs.

The information contained in Matthews' article on screen layout and design was presented at a 1985 CLR-sponsored conference and reported at ALA in January 1986. Nevertheless it is a boon to all (re)designers of OPACs to have these in codified form. Unfortunately, it is not always possible to adhere to all of the suggested guidelines. The bibliography, though a bit outdated, is still very valuable.

B. Nielsen and B. Baker build on the extensive work Northwestern staff have done with system transaction logs. Although, as the authors point out, the level of self-interpretation of an OPAC very much depends on the characteristics of the individual catalog (e.g., clarity, screen design), the instructional model they develop can be usefully adapted to other systems. The study would have been even more interesting (and much more difficult to carry out) had it spanned a longer time period.

Kalin's short but pithy article on dial-in is valuable for the experience she shares. She points to the need for good communica-

tion and also for publicity. The latter is unfortunately not addressed at all in the article by B. A. Lipetz and P. Paulson. The omission of information on how, or if, the experimental OPAC was advertised was somewhat puzzling in an otherwise informative article comparing before and after computerized subject searching in the New York State Library.

Two well-written articles by British colleagues are among the best in the collection. J. Kinsella and P. Bryant of the Centre for Catalogue Research in Bath describe the effectively organized OPAC research going on in Britain. The indicated husbanding of limited resources to prevent overlap with research going on elsewhere is gratifying and whetted this reader's appetite for more information.

S. Walter's article on OKAPI, a prototype OPAC at the Polytechnic of Central London, describes a number of excellent experiments, e.g., the use of a modified Soundex to aid in correcting spelling problems. There are also several potentially fruitful possibilities for improving subject searching in OPACs.

C. Hildreth's wrap-up piece is rich in suggestions for further experimentation and research as we move into the third generation of OPACs. In particular, the suggestion of loading a subset of abstracting and indexing (A & I) records is interesting; though it ignores the "rest" of such records it does point to the OPAC as a gateway to the vast wealth of information available and to a unification of information resources.

The diversity of materials and vocabulary and the problems these pose for subject searching in OPACs is a theme that runs throughout this collection. Thus it was puzzling that no mention was made of Marcia Bates' excellent article on this topic (*JASIS* 37, no.6:357–76, 1986).

In summary Karen Markey has gathered a mix of articles that addresses the "dynamic process of online catalog design, implementation, user training, user evaluation, and system improvement." Though we have read or heard about many of the ideas before, these articles pull together many issues, question assumptions, and point the way to a wholly different and much more powerful generation of OPACs.—*Gail Persky, New York University, New York, New York.* ■■

The Software Encyclopedia 1986/87. New York: Bowker, 1986. 2v. $125 (ISBN 0-8352-2090-7); v.1 (0-8352-2091-5); v.2 (0-8352-2092-3).

This 3,346-page hardcover giant is a catalog of some 27,000 microcomputer software packages, listed in alphabetic order by product name, and indexed, in volume 2, by computer system, each subdivided by some 850 application types. A complete directory of cited publishers is included at the back of each volume. The current issue incorporates the *PC Telemart* and *Microcomputer Market Place* databases. It's not yet *Software in Print*, but it's getting closer.

Name entries contain the most information, including version number; release date; memory, hardware, and operating system requirements; author(s); price; publisher; ISBN; and a "description annotation," extracted from publisher-supplied information. Copy protection is not noted except when both a copy-protected and nonprotected version are sold. Computer System index entries include version, publisher, and the annotations, but lack price and release date. Grade level is included in both entries, for educational (only) games and lesson materials.

System coverage is conveniently subdivided by family, e.g., "Radio Shack Tandy Family"; "Commodore 8-bit Micros"; "CP/M, MP/M Environments"; and "Unix & Unix-Like Environments." Application types are considerably more confusing. They are listed in alphabetic order under each system, but the "Guide to Applications" headings list is unhelpfully subdivided into business, professional, consumer, educational, and utility types. Word processing is thus found as a general category under Consumer Applications, as well as listed as a subdivision of each of several "professional areas." Information Retrieval may be found only as a subdivision of Communications (e.g., ProSearch), presumably overlapping Library Services—Online (e.g., four Biblio-Link programs), Library Services—Reference and Informa-

tion (e.g., Sci-Mate, Ref-11) and Personal Record Keeping—Personal Database Management (e.g., Desktop Bibliography) under Consumer Applications.

