

Information Technology and Libraries

September 1988

CONTENTS

- 221 Guest Editorial: Looking Forward
Frederick G. Kilgour
- 223 The Online Avery Index End-User Pilot Project:
Final Report
Janice Woo
- 230 Library Automation in China
Sharon C. Lin
- 243 Investigating Computer Anxiety in an Academic
Library
*MaryEllen Sievert, Rosie L. Albritton, Paula Roper, and
Nina Clayton*
- 253 The Effects of Entry Arrangement on Search
Times: A Cross-Generational Study
*Margaret Ann Wilkinson,
Patricia V. Burt, and Mark T. Kinnucan*
- 263 Smart Barcoding in a Small Academic Library
*John Buschman, Rebecca Reilly,
and Ene Andrilli*
- 273 Special Section: Online Subject Access
- 273 The Variability and Intensity over Time of Subject
Searching in an Online Public Access Catalog
Neal K. Kaske
- 288 Subject Heading Compatibility between LCSH and
Catalog Files of a Large Research Library: A
Suggested Model for Analysis
Carolyn O. Frost and Bonnie A. Dede
- 299 Integrating the Machine-Readable LCSH into
Online Catalogs
Karen Markey
- 313 Reports and Working Papers
- 313 User Interaction with the Authority Structure of the
Online Catalog: Results of a Survey
Julie Blume Nye
- 319 News and Announcements
- 324 Recent Publications
- 324 Book Reviews
- 324 Batt, Fred. *Online Searching for End Users: An Information Sourcebook*, reviewed by
Linda Friend
- 325 Crawford, Walt. *Technical Standards: An Introduction for Librarians*, reviewed by
Gary Ross
- 326 Software Reviews
- 326 *MITINET/MARC*, reviewed by David A. Badertscher
- 330 *Sci-Mate Software System* and *Dialoglink*, reviewed by Jill Newby and Charlene M.
Baldwin
- 336 Letters
- 336 Index to Advertisers



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CONTENTS

- 221 Guest Editorial: Looking Forward
Frederick G. Kilgour
- 223 The Online Avery Index End-User Pilot Project:
Final Report
Janice Woo
- 230 Library Automation in China
Sharon C. Lin
- 243 Investigating Computer Anxiety in an Academic
Library
*MaryEllen Sievert, Rosie L.
Albritton, Paula Roper, and
Nina Clayton*
- 253 The Effects of Entry Arrangement on Search
Times: A Cross-Generational Study
*Margaret Ann Wilkinson,
Patricia V. Burt, and Mark T.
Kinnucan*
- 263 Smart Barcoding in a Small Academic Library
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and Ene Andrilli*
- 273 Special Section: Online Subject Access
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Searching in an Online Public Access Catalog
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Catalog Files of a Large Research Library: A
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Online Catalogs
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Baldwin
- 336 Letters
- 336 Index to Advertisers

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Guest Editorial: Looking Forward

Twenty years ago, when the *Journal of Library Automation* first appeared, there were high hopes that computerization would increase the availability of library materials to individual users and also prove an effective weapon to combat the rate-of-rise of per-unit library costs. Studies have shown significant achievements in both areas, but both the volume of demand and the number of demanders have so increased that there has not been a reduction in patrons' failure to obtain materials. Libraries must make greater efforts to improve their delivery of books and other materials as artifacts, but more importantly, they must meet their users' ever-increasing demands for information contained in the artifacts.

Demand for the immediate delivery of accurate information has snowballed in the half century since the start of World War II. That war, fought with vehicles ranging from automobiles to rockets, was dynamically offensive in character, a radical difference from the primarily static trench defense of the First World War. It was also characterized by the use of propaganda and economic weapons. All aspects of global war demanded retrieval of information buried in books, journals, newspapers, and document files. The world learned to operate on a knowledge base, and libraries must now concentrate on supplying content information if they are to remain viable institutions.

Fortunately, just as library computerization became feasible with the introduction of the computerized high-speed printer a half-dozen years before the advent of the *Journal of Library Automation*, so has content retrieval become feasible with the introduction of electronic publishing a half-dozen years ago. At least one organization is already developing a large, comprehensive, online system enabling libraries to make available to remote users the contents of electronic books. Since an electronic book can always be "on the shelf," library success in satisfying patron demand could rise to nearly 90 percent from the present 60 percent by means of such systems.

Information Technology in Libraries has published a few papers on computerized content retrieval. One of them, Celia Wall's fine article in the March 1987 issue, "Newspaper Indexing: Using an IBM Mainframe Computer and a Text-Formatting Program," is reminiscent of papers in the first volume of *JOLA* because it concerns an application in a single library. Raymond De Buse's "So That's a Book . . . Advancing Technologies in the Library" in the March 1988 issue evokes no comparison with articles twenty years ago in that it discusses a turnkey system, which did not exist then. Coming issues should contain more articles such as these, as well as reports on the operation of large, comprehensive systems. Libraries must begin to live in the dynamic world of information supply.

FREDERICK G. KILGOUR

Editor's note: In addition to his many other accomplishments, Kilgour was the founding editor of the *Journal of Library Automation*, the predecessor of *Information Technology and Libraries*.

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The Online Avery Index End-User Pilot Project: Final Report

Janice Woo

The Avery Index to Architectural Periodicals is produced at the Avery Architectural and Fine Arts Library at Columbia University as an operating program of the J. Paul Getty Art History Information Program. Its production and online access is supported on the Research Libraries Information Network (RLIN) of the Research Libraries Group (RLG). RLIN can be accessed not only by RLG member libraries but also by any other users who establish an account with the Cooperative Library Agency for Systems Service (CLASS), through which users can connect into RLIN via Telenet. A terminal or computer with a modem and telecommunications software is required for access.

BACKGROUND

The Avery Index to Architectural Periodicals was first developed in 1934 as a card catalog. Citations to articles in major architectural magazines were indexed by author and subject matter. In 1963 and at subsequent intervals, the card catalog was printed in book form by G. K. Hall & Company. In this format the Avery Index also became accessible to users outside of the Avery Library. In both printed and card form, the intervention of a librarian was not necessarily required. In 1979 the Avery Index began to be produced and accessed as an RLIN Special Data Base. In most cases, searching of the Avery Index now had to be performed by a librarian or information professional trained on the RLIN system;

use of the Avery Index had become mediated. Although users could still refer to the G. K. Hall volumes published for years after 1979, more current citations and more complicated search queries could only be retrieved by searching online. How could nonmediated online access be made available to the end-user? How easy would it be for end-users to search the Avery Index directly via the RLIN system? Did these users already have the necessary personal computers and modems? Could this be incorporated into a model for a scholar's workstation within the Scholarly Information Center?

THE PILOT PROJECT

The Online Avery Index End-User Pilot Project was developed to test the viability of remote nonmediated access to the index (i.e., end-users search the database on their own, using their own home or office computers outside of the library setting). The pilot project offered this service free of charge and allotted each user up to five hours of searching during a one-month period.

The pilot project took place during the month of April 1987. The budget allowed for sixteen participants, who were limited to Columbia students, faculty, staff, and alumni and were required to have access to the necessary equipment and software. Participants selected two specific dates in April for their searching activities and learned how to search the index by a formal

two-hour hands-on training session or by a ten-minute briefing. They were also given various handouts that explained search commands, displays, and strategies.

Specific objectives of the pilot project included

- (a) testing the demand for remote non-mediated searching,
- (b) evaluating the feasibility of command-driven searching with limited training,
- (c) measuring user satisfaction with the database content,
- (d) enumerating the correlation between anticipated and actual database access points, and
- (e) acting as a marketing and promotional device.

To help measure these objectives, a transaction log of the designated RLIN account was requested. This log recorded only input events (i.e., what the searcher asked for) and included a date and time stamp. A questionnaire that asked participants to rate their reactions to the database was to serve as a secondary test measure.

THE PARTICIPANTS

Within the Avery Library, the index has a potential user population of approximately 300 students and 50 faculty members in the Graduate School of Architecture, Preservation, and Planning and approximately 450 students and 40 faculty members in the Department of Art History and Archaeology. How much of this potential population actually has need to search the index, however, is not ascertainable.

During March 1987, an announcement concerning the pilot project was posted on bulletin boards, handed out at service points, and sent to each faculty member. Application was made via the Avery Library reference desk.

Fourteen applications were received, and each applicant was sent a confirmation letter accompanied by terminal specifications/configuration information. Each was then asked to attend a two-hour training session or to stop by the library anytime for a ten-minute briefing. The participants were to be apprised of their account numbers and passwords at these times.

Of the fourteen applicants, seven came to the library to receive their account numbers and passwords. Of the seven who received training or briefing, only three continued in the project by actually logging in search time from their home or office. All three participants were graduate students.

QUESTIONNAIRES

To find out why eleven of the fourteen applicants had not taken part in the project, two questionnaires were developed: one was sent to the seven applicants who did not take part in the project, and the second was sent to the four who had received their instructions but had not actually done any searching. Of the eleven questionnaires sent out, seven were returned: four from the seven nontrained applicants and three from those who had received their instructions.

Their responses (with the number of answers noted in parentheses) were as follows:

Questionnaire to the seven nonparticipants

Why were you initially interested in searching the Online Avery Index from your home or office?

- (2) For study or research in the field of architecture
- (1) For study or research in the field of computer graphics
- (2) Interested in learning to use online databases in general
- (2) It was offered for free
- (1) Preferred to search on my own time

Why did you elect not to participate in the program?

- (1) Did not foresee the possibility of searching the Avery Index on my own following the program
- (3) Didn't have time to come to the training session
- (2) Didn't have time to pick up the instructions
- (2) Didn't have time to do any online searching during the period it was offered
- (2) Could not schedule two specific days for my searching

Would you be interested in participating in this program at a later time?

- (2) Yes (1) during September (1) during July
- (1) Maybe, depending on the length of time allowed for searching
- (1) Maybe, depending on my needs and access to Avery Library itself

Questionnaire to the four nonsearchers

Why were you initially interested in searching the Online Avery Index from your home or office?

- (1) For study or research in the field of Islamic architecture
- (1) For study or research in the field of real estate
- (2) Interested in learning to use online databases in general
- (1) It was offered for free

What prevented you from searching the Online Avery Index from your home or office?

- (3) Didn't have time to do it on my scheduled days
- (1) Did not foresee possibility of searching the Avery Index on my own following the program

Would you be interested in participating in this program at a later date?

- (2) Yes, during the summer
- (1) Maybe

Findings

With such a small body of respondents, general conclusions are far from possible. However, even this small sampling indicates that there is at least some interest in remote nonmediated access to the index, especially among graduate students.

The primary reasons for not taking part in the pilot project seem to be (a) a lack of time, both in general and for scheduled activities, and (b) that end-user searching of the index would not be possible following the project. On the other hand, the applicants did not cite mediated searching as a preferable alternative, nor did they indicate that they did not feel competent to search on their own.

Summary

Of a total potential user population of around 800 students and faculty, 14 applied to participate in the pilot project. Half of these applicants received instruction and access information, but only 3 continued with the project by actually logging in search time from their home or office. Considerations that may have limited project participation included scheduling, end-use following the project, not having a

computer and appropriate software, and perhaps nonawareness of the project or the database itself.

SEARCHING OF THE DATABASE

A third questionnaire was sent to the three searchers, asking them to rate their concurrence with statements regarding the general system, the Avery Index database, and their retrieval results.

Their responses (with averaged ratings on a scale of 1 to 5 indicated in parentheses) are shown in table 1.

Findings

The responses from this questionnaire show that the participants were generally satisfied with their end-user searching. Satisfaction with the database system itself was fairly high, except for the lack of help screens and menus. Given that there were no menus, however, the typing of direct commands and indexes did not seem to be problematic for the participants.

The rating of the two types of training indicates that the full-two hour session is much preferable, and the documentation rating shows that it was moderately satisfactory, but that some improvements could probably be made. In terms of database content and search results, the rating of the displays was favorable, as was the number of citations retrieved. Currency was rated slightly higher than moderate, while retrospective coverage was rated slightly less. Relevancy of the retrieved citations was perceived as moderately good.

The statements relating to the construction of search requests all received the median rating, except for choosing the right index, which was rated as more difficult.

The end-users had been instructed that appropriate subject terms could be determined by either checking the Avery Reference file or by searching for a title word and then examining the citation's subject headings. The success of these two methods were rated at the midpoint.

All three participants indicated that they would be willing to pay only \$10 per hour to search the Avery Index from their home or office.

Table 1. *Questionnaire to the Three End-User Searchers*

	Disagree			Agree	
	1	2	3	4	5
<i>Database System</i>					
Overall set-up of the database access is good					(4.00)
Dial-up procedure is easy					(4.33)
Log-on procedure is easy					(3.66)
Welcome message and news is helpful					(3.33)
Typing commands (like FIN) is no problem					(4.33)
Typing indexes (like SW) is no problem					(4.66)
Lack of help screens is okay					(2.00)
No menu selections is preferable					(2.33)
<i>Training Provided</i>					
Two-hour session was valuable					(5.00)
Ten-minute consultation was sufficient					(2.66)
<i>Instructions Provided Were Satisfactory</i> [all documents were rated the same]					
					(3.66)
<i>Search Results</i>					
Statement of results retrieved is clear					(4.66)
Display prompts (like MUL, + B) are clear					(4.33)
Displays contained necessary data					(4.00)
Too many citations were retrieved					(2.00)
Too few citations were retrieved					(2.00)
Currency of citations was good					(3.66)
Retrospective coverage was good					(2.66)
Citations were relevant to my interests					(3.66)
I think there are citations in the database that I could not retrieve					(3.00)
It was easy to narrow my search results					(3.00)
It was easy to expand my search results					(3.00)
It was easy to choose the right index					(2.33)
My search items retrieved the desired results					(3.00)
The right terms could be found by searching AREF					(3.00)
The right terms could be found by searching TW					(3.00)
What is the maximum you would pay for this service in your home or office?					
_____ \$325 start-up, plus \$100 per year, plus \$55 per connect hour					
_____ \$325 per year, plus \$55 per connect hour					
_____ \$55 per connect hour with no other fees					
_____ 3 \$10 per connect hour					
_____ only for free					

TRANSACTION LOG ANALYSIS

In order to quantify some aspects of the end-user searching, a transaction log of the three participants' search activities was recorded.

Frequency Tables

To carry out the analysis, some simple frequency tables were produced, from which basic statistical information was derived. The total number of transactions (i.e., each time the users pressed the "enter" or "send message" key) was 1,302. Sixty-five of these were blank or transactions

without content, leaving 1,237 as the actual number of commands requested (see table 2).

Findings

Again, with such a small sample, general conclusions are not possible; however, a few observations can be made:

- the 72% display rate shows that the users were able to retrieve a good number of results;
- subject searching outweighed citation searching by almost two to one;
- subject phrase searching (22%) is fairly frequent in comparison with

Table 2. Transactions

	No.	%
<i>Transactions by types of commands (total = 1,237)</i>		
Search commands (FIN, BRO, AND, SEL)	327	26
Log-off command	7	1
Invalid commands or typos	10	1
Display commands (+, MUL, DIS, +B)	893	72
<i>Transactions by types of indexes (total = 327)</i>		
SW Subject word	113	35
SP Subject phrase	74	22
PN Personal name	68	21
TW Title word	23	7
TP Title phrase	1	.3
AREF Avery reference file	14	4
JP Journal phrase	6	2
CW Corporate word	3	1
PE Personal name exact	2	.7
Invalid indexes or typos	23	7

subject word searching (35%);

- d) searching of the Avery Reference file, while not frequent, was used to some extent (4%);
- e) there was a very low percentage of invalid commands (1%), indicating that a command driven database is viable for even novice users;
- f) the higher percentage of invalid indexes or typos (7%) shows that using an index to qualify or characterize a search term may be a difficult concept or, simply, that typos are a common occurrence.

Coding and Sorting the Transactions

A method of analyzing the logs was also developed in which each transaction would be coded and sorted according to certain validity characteristics. This type of analysis was indicated because (a) the nature of the result displays could not provide a simple success/failure ratio, and (b) only input events had been recorded.

In the RLIN system, a single "hit" is displayed without further command by the searcher. Seven or fewer hits are displayed without further command in a short citation form. It is only when eight or more citations are retrieved that a user must give a subsequent display command. Lack of a display command following a search command, therefore, was not particularly meaningful.

Since only the input events had been recorded in the logs, analyzing the search results would have required replicating each search. While some of the searches were replicated to isolate problems such as truncation, replicating all of the searches would have been inordinately time-consuming. Instead, each of the search transactions was manually coded in relation to its expected validity for the database. A valid designation, therefore, was given to each search statement formulated so that one could expect to get results if the database did indeed contain that data. All personal names and title searches that were syntactically correct were coded as valid. Browsing for any term was also coded as valid. Invalid search transactions were coded into categories relating to command language, form of search term, content, and miscellaneous typos.

The search commands, which excluded display commands but included the log-off and invalid command typos, were coded and sorted, with the number of occurrences and percentages indicated in table 3.

Findings

The total number of search transactions analyzed was 344. Invalid search commands totaled 135. In percentage breakdown,

- (a) valid search commands comprised 61%;
- (b) the next most frequent type of characteristic (9%) was the nonpreferred

Table 3. Search Commands with Log-Off and Invalid Command Typos

	No.	%
Valid		
[a]	209	61
Invalid		
Command language		
[b] no command or invalid command	3	1
[c] no index or invalid index	14	4
[d] mismatched command/index	1	.5
[e] mismatched index/search term	15	4
[f] problem with Boolean operators, including omission of	6	2
Form of search term(s)		
[g] nonpreferred search term	31	9
[h] incorrect form of search term	9	3
[i] incorrect truncation	17	5
[j] punctuation problem	6	2
[k] typo in search term	13	4
Content		
[l] out-of-scope request	2	.5
Miscellaneous		
[m] other typos, etc.	18	5

- search term (i.e., a value that is not used as a standard subject heading);
- (c) problems with the command/index part of a search request accounted for 11.5% of the invalid search transactions;
- (d) problems relating to the form of a search term or value accounted for 23%;
- (e) requests for subject matter not included in the scope of the database was a scant .5%;
- (f) 96% of the display commands followed a valid search command;
- (g) of the total 893 displays requested, 38 of these followed an invalid search command. This is important because it shows that results retrieved by a faulty search are, nevertheless, being examined.

A comparison of end-user perceptions and the transaction log analysis presents a reasonably good correlation. User satisfaction with results retrieved is supported by the 72% displays requested. The relative ease of direct commands is supported by 61% in the valid search command category (a) and the mere 1% in the invalid command category (b). The users' perceived difficulty with choosing the correct index is substantiated by 8.5% in the three categories

of invalid indexes (c through e), while the median ratings for finding the right search term is enforced by the 23% occurrence of invalid search terms (g through k).

A more in-depth analysis, which would have correlated the valid and invalid occurrences for the same search term, comparison of the results, and use of the Avery Reference file, was not carried out due to limited data processing facilities.

OBJECTIVES AND FINDINGS

1. The demand for nonmediated searching was not found to be overwhelming. The responses to the questionnaire indicate that lack of time was a major factor, with a secondary factor being little possibility of end-user access after the project. An unsupported factor might also be the lack of appropriate hardware and software for this type of activity.

To compare this minimal demand with Avery Library's mediated searching, one can generalize that mediated searching of commercial databases is relatively low, while mediated searching of the Online Avery Index and other RLIN databases is fairly high. During the month of the pilot project, less than five minutes of commercial database searching were performed for patrons, while on the Online Avery Index,

118.960 connect hours and 329.133 cpu secs were logged in at the Avery reference desk terminal.

It might be suspected, therefore, that greater visibility and promotion of services would help inform patrons of online options in general.

2. It seems fairly evident that command-driven searching can be successfully accomplished even by novices with little training. This is supported by the fact that 61% of the search transactions were considered correctly entered and valid, whereas there was a low frequency of invalid commands (1%) and invalid indexes and typos (7%).

This analysis is in accord with the end-users' perception that typing commands and indexes is not much of a problem (4.33 and 4.66, respectively, on a scale of one to five). They did indicate, however, that they believed there were database citations they were not able to retrieve and that choosing the right index was problematic.

3. Satisfaction with the database content can be gauged by the fact that 72% of the transactions were display requests, indicating many hits. The end-users' responses to the questionnaire show that they were quite satisfied with the display format, the number of results retrieved, the currency of the database, and the relevancy of the citations retrieved. As would be expected, retrospective coverage was rated less highly. Since only .5% of the search terms requested were out of the scope of the database, one could conclude that the end-users must have found the database to be covering their topics of interest.

4. The correlation between anticipated and actual database access points was rated at midpoint by the end-users. The transaction log analysis supports this, as 23% of the total search transactions were invalid due to a problem with the search term. Of this 23%, however, only 9% were actually nonpreferred terms not used in the database, while the rest were in error due to

construction or syntax of the search value. In scanning the nonpreferred search term category, it seems quite probable that results would have been retrieved if a less-restrictive index had been used or if truncation had been used more effectively.

Although the database vocabulary was not in complete accord with that of the end-users, it should also be kept in mind that, as with any database, familiarity with the vocabulary develops through practice.

5. To the best of our knowledge, remote nonmediated access to the database by the targeted population has not increased as a result of the pilot project. The one overriding factor seems to be cost. Presently, under the access through the CLASS arrangement, an end-user would need to spend \$325 to get started, another \$100 per year, and \$55 per connect hour. The participants indicated that they would only be willing to pay \$10 per hour to use the database.

SUMMARY

The outcome of the Online Avery Index End-User Pilot Project was affected most by the limited number of participants. This limited participation seemed to be due to a lack of time for both learning and searching an online database and a perception that end-user searching would not be feasible after the pilot project. Since only three people actually performed their end-user searches, the analysis of their questionnaire responses and logged search transactions provide somewhat limited conclusions. Nevertheless, it seems clear that the three relatively novice end-users could successfully perform searches on the Online Avery Index with only minimal training and that they were satisfied with both the system and their retrieval results.

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Library Automation in China

Sharon C. Lin

Library and information services in the People's Republic of China are under the jurisdiction of two separate government agencies, although there have been discussions on combining them into one operation. After the establishment of the new government in 1949, the first five-year plan (1952-1956) was implemented, and it stimulated a great deal of scientific and technical research in order to reach a national goal of building China into an industrialized country. A long-term development project in science and technology for 1957-1968 called for the creation of a scientific and technical information organization. As a result, the Institute of Scientific and Technical Information (ISTI) was founded in October 1956 within the Chinese Academy of Sciences (CAS) to serve the research needs of the numerous institutes of the academy. In May 1958, at the First National Working Conference of Scientific and Technical Information, it was decided, and approved by the State Council, that ISTI be expanded and strengthened to become a national scientific and technical information center as well as a national coordinating organization of information work for the entire country. The outcome was the Institute of Scientific and Technical Information of China (ISTIC), now a government agency under the State Commission of Science and Technology.¹ Since then, ISTIs were established under every ministry, most of the commissions within the State Council, and also at the provincial level. In addition, regional information centers were es-

tablished in seven cities. Thousands of regional and national information exchange networks were also created in the country, forming an enormous national information system parallel to the nation's library system. To this date, information seekers in China are served by units under these two separate systems. The number of information professionals is estimated to be more than 50,000 persons.

The Chinese library system, similar to that of many other countries, can be grouped into four major categories: (1) the public libraries headed by the National Library of China (formerly the National Library of Beijing) and including the provincial, municipal, prefectural, and county libraries, etc., which are under the jurisdiction of the Administrative Bureau of Library Service of the Ministry of Culture; (2) the educational libraries under the control of the Ministry of Education and including the university and college libraries and middle and elementary school libraries; (3) the libraries of CAS and a large number of libraries affiliated with other research institutes throughout the country, constituting the science and research libraries; and (4) the great number of factory and workshop libraries organized by the trade unions within factories. This group of libraries makes extensive use of the libraries belonging to the other three groups through group borrowing. Though different types of libraries are under the administration of different central authorities, they are all coordinated by the Administrative Bureau of Library Service of the Ministry of Culture.²

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While Chinese library and information services belong to two parallel systems, the information scientists, to a certain extent, have higher social status than librarians, and agency support for information centers is greater than that for libraries. Ever since the early fifties, the Chinese officials, influenced by the Russian system, maintained that information centers served the scientific and industrial communities and contributed directly to the growth of the national economy. Libraries, in their opinion, served only academic and educational communities, with no apparent profit to the society. It was only after the nation adopted its open policy that the Chinese officials began to realize that library and information sciences, especially in an academic environment, have many attributes in common; there is no real distinction between them. In 1978, at the First Working Conference of Library and Information Science, which was considered an important milestone in the development of contemporary Chinese libraries, the idea of integrating the library and information sciences was introduced for the first time in the new society.³ Although some progress has been made, and perceptions have gradually changed in the past ten years, libraries and information centers are still under the jurisdiction of completely independent government agencies.

At present, much progress has been made in computerized information retrieval in terms of both techniques and equipment.⁴ In a recent article, this author summarized the development of computer applications in Chinese information services, outlining the national efforts toward standardization and coordination that paved the way for information computerization; reviewing the experiments involving computer processing of materials in Chinese scripts and the specific attempts at information retrieval with foreign and domestic databases; and discussing the status of online retrieval with national and international databases.⁵

The environment for developing library automation was not as favorable as that for information services; there are practical reasons for this disparity. On the one hand, information retrieval in the early stage deals mainly with imported databases of

Western-language materials in the scientific and technical fields serving the immediate needs for modernization. This is an efficient and rather simple way to fill the ten-year gap when foreign purchases and subscriptions were suspended during the Cultural Revolution. It is therefore understandable that information services attract financial support readily. On the other hand, automation in Chinese libraries deals with the creation and conversion of bibliographic records for the collections, which require computerization of Chinese scripts and databases. Both require sophisticated Chinese-character processing, computer equipment, software expertise, and trained personnel not readily transplanted from abroad.

In spite of all these difficulties, however, there has been a great awareness among the Chinese libraries of the need for computer-assisted operations. At an early stage, academic and research libraries of different sizes began to experiment with computer application in various operations for library processes as well as information retrieval. Even though many libraries did not have their own machines, they used the equipment from their parent institutions, for example, university computing centers. The situation has improved greatly in the past few years. With the help of a World Bank loan of \$250 million for university automation projects, by the mid-eighties twenty-six universities and colleges have acquired good-sized computers capable of supporting approximately sixty terminals, with most of the terminals stationed close to the computing centers.⁶ In addition, in 1985 IBM China Corporation donated 100 IBM 5500 Chinese-language multifunction workstations to the four leading universities: Qinghua, Beijing, Fudan, and Shanghai Jiao Tong.⁷ By the end of 1984 microcomputers were available in 80 percent of the specialized information centers and 60 percent of the regional ones, while more than 80 percent of the universities with library and information science programs were equipped with microcomputers.⁸

Because of the complexity of Chinese-character processing and the lack of equipment, the initial efforts of automating library operations involved experiments on

university campuses, usually with Western materials. Databases were built from two sources: tapes imported from the United States and Japan, primarily for information retrieval purposes; and each library's holdings of Western-language materials. Acquisitions, cataloging, circulation systems, union catalogs of Western-language books and serials, as well as retrieval systems developed to utilize foreign databases, were some of the early areas of experimentation.

The following sections of this article describe the initial efforts of automation at the National Library of China (NLC). NLC is the Chinese counterpart of the Library of Congress: both are depository libraries of their nation's publications and make available their cataloging to other libraries through cards and machine-readable magnetic tapes, although the latter service is not yet operational at NLC.

NATIONAL LIBRARY OF CHINA

NLC has been a member of the International Federation of Library Associations and Institutions (IFLA) since 1981. At present, it has a collection of 13 million volumes and a staff of 1,600. As the national library of China, NLC takes careful and thorough steps in preparing for automation. The library has a three-stage, long-range plan with an ultimate goal of creating a national online database of bibliographic records for materials in Chinese and in foreign languages:

1) 1986-1988: The move into a new building will be completed. Full service will be offered to the public with automation realized in certain areas.

2) 1989-1990: With the installation of large-scale computers, bibliographic databases for Chinese- and Western-language materials, print and nonprint, will be built and available to the nation's libraries and information units.

3) 1991-1995: The completion of a multilanguage, integrated-library online system will make NLC the bibliographic center of China, realizing all functions as a national library.⁹

NLC automation plans have been more fully outlined by Sun.¹⁰

The NLC automation development department was set up in 1975. In the following three years, one dozen young staff members were sent to American universities and colleges to study computer science, both hardware and software. In the meantime, several library staff members who were experienced in the application of computer technology in library service were transferred to the department. An examination and translation of literature on the subject, especially information dealing with the MARC tapes of the Library of Congress, and a study of the development of library automation in major countries were carried out when the students returned to China. The functions required for the library's manual cataloging of Western-language materials and the feasibility of their being performed by computers were investigated carefully. State-of-the-art hardware and software and Chinese-character-processing techniques were also surveyed.¹¹

In summer 1979 a seminar entitled "Information Automation and Online Retrieval Systems" was held in Beijing. Sponsored jointly by UNESCO, the National Bureau of Scientific and Technical Information of France, and ISTIC, it provided momentum for the development of automation in Chinese library information institutions.¹² During this period, participants from major libraries in the Beijing area exchanged opinions on a future Chinese MARC. They acknowledged the complexity of Chinese-character processing, the lack of equipment, and the urgent need for foreign scientific and technical information to carry out the national modernization policy. Subsequently, they concluded that libraries should put their efforts together in a MARC database for Western-language books in the Beijing area instead of starting with machine-readable cataloging for Chinese materials. The first step of this project would be experimenting with LC MARC tapes on imported computers; based on that, researching and experimenting with a Chinese MARC would then take place. This resulted in the formation of the Beijing Area Coordination Group Research and Experiment on Machine-Readable Catalog of Books in Western Languages

(coordination group for MARC). Six units participated: NLC, the library of CAS, the University of Beijing, Qinghua University, the Chinese Peoples' University, and the China National Publications Import & Export Corporation. Thus, a new environment was provided for Chinese libraries in the development of machine-readable catalogs. The group's tasks were to analyze the format and contents of LC MARC II, to develop the cataloging and retrieval program, and to compile the Beijing-area union bulletin of new books in Western languages. Programs for the three tasks have been completed successfully.¹³

After the personnel training and other preparations, in 1980 NLC began to subscribe to MARC tapes from the Library of Congress. The coordination group built a simulated system in early 1981 and conducted experiments with the MARC tapes on a Felix 3512 computer. The experiments were conducted on the library's acquisitions and cataloging processes to test the system's feasibility. Eighteen application programs were written for the system, which realized all the functions required by online cataloging for Western-language books.¹⁴ Unfortunately, due to practical limitations, this simulated system has never been put into use. Meanwhile, in 1981 five library members of the MARC group input the data from their catalog cards for Western-language books and created the *Union Bulletin of Western-Language Books in Beijing Area*.¹⁵ Eight thousand records were entered into this homemade database, from which two sample copies were compiled, a big step forward in the management of computer data. Due to the lack of uniform standards for cataloging and classification among participating libraries, many problems have been encountered in processing the large amount of data. However, the experience of dealing with these problems has helped in understanding the MARC format. The *MARC Format Working Manual* (first draft) is one of the products of this learning process. This project has also resulted in a push for standardization in the many areas affecting cooperation in an online environment. Using LC MARC tapes, in 1981 NLC began to provide the selective dissemination of infor-

mation (SDI) and subject retrieval services to units both within and outside of the library. MARC tapes were also used for interlibrary loan services.

In the latter part of 1982, another project was launched at NLC to experiment with a machine-readable catalog of serials in Western languages. The major considerations for doing so can be summarized as follows:

1) More than 80 percent of foreign references cited by the researchers are from periodicals, yet the work on union listing for foreign periodicals has lagged far behind.

2) The publication of foreign periodicals subscribed to by Chinese libraries is generally more stable than the Chinese journals. Thus, once prepared, the list can be used for a long time with only periodic updating.

3) Most of the foreign journals are concentrated in a few major libraries; hence, the efforts of a small group can be shared by all libraries in the nation.¹⁶

The long-term goals for this project are

1) to establish a list of social science journals in Western languages held by NLC. This list will facilitate library work in acquiring missing issues, preparing various catalogs and indexes, establishing a database for union lists, and providing different statistics;

2) to create a national union list of Western-language journals with separate files for scientific and technical journals and social science journals; and

3) to further expand the database and, when the time is ripe, to establish a network system and provide various services to the public.

In six months, preparation for this project, such as drafting the cataloging rules for Western-language serial publications, data input, application programs, etc., was well under way. One-fifth of the data was already input. This was merely a testing ground, however, for a more sophisticated system yet to be developed.

Experimenting with LC tape-related projects led to a realization of the urgent need for standardization. Under the supervision of the Technical Committee on National Standardization of Documentation (TCNSD), NLC (along with other perti-

nent institutions) was actively involved in drafting many of the national standards, which facilitated the data processing of both Chinese and foreign materials. There are at present nearly twenty standards developed in the library information field, all compatible with the international standards. They relate to codes for document types and media, Chinese-character sets for information interchange, standards for editing and abstracting journals, subject indexing, format for bibliographic records exchange on magnetic tapes, and cataloging rules for various types of publications.¹⁷ Many other national standards are waiting to be confirmed.

Policies and guidelines relating to international standards that represent radical breaks from the past were also established and recommendations were made. For instance, at the August 1983 Conference on Standardization and Automation for Cataloging Western-Language Books, sponsored by the Working Committee of National Libraries of Higher Education (WCNLHE), participants unanimously agreed on the adoption of the Anglo-American Cataloguing Rules, 2d edition (AACR2), the International Standard Bibliographic Description (ISBD), and the Library of Congress Subject Headings for cataloging their Western-language books with modifications to suit local practice.¹⁸ This consensus not only solved practical problems encountered in developing a machine-readable catalog for Western-language books, but also facilitated the formulation and promotion of other standards for library use. Participants at this meeting further explored topics such as MARC format, format of bibliographic files for computer searching, searching strategy, networking techniques, etc. Furthermore, WCNLHE has been set up under the Ministry of Education. It coordinates library automation and computerized information retrieval among universities. These activities form the groundwork for computer applications in creating bibliographic databases and in machine retrieval and networking.

In mid-1984, NLC imported a Japanese minicomputer system, Hitachi M-150H, on which several application systems were developed. Since late 1984 various services us-

ing LC MARC tapes and International Serials Data System (ISDS) tapes have been provided to related departments in the library and to other institutions. Besides maintaining the application systems already developed and further developing the system resources on the M-150H, the MARC group also worked on introducing the National Bibliographic Center Computer System for the new library building scheduled for completion in 1987.¹⁹ NLC also maintains a publication management system on its Changcheng microcomputer.

Under the National Directive Group for Computerized Information Retrieval, a body responsible for coordinating the activities and national planning for information retrieval, the National MARC Center was established in the National Library of China. In 1985, more than 600,000 LC MARC records from tapes issued between 1978 and 1984 were stored on the NLC computer. Also in 1985, work on Chinese MARC for input into the system began with the ultimate goal of realizing a nationwide computerized cataloging system.²⁰ Finally, on December 28, 1985, a Chinese-character-attribute dictionary and its software system developed by NLC on the M-150H computer passed its appraisal test. It is specified by the Ministry of Electronic Industry as the basis for formulating national standards of Chinese-character attributes. The system consists of several Chinese-character codes and is capable of converting between the simplified and traditional forms of Chinese characters; therefore, it enables the libraries on mainland China to use the bibliographic records created online by their counterparts in Taiwan and other areas.²¹

Though Chinese literature displays a whole range of important bibliographies for all periods, they are usually retrospective in nature. Since the establishment of the People's Republic of China in 1949, the monthly *National Bibliography of New Books* was first issued in August 1950. Based on the information in the monthly bibliography, the annual *National General Bibliography* was compiled. These two bibliographies are lists of current publications issued by publishing agencies. In the absence of an official national bibliogra-

phy, these trade catalogs fulfill some of its functions. In recent years, bearing in mind the function of a national library, NLC has placed the production of a national bibliography on its immediate agenda. Plans were made to compile and publish the *Chinese National Bibliography* by means of computer technology beginning in 1986. Its bibliographic description conforms to the principles laid down by ISBD and all the relevant national standards of the People's Republic of China. When completed in 1988, this bibliography will be available in three different forms: the book form, card form, and machine-readable tapes.²²

The National Library of China is undergoing rapid expansion. On October 15, 1987, it moved into a new building with 1.5 million square feet of space. The new facility has a whole wing for automation operations, with separate rooms for computers, data entry, cataloging, and terminals.²³ As China's leading library, it strives for the early realization of an integrated library system that will automate the functions of acquisition, cataloging, retrieval, circulation control, and catalog production so as to make it the national bibliographic data center of China. Early in 1987, NLC decided to use the Washington Library Network (WLN) software to process its Western-language materials.²⁴ The CLSI online circulation system was installed on October 1, 1987, to control a 300,000-volume, all-Chinese open-stack circulating collection, serving the Beijing business and government communities.²⁵ The CLSI circulation system, the first major automation system at NLC, went online when the new library building opened to the public.

Other Chinese Libraries

Other libraries have also been experimenting with computer technology for library processes of one kind or another. With the exception of a few major libraries, automation systems are mostly developed on microcomputers. The information retrieval research unit of the mathematics department of Nanjing University, for instance, experimented with developing a machine-readable catalog for Western-language materials as early as 1978. In 1987, the acquisition systems for Chinese-

and Western-language materials and the serials control system were being developed on an IBM PC/XT-AT microcomputer and are near completion.²⁶

Because of the difficulty in Chinese-character processing and the lack of equipment, many computerization efforts in the early stages were spent developing retrieval systems using foreign magnetic tapes. For similar reasons, the development of a computer cataloging system did not receive much attention, although a bibliographic database created through online cataloging is the core of library automation. Among the automated systems developed by the Chinese libraries, the circulation system is the most popular. The following section lists some of these systems according to their function:

Acquisitions

Union Bulletin of Western-Language Books in Beijing Area. As described earlier, this is an acquisition list of five university libraries in the nation's capital. Database information comes from the catalog cards for Western-language books of the participating libraries.

*Western-Language Acquisition System.*²⁷ Developed in 1982 by Shanghai Jiao Tong University on the university's Burroughs 1955 computer, this system can print orders and provide statistics and financial reports in five subject disciplines. The program for this system has been tested and can be put to service with some refinements.

*Xian Jiao Tong University Western-Language Acquisition/Cataloging System.*²⁸ In operation since March 1984, this system uses the Cromemco III microcomputer, Intel 8080 CPU, and COBOL language. The main program consists of fifteen parts, including data input, output printing, self-indexing, indexing file creation, file management, information retrieval, etc. The system is capable of printing orders and producing card and book catalogs, book card stencils, new book lists, and various statistics. Though the original intention was to follow MARC II format, in practice MARC had to be modified because of limited storage capability of the microcomputer.

Qinghua Bibliographic Retrieval System (QBR).²⁹ This system began operation April 4, 1983, on a Chinese DJS-130 computer. The database of this system consists of bibliographic records of new books in Western languages received since November 1981 and is the first of its kind among the Chinese libraries. The computer application research unit of the university library has been working to further develop the acquisition, circulation, and cataloging systems.

Cataloging

Western-Language Cataloging System at Shanghai Jiao Tong University.³⁰ The program for this system passed testing on the Burroughs 1955 computer in December 1982. Cataloging is done by taking advantage of the MARC II tapes of the Library of Congress. Original cataloging is done on the computer according to AACR2 when no MARC record is available from the tapes.

Circulation

Shanghai Jiao Tong University Circulation System (SJTUCS).³¹ This circulation system runs on an HP 3000/39 computer with the Image/3000 database management system and is complete with the SJ-II Book Detecting System using bar-code and light-pen technology. When SJTUCS was implemented on May 15, 1986, the database had only reader information and lending regulations, with no bibliographic records. The system works as follows: when a book is charged out, a pair of bar-code strips with the same numbers are placed on the book and on the manual charge slip in the book pocket. The light pen is run over the bar codes on the borrower's card and on the book. At the end of the day, based on the charge slip, brief bibliographic information, including the call number, is fed into the computer for those books checked out during the day. This not only eliminates the bulk of the work in preparing a complete bibliographic database before the system can go online, it also saves the computer from being cluttered with records for books that may never be charged out. This is probably the first full-scale circulation system, as well as the first computerized li-

brary operation, in China.