Lack of price information seriously detracts from the usefulness of the Systems/Application index: it is time-consuming, for instance, to return to volume 1 to sort out PC-Write at $10 from Samna Word III at $650, both listed under Word Processing—General (IBM PC family) in volume 2. This otherwise conveniently arranged volume also suffers from its running heads. Application category is at the outside margin and system name is at the inside margin, so that it is necessary to confirm continuously that one is still within the pages for a particular system while leafing through the application types available for that system. (It would seem much easier to keep one's place within twenty-one computer system types than it is to do so within 850 application types, each repeated up to twenty-one times).

How does an annual-only software list compete with catalogs of greater frequency?

Table 1 compares Bowker's offering with two of its competitors; Bowker is the clear winner on price and coverage. Table 2 compares the retrieval of three sample searches in *The Software Encyclopedia* against retrieval from Elsevier's quarterly updated *Software Catalog: Microcomputers.* The latter does better, presumably because of being more up-to-date, but less well than might be expected given the respective issue dates (Bowker, copyright

Table 1. Comparison of Three Software Directories

Attribute	Bowker's *Software Encyclopedia*	Elsevier's *Software Catalog: Microcomputers*	McGraw Hill's *DataPro Directory of Microcomputer Software*
Frequency	annual (1985/86)	4 times a year	monthly
Price (1987)	$125	$350	$671 (first year) $511 (thereafter)
Scope	all types of software	all types of software	"business oriented" software
Number of Software Listings Claimed	>27,000	>24,000	≈8,800
Number of Publisher Listings Claimed	≈ 4,000	> 4,000	≈1,000
Online Version?	Dialog #278 *Microcomputer Software & Hardware Guide*	Dialog #232 *Menu; the International Software Database*	—

Table 2. Searching for Software Packages in Two Directories

Dealer Catalog		Number of Packages Found: Bowker's *Software Encyclopedia* (1986–87)	Number of Packages Found: Elsevier's *Software Catalog: Microcomputers* (Summer 1987 issue)
Catalog 1	58 commercial packages[1]	17	25
Catalog 2	47 commercial packages[2]	25	27
Catalog 3	25 shareware packages[3]	7	6
Total:	130 software packages	49 (37.7%)	58 (44.6%)

1. Selective Software, Santa Cruz, California, Fall 1987 catalog.
2. Power Up!, San Mateo, California, Fall 1987 catalog.
3. Shareware Express, San Juan Capistrano, California, Fall 1987 catalog.

1986, publication date January 1987; Elsevier, copyright 1987, issue dated Summer 1987, received August 31 in San Francisco).

Half of the programs in which I'm currently interested weren't listed in either work, for whatever reason, and those that were listed seemed invariably to be under some other heading than the one I first consulted. Cross references would be welcome (to warn me, for instance, that Word and 1-2-3 are listed under Microsoft and Lotus, respectively, but MS-DOS and Symphony are not). Bowker assures me I need the ISBN and Elsevier touts its *ISPN* (International Software Package Number), but I've never used either one to place a software order and don't know which one I really need. However I really do care whether or not a program is copy protected and would prefer to find out before the order is placed. (Though perhaps the current abandonment trend will make that need moot.)

Overall, I found entry layouts clearer and programs easier to locate through *The Software Encyclopedia*'s title arrangement, than in Elsevier's work, which requires a two-step, title-to-ISPN look up, lists packages under unexpected names, and fails to note copy protection status. The latter's *Software Catalog* wins for currency, number of lookup points (six indexes), and ease of handling (three paper volumes); *The Software Encyclopedia* is a winner for easy look up and price. You takes your choice.—*Justine Roberts, University of California, San Francisco.* ■■

Westlake, Duncan R., and John E. Clarke. *Geac: A Guide for Librarians and Systems Managers.* Aldershot, Eng. and Brookfield, Vt.: Gower, 1987. 307p. $80.95 (ISBN 0-566-05215-6).

An entire book about the Geac Integrated Library System? What on earth could it contain? This unusual work contains both too much and too little on the single topic of one of the major turn-key library systems available. It contains too much detailed description of complex application functions and entirely too little evaluation of system operations. Some of the difficulties with the work are identified by the authors at the outset. They acknowledge that it is virtually impossible to describe accurately an evolving online system in a medium as static as a printed book. They also understand that their perspective as public librarians in England will impart a bias that may not be satisfying for all their readers.

The authors begin with a brief and interesting history of Geac, including a survey of their early products and the evolution of the library system from a circulation system for the University of Waterloo to the diverse system available today. An overview of the basic hardware available at the time of the writing includes some useful descriptions for those librarians investigating Geac as a possible vendor. Descriptions may apply to equipment available only in the European or UK market and unfortunately are not clearly identified as being unavailable in North America.