Nanjing University Automated Circulation System for Chinese Materials.³² A variety of microcomputers with sophisticated features and the capability of processing Chinese characters are available commercially; Ashton-Tate's dBASE III is one of numerous packages that offer a Chinese version.

Nanjing University's circulation system successfully handles Chinese-language materials, which constitute over 75 percent of the entire library collection. The system has been in operation since April 1986 and is the first important circulation system in Chinese universities that is supported by a database of Chinese characters. It uses dBASE III and is developed on an IBM PC/XT to control the university's all-Chinese open-stack circulation. It is also the first Chinese-made system that is equipped with a laser beam bar-code reader and has such functions as charge, renewal, hold, loss report, compensation for lost books, fine, etc.

People's University.³³ Experiments have been conducted on Cromemco's database management system for functions in circulation operation. Based on these experiments, the information retrieval system was also tested with success. The university library also used the software package *MINISIS* of the HP 3000 minicomputer for experiments on building a bibliographic database and conducting information retrieval thereon.

Apple II Omninet Library Activity Management System.³⁴ This circulation system can perform statistics management and can also be used as a searching tool for acquisition purposes. The system was developed by three academic institutions in Guiyang using BASIC language.

Union List of Serials

Computerized Union Catalog of Serials in Western Languages.³⁵ Started in April 1983, this project involves all libraries under CAS, totaling about 140 units. Its completion takes three stages: (1) recataloging more than 20,000 serial titles currently subscribed to and held by the CAS libraries according to AACR2 and ISBD(S); (2) developing software to process the data; and (3)

presenting the data in three forms: card, tape, and book. Software for processing these data are being developed, and the project is expected to be completed in the near future.

*Chinese University Journal Abstracts (CUJA).*³⁶ Coordinated by Qinghua University, this is a joint effort of 340 college and university libraries in preparing an English-language machine-readable tape of their journals. The magnetic tapes, consisting of 10,000 papers as of April 1986, are available on market; an estimated 20,000 documents will be added to its database annually.

Two CUJA retrieving files were established on the UNIVAC 1100/10 computer of the Beijing Documentation Service Information Retrieval System (BDSIRS). CUJA participants are able to successfully search the database from their own terminals in more than thirty cities within China. The system is compatible with world standard communication patterns. A general input form based on the national standard, Magnetic Tape Format for Bibliographic Information Exchange (GB 2901-82), is used by the participating libraries. CUJA database is the first Chinese-created nationwide database in the English language. It may have considerable significance in Chinese database provision in the future, as it represents a major cooperative project among institutions. It is likely that the CUJA data will join the international databases and provide access to a source of valuable information that has never been available through computers.

Shenyang Computation Institute and Tongji University in Shanghai both designed an online union catalog of serials in Western languages and accompanied it with retrieval systems.³⁷

Serials Control Systems

*Shanghai Jiao Tong University Serials Control System.*³⁸ Developed on a Burroughs 1955 computer at the university's computing center, this system has data management software with good searching capability. It is planned that data will be linked to the library's own system when its computer is delivered.

Microcomputer Serial Control System of

*Western-Language Materials (WLPMS).*³⁹ Developed on a DB 8/1 by the Guangdong Institute of Scientific and Technical Information, the Guangdong Computing Center, and the Earthquake Research Institute of Guangdong, this system offers searching, check in, claiming, binding notification, and statistics—including monthly and annual borrowing records—and is one of the nine selected microcomputer retrieval programs recommended by the National Directive Group for Computerized Information Retrieval for practical applications.

Online Catalog

*Nanjing University System.*⁴⁰ The information retrieval research unit of the department of mathematics experimented in 1978 with an online catalog of Western-language materials. This was the earliest effort among Chinese libraries in using a computer for a library operation. Several hundred entries for Western-language books were input, and the first computer-created catalog was printed. In June 1979 SDI retrieval software was developed based on the MARC format. Meanwhile, more than 4,000 Western-language bibliographic records were input into the computer. They can be retrieved by more than ten access points. The project stalled due to the high cost of building sizable databases that could offer practical use. In May 1980 the library imported databases for the Bioresearch Index and the BioSciences Information Service of Biological Abstracts (BIOSIS) and developed retrieval softwares for them. Since then, it has been offering SDI services to a dozen universities in Nanjing, Shanghai, Hangzhou, and other cities in China.

*Online Bibliographic Retrieval System of the Chinese Academy of Sciences.*⁴¹ In June 1984 the library of the academy designed and began to operate a computer retrieval system for Western bibliographic monographs. In 1986 a similar system was developed for Chinese monographs. This new system is now operated on a PDP 11/34 minicomputer and consists of data for all new books in Chinese received by the library since 1986. The system can also generate charge slips.

*Wuhan University Microcomputer Library and Information Control System (WD-TQGX System).*⁴² This BASIC language system was developed for the university library on a MC-68000 microcomputer manufactured by Codata Systems Corporation. It is suitable also for other general libraries and information organizations and consists of six subsystems: cataloging, new book announcement, online retrieval, indexing, SDI, and statistics. These subsystems are mutually independent but share a common database built on the holdings of the university library.

In cooperation with an information institute in Hubei Province, the library department is creating a database of Chinese books held within the province, using the Bulgarian EC-1022, to realize a local online retrieval service.

*Beijing University.*⁴³ Preparation for an integrated system was preceded with a thorough system analysis at Beijing University. In November 1982 the university had a collection of 3.3 million volumes. Total library automation, including all languages and media, is scheduled for the year 2000. The first-stage goal for 1990, to be carried out on a high-grade VAX-11/750 system, will include the creation of a Western-language-materials database of 150,000 records to facilitate online acquisition, cataloging, international gift/exchange of those materials, online serials control, automated circulation for the main library, and the planning for a campuswide network.

The Documentation Center of the First Ministry of Mechanical Industry has been working on a library automation project that will, in the first stage, using *MINISIS* software, computerize the functions of acquisitions, cataloging, and serials control.⁴⁴ The circulation control function will be added later. An eventual online catalog in the second stage will be realized when more terminals are available.

Library Management

*Microcomputer Information Service Control System.*⁴⁵ Designed by the Information Institute of the Science and Engineering Commission of the Defense Department, this system consists of four

subsystems: document collection control, circulation, general information data management, and a Chinese scientific and technological reports editor.

*Sichuan University Library Computer System.*⁴⁶ The system was developed on the American Dual 83/80 computer by the university library in cooperation with the Department of Computer Science. This integrated system consists of the acquisition, cataloging, catalog retrieval, and circulation subsystems. Acquisitions lists are printed regularly. The online catalog (which is not yet available for public use) has an English-language database of more than 10,000 bibliographic records, which can be accessed through subject and title keywords, among others. There are also plans for a union catalog of new Western-language books at the Chengdu-area college and university libraries.

*Qinghua University Business Management System.*⁴⁷ This is a system for personnel and payroll management.

*Microcomputer Chinese Materials Retrieval/Management System.*⁴⁸ This system was developed by the Institute of the Scientific and Technical Information of the Ministry of Posts and Telecommunications on the ZD-2000 microcomputer. In full operation since December 1984, its database consists of the library's bibliographic records for more than 30,000 volumes of Chinese and foreign materials. It is capable of editing and typesetting Chinese-language indexes and abstracts. It can also offer retrieval to Chinese periodical publications as well as circulation control of Chinese and foreign materials and preparation of various management statistics. Two issues of the *Communication Abstracts of Scientific and Technical Documents* had been published by 1985, covering more than 500 papers in each issue. Two subsystems—the circulation and the acquisition statistics management—have been in operation. Monthly reports on the library acquisition statistics have been issued regularly.

*Microcomputer Library Management System.*⁴⁹ The Fujian Provincial Library, in cooperation with the Computing Center of Fujian Province, developed this system on an IBM PC/XT. The system passed its technical appraisal test given by the Commis-

sion of Education, Province of Fujian, in December 1986.

This is a relatively complete library management system comprised of four subsystems: retrieval for Chinese- and Western-languages, library acquisitions/cataloging, circulation, and serials control for Chinese periodicals. The database contains about 7,000 bibliographic records on industrial technology in Western languages.

*Microcomputer Mongolian Library Catalog Management System.*⁵⁰ Developed by the Library of Inner-Mongolia Autonomous Region, this is the first library automation system that uses a minority language. The design is based on national standards.

*Microcomputer Publishing Business Management System.*⁵¹ This system, containing 117 programs, uses a dBASE II database. Developed by the Bibliography and Documentation Press on a Chinese Changcheng 0520-A microcomputer, it passed its appraisal test in Beijing on May 24, 1986.

*Automatic Indexing System for Chinese Science and Technology Literature (AISCSTL).*⁵² This relatively advanced indexing system was developed by the library department of Beijing University on an IBM PC/XT. It can be easily adapted to the Changcheng 0520 model or other IBM-compatible computers. AISCSTL is the first successful multifunction system that can perform automatic indexing and subject heading assignment of Chinese scientific and technical literature, subject-term control, database creation, and editing and typesetting. It is regarded as a pioneer in the computerization of documentation for the Chinese-language database.

CONCLUSION

Meaningful efforts in automating Chinese library services began only in the mid-seventies, although attempts were initiated as early as 1956 with the formation of the Institute of Computing Technology in the Chinese Academy of Sciences.⁵³ In little more than ten years, significant progress has been made. Problems encountered at the early stage, such as the lack of standards and computer equipment and the difficulty

of processing Chinese characters, are mostly solved.

In view of the ambitious plan in realizing modernization in the fields of industry, agriculture, national defense, and science and technology by the year 2000, the Chinese government recognizes the important role that academic and research libraries play in the information transfer process. Consequently, the creation of a computerized integrated library system for NLC and the automation and networking of other important library and information systems have been listed among the key projects of national construction.

Rapid advances in information and computer technologies and the deployment of microcomputers with sophisticated capabilities make it possible to store more and more information in smaller and cheaper equipment—and to retrieve it more and more rapidly. In February 1987 the Ministry of Culture sponsored the fourth appraisal and awards meeting in Beijing for scientific/technological achievements in cultural endeavors during the 1985/86 fiscal year.⁵⁴ Ten prizes were awarded to computer systems related to library processes—a notable improvement over no prize being awarded to libraries at the first meeting, one at the second meeting, and three at the third meeting. This is perhaps a strong indication that the importance of library services is now well recognized by the government. At the National Working Conference of Libraries of Higher Education held June 12–16, 1987, 203 academic and research library directors and educational officials discussed the automation and networking plan for library and information services of higher education to be carried out during the seventh five-year plan (1986–1990).⁵⁵ In 1986 the CAS Wuhan Library and the Online Computer Library Center (OCLC) initiated a joint effort to develop a Chinese database.⁵⁶ Five more libraries in the Wuhan area have since begun participating in this international endeavor. The Chinese MARC tapes developed will be loaded into the OCLC database, while OCLC will supply a free copy of its tapes to each of the six participating libraries. The results of the research projects belong to the seven member institutions. The copyright in China be-

longs jointly to the six Chinese libraries, and OCLC has the right to use the same outside of China.

In the area of library computer personnel, China has been sending information engineers abroad, many to the United States, to study information systems in the universities.⁵⁷ They are quite proficient and well informed of current trends. Despite the considerable accomplishment, one must realize that this is only the beginning. Many problems remain to be solved or conditions to be improved. For instance, the computer storage capacity is still disturbingly limited, which greatly restricts retrospective conversion of old bibliographic records. In some cases, cataloging rules deviating from AACR2 are adapted to save computer space. Furthermore, there is a lot to be desired of the present telecommunication and transportation systems. Telephone lines are limited and few. Positive measures are being taken, however, and concrete results have been achieved.⁵⁸ Nonetheless, the important elements necessary for China

to automate the library information resources and to link them nationally and internationally are available. China can now realistically begin to plan implementation of a national data communications network to link automated libraries. Obviously, a stable political atmosphere is essential for any meaningful development of academic research in China. One advantage the Chinese have is that they do not have to go through all the trials and errors their American and European colleagues have experienced. A few generations of hardware and software can be saved.

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Twenty Years Ago in JOLA

Le plus ça change . . .

Although library literature contains numerous accounts of library automation programmes, it is very obvious that the chief emphasis has been on technical services and circulation applications . . . we failed to locate any existing mechanized system of producing subject bibliographies for reference use.

Ching-Chih Chen and E. Robert Kingham, "Subject Reference Lists Produced by Computer," *JOLA* 1, no.3:179 (Sept. 1968).
Contributed by Michael Gorman.

Investigating Computer Anxiety in an Academic Library

MaryEllen Sievert, Rosie L. Albritton,
Paula Roper, and Nina Clayton

A staff development program on computer technology at the University of Missouri-Columbia Libraries provided the opportunity to study computer anxiety and other factors related to resistance to computers. To determine computer anxiety, a survey was administered to staff volunteers. Some determinants of computer anxiety were identified, and the effect of the anxiety level upon workshop participation was determined. Results indicated that the workshop participants were influenced by their previous computer experience, their department, and the number of years they had worked in the library.

Computer anxiety, one of the components of resistance to technology, has not been studied in relation to academic libraries. A series of in-service computer literacy workshops at the University of Missouri-Columbia Libraries provided such an opportunity.

These libraries are committed to automating services. Within their mission statements are goals that demonstrate administrative awareness of the benefits of automated systems, the implications of technological change, and the impact of such change on library personnel. The libraries are currently involved in an ongoing conversion of bibliographic records for their online catalog, are implementing an online circulation system, and are developing computer-based acquisitions and serials holding subsystems. In addition, they are purchasing computer equipment for report writing, ac-

counting, and other general office functions. Thus, the impact of automation has spread to practically all staff positions.

With this increased automation comes the need to train and retrain staff members, on both a general level to learn detailed procedures for a distinct subsystem, such as the online catalog, and for overall system redesign. To raise the computer competence of the libraries' staff, the staff development and automation committees were jointly charged in early 1985 to develop a computer literacy program and seek funding for it. A grant proposal was submitted to the H. W. Wilson Company, and the libraries were awarded the 1985 H. W. Wilson Staff Development Award of the American Library Association. The computer literacy program was implemented in fall 1985, designed as a voluntary, sixteen-week in-service program emphasizing

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ing sequential instruction that staff members could somewhat tailor to their own needs.

The libraries were attempting to augment positive aspects of library automation by providing staff development programs. The successful design, implementation, and use of library automated systems require careful attention to the psychological and psychosocial needs of personnel. Luquire suggests that technological change in libraries must be approached from the attitudinal or psychological point of view even more than from the technical view.¹ Research by Fine and Sheridan indicates that (1) human beings react strongly to change, whether it is seen as positive or negative, and tend to resist it, even when they acknowledge that the change is good for them and (2) people react to the attributes of technology rather than to the technology itself.^{2,3}

In a historical review of technological innovation and resistance, Fine reconfirms her earlier research with the following statement, "The acceptance of current technology in its current state of development does not preclude that new technology will encounter new resistance."⁴ Fine's study further suggests that resistance is not a function of personality or demographics but is related to the climate of the organization and the beliefs, attitudes, and values of the individual.

Identifying the exact nature and causes of staff reactions is essential for successful implementation. Negative reactions to technology may be caused by people themselves or by the work environment itself. According to Faerstein, some factors leading to anxiety and difficulties with using technology are need for control or autonomy, resistance to change, need for status or power, fear of failure or the unknown, feeling of isolation, and role identity.⁵ Faerstein further indicates that changes in the work environment and the organization accompanying the introduction of technology can lead to concern on the part of people faced with the technology. Some representative changes that might occur are sorting out of equipment capabilities, information overload, skill requirements, organizational and job changes, work vol-

ume, more responsibility and no reward, and physical effects.

In terms of people's reactions, *anxiety* is an exaggerated state of fear that motivates a variety of defensive behaviors, including physical signs, conscious apprehensiveness, or disorganization. On the other hand, normal fear is something caused by external realities or factors already existing in the environment. The concept of *computer anxiety* has been identified by some psychologists and educators as comparable to *test anxiety* and *math anxiety*. These researchers imply that, like the latter two, computer anxiety should be identified, measured, prevented, and/or remediated to obtain successful education and socialization of its victims.

Maurer defined *computer anxiety* as "the fear and apprehension felt by an individual when considering the implications of utilizing computer technology, or when actually using computer technology. The individual is in the state [of computer anxiety] because of the fear of interaction with the computer, even though the computer possesses no immediate or real threat."⁶ The construct of computer anxiety was further clarified by Maurer and Simonson:

Although there are rational fears related to computer utilization (e.g., job displacement, increased exposure to radiation from terminal screens) the fears that were being addressed in this study were fears that could be called "irrational" fears (e.g., impending doom or sure calamity because of contact with computers). . . . The following are the behaviors that were identified as being indicative of computer anxiety:

1. Avoidance of computers and the general areas where computers are located.
2. Excessive caution with computers.
3. Negative remarks about computers.
4. Attempts to cut short the necessary use of computers.⁷

SELECTED LITERATURE REVIEW

Several studies have reported the relationship of employees' attitudes toward computers and the successful implementation of technological innovation. Two of these studies were in the library field.

Dakshinamurti, in a study that used library staff as subjects, reported that effects of technology on library personnel can be both positive and negative.⁸ Results of this

survey of Canadian libraries indicated that (1) most library personnel welcome technological applications and feel positive about computer applications and (2) the staff members' acceptance of automation was not proportionally related to the number of years of formal training.

Miwa and Nakayama, using librarians learning online searching, examined changes in attitude of forty inexperienced academic librarians who attended a three-day online searching training session.⁹ Each trainee completed pre- and post-training questionnaires. Overall attitudes toward computers changed from negative to positive. The researchers reported that the positive change in the trainees' attitudes reflected the success of the training session. Factors important for online training sessions were (1) uniformity of the trainees' background, (2) fitness of the training contents to the trainees' interests, and (3) proper selection of databases for the terminal session.

Studies outside the field of library and information science revealed the following information:

1. Among educators

a. Age, gender, locus of control (whether internal or external), and math skills contributed to the explanation of computer awareness.

b. Computers were viewed as dehumanizing and as contributing to isolation and insecurity of individuals.

c. Average attitudes toward computers showed a high positive correlation with average level of computer knowledge.¹⁰

2. Among college students

a. Computer experience was significantly related to more positive attitudes of computer anxiety, use confidence, and computer acceptance.

b. Negative attitudes were related to unwillingness to learn about computers and to choice of college major.¹¹

3. Among health services personnel

a. Resistance was highest among professional staff, while acceptance of new computer systems was high among personnel with less than a college degree.

b. Knowledge of and involvement with computers were identified as two important variables affecting the overall suc-

cess of new computer systems.

c. Acceptance of new computer systems would have been improved significantly by preparing the organization for creative change.¹²

OBJECTIVES OF STUDY

Based on the research literature cited above, it was assumed that attitudes about computers precede knowledge of them and their effective use. An unwillingness to learn about computer operations may be related to negative attitudes or beliefs about them. As computer use becomes more important in the library environment, these attitudes may influence staff success in computer-related assignments. Positive attitudes are believed to increase the prospect for achievement, and negative attitudes make achievement of competency less likely; empirical study of the relationships among these attitudes will help clarify the nature and significance of computer attitudes among library personnel.

This study investigated computer anxiety among library staff and its effects on:

1. Level of participation in a library computer literacy program, and

2. Attitudes toward library automation and computers in general.

Four hypotheses were developed:

1. Library staff who agreed to participate in the computer literacy program would have more favorable computer attitudes (lower computer anxiety) than personnel who did not participate;

2. Demographic variables (age, gender, education) of library staff would be strongly related to their computer anxiety;

3. Library situational or environmental variables, such as position and department, would be strongly related to staff attitudes; and

4. Computer experience, such as OCLC, computer courses, or computers at home, would also be strongly related to staff computer attitudes.

METHODOLOGY

Subjects

Attendance records from the 16 computer literacy workshops were analyzed to identify three groups of subjects: nonparticipants, low participants, and high par-

ticipants. The nonparticipants were those who attended no computer literacy workshop sessions. Thirty-seven people were identified as nonparticipants and considered as possible candidates for further study. A second group of 25 people who had attended three or fewer sessions were identified as low participants. At the other end of the spectrum were those people who had attended 6 or more of the sessions; these 37 people were identified as high participants.

Those identified as possible candidates for the study were contacted by a letter explaining the study and their role in it. At the end of the letter was a consent form for those willing to participate to sign and return.

Not all who were invited to participate in the follow-up study chose to do so, but some members of all three groups—low participants, nonparticipants, and high participants—did. However, so few of the nonparticipants responded that the responses from those who did were combined with the low participants. It was possible that the same variables that had influenced the nonparticipants would also influence those who attended only a few sessions. Thus, for the statistical analysis there were only the two groups: 30 low participants (including some nonparticipants) and 33 high participants.

Variables

The review of the literature indicated several variables important in other studies. Three categories of independent variables were identified from the review and from a preliminary analysis of the workshop data:

1. Demographic or personal,
2. Environmental, and
3. Experience.

With computer anxiety as our dependent variable, we examined the relationship of the three groups of independent variables.

Demographic or Personal

- Age
- Gender
- Education

Environmental (library-related)

- Position classification (professional or support)

- Work in other libraries
 - Department of library
 - Number of years worked in library
- Experience (with computer)
- Access to a computer outside of job
 - Early OCLC experience
 - Formal computer course
 - Hands-on experience with computers
 - Computer on the job
 - Experience with online catalog

Instrument

To determine computer anxiety, the Computer Opinion Survey by Maurer and Simonson was administered to the 63 volunteer subjects.¹³ This instrument had 26 questions and offered six choices on a Likert scale from strongly agree to strongly disagree. On the front page of the survey, subjects gave their age, educational background expressed in years of schooling, and whether or not they had taken a computer course. To gain additional information about job-related variables and computer experience, the subjects were interviewed.

Data Analysis

To analyze the data, the relationship between computer anxiety and the other variables was tested with an analysis of variance, using the SAS program.¹⁴ The analysis of variance (ANOVA) tests allowed two steps:

1. The means and standard deviations of each independent variable were examined and compared with the computer anxiety scores of the sample as a whole, and
2. The means and standard deviations of the computer anxiety scores were also examined for differences between the high and low participant groups within the sample.

RESULTS

Computer Attitudes and Participation

There was no significant difference between the two groups on the Computer Opinion Survey ($p = .10$). The mean score for the high participants was 55 with a standard deviation of 21, and the mean score for the low participants was 64, also with a standard deviation of 21. (A lower score on this instrument reflects less computer anxiety.)

ety.) Scores for the high participants ranged from 26 to 115, and scores for the low participants from 34 to 118. Figure 1 shows the range of scores and the mean scores for each group.

Computer Anxiety among Library Staff

Several variables that previous research had shown to influence other groups also influenced computer anxiety scores among library staff. Other variables unique to libraries also were shown to have had an influence.

Nonsignificant Variables

Among the members of this library staff, none of the demographic variables—age, gender, or education—was shown to have a relationship with computer anxiety, although each had been considered important in other studies. In addition, two of the

environmental variables—position classification (professional or support) and work in other libraries—did not show a significant relationship with computer anxiety.

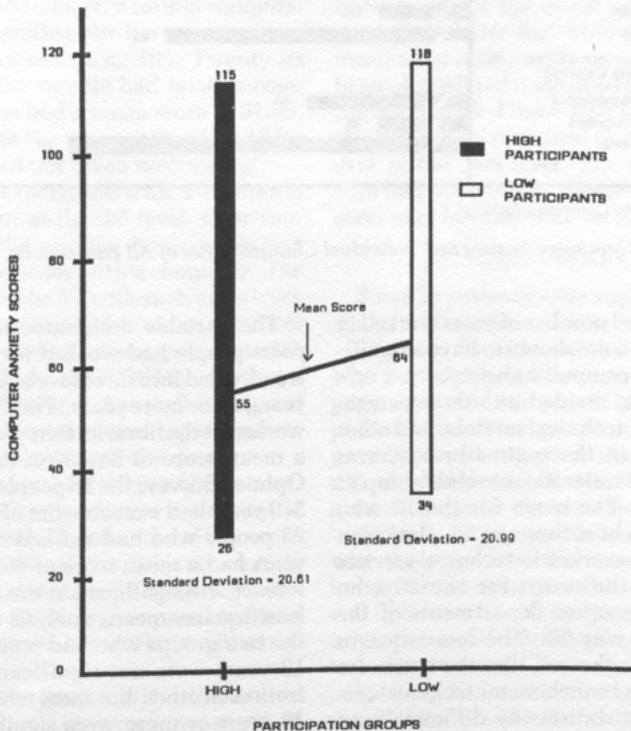
Computer experience has been cited in the literature as an important factor in computer anxiety. In this study, however, two variables that were identified as denoting computer experience—access to a computer other than at work and exposure to OCLC—did not show a significant relationship with computer anxiety.

Significant Variables

Figure 2 shows the mean scores for each of the significant variables. Table 1 summarizes the statistical tests for the variables shown to be significant.

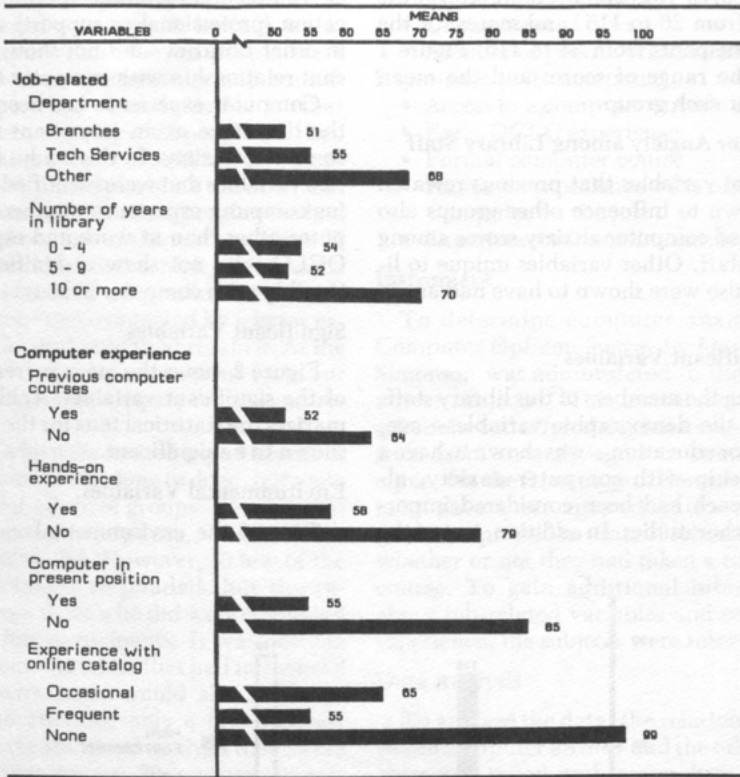
Environmental Variables

Two of the environmental variables—



Comparison of High-Low Participation Groups Showing Range and Mean of Computer Anxiety Scores.

Fig. 1. Results: Computer Anxiety and Participation Groups.



Variables Related to Computer Anxiety.

Fig. 2. Results: Computer Anxiety and Individual Characteristics of All Participants.

department and number of years worked in the libraries—were shown to have a significant effect on computer anxiety.

Department, divided into three categories (branches, technical services, and other departments in the main library), was shown to have a significant relationship at the .02 level. The mean for the 12 who worked in the branches was 51, the mean for the 26 who worked in technical services was 55, but the mean for the 23 who worked in the other departments of the main library was 68. The least squares means analysis showed that the scores for those from the branches and technical services were not statistically different from each other, but the mean scores for those who worked in other departments in the main library were significantly different from the other two groups.

The variable designated as number of years people had worked for the libraries was divided into three levels: 0-4 years, 5-9 years, 10 or more years. The 22 people who worked at the libraries four years or less had a mean score of 54.45 on the Computer Opinion Survey; the 16 people who worked 5-9 years had a mean score of 51.5, but the 23 people who had worked more than 10 years had a mean score of 69.78. This difference was significant at the .01 level. The least squares means analysis revealed that the two groups who had worked less than 10 years were not significantly different from each other, but those who had worked 10 years or more were significantly more anxious than others in the sample.

Computer Experience Variables

Four of the six variables denoting com-

Table 1. Computer Anxiety and Individual Characteristics of All Participants: Variables Related to Computer Anxiety by ANOVA

	F	P
Job-related		
Department	3.81*	.0280
Number of years in library	5.13†	.0090
Computer experience		
Previous computer courses	6.56*	.0130
Hands-on experience	4.06*	.0490
Computer in present position	21.46°	.0001
Experience with online catalog	5.96†	.0040

* $p < .05$

† $p < .01$

° $p < .001$

puter experience were significant in determining computer anxiety. The variables were formal computer class, hands-on experience, working with computers in current position, and experience with online catalog.

Those who had taken a formal computer class were significantly less anxious than those who had not ($p < .01$). Twenty-six members of the sample had taken a computer class and had a mean score of 51.58, as compared to the mean score of 64.47 for the 32 who had not taken such a class.

Hands-on experience with a computer was significant at the .05 level. Only four members of the sample, however, lacked hands-on experience with a computer. The mean score for the 57 with such experience was 58.05, as compared to a mean score of 79.50 for those who had no experience with computers. While the ANOVA revealed a significant difference, the small number of subjects with no computer experience resulted in some skewing of the data.

The experience of working with a computer at the current job was significant at the .0001 level. Again, the data were skewed, with 52 of the subjects already working with computers. This group had a mean score of 54.96, as compared to 85.44 for the 9 who were not working with computers.

Experience with LUMIN, the online public access catalog, was measured at three levels: occasional experience, frequent experience, and no experience. Those who used the automated catalog frequently had a mean score of 55; those who

used it occasionally had a mean score of 66, while those who had never used it had a mean score of 99. However, only three members of our sample had never used this system. The ANOVA revealed a significant difference at the .004 level. In response to a question about the quality of that experience, those who had been pleased had a mean score of 56, while those who had not been pleased had a mean score of 63. Since the test included those who had never used the system, the statistical result was significant at the .008 level. The small number who had not used the online catalog, however, may have skewed the results.

DISCUSSION

Some hypotheses were supported by the study, while others were rejected.

The first hypothesis, that library staff who participated in the computer literacy program would have more favorable computer attitudes than personnel who did not participate, was rejected. There was no significant difference between the two groups on the Computer Opinion Survey.

At least three possible reasons explain why there was no difference between the two groups in computer anxiety. First, several of those who did not participate in the original series of workshops were unwilling to be interviewed. Thus, the groups compared may not have contained those individuals who would have exhibited the highest computer anxiety. This anxiety, in fact, could have been one reason they were unwilling to participate in the follow-up study.

A second possible explanation is that computer anxiety can be controlled or at least influenced by other positive motives. Even those who were very anxious were aware of the role of the computer in the libraries and, thus, in spite of their fears, attended the literacy program. The slight difference in the highest scores and the closeness of the range of scores for the two groups both suggest that this phenomenon may be occurring. Dakshinamurti's research in which he concluded that the libraries' personnel welcome technological applications supports this explanation.¹⁵

The third possible explanation is somewhat similar to the second. These libraries have a long history of automation. Some individuals in the sample might, under different circumstances, have exhibited high computer anxiety, but here their previous experience with computers has reduced this anxiety. The small number of individuals who did not have computer experience supports this possibility.

The second hypothesis, that the demographic variables of the library staff were related to computer anxiety, had to be rejected. Age, gender, and education were not significantly related to the scores on the Computer Opinion Survey. This result contradicts much of what had been discovered with other samples. Here, it was *not* the older, less-educated female who necessarily had the highest computer anxiety. This result is probably closely related to and influenced by the high degree of computer experience exhibited by the staff of these libraries.

The third hypothesis, that situational or environmental variables would be strongly related to staff attitudes, was partially supported, since two of the four variables, department and number of years worked, were significant. Probably of greatest interest is the significant difference found in department. Those in technical services or the branches were significantly less anxious than those who worked in other departments in the main library (see figure 2). Since the technical services department was one of the first places library automation was initiated, it is probable that those working there have already overcome any computer anxiety.

In addition to technical services, there are two large departments in the main library, access services and public services. Those in access services were already working with an automated circulation system, though they were facing the introduction of a new system and a massive barcoding project. Their scores, therefore, may have been influenced by the knowledge that change in their automated system was coming. Similarly, many in public services have been using OCLC and online vendors for many years. Some in this department, however, had little experience with such systems. With the coming of optical disc systems, they were facing inevitable contact with computers. In both cases, then, the fear of new systems already in the planning stages may have influenced the computer anxiety scores. This explanation would support Fine's hypotheses that staff fear change, regardless of how that change is perceived.¹⁶ The relationship of department and number of years worked in a library to computer anxiety is clearly an area for further research and investigation.

In almost all of the studies in other areas, computer experience was shown to have a significant relationship with computer anxiety. The results of this study supported those earlier findings to some degree.

As would have been expected, those who had taken a formal computer class were significantly less anxious than those who had not. The sample was divided fairly evenly between those who had taken such a class ($N = 26$) and those who had not ($N = 32$). Thus, this result was not skewed by the size of the groups and does represent a true difference. This relationship was also found in studies in other disciplines.

Experience with the online public access catalog, hands-on experience with a computer, and working with a computer at the job should have shown a relationship with computer anxiety and did. What is probably most important about these variables, however, is the small number of people in the sample who did not have computer experience. Only nine members of the sample were not working with computers at the time of the study, only four lacked hands-on experience, and only three had not used the online public access catalog. These

numbers undoubtedly skewed the statistical tests. More important, however, this widespread experience with computers probably influenced the whole study and may be part of the reason that variables were not significant.

The two variables not significantly related to computer anxiety—access to a computer outside the job and early experience with OCLC—probably were influenced by the other computer experience variables. If these variables are isolated for study in another sample, they could show a stronger relationship with computer anxiety. The overall computer experience level of the sample was so high that these two particular experiences lost any possible significance.

CONCLUSIONS

The most obvious conclusion from this research is something not tested for but that appeared in several forms—the degree to which the staff of the libraries was already familiar with and using computers. All other conclusions must be read in light of this fact. The libraries have a long history of automation, and the current administration lists further development and use of technology as one of its major goals. The staff seemed to be well aware of this goal, at least as it affects them in their daily activities.

Several factors were found to influence computer anxiety in library staff. The primary determinants of computer anxiety were those variables that might be classified as experience with a computer. Even the department worked in might be so classed if it is true that technical services is the most automated department in the libraries. On the other hand, the high anxiety discovered among those who had worked longest at the libraries suggests that

library administrators should be careful about planning tasks involving computers with long-term employees. Because of the high degree of computer awareness and experience mentioned above, further research with a different sample could be valuable.

This research suggests that library personnel are ready for in-service staff development in computer technology, in spite of whatever levels of computer resistance might exist. This conclusion is drawn from the two major findings that revealed a lack of difference in the scores on the Computer Opinion Survey between the high and low participants and the lack of strong relationships between individual characteristics and the Computer Opinion scores. These results suggest that:

1. An unwillingness to learn about computers and computer operations is not related to negative attitudes or beliefs about computers, and

2. Resistance to computer technology is not a function of personal characteristics or demographics.

Whatever fears, attitudes, beliefs, or values the staff have, they are willing to learn about new technology. Positive attitudes may indeed increase achievement and negative attitudes may make competency achievement less likely, but these attitudinal differences may not determine an individual's decision to seek computer knowledge and training.

This study further suggests:

1. Computer anxiety in a library staff may be a function of the degree or type of computer experience, the department worked in, as well as the number of years worked in the library, and

2. Resistance may indeed decline with familiarity and experience with automated technology. ■■

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Twenty Years Ago in JOLA

Information science differs from most other areas of scientific endeavor in several ways, one of which is the fact that it exhibits almost no written history. It is a new field—so new, even now, that there is no general agreement as to its name—what is information science?—or to its technical components—are library automation and information retrieval kindred areas of research and application or are they not?

A. J. Goldwyn reviewing *H. P. Luhn: Pioneer of Information Science, Selected Works*. *JOLA* 1, no. 3:213 (Sept. 1968).

Contributed by Michael Gorman.

The Effects of Entry Arrangement on Search Times: A Cross-Generational Study

Margaret Ann Wilkinson, Patricia V. Burt,
and Mark T. Kinnucan

This article describes an experiment to test the effects of a vertical versus a horizontal arrangement of brief structured text entries on known-item search times. Two groups of twelve women university graduates (mean ages—seventy-one years and thirty-three years, respectively) participated by locating and answering factual questions about thesaurus entries arranged in each format. Results showed that differences in search times were proportionately the same for both age groups, that significantly slower search times occurred under the horizontal arrangement, and that no subject judged the horizontal arrangement to be easier to use than the vertical arrangement.

This experiment was designed to investigate people's abilities to interact with different arrangements of structured textual information. Many information sources present textual information in the form of brief, structured entries, for example, microfiche catalogs, directories, and computer-produced reports. In such works, the entries are sorted alphabetically by the letters in the first item of the entry or numerically by an accession number. The normal arrangement of entries has been to lay them out vertically in columns. The user reads from the top to the bottom of the page in the first column and then moves to the top of the second column and reads down to the bottom of the page and so on (see figure 1).

Widespread use of computer technology, however, has led to a different arrangement of entries (see figure 2). In this arrangement of data, the entries appear to be in columns but are actually in rows, and the

alphabetization proceeds horizontally rather than vertically. Perhaps to facilitate computer data entry or storage or because of printer limitations, this latter arrangement seems to be occurring more often within reference tools and finding aids. In the horizontal arrangement, the entries line up directly above and below each other, so that the entire page takes on the appearance of a grid of entries. Because of this grid appearance, it may not be apparent to the user that a horizontal arrangement of entries is being used. This problem occurs less frequently with the vertical arrangement. In most vertical arrangements, entries in adjacent columns do not consistently begin on the same line; thus, the impression of a grid is not made.

Although many researchers have studied people's perceptions of text, these studies have dealt either with how people read or with their comprehension and memory for text. The linguistic materials investigated

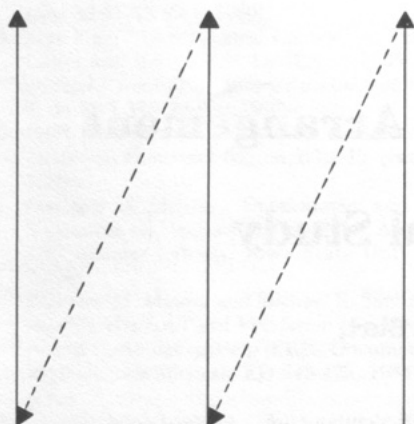


Fig. 1. Columnar Order.

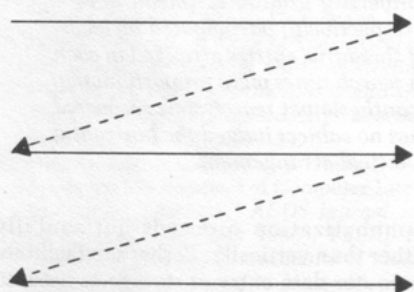


Fig. 2. Tabular Order.

have varied from individual letters to sentences, paragraphs, and short articles or stories. For example, Wright surveyed research on the comprehension of technical information from prose.¹ Very little research has been done, however, on searching for information in short, structured entries such as those investigated in the present study.

Although there seems to be no previous research that varied the arrangement of *textual* entries, some attention has been given to comparisons of vertical and horizontal arrangements of numbers,² individual words,³ and tabulated information.⁴ The work most similar to the topic of the present study is that of Sprent and others.⁵ They devised two different versions of a bus timetable for a single route in Derbyshire, England. The standard version had the different runs along that route across the top of the timetable and the stops down the left

side. The reflected version had the runs on the side of the timetable and the stops across the top. Sprent and others found that students read faster and made fewer errors using the reflected timetable, especially after a little practice. They related this result to the relative ease of scanning the table in its different formats, concluding that horizontal scanning is easier than vertical scanning. It is important to keep in mind, however, that since Sprent and others were studying the use of a *table*, rows and columns were meaningful in both arrangements of the timetable. In the present study the arrangements are *not* tabular; the entries are arranged either in columns or in rows but not in both at once.