A lengthy description of Geac software modules is provided. Each application module is discussed in exquisite detail. Each functional description is accompanied by sample screen displays with a list of the commands used and their function. Once again it is difficult to sort out the features available in each of Geac's major market areas. Circulation, a central Geac module, is described as having Archival Issue Records, Cash and Bindery Management, and a Help System—none of which is marketed in North America as part of the standard system and leads to speculation about whether or not they are actually included in the standard European or U.K. system package. It should be noted that the circulation software discussed is a version not available in North America and contains descriptions of unique U.K. features such as the Local Information Utility. This does not appear to be a case of different labels or terminology, but evidence of striking differences in the Geac system as it is installed on two sides of the Atlantic.

The detailed description of the functions and operation of each module surpasses the documentation available from Geac and may well justify the cost of the book for active Geac customers. The work does not attempt any evaluation of the Geac system. It is a descriptive work that provides no comparisons between systems. There is very lit-

tle in this discussion of Geac that points to the critical issues in major library automation efforts. While there is a good, but brief, discussion of response time issues and options, there are few other insights to be gained about Geac system performance.

A narrowly focused description of a single company and its offering in the library automation market is puzzling. There is little informational difference between this material and existing Geac corporate publications describing Geac products. Although Westlake and Clarke are quick to point out small features that have not been perfected, they are not willing to offer up a critical examination of their experience. A broader discussion of Geac system performance, cost effectiveness, hardware growth paths and software development trends would have produced better guidance to librarians and system managers. This work is likely to become a curious record of one moment in library automation history rather than a tool for library decision making.—*Tamara Miller, University of Tennessee, Knoxville.* ■■

Other Recent Receipts

Listed here are books and other publications received for review that are of potential interest to LITA members. Some of these materials may be reviewed in later issues of ITAL.

Build Yourself a Generic Computer. [Videotape] Westport, Conn.: Meckler, 1987. 30 mins. $49.95 (Beta format, ISBN 0-88736-225-7); (VHS format, ISBN 0-88736-226-5).

Clayton, Marlene. *Managing Library Automation.* Brookfield, Vt., and Aldershot, Eng.: Gower, 1987. 239p. $53.95 (ISBN 0-566-03529-4).

Dewey, Patrick R. *Essential Guide to Library Bulletin Board Systems.* Westport, Conn.: Meckler, 1987. 205p. paper, $24.95 (ISBN 0-88736-066-1) "Supplement to *Small Computers in Libraries*, no.2."

Hawley, George S. *The Referral Process in Libraries: A Characterization and an Exploration of Related Factors.* Metuchen, N.J., and London: Scarecrow, 1987. 188p. $22.50 (ISBN 0-8108-2010-2).

Libraries, Coalitions & the Public Good. Ed. by E. J. Josey. New York and London: Neal-Schuman, 1987. 174p. paper, $29.50 (ISBN 1-55570-017-9).

Miller, Charles R., III. *Essential Guide to Interactive Videodisc Hardware and Applications.* Westport, Conn.: Meckler, 1987. 124p. paper, $29.95 (ISBN 0-88736-091-2).

Online Databases in the Securities and Financial Markets. New York: Cuadra/Elsevier, 1987. 322p. paper, $39.95 (ISBN 0-444-01276-1). "Subset of . . . January (main) and April (supplement) 1987 issues of the Cuadra/Elsevier *Directory of Online Databases*, plus major changes through June 1987."

Oxford Surveys in Information Technology, Volume 3. Ed. by P. I. Zorkoczy. Oxford, Eng.: Oxford Univ. Pr., 1986. 324p. $67.50 (ISBN 0-19-859018-0).

Phillips, Jen. *The NAG Library: A Beginner's Guide.* Oxford, Eng.: Oxford Univ. Pr., 1986. 245p. $35 (ISBN 0-19-853263-6).

Policy and Practice in Bibliographic Control of Nonbook Media. Ed. by Sheila S. Intner and Richard P. Smiraglia. Chicago and London: American Library Assn., 1987. 197p. paper, $24.95 (ISBN 0-8389-0468-8).

Richardson, John, Jr. *Government Information: Education and Research, 1928–1986.* Bibliographies and Indexes in Library and Information Science no. 2. New York [etc.]: Greenwood, 1987. 186p. $35 (ISBN 0-313-25605-5).

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