Frequently, people seeking information about a *known* item do not take time to learn to use an information source that they perceive to be straightforward. Information seekers look for a target item in the location where they expect to find it and, if it is not found, assume that the item is not contained in the source. Apparently, people rarely consider the possibility that the arrangement of entries in a source might not be the one that they were expecting, nor do they confirm their understanding of the source. Producers of information sources would do well to use an arrangement that matches users' expectations, or they should at least provide prominent, clear instructions alerting users to an unusual format.

To explore the generality of our results, two age groups were selected for our study: senior citizens and younger adults. The aspect of interest was not the overall ability of the groups' members to find information in the entries, but whether, in comparison to the horizontal arrangement, the vertical arrangement of the entries facilitated or hindered the search for one age group more than the other. This type of study has been labeled "person by treatment interaction" research.⁶

Most of the research on age differences in cognitive tasks has dealt with memory differences. For example, Waddell and Rogoff asked middle-aged and older women to complete a spatial memory task involving toylike objects that, in one condition, comprised a model of a village.⁷ In a second condition, the same objects were placed

randomly in a bank of cubicles, and the subjects were asked to re-create a previously viewed arrangement of the objects. No performance differences between the age groups occurred in the contextually organized condition (the village). In the non-contextually organized condition (the cubicles), the middle-aged group outperformed the older group. It appears that the middle-aged group created their own strategies to deal with the noncontextually organized material, whereas the older group was more overwhelmed by the complexity of that task. Howell also showed that familiarity can ameliorate a memory deficit in older individuals.⁸ She prepared three sets of cards: meaningless patterns, objects from the 1908 Sears Roebuck catalog, and pictures of modern items. The recognition scores of the older group (mean age sixty-nine) were significantly lower than the scores of the younger group (mean age twenty-eight) for the meaningless patterns and for the complex modern items, but their scores were about the same on the Sears catalog items. The results of both these memory studies suggest that the performance of older subjects degrades more than that of younger subjects in unfamiliar situations. In the present study, the horizontal arrangement is presumed to be the less familiar situation, suggesting that if the finding task relies on memory, the horizontal arrangement might be more troublesome for the older subjects.

When one is interested in age differences, usually either a longitudinal or a cross-sectional study is undertaken. In a longitudinal study, the same people are tested at two or more different points in their lives. But, when the age differences span several decades, longitudinal studies are impractical. Thus, the present study was designed to be cross-sectional, in which two or more different groups, each composed of subjects in a different age bracket, are tested at the same time. However, as Schaie and Strother pointed out, the problem with a cross-sectional design is that "differences between age groups therefore could be a function of actual age differences, or they could be a function of differences between cohorts, or due to both age and cohort differences."⁹ As used here, a

cohort is a group of people born around the same time and thus tending to share similar events in their lives. Schaie and Strother tested several cognitive abilities using a "cross-sequential" methodology designed to separate age and cohort differences. Of the areas they tested, the one that is closest to the kind of cognition involved in our study was personal perceptual rigidity, i.e., the ability to adjust readily to changes in cognitive patterns. Their study indicated that the difference in rigidity between the groups of subjects can probably be attributed to both age and cohort differences. This could suggest that any differences in search times in this study might be related more to generational differences (age group, in our study) than to actual age.

The hypotheses this study tests, then, relate to possible age differences in the effects of the arrangement of entries on finding information in a printed source. Specifically, we first hypothesize that subjects expect to and do find information faster in a vertical alphabetical arrangement of short structured text entries than in a horizontal alphabetical arrangement. Second, we suggest that when faced with an organization other than the usual columnar style, subjects become disoriented and find information more slowly. Third, we suggest that the age of an individual makes no difference to the initial disorientation when faced with an unfamiliar arrangement; that is, the proportional difference in search times between horizontal and vertical text arrangements will not be significantly greater for older subjects than for younger subjects. Fourth, we suggest that library reference experience will facilitate the search for information under both text arrangements, thus yielding shorter search times for those subjects with experience than for those without such experience.

METHOD

Subjects

A total of twenty-four subjects participated in the experiment. Subjects were selected on the basis of age to form two groups of twelve subjects each. The older group was solicited from an organization of women university graduates. The average

age of this group was seventy-one years, with an age range from fifty-nine to seventy-nine years. The younger group consisted of twelve women students in a school of library and information science. The average age of the students was thirty-three years, with a range from twenty-three to forty-five years. For reasons of availability, only women were invited to participate in the study. Subjects were screened for auditory and visual acuity at a level sufficient to perform the task.

Subjects were further classified as either having or not having library reference experience. Library experience was judged to be present where there was more than two years professional service dealing directly with library patrons. Five of the older women and five of the younger women had library experience according to this criterion.

Materials

To simulate the situation of a user looking for specific textual information in a reference context, an instrument was designed that required subjects to find a particular entry. Thesaurus entries were arranged in two presentations: a vertical alphabetical order and a horizontal alphabetical order (see figures 3 and 4). Subjects were asked to respond to five types of queries that required finding the appropriate thesaurus term in the listing and reading a specific item of information from the text of the entry (see appendix A). These queries varied

in terms of what information it was necessary to obtain from the entry in order to answer the question. The types of query were the same for all sheets, and the queries themselves were identical for vertical and horizontal arrangements of the same letter.

Entries were taken from the *Thesaurus of ERIC Descriptors*, which was selected because it contains textual information of an appropriately simple nature in an easily understood and relatively standard format (see figures 5 and 6).¹⁰ It was thought that none of the subjects would be familiar with the use of this thesaurus. In fact, only one of the twenty-four subjects knew that the entries were from the ERIC thesaurus, although she had not used the thesaurus.

Entries were chosen from the ERIC thesaurus under three randomly selected letters (*F*, *M*, and *U*). Twenty-one entries, including six cross-references, were chosen for each initial letter. Entries were chosen that would permit the composition of both horizontal and vertical alphabetical arrangements of all twenty-one entries on a single sheet of paper. Due to the small print in the original ERIC publications, the entries were enlarged. They were then arranged in three columns for the vertical alphabetization and in rows of three entries for the horizontal alphabetization. This resulted in a total of six different presentation sheets (three letters multiplied by two arrangements). Page headings, footnotes, and other identifying material were not included in the test sheets.

FAMILY HEALTH	Family Living	FAMILY STRUCTURE
text of entry	text of entry	text of entry
FAMILY INCOME	Family Management	Family Unity
text of entry	text of entry	text of entry
FAMILY INVOLVEMENT	FAMILY PLANNING	Fantasy Play
text of entry	text of entry	text of entry

Fig. 3. Example of Vertical Presentation.

FAMILY HEALTH	FAMILY INCOME	FAMILY INVOLVEMENT
(text of entry)	(text of entry)	(text of entry)
Family Living	Family Management	Family Trees
(text of entry)	(text of entry)	(text of entry)
FARM VISITS	FARMERS	FASCISM
(text of entry)	(text of entry)	(text of entry)

Fig. 4. Example of Horizontal Presentation.

Unskilled Labor (1966 1980)

Use UNSKILLED WORKERS

Fig. 5. Example of a Cross-Reference (ERIC 1986).

FAMILY SCHOOL RELATIONSHIP Jul. 1986

CIJE: 243 RIE: 422 GC: 330

- UF Home School Relationship
- School Family Relationship
- School Home Relationship
- NT Parent School Relationship
- BT Relationship
- RT Culture Conflict
- Family (Sociological Unit)
- Politics of Education
- etc.

Fig. 6. Example of Main Thesaurus Entry (ERIC 1986).

Procedure

To begin the experiment, each subject was shown a sample sheet containing an example of a full thesaurus entry and an example of a cross-reference, as in figure 3, but the parts of each entry were labeled in these examples. The subject was asked to familiarize herself with the entries and was encouraged to ask questions about them. Sample questions were given so that the subject could practice the method of response. During the test, the labeled examples were available for further reference. It was emphasized at the outset that what was being tested was not comprehension or memory but simply the speed at which they could locate information under two different presentations. Subjects were not told that the presentations were in alphabetical order, nor were they told that the presentations were horizontally or vertically arranged.

Each subject responded to five queries about the entries on a horizontally arranged sheet and to five queries about the entries on a vertically arranged sheet. For a given subject, the entries on the horizontal sheet were different from the entries on the vertical sheet. For example, the horizontal sheet for a given subject might contain the entries beginning with *F*, while the vertical sheet would contain the entries beginning with *M*. Another subject might get "*U* horizontal" and "*F* vertical," and so on. The presentation order was randomized so that half the subjects in each age group received a horizontal arrangement first and half received a vertical arrangement first.

Each subject determined the order in which queries were presented by selecting successively from the five question cards for her first arrangement. The query order selected for the first arrangement was used again for the second.

To begin the testing itself, the example sheet was placed adjacent to the subject for easy reference. The first test sheet was placed in a closed folder in front of the subject. After the subject had selected a question card, the researcher read the question aloud. The subject could ask for clarification or to have the question repeated or could consult the example sheet to deter-

mine the location of similar information in the sample entry. When the subject felt ready to respond, she was instructed to open the folder, locate the appropriate entry, read aloud the required information, and then close the folder. Subjects were instructed to respond as fast as possible but to make sure they had found the correct answer. It was emphasized that the important factor was the difference in the times between the two presentations and that the absolute times on each were not of interest in this study. The procedure was then repeated with the remaining questions for the first sheet. The second sheet was then placed in the closed folder, and the questions appropriate to that sheet were asked.

Times were recorded to the hundredth of a second using a stopwatch, with timing beginning when the subject opened the folder and continuing until the subject read the response from the sheet. If the subject found the wrong entry, the response was marked incorrect and the corresponding time was not included in the analysis. There were very few wrong answers. For each subject, averages of response times for correct answers were calculated separately for the horizontal and vertical arrangements.

After the test queries had been administered, the subjects were asked to complete a brief questionnaire (see appendix B). Subjects reported their ages and any previous library reference experience and indicated whether they had noticed any difference in the arrangements.

For practical reasons, the age groups were tested in different environments, but the methodology used was the same for all subjects. The researchers visited each of the older subjects in her own home at a time of the subject's choosing. The younger students were tested one at a time in the office of one of the researchers.

Results

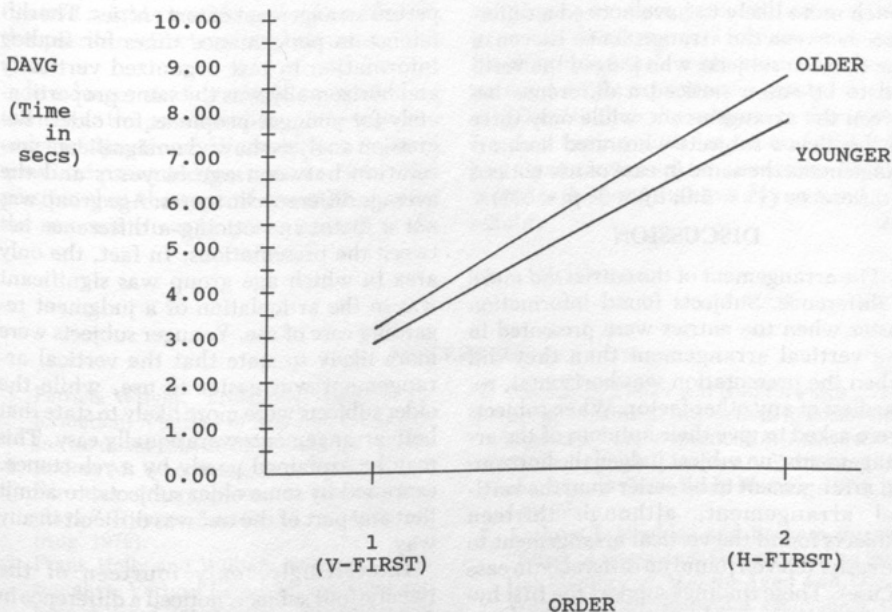
Since the factor of greatest interest was the effect on search times of an unfamiliar arrangement of entries, the initial analysis had to address the question of whether there *was* a significant difference in the search times between the horizontal and vertical presentations. If so, then subse-

quent analysis should consider the consistency and direction of that difference, as well as the effect of the other variables in the experiment. The important data unit for analysis, then, was the *difference* in time for each subject rather than the actual times themselves. This difference was calculated for each subject by subtracting the average time taken on the vertical arrangement from the average time taken on the horizontal arrangement. This difference score was analyzed in a two-way analysis of variance (ANOVA) in which the independent variables were age group (older versus younger) and order of presentation (horizontal first versus vertical first). In this analysis, comparing the times with the horizontal arrangement to the times with the vertical arrangement is accomplished by testing the null hypothesis that the average value of the difference score is equal to zero.

Figure 7 shows the average difference scores for the two age groups. The ANOVA

confirmed that the average difference score was significantly greater than zero ($F = 19.3$; $df = 1,20$; $p < .001$; $MSe = 40.2$).

Performance times for both age groups were affected equally by the horizontal arrangement. That is, the difference scores for the older group were substantially the same as the difference scores for the younger group ($F < 1$, n.s.). The data show that twenty of the twenty-four averages are positive, indicating that most of the subjects in both groups were faster with the vertical arrangement than with the horizontal arrangement. Regression analysis confirmed that age had no significant correlation with difference scores. And the order of presentation had only a marginal effect on the difference scores ($F = 4.2$; $df = 1,20$; $p < .06$; $MSe = 40.2$). Subjects who faced the vertical arrangement first were less slow with the horizontal arrangement than subjects who faced the horizontal arrangement first. When the vertical presentation came first, the mean difference score was 3.02



DAVG represents the average difference, in seconds, between finding times for the horizontal presentation and the vertical presentation. ORDER (V-FIRST) and ORDER (H-FIRST) represent the groups that received the vertical presentation first and the horizontal presentation first, respectively.

Fig. 7. Effect of Age and Order of Presentation on Difference Scores.

seconds; whereas when the horizontal presentation came first, the mean difference score was 8.34 seconds.

Chi-square tests were performed to determine if age group, order of presentation, or library reference experience were related either to judgment of relative ease of use or to noticing a difference between arrangements—and whether ease of use and noticing a difference were related. Most of these tests showed no significance, except for judgment of ease of use, which *was* significantly related both to age group and to noticing a difference in arrangements. Nine of twelve younger subjects found the vertical arrangement easier to use than the horizontal arrangement, while only four of the twelve older subjects found the vertical arrangement easier ($\chi^2 = 4.2$; $df = 1$; $p < .05$). No subject in either group rated the horizontal arrangement easier; rather, the subjects who did not rate the vertical organization easier said there was no difference between the arrangements. In addition, those subjects who judged the vertical arrangement to be easier were much more likely to have noticed a difference between the arrangements. Eleven of the thirteen subjects who judged the vertical to be easier noticed a difference between the arrangements, while only three of the eleven subjects who rated both arrangements the same in ease of use noticed a difference ($\chi^2 = 5.9$; $df = 1$; $p < .02$).

DISCUSSION

The arrangement of the entries *did* make a difference. Subjects found information faster when the entries were presented in the vertical arrangement than they did when the presentation was horizontal, regardless of any other factor. When subjects were asked to give their opinions of the arrangements, no subject judged the horizontal arrangement to be easier than the vertical arrangement, although thirteen subjects found the vertical arrangement to be easier (eleven found no difference in ease of use). These findings support the first hypothesis that people expect and are more comfortable with a text organization that is in vertical alphabetical columns.

The second hypothesis, that an organization of text other than vertical disorients

people and causes them to have difficulties extracting information, is supported by the overall slower times for the horizontal presentation. It is also supported by the finding that when the horizontal presentation was given first, the difference in scores between horizontal and vertical was greater than for the group where the vertical was presented first. This suggests that there was an adverse overall effect on performance from being exposed to the horizontal arrangement first. It was noted during the test administration that those subjects who received the horizontal arrangement first appeared disoriented throughout the test, even when they turned to the vertical arrangement, whereas subjects who first had the vertical arrangement did not. Subjects who received the horizontal arrangement first frequently did not recognize the vertical order of the second arrangement, although they performed faster with the second, vertical arrangement.

Results also showed support for the third hypothesis, that there is *no* effect of age upon disorientation caused by an unexpected arrangement of text entries. The difference in performance times for finding information in text organized vertically and horizontally was the same proportionately for younger people as for older. Regression analysis showed no significant correlation between age in years and the average difference in scores. Age group was not a factor in noticing a difference between the presentations. In fact, the only area in which age group was significant was in the articulation of a judgment regarding ease of use. Younger subjects were more likely to state that the vertical arrangement was easier to use, while the older subjects were more likely to state that both arrangements were equally easy. This may be explained partly by a reluctance, expressed by some older subjects, to admit that any part of the test was difficult in any way.

Interestingly, only fourteen of the twenty-four subjects noticed a difference in the two arrangements. Of these fourteen, however, only four were able to accurately articulate what the difference was. Two noticed the difference during the test, and the other two only realized it when answer-

ing the questionnaire. Some of those who did not accurately articulate the difference suggested that there was *no* order in what was actually the horizontal arrangement. Others suggested that what was in fact the horizontal arrangement differed from the vertical in that it contained more information.

Regarding the fourth hypothesis, prior experience *did* prove to be significant in our study. However, contrary to our expectations, in the only area where experience was significant, the younger people with experience performed more slowly with the horizontal presentation than did younger people without experience. Experience made no difference to the older people's results. It is possible that the younger women with library experience had more rigid expectations than the older women with experience who had perhaps long since tempered any rigidity through the necessity to adapt to significant changes in libraries over the years. It should be noted, however, that only a rough assessment of prior experience was made. Further investigation might provide useful insights into the possible effects of experience in this area.

In a larger study it might be interesting to analyze the possible effect of the type and order of questions. We used five types of questions presented in a random order. It is possible that the type of question affected the response times in either or both of the

alphabetical arrangements. The responses to questions on cross-references seemed to come more slowly than responses to other types of questions, perhaps because the cross-references are smaller entries and may be harder to find. The raw data does show some variation along these lines, but the number of cases is too small to be reliable.

In conclusion, we must reiterate that our study was limited in its scope (only twenty-four subjects, all women and all university graduates) and therefore limited in the generalizability of its results. However, our results do indicate a significant effect of the arrangement of entries on search times, regardless of age. Several subjects needed to be reassured between questions that the information they were seeking really was contained on the test sheets. In a real situation, these users would not have persevered long enough to find what they were seeking. Producers of information sources and those providing access to them might be well advised to take note of this finding and either format the sources in the "usual" arrangement or alert potential users to the presence of an "unusual" format. It is possible that individuals with less academic experience might experience a greater degree of difficulty than the subjects in this study. Further testing with larger and different populations would be necessary to test whether these results have a broader applicability. ■■

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APPENDIX A. QUERY TYPES FOR TEST SHEETS

(Terms in capitals vary according to the test letter selected)

Type 1

What is the month and year beside the term MIGRANT WORKERS?

Type 2

What is the date range associated with the term FAMILY MANAGEMENT?

Type 3

What is the number after the CIJE code associated with the term UNWRITTEN LANGUAGES?

Type 4

What is the FIRST RELATED term, code RT, listed under the term MIGRATION PATTERNS?

Type 5

What is the BROADER term, code BT, listed under the term FAMILY STRUCTURE?

APPENDIX B. QUESTIONNAIRE—BACKGROUND INFORMATION

The following information is required in order to analyze the results of the information retrieval test you have just completed.

Please do NOT write your name anywhere on this sheet. Your responses will be kept confidential and separate from the consent form that you signed.

1. Please indicate your age in years, as of your last birthday.

2. (a) Have you ever worked in a library or information centre?

YES _____ NO _____

If your response to this question is YES, please continue with questions 2(b) - 2(d).

If your response to this question is NO, please continue with question 3.

- 2(b) How many years (approximately) did you work in this capacity?

- 2(c) What position(s) did you hold? Please list briefly.

- 2(d) In your position(s) did you have direct contact with the patrons of the library or information centre?

YES _____ NO _____

3. Did you notice a difference between the two presentations?

YES _____ NO _____

If YES, what was the difference?

4. Please indicate which format you found easier to use.

FORMAT ONE _____ FORMAT TWO _____ NO DIFFERENCE _____

5. On the following scale please indicate the strength of your preference for the format you found easier.

1 2 3 4 5
a little easier a lot easier

THANK YOU FOR PARTICIPATING IN THIS STUDY.

Smart Barcoding in a Small Academic Library

John Buschman, Rebecca Reilly, and Ene Andrilli

This article describes the smart barcoding of the circulating collection in a small university library with limited funds and personnel. Preliminary investigation of library literature revealed little information on such projects at institutions of similar size. Specific details of methodology are, therefore, incorporated so that the article may guide other libraries with restricted resources.

In the academe, August is traditionally a time for vacations, a breathing space before the onslaught of students in the fall. However, during August 1987 the staff of Drexel Library at St. Joseph's University (Philadelphia), aided by volunteers, successfully barcoded the entire circulating collection of approximately 160,000 volumes. Completing this project was a triumph of hard work and determination over heat, humidity, and a host of other problems. During the initial planning for the barcoding, the library staff discovered few articles in the literature on barcoding in a relatively small library with limited resources. With this lack of literature in mind, the authors of this article share their experiences with other librarians who face the task of barcoding their library collections. The description proceeds chronologically through the various phases of the project. Readers may benefit from our methods for handling the problems we faced last summer.

St. Joseph's is a comparatively small university (approximately 5,700 students) conducted by the Society of Jesus (better known as the Jesuits), one of twenty-eight such universities in the U.S. The Jesuit order is renowned for excellence in teaching in the liberal arts tradition.

The library of St. Joseph's has holdings of about 220,000 volumes. The collection is strongest in the areas of theology, philosophy, and the liberal arts. In August only the circulating collection was barcoded, not reference books or periodicals.

It had been determined that smart barcodes would be used. Since these were pre-linked to the Geac database, most of the collection would be ready to circulate after the completion of the project. The time-consuming manual link-up required for dumb barcodes was thus alleviated. Geac's MARC Records Management System (MRMS) permits the production of bibliographic records in MARC format. The library's OCLC records were extracted on tape, and the barcodes were produced by a commercial vendor. This production also included barcodes for Campbell Library, a separate food-marketing library on campus. The holdings at Campbell were not included in the August project.

The barcoding project was conducted under unusual and somewhat stressful circumstances. The library was operating under the authority of the university administration because the library director had retired at the end of June and the new director did not assume the position until late

August. The administration decided that the library was to maintain its normal schedule throughout the project, although the stacks were closed for most of the project's duration. No overtime or compensatory time for the library staff was permitted. Therefore, barcoding took place within regular working hours from Monday through Friday, with the library closed on weekends in accordance with normal summer policy.

Since Philadelphia summers are hot and humid, and the library's air conditioning is notoriously unreliable, arrangements were made for extra fans to cool the stack areas and for refreshments for the workers. Once the dates for barcoding were determined, a memo was circulated throughout the university community asking for faculty and staff volunteers to work on the project. Shelves were read completely through once (and in some areas twice) to ensure better than usual accuracy in the order of the books.

ORGANIZATION

In July the serials librarian was asked to coordinate and plan the barcoding project because the systems librarian and the heads of technical and public services, all of whom were already overburdened with other aspects of the project. Preparations had to proceed quickly, since nothing had been done prior to July 1 and the project was to begin on August 3. Two factors had to be accounted for in planning: lack of a stable (or highly trained) work force and lack of prior experience with barcodes, which arrived just before the beginning of the project. Priorities of barcoding within the collection had to be set, since there was no guarantee that the project would be completed, and it would be most desirable to have areas of heavy use finished. Prioritization was relatively simple, utilizing circulation statistics, geographic proximity of the areas, and the past experience of the head of circulation with inventories. The result was a hierarchy of twelve collection areas to be done in descending order of importance.

The next step was to determine how to divide the aisles and sections in each prior-

ity area, since this in turn would suggest a scheme to divide the workers among the stacks and a method of separating the barcodes into discrete units for the work in the sections. What was adopted was a map of the twelve separate collection areas with each row divided into halves or, in most cases, an aisle divided into quadrants (see figure 1). Beginning and ending call numbers and shelf numbers for each quadrant were recorded on the maps for each priority area and double-checked for accuracy. These maps were then copied and used by the librarians to separate the barcodes by quadrants and then package them in order. Those packages were then labeled by shelf number, quadrant section (A,B,C,D consistently throughout the collection), and call numbers of the barcodes. This system of lettering the quadrants developed from working with the barcode sheets and proved valuable in tracking shelves, packets, and problems in the stacks.

Next, the supervision of work and troubleshooting had to be addressed. Four professionals and two paraprofessionals were asked to supervise sections on a rotating basis. Two to four sections would be working at once depending on the number of volunteers and staff at any given time. When not leading a team of workers, these six people were asked to work in an ongoing section, then switch back later—often in the same day. Team leaders would be responsible for their assigned sections from start to finish in order to ensure continuity in problem-solving and problem-recording, as well as to keep confusion and lost barcodes to a minimum. They would supervise the work, distribute workers and barcode packets through their section, and take care of any problems. The team leaders also handled the volunteers after the first contact and brief training, pairing them up with experienced workers.

Obviously, the entire project depended greatly on the team leaders not only to complete their sections, but to efficiently manage work flow, minimize disruptions, and keep track of problems in their areas. During barcoding some attrition pared this number down to three people who supervised the bulk of barcoding the book collec-

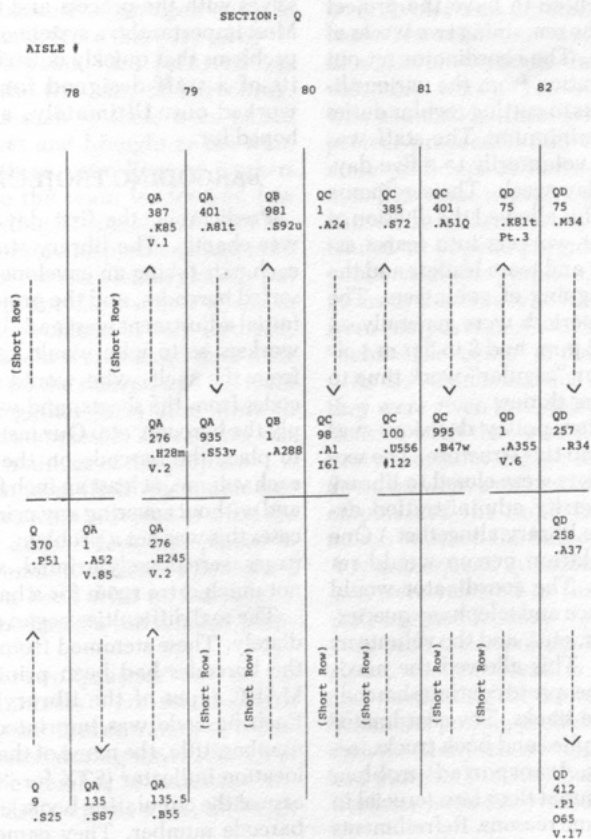


Fig. 1. An Aisle Divided into Quadrants.

tion. Coincidentally, that was the number of sections most feasible to open and work at once.

The solicitation and scheduling of volunteers did not proceed in such a logical manner. Rather, it tended to vacillate at times. The letters asking for work came from the university administration. After some initial confusion on the details of time, a correction was issued, and the end policy was that faculty, professionals, and staff were asked to donate two hours of their time to the project. Twelve-month (nonfaculty) employees could use university time to work in the library. The responses were directed to the library coordinator by either phone or mail-in form. A calendar was set up for each day to assess the help available

per hour and the number of staff members needed to pair up with the volunteers. This calendar was also used to notify each team leader of the number of volunteers and when to expect them. It was determined to keep the training of volunteers as brief as possible in order not to waste work time. Team leaders and staff workers were relied upon to finish training and start productive work quickly. The library coordinator met incoming volunteers, gave the brief introduction, and escorted them to the team leaders in the stacks. Upon scheduling, each volunteer was called to confirm time and date of work and encouraged (if possible) to donate more time.

With these situations set, the staff schedules had to be worked out. The university

administration chose to have the project operate around the remaining two weeks of summer flextime. The coordinator set out to ask for cooperation from the various library departments in cutting regular duties to an absolute minimum. The staff was asked to go back voluntarily to a five-day, eight-hour per day week. Their response was very good. This allowed the division of staff and student workers into teams assigned to sections and team leaders and the proportional assigning of volunteers. The barcoding work periods were generally set from 9 a.m. to 12 p.m. and 2 to 5 p.m., allowing a one-hour "regular" work time to keep up with other duties.

A series of other policy decisions was made, built around this structure. The second and third floors were closed to library users. (The university administration declined to close the library altogether.) One doorguard/circulation person would remain downstairs. The coordinator would handle all reference and telephone queries, requests for books, etc., and the volunteers as they came in. This allowed the maximum number of people to continue barcoding upstairs in the stacks. The coordinator also gathered supplies and book trucks, reproduced forms, transported problem books, and distributed floor fans (crucial in August) for the same reasons. Refreshments were ordered for the workers. Music was played over the public address system and, unfortunately, to the still-operating first floor as well. The emphasis was on keeping morale up for both staff and volunteers.

In all, the money and effort expended were well worth the trouble. Workers had a high time-on-task proportion, and spirits were strong. The volunteers experienced a more pleasant environment than expected, so the undercurrent push for better public relations was greatly aided while the staff was able to work effectively well beyond the usual time limits recommended in the literature.¹

At the end of this planning process, the staff had two days to "practice" and prepare before the volunteers arrived. The B and P sections were the top two priorities, so team leaders were picked to experiment on each area. The object was for team leaders and staff members to familiarize them-

selves with the process and the problems. Most importantly, a system of handling the problems that quickly outstripped the limits of a staff-designed form had to be worked out. Ultimately, a routine was hoped for.

BARCODING PROJECT BEGINS

Predictably, the first day of barcoding was chaotic. The library staff paired up, each pair taking an envelope of previously sorted barcodes, and the project began. An initial adjustment was made by each pair of workers as to who would take the books from the shelf, who would peel the barcodes from the sheets, and who would apply the barcode, etc. Our instructions were to place the barcode on the title page of each volume, at least an inch from any edge and without covering any printing. In most cases this was not a problem, but some title pages were densely printed, and there was not much extra room for a barcode.

The real difficulties began almost immediately. These stemmed from the fact that the barcodes had been printed using the MARC tapes of the library's collection. Each barcode was imprinted with a call number, title, the name of the university, a location indicator (STX for "stacks" in the case of the circulating books), and a unique barcode number. They came in sheets of fifty-two barcodes per sheet. The barcodes with the location indicator other than STX, such as REF for reference, were presorted by the producer before they arrived at the library. The barcodes were sorted in call-number order so, theoretically, the workers would have only to move along the shelves, applying each consecutive barcode to each consecutive book. In reality, the sorting took into account the spacing in the call number as it had appeared on the initial MARC record, and the call number spacing was not consistent in every record. Therefore, the actual barcode sheets were not in perfect order. There were also occasional problems with the order of books on the shelves. A great deal of vigilance was necessary to prevent the barcodes from being placed in the wrong books, as both the call number and the title had to match the book. Also, in many cases of books in series, an insufficient number of barcodes had

been printed because of an open entry in the MARC record. Since there are many series in the collection, this occurred frequently. On the first day of barcoding, problem books such as these were pulled from the shelves and brought to the team leader. Soon there were lines of workers waiting to see the team leader and few workers barcoding. It was obvious that another system for solving problems had to be devised. One of the team leaders hastily put together a form for the workers to use to write down the problems as they occurred. The problem books were turned onto their forward edges on the shelves, and the team leaders would gather them after work in the section was completed. This system was used for the remainder of the project.

The problem form itself was simple (see figure 2). Spaces were provided to write the call numbers, and a check was placed in one of four columns to indicate whether the problem was a book with no barcode, a barcode with no book, a call number problem, or "other."

After the first two "practice" days for the staff, the volunteers were scheduled to start. The heaviest concentration of volunteers was expected during the first week of barcoding. The number of volunteers decreased in each subsequent week, although

several volunteers did come back more than once. The volunteers were scheduled into time slots of two hours. In most every case, volunteers were paired with staff members who could show them what to do. As the project proceeded and the staff became more proficient at barcoding, many staff members came to prefer working alone because the volunteers were slower and tended to impede progress. However, for public relations purposes, it was advantageous to the library to have the volunteers from campus come in and see what goes on "behind the scenes" in the library.

As the volunteers came in for their shifts, they were given brief introductory instructions on what they would be doing. The library coordinator gave them a quick run-down on what a call number looks like and emphasized the importance of an exact match between the barcode and the book. Any subsequent questions the volunteers had were referred to the team leader in their assigned section.

As each section of the library was completed, the team leaders were responsible for investigating the entries on the problem sheets and pulling problem books from the shelves. Many errors (e.g., barcodes that had matches but had been missed by the workers) were discovered and rectified at

ROW # _____

CALL #	BOOK- NO LABEL	LABEL- NO BOOK	DUPLICATE LABEL	CALL # WRONG	OTHER

Fig. 2. Barcoding Problem Sheet.

this time. The books without barcodes and those with cataloging problems were gathered into the upstairs seating area. After the first run-through of all the barcodes, these books were sorted by problem and placed in call-number order on temporary shelving in a conference room. The flow and number of these problems quickly outpaced the ability of three technical services employees to keep up. The job of clearing those problems is, of course, an ongoing project.

RESULTS AND RESOLUTION OF PROBLEMS

The result of the barcoding was, on the whole, a very pleasant surprise. Before discussing numbers and averages, a word must be said about the definition of "applying a barcode." By this we mean that the sheets of barcodes and corresponding shelves of books were worked through, matching as many as possible to the correct book (usually 80-90 percent), identifying the problems, and recording and marking them properly. In this sense, these problem books required as much or more work than the exact matches and thus were counted as "applied" barcodes.

In the end, 158,219 barcodes were applied in the four weeks between August 3 and August 28. (see figure 3). This was the complete circulating book collection. Approximately 5,750 volumes had to be set aside for review, correction, and cataloging changes. The problems generally were: (1) books with no barcodes, (2) barcodes with no books, (3) insufficient barcodes for books in series, (4) incorrect or incomplete call numbers, and (5) miscellaneous cataloging problems. Addressing these problems represented a second, separate phase of the project.

Books with no barcodes were checked against MRMS for the existence of a barcode. If the system indicated that one existed, the files were double-checked for the missing label. A search was also made for any added copies, and, if any were found, dumb barcodes were applied. The files were checked a third time for the missing barcode, and if it was not found, the book was dumb barcoded.

The process for determining why bar-

codes existed for books not found was as follows: the MRMS record was verified, the shelflist was examined for the number of copies in the library, the shelves were scanned again, and a search was made to establish whether the label was for a discarded book, one in special storage, or a duplicate copy.

Having an insufficient number of barcodes for books in series was a problem generally solved by using the original smart barcode for the first volume, and, after inspecting MRMS, dumb barcoding the rest of the series. However, duplicate sets of barcodes had been produced for some monographic series: one set for each volume number in the series and another set with each separate title. The technical services department determined which set was more descriptive of the MRMS records, and that set of labels was applied to the volumes.

For incorrect or incomplete call numbers on the labels, the shelflist or book was compared to MRMS, where the problem was often found to be a typographical error and was corrected.

In the category of miscellaneous cataloging problems, the most prevalent difficulty was the nontransfer of OCLC records to Geac. Additionally, there were cases of smart barcodes being available for books already dumb barcoded before August. During the project, incorrect labels were sometimes applied and then the correct labels were placed directly over them, effectively obscuring the first one applied. Barcodes were also affixed to the wrong books and then destroyed in the process of removal. Sometimes a label was not put in the proper edition. Also, barcodes were printed only for the most recent edition of a title appearing in the OCLC records. Therefore, if Campbell Library, the branch food-marketing library on campus, had acquired a later copy, a barcode label was produced for that copy rather than for the one at the main library.

The project was finished due to a continued rise in productivity. The first week averaged 82.5 bc/hr (barcodes applied per hour). Using these figures the coordinator estimated that the project would fall short by about 30,000 barcodes. However, that

WEEK & # OF BARCODES	BARCODE SUBTOTAL	# OF STAFF HOURS	VOLUNTEER HOURS	TOTAL HOURS (S & V)	HOURS - SUBTOTAL	AVERAGE BC/HR	CUMULATIVE UC/HR AVG.
August 3 - 7 32,916	-----	297	102	399	-----	82.5	82.5
August 10 - 14 40,144	73,060	303	136	439	838	91.4	87.5
August 17 - 21 49,582	122,642	270	140	410	1248	120.9	98.3
August 24 - 28 35,577	158,219	190	44	234	1482	152	106.8
TOTALS	158,219	1060*	422**		1482		

* STAFF HOURS WERE 71.5% OF TOTAL TIME

** 127 VOLUNTEERS WITH AN AVERAGE OF 3.32 HOURS EACH

Fig. 3. Statistics Chart.

average climbed each week to 91 bc/hr the second week and 121 bc/hr the third week to 152 bc/hr the final week (see figure 3). The cumulative average was 106.8 bc/hr.

The volunteers provided slightly less than 30 percent of the work put into the project. A total of 127 volunteers provided 422 hours of work. Those people who returned to work again proved especially valuable, while, as mentioned, new volunteers tended to slow down the very quick staff workers. In all, the university professionals and staff provided the major proportion of volunteers. Only a few faculty (usually well-known library supporters) came to work. A total of twenty staff members (seventeen FTE) provided just over 70 percent (1,060 hours) of work. Four others concentrated on cataloging and technical services problems and fallout, and two were at large: the door-guard/circulation person and the coordinator.

The last set of "results" is an impression of the costs and benefits of the project. While the volunteers were at times mixed blessings as workers, their help has paid excellent dividends in public relations. The library has let a great deal of the campus in on the complexity and importance of its work, and the completion of the project spoke very well of the entire staff. The accuracy of the application of the barcodes has been very good as tested so far. Initial circulation use has not yielded an unusual number of problems. One question remains: Why was the project finished when preliminary estimates showed it falling short? Much of the credit must go to the

Drexel Library staff. They persevered through the rough first week and kept pushing on when the routine became a drudge. They consistently pulled together, adapted, and worked steadily through the project. There cannot be enough said for the good humor and spirit shown during that difficult month.

It would obviously be preferable to manage a project of this magnitude with more resources on hand. However, the St. Joseph's University model may benefit those libraries with budgets that do not support additional personnel or funds. Those who attempt to follow our example successfully should keep several things in mind:

- (1) Enormous commitments of time and energy will be expected from the staff.
- (2) Dependence on team leaders is crucial.
- (3) Flexibility in the project's organization should be maintained.
- (4) Any small effort to make the experience pleasant will heighten morale and increase productivity.

ACKNOWLEDGEMENTS

John Buschman was the coordinator of the project. Rebecca Reilly and Ene Andrilli were team leaders. The authors would like to thank the St. Joseph's University library staff and the volunteers for their extraordinary effort in August 1987. This article does not necessarily reflect the views of anyone other than the authors, who accept responsibility for any errors or misrepresentations. ■■

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BAR CODE APPLICATIONS



- BAR CODED LABELS WITH YOUR NAME ON TOP
- BAR CODE WANDS or LASER SCANNERS
- PORTABLE BAR CODE READERS FOR BOOKMOBILE AND INVENTORY
- COMBINATION UNIT FOR USE AS AN ON-LINE SCANNER AND A PORTABLE
- TLS - SINGLE USER CIRCULATION SYSTEM FOR XT/AT
- MBS - MEDIA BOOKING SYSTEM FOR IBM PS/2 WITH LC COMPACT DISC INPUT
- CAMS - CAPITAL ASSET MANAGEMENT SYSTEM USING BAR CODE LABELS FOR MANAGING EQUIPMENT

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Online with the future.

Special Section: Online Subject Access

Editor's note: The following three articles on subject access were submitted separately and fortuitously scheduled for publication in this issue. They are grouped together here for the reader's convenience.

The percentage of subject searching of online catalogs by patrons is high, and so is our need to understand and improve the ease with which patrons can conduct subject searches. The three articles that follow all address online subject access. Each contribution provides new information and/or insight on how we can improve subject access to library materials. Kaské's research investigates the fluctuation in patrons' use of subject searching in an online catalog over time by analyzing a full semester of transactions log data. He found a great deal

of variability at the one university studied. Frost and Dede studied the level of agreement between one large research library's use of topical and geographic subject headings and the Library of Congress Subject Headings (LCSH). They also explored the levels of difficulty in the implementation of automated subject authority control and found a surprising degree of agreement. Markey discusses the need and advantages of incorporating LCSH (in machine-readable form) into online catalogs.

Each of these articles should help us provide better subject access to library materials. Because we have just begun to understand the problems of providing reasonable subject access, it is encouraging to see additional research in this area.—WGP.

The Variability and Intensity over Time of Subject Searching in an Online Public Access Catalog

Neal K. Kaské

The percentage of subject searching in an online public access catalog (OPAC) at a university library was studied over time to learn its degree of variability. By studying a full semester's worth of transactions, it was found that subject searching varied from a low of 35% to a high of 52% over the weeks of the semester. Variability for hours of the

day ranged from 40% to 55%, and within the days of the week variability ranged from 44% to 64%. A measure of intensity of searching (mean number of searches per hour) is presented along with methods for noting high and low system utilization. This research also provides management information on the general utilization of the OPAC studied through numerous charts and graphs.

The primary goal of this research effort was to learn if the use of subject searching by patrons in an online public access catalog (OPAC) varied over time. The secondary goal was to provide the library staff with management information about the general utilization of the OPAC by patrons over time. The time units selected for analysis of variability and intensity of use were time of day, day of week, week of term, and month of term. Variability was measured by the percentage of shift in subject search-

Neal K. Kaské is on the faculty of the Graduate School of Library Science, University of Alabama, Tuscaloosa.

ing over time within each of the four time units. The intensity of use of subject searching was measured by the mean number of subject searches per hour, per public service terminal, for each of the four time units.

The University of Alabama was the location of this research effort. The enrollment at the time of the study was an estimated 13,000 undergraduates and 2,500 graduate students. The faculty numbered more than 700, and the library was employing more than 40 professional and 60 classified staff and about 43 FTE student assistants. The library system is made up of the main library and four branches (business, education, engineering, and science) under the direct management of the dean of libraries. The other libraries on campus (law, health sciences, etc.) were not using the online system at the time of this study. The holdings in the main library and the four branches exceed 1.5 million cataloged volumes plus 1.2 million microform units. Over 90% of the collection was represented in the OPAC at the time of this study.

The OPAC in use was the Virginia Tech Library System (VTLS). The methods of searching available to the patrons at the time of this investigation were author, title, subject, and call number. The VTLS system does support Boolean searching, but that feature was not in place at this site during the time of this study.

Subject searches were defined as those using the subject command (S/). Known-item searches were defined as those that used either the author or title search commands (A/ or T/). The call number searches (C/) were not factored into the known-item-to-subject-searching ratios, because good arguments can be made for their being called subject searches or known-item searches. For example, if a patron used a call number search to browse a section of the catalog, this search was a subject search. However, if a patron was looking for a given book (via a call number search) to learn if the book was still out on loan, then a known-item search was conducted. The overall percentage for call number searching was very low (3% to 4%); thus, omitting these searches when calculating the percentage of subject searching did not

appreciably affect the results. The omitting of call number searches gives a clearer picture of the ratio of known item to subject searching.

The data for this study were generated by patrons searching on each of twenty-three public terminals plus three dial-in (telecommunications) ports. Two terminals are located in each of four branch libraries. Fifteen terminals are positioned throughout the five-story main library building.

The transactions studied were those that transpired on this VTLS system from January 8 through May 8, 1987. This time frame encompasses the full spring semester from the first day of classes to the last day of finals. The word *term* will be used in this paper to note the spring semester studied.

RELATED RESEARCH

Past research efforts that reported the percentage of subject searching on OPACs have been reviewed by Karen Markey in *Subject Searching in Library Catalogs*.¹ Markey reports the results of eight studies in this work; each study used sample data for a few days or a week or two. These studies were conducted at the following locations: West Valley Community College, University of California (both look-up and command modes), Dallas Public Library, Mankato State University, Syracuse University, Northwestern University, and Ohio State University Library.

The research findings related in this article are based upon a full academic semester's worth of data, not a sample. It is possible that the past studies would have shown the same degree of variability within each system as they did across systems (34% to 65%) if they had also studied total populations.

METHODOLOGY

The raw data for this research comes from a VTLS statistical report, *Alphabetic Searches*, which displays hourly totals for the number of author, title, subject, and call number searches conducted per hour, per day, per terminal. A section from one of the University of Alabama's reports is shown in figure 1. There are other commands reported on this form, but these are

not commands known or used by the public. This report format is used for any terminal (public or staff) on the system.

A machine-readable copy of this report data was processed by a program that formatted the needed data into a structure that could then be analyzed by SAS programs. One data element was created and added during this processing. The element was a code for the days of the week. A labeled example of this transaction record is displayed in figure 2.

The independent variables for this study were the time units: hour of day, day of week, week of term, and month of term. The dependent variables were the number of author, title, subject, and call number searches conducted per hour per public terminal. Statistical tests for significant differences in the variability and intensity of use

of subject searching over time were not run because no sample was drawn. This project studied the entire population of searches conducted from public terminals for the full spring 1987 semester.

RESULTS

The findings are presented in five sections. The first section provides general descriptive statistics for searching by author, title, subject, and call number. Each of the following sections reports the percentages of subject searching over the four time units reported. Within each of these four sections the intensity of subject searching is also reported.

The primary goal of this research effort was to learn whether the use of subject searching by patrons in an OPAC varied over time. This goal was reached, and the

DATE: 3 Oct. 87

TERMINAL: 033

HOUR	A/	S/	T/	C/	W/	M/	H/	N/
10				1				
11	1		1					
12			3					
13		3						
14	1	3	1	2				
15	3	4	8					
16			2					
TOTAL	5	10	15	3				

Fig. 1. Report of Alphabetic Searches.

Terminal number <u>31</u>	31	907/04/872	16	0	56	0
Hour <u>10</u>	31	1007/04/872	23	0	32	1
Date <u>DD/MM/YY</u>	31	1107/04/872	1	0	13	0
Day code <u>2</u>	31	1507/04/872	0	7	0	0
Author searches <u>3</u>	31	1707/04/872	3	8	4	10
Subject searches <u>1</u>	31	1807/04/872	3	1	1	0
Title searches <u>10</u>	31	1907/04/872	0	4	10	0
Call number <u>4</u>	31	2007/04/872	0	5	1	4

Fig. 2. Formatted Transaction Data Record.

results will be presented in the following sections of this paper. The secondary goal was to provide the library staff with management information about the general utilization of the OPAC by patrons over time. This goal was reached by providing both the findings here and by presenting many charts and tables that record the variability and intensity of the different types of searching done by patrons across the campus libraries. This paper gives examples of the charts and tables for total and subject searches only. The library management team was given information on each type of search (author, title, subject, and call number) for each of the time units (hour of the day, day of week, week of term, and month of term). This information was for both the variability and the intensity of use. The full presentation of the reports given to the management team is not included.

General

From January 8, 1987 (the first day of classes), through May 8, 1987 (the last day of final exams), there were 165,083 searches conducted on the public terminals. The breakdown of these searches by author, title, subject, and call number are noted in table 1.

Table 1. Total Searches

Author	38,453	23.29%
Title	45,499	27.56
Subject	75,629	45.81
Call Number	5,512	3.34
Total	165,083	100.00%

Making the adjustment for the call number searches (omitting them), the percentages change a little for the different types of searches. These adjusted values are shown in table 2, which reveals that the ratio of subject to known-item searches for the complete term was 47.4 to 52.6. The variability and intensity of subject searching for each of the four time units studied are reported next.

Time of Day

Hours were used as the unit of time measured within a day. In table 3 the lowest level of subject searching for a complete hour is from 8:00 to 9:00 a.m. The libraries

within this system open at 7:45 a.m. Only full hours were analyzed; therefore, the first quarter hour has been omitted from the time-of-day analysis.

The time of greatest subject searching and total searching is from 3:00 to 4:00 p.m. (See figure 3 and figure 4). Two peaks of activity (afternoon and evening) are depicted in these figures. The first peak is between 3:00 and 4:00 p.m., and the second peak comes in the evening between 7:00 and 9:00 p.m.

The percentage of variability for subject searching over the hours of the day is 27.23%. This percentage is calculated by using the percentage value for the highest hour (55.19% for 8:00 to 9:00 p.m.) as a base and subtracting the lowest value (40.16% for 8:00 to 9:00 a.m.) and then dividing the difference by the highest value. The mathematics are as follows: $55.19 - 40.16 = 15.03$; $15.05 \div 55.19 = 27.23\%$.

Turning now to the intensity of use (mean number of searches per hour per terminal), again, there are two peaks for total searches (note figure 5). The two peaks are from 3:00 to 4:00 p.m. and from 7:00 to 9:00 p.m. However, in figure 6 the two peaks are between 8:00 and 9:00 p.m. and between 10:00 and 11:00 p.m. The key findings here are that the mean number of subject searches per hour goes up all the time the library is open so that there is more intense use of subject searching in the evenings.

To measure the percentage of change in the intensity of subject searching during the day, the highest mean value was used as the base. This is the same method used to calculate the percentage of change for the variability of use. In this case the values used were as follows: $6.18 - 2.00 = 4.18$; $4.18 \div 6.18 = 67.64\%$. These numbers were taken from table 3. In the last column of this table are the mean number of subject searches per hour. The high value of 6.18 was for the time between 7:00 and 8:00 p.m. The low time was between 8:00 and 9:00 a.m.

The intensity measure for all searches across the hours of the day shows the percentage of change to be 54.82% ($11.51 - 5.20 = 6.31$; $6.31 \div 11.51 = 54.82\%$). This percentage change in intensity of use

Table 2. Subject to Known-Item Ratio

Author	38,453	24.1 %		Known Item
Title	45,499	28.5	52.6%	
Subject	75,629	47.4	47.4	Subject
Total	159,571	100 %	100 %	

Table 3. Total and Subject Searches per Hour of the Day

Hour	Total Searches	% Subject	Mean No. of Total Searches per Hour	Mean No. of Subject Searches per Hour
7 a.m.	155	41.45	2.35	.95
8	3,429 Low	40.16 Low	5.20 Low	2.00 Low
9	7,313	43.51	6.92	2.90
10	10,839	40.54	8.53	3.32
11	11,376	41.01	8.64	3.44
12	11,418	44.33	9.00	3.87
1 p.m.	13,301	43.68	9.45	3.98
2	15,742	45.09	10.33	4.52
3	16,812 High	46.15	11.10	4.89
4	12,985	48.12	10.31	4.83
5	11,055	51.23	9.88	4.89
6	10,377	50.13	9.80	4.75
7	12,619	53.85	11.29	5.87
8	12,465	55.19 High	11.51 High	6.18 High
9	9,744	51.92	10.92	5.53
10	5,463	54.31	11.17	5.86

SEARCHES

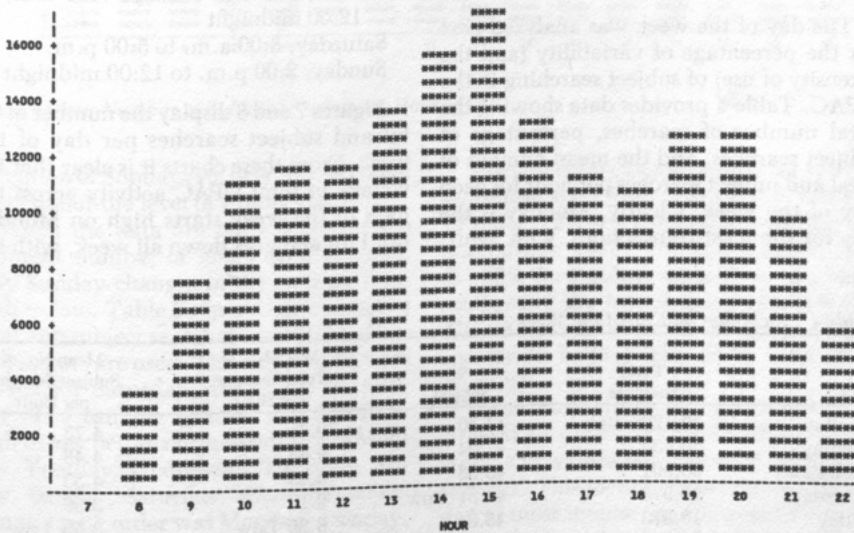


Fig. 3. Total Searches per Hour.

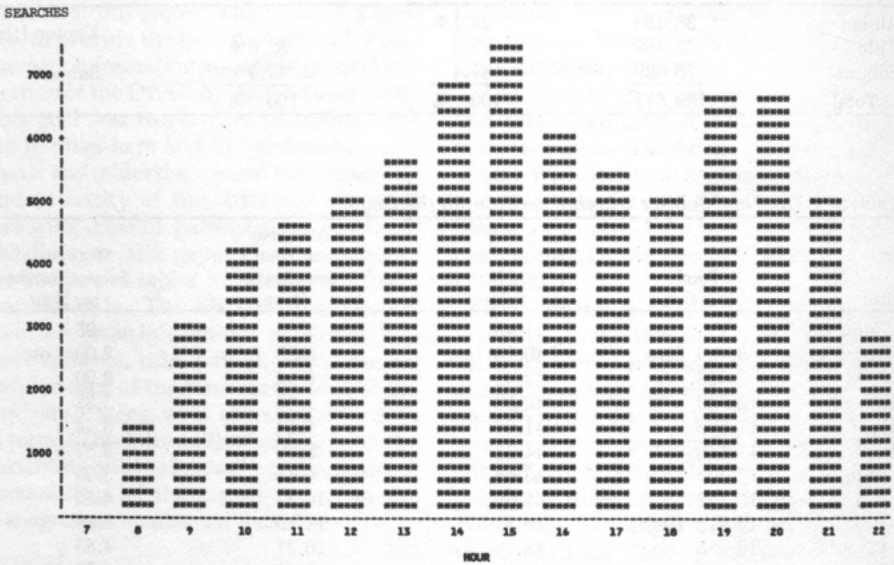


Fig. 4. Total Subject Searches per Hour.

for all searches is not as great as the change in the intensity of subject searching (67.64% versus 54.82%). The mean values for both total searches and subject searches are given in table 3.

Day of Week

The day of the week was analyzed next for the percentage of variability (and the intensity of use) of subject searching in the OPAC. Table 4 provides data showing the total number of searches, percentage of subject searches, and the mean number of total and subject searches per hour for each day of the week. Clearly, Monday is the day for the most transactions, with Satur-

day having the fewest. This is due in part to the library's hours; the campus libraries are not open as long on the weekends. The library hours during this study were the following:

- Monday through Friday: 7:45 a.m. to 12:00 midnight
- Saturday: 8:00 a.m. to 5:00 p.m.
- Sunday: 2:00 p.m. to 12:00 midnight

Figures 7 and 8 display the number of total and subject searches per day of the week. From these charts it is clear that the volume of total OPAC activity across the days of the week starts high on Monday (32,120) and goes down all week, with the

Table 4. Searches by Day of the Week

Days	Total Searches	% Subject	Mean No. of Total Searches per Hour	Mean No. of Subject Searches per Hour
Monday	32,120 High	47.40	10.31	4.73
Tuesday	30,734	47.04	9.85	4.48
Wednesday	28,901	48.58	9.48	4.33
Thursday	26,978	44.81 Low	9.17	3.99
Friday	19,873	45.04	8.26 Low	3.59 Low
Saturday	10,340 Low	45.61	9.88	4.30
Sunday	16,147	54.26 High	11.38 High	6.00 High

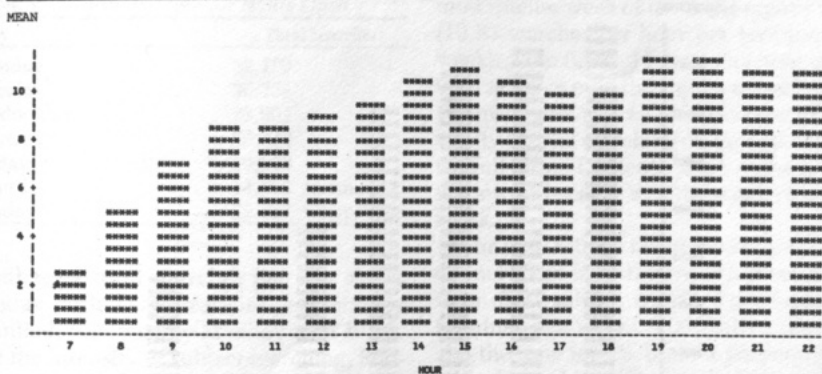


Fig. 5. Mean Number of Total Searches per Hour.

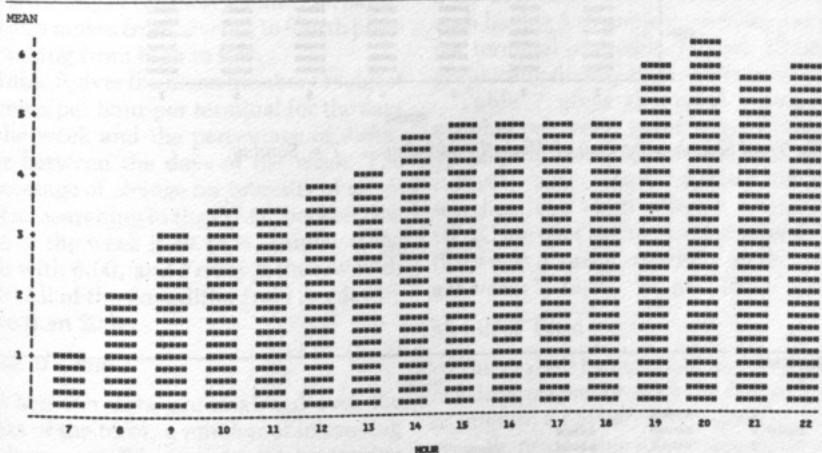


Fig. 6. Mean Number of Subject Searches per Hour.

exception of Sunday (16,147), which comes up to about the level of Friday (19,873).

When the data are normalized for the different number of hours open per day, only Sunday changes in the ranking from high to low. Table 5 reports the number of total and subject searches when normalization factors are used. The factors used were 1.4462 for Saturday and 1.3846 for Sunday. The ranking of total searches from high to low before normalization was Monday, Tuesday, Wednesday, Thursday, Friday, Sunday, Saturday. After normalization the rank order was Monday, Tuesday, Wednesday, Thursday, Sunday, Friday, Saturday.

The percentage of variability for subject searching over the days of the week is 17.42%. This was calculated by using the percentage value for the highest day (54.26% for Sunday; see table 4) as a base, subtracting the lowest value (44.81% for Thursday), and then dividing the difference by the highest value ($9.45 \div 54.26 = 17.42\%$).

When the intensity-of-use measure is calculated to differentiate the days of the week, a very different picture of library use emerges. This picture shows Sunday as the day of most intense use for overall searching, as well as the day of most intense use for subject searching. In table 4 the mean

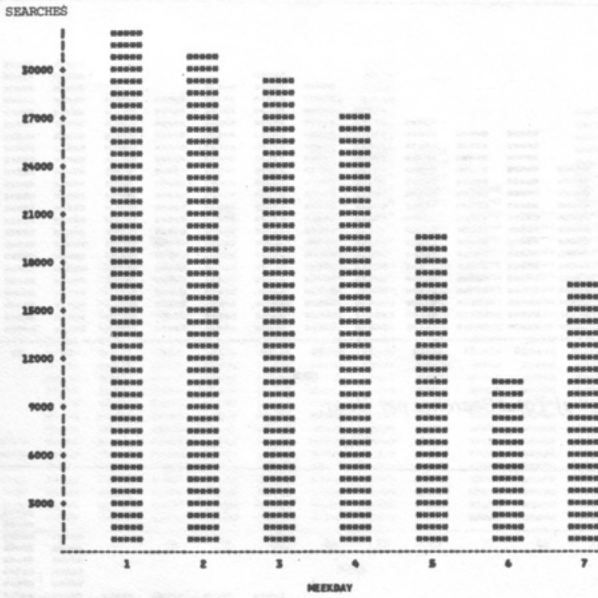


Fig. 7. Total Searches per Day of Week: 1 = Monday . . . 7 = Sunday.

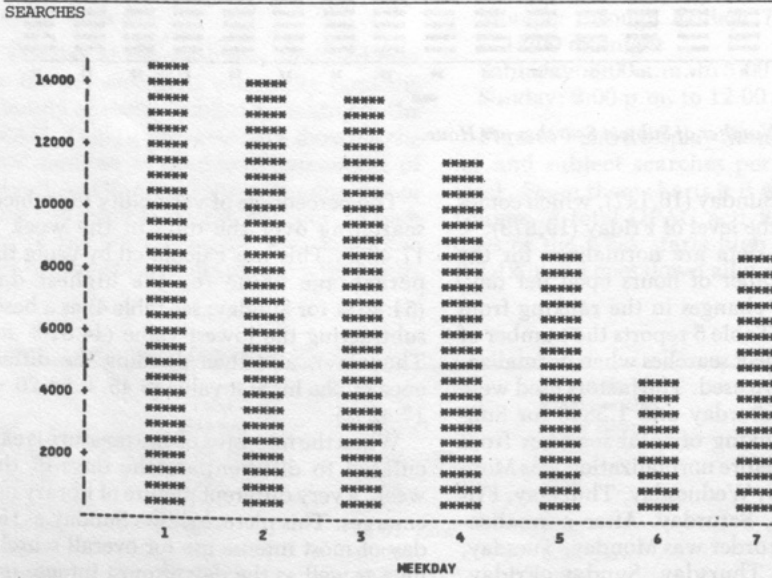


Fig. 8. Total Subject Searches per Day of Week: 1 = Monday . . . 7 = Sunday.

Table 5. Normalization for Hours Open

Days	Total Searches
Monday	32,120
Tuesday	30,734
Wednesday	28,901
Thursday	26,978
Friday	19,873
Saturday	14,953 Normalized
Sunday	22,357 Normalized

number of total searches per day shows Sunday with 11.38 searches per hour per terminal, followed by Monday with 10.31. For the intensity of subject searching, Sunday is also highest with 6.00 searches per hour per terminal, followed by Monday with 4.73. Figures 9 and 10 reveal that Sunday is the day of the most intense use. Saturday also moves from seventh to fourth place in ranking from high to low.

Table 6 gives the mean number of subject searches per hour per terminal for the days of the week and the percentage of difference between the days of the week. The percentage of change for intensity of use of subject searching in the OPAC between the days of the week is 40.17%. Sunday is the high with 6.00, and Friday is the low with 3.59. All of the days differ from Sunday by more than 20%.

Week of Term

When the data are analyzed over the weeks of the term, a number of interesting results appear. The peak for total searching comes during the fifteenth week of the term (13,157 searches), while the most intense use of the total system comes during the seventh week (11.43 searches per hour per terminal per week). The second biggest week for total searching is the fourteenth week of the term (12,925 searches). The second

Table 6. Percentage of Fluctuation per Day of Week

	Mean No. of Subject Searches	% of Fluctuation from Sunday
Monday	4.73	21.17
Tuesday	4.48	25.33
Wednesday	4.33	27.83
Thursday	3.99	33.50
Friday	3.59 Low	40.17
Saturday	4.30	28.33
Sunday	6.00 High	0

most intense week of use is the eighth week (10.83 searches per hour per terminal per week). Note figure 11 for a charting of the total searches over the eight-week term. Figure 12 provides an illustration of the intensity of total searching on the system over the full term. The tenth week of the term is the lowest because it is the week of spring break.

The most intense use of subject searching did not come until the twelfth week of the term (5.21 subject searches per hour per terminal per week). Naturally, this was also the time for the highest percentage of subject searching. The week with the next highest intensity of use was the eighth week (5.15 subject searches). The third week was a tie between weeks fourteen and seven, each having 5.07 subject searches per hour per terminal per week. Figures 13 and 14 graphically display these differences.

Table 7 gives the total number of searches per week, percentage of searches by subject, mean number of searches by subject, and mean number of total searches. This chart offers a summary of OPAC use over the weeks of the term. The five weeks of greatest activity on the system are weeks 7, 13, 12, 14, and 15.

Month of Term

The analysis by month of term adds little new information because the unit of analysis (month) is not very finely grained. However, there are some interesting differences between the highs and lows for the mean number of total searches and for mean number of subject searches. Table 8 lists the total searches, percentage of subject searches, and the mean number of both total and subject searches for each month of the term. In April the greatest number (50,523) of searches was conducted. March, however, had the highest percentage (50.43%) of subject searching, with a total of 36,197 searches. The month for the most intense use of the total system was February with a mean number of 10.30 searches per hour per terminal. March was the month for the most intense use of subject searching with a mean 4.78 subject searches per hour per terminal.

The percentage of variability for subject searching over the months of the term was

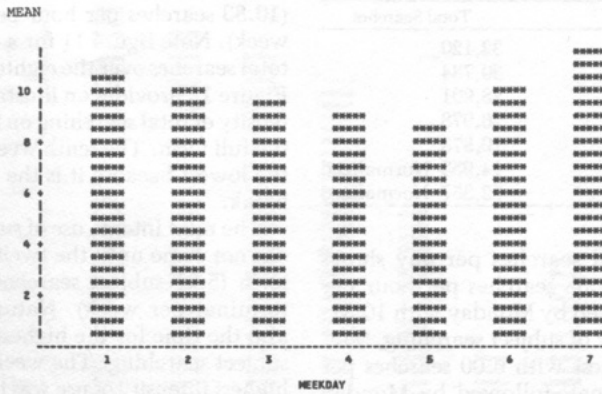


Fig. 9. Mean Number of Total Searches per Hour per Day of Week: 1 = Monday . . . 7 = Sunday.

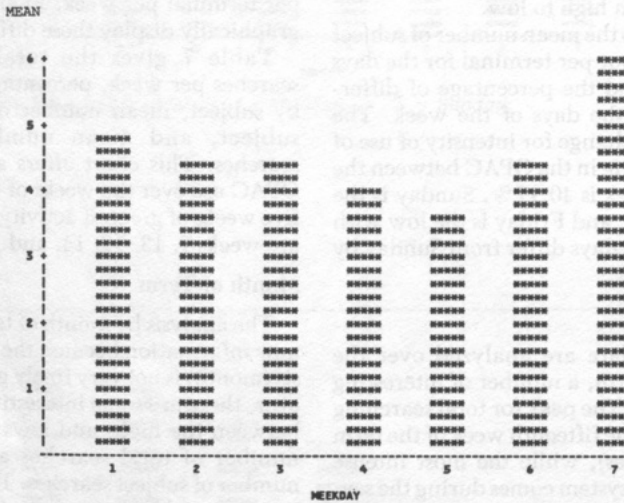


Fig. 10. Mean Number of Subject Searches per Hour per Day of Week: 1 = Monday . . . 7 = Sunday.

17.19%. The percentage of subject searching ranged from a low of 41.76% in January to a high of 50.43% in March.

SUMMARY AND CONCLUSIONS

This study has shown that percentage and intensity of subject searching in a university library's OPAC varies a great deal over time. Variability in subject searching was measured by the percentage of shift over four time units for the amount of subject searching compared to known-item searching. The four time units were hour of

the day, day of the week, week of the term, and month of the term. Table 9 gives an overview of the percentage of variability of subject searching over the four time units. The percentages of variability differ from a low of 17.19% between months of the term to a high of 33.09% between weeks of the term.

The percentages of subject searches for the hour of the day range from a low of 40.16% to a high of 55.19%. As for the day of week, the range was from 44.81% to 64.26%. The week of term ranged from

Table 7. Searches per Week of Term

Week	Total Searches	% Subject Searches	Mean No. of Total Searches per Hour	Mean No. of Subject Searches per Hour
1	3,465	35.37	8.80	3.02
2	9,365	38.60	8.62	3.24
3	10,969	44.05	9.92	4.22
4	4,978	47.26	9.78	4.42
5	8,312	45.24	9.39	4.12
6	10,818	45.18	9.46	4.17
7	11,919	46.27	11.43 High	5.07
8	11,614	49.23	10.83	5.15
9	9,168	47.55	9.77	4.47
10	16	0.00 Spring Break	2.29	0.00
11	9,465	50.48	9.27	4.57
12	12,123	52.86 High	10.12	5.21 High
13	11,753	49.93	9.87	4.75
14	12,925	51.25	10.24	5.07
15	13,157 High	51.32	10.14	5.03
16	9,744	51.20	8.66	4.30
17	9,871	43.73	9.02	3.80
18	5,431	40.95	7.42 Low	2.89 Low

Table 8. Searching by Month of Term

Month	Total Searches	% of Subject	Mean No. of Total Searches per Hour per Terminal	Mean No. of Subject Searches per Hour per Terminal
January	28,777	41.76	9.30	3.75
February	42,663	46.60	10.30 High	4.64
March	36,197	50.43 High	9.76	4.78 High
April	50,523	49.80	9.69	4.65
May	6,933	42.21 Low	7.34 Low	2.97 Low

Table 9. Variability of Subject Searching: A Summary

Time Unit	Low / High % Subject Searches	% of Variability (using high value as base)	Low Points	High Points
Hour of Day	40.16-55.19	27.23	8:00-9:00 a.m.	8:00-9:00 p.m.
Day of Week	44.81-64.26	17.42	Thursday	Sunday
Week of Term	35.37-52.86	33.09	1st	12th
Month of Term	41.76-50.43	17.19	January	March

35.37% to 52.86%, and the low and high for month of term were 41.76% and 50.43%.

The intensity of use was measured by the mean number of total and subject searches per hour per terminal for each of the four time units. Table 10 shows that the greatest percentage of change in the intensity of

subject searching was in the hour of the day. The percentage of change was 67.64%. The low point of the day was from 8:00 to 9:00 a.m. (with a mean number of subject searches of 2.00 per hour per terminal), and the high point was from 8:00 to 9:00 p.m. (with a mean number of subject searches of 6.18 per hour per terminal).

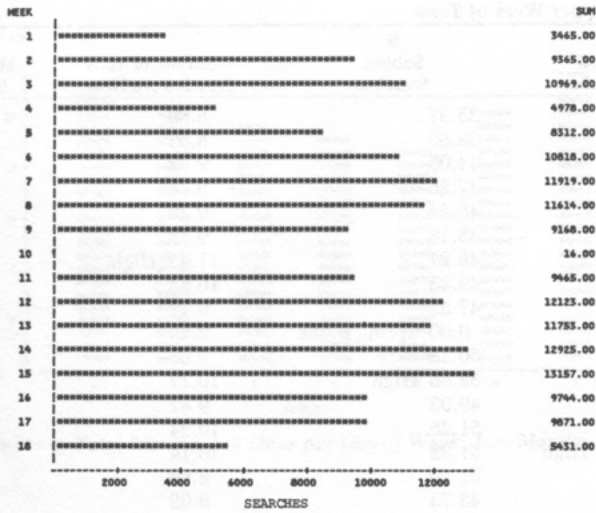


Fig. 11. Total Searches per Week of Term: Spring 1987.

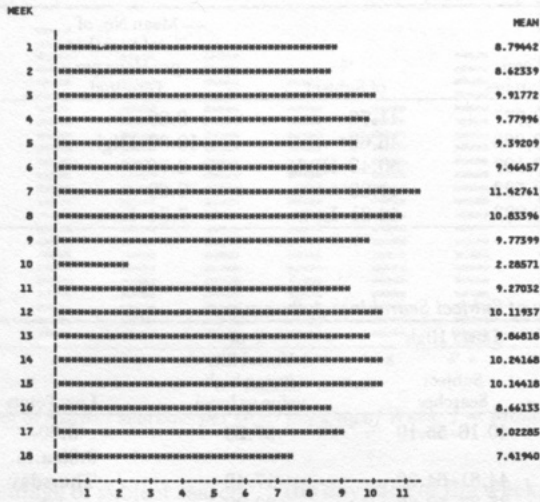


Fig. 12. Mean Number of Total Searches per Hour per Week of Term: Spring 1987.

The least variation in the intensity of subject searching was noted over the months of the term: May had a low with 2.97 mean number of subject searches per hour per terminal; March had the high with 4.78 mean number of subject searches per hour per terminal.

The percentage of change for the day of

week was 40.17%. Friday showed the least intensity of use with a low of 3.59 mean number of subject searches per terminal and Sunday the greatest with 6.00 mean number of subject searches per terminal.

Week of term showed a percentage change of 44.53%. The eighteenth week was the low point with only 2.89 mean

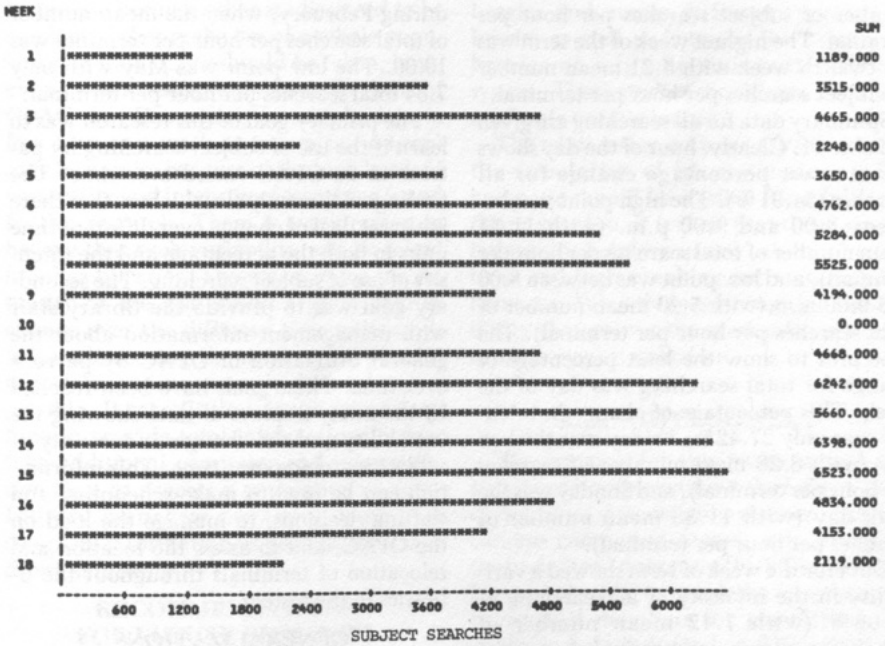


Fig. 13. Total Subject Searches per Week of Term: Spring 1987.

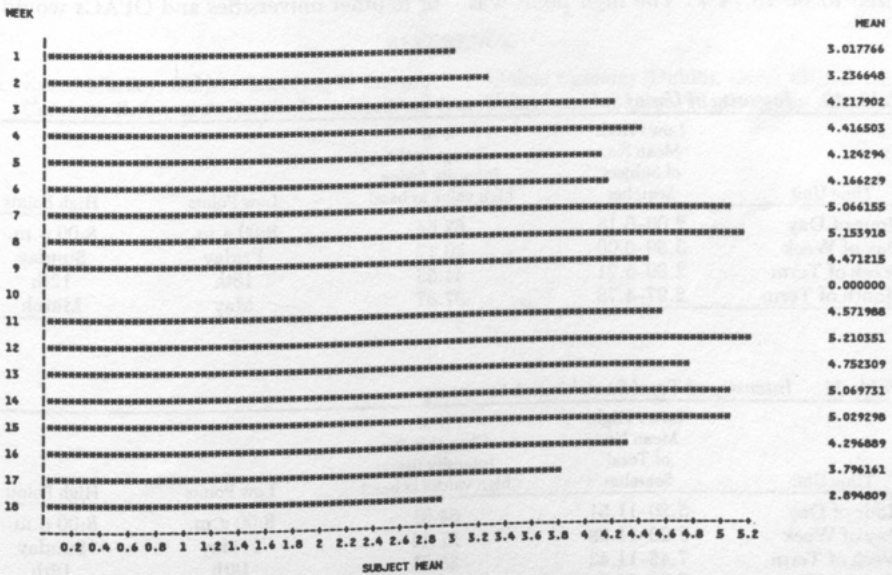


Fig. 14. Mean Number of Subject Searches per Hour per Week of Term: Spring 1987.

number of subject searches per hour per terminal. The highest week of the term was the twelfth week with 5.21 mean number of subject searches per hour per terminal.

Summary data for all searching are given in Table 11. Clearly, hour of the day shows the greatest percentage change for all searches (54.91%). The high point was between 8:00 and 9:00 p.m. (with 11.51 mean number of total searches per hour per terminal), and low point was between 8:00 and 9:00 a.m. (with 5.20 mean number of total searches per hour per terminal). The time unit to show the least percentage of change for total searching was day of the week. This percentage of change in intensity was only 27.42%; Friday was the low day (with 8.26 mean number of searches per hour per terminal), and Sunday was the peak day (with 11.38 mean number of searches per hour per terminal).

Data for the week of term showed a variability in the intensity of all searching of 35.08% (with 7.42 mean number of searches per hour per terminal during the eighteenth week for the low, to a high of 11.43 mean number of searches per hour per terminal for the twelfth week of the term).

The variability in intensity of all searching over the months of the term was measured to be 28.74%. The high point was

during February, when the mean number of total searches per hour per terminal was 10.30. The low point was May with only 7.34 total searches per hour per terminal.

The primary goal of this research was to learn if the use of subject searching by patrons in an OPAC varied over time. The findings of the study clearly show that there is a great deal of change over different time units in both the percentage and the intensity of use of subject searching. The secondary goal was to provide the library staff with management information about the general utilization of OPAC by patrons over time. These goals have been reached by the many displays of data showing the variability and the changes in intensity of subject searching over time. This information can be used to make scheduling and staffing decisions, to manage the load on the OPAC, and to assess the location and relocation of terminals throughout the libraries in the system.

GENERALIZATIONS OF THE FINDINGS

This research made use of a population of data. All the searches done on the University of Alabama's OPAC via public terminals during the spring 1987 semester were analyzed. To generalize past this one term or to other universities and OPACs would

Table 10. *Intensity of Use of Subject Searching: A Summary*

Time Unit	Low / High Mean No. of Subject Searches	% of Change in the Intensity (using high value as base)	Low Points	High Points
Hour of Day	2.00-6.18	67.64	8:00 a.m.	8:00 p.m.
Day of Week	3.59-6.00	40.17	Friday	Sunday
Week of Term	2.89-5.21	44.53	18th	12th
Month of Term	2.97-4.78	37.87	May	March

Table 11. *Intensity of Total Searching: A Summary*

Time Unit	Low / High Mean No. of Total Searches	% of Change in the Intensity (using high values as base)	Low Points	High Points
Hour of Day	5.20-11.51	54.91	8:00 a.m.	8:00 p.m.
Day of Week	8.26-11.38	27.42	Friday	Sunday
Week of Term	7.42-11.43	35.08	18th	12th
Month of Term	7.34-10.30	28.74	May	February

be unwise because other studies need to be conducted that make use of a whole population of data. Care should be taken, however, when using only sample data of OPAC use. Depending on sample data (a few days or a week or two out of a term) may be unwise because of the high levels of variability and intensity of searching found by this research. There is every reason to believe that such variability will be found in other libraries. The measure for the intensity of use also shows a great deal of change over the different time units studied, underscoring the need to use population data and not sample data wherever possible. It takes little extra programming time to provide total information; it does take additional computer and interpretation time to process a population of data. Library managers need and deserve as complete information as possible for use in decision making.

RECOMMENDATIONS FOR FUTURE RESEARCH

Additional research is needed to learn if there is variability across academic terms and between university libraries in the use of subject searching by patrons on OPACs. It would be ideal to study the use of the same OPAC across different university li-

braries and across different types of libraries as well as between the branch libraries of any one university library system. These studies should run for a full academic year or longer.

The relationship between OPAC use and the circulation of library materials for home use should be studied for a full academic year too. It is clear that there are relationships between use of catalogs by patrons and their checking out materials for home use. What these relationships are and if they change over the academic year (and in what way) is unknown.

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Subject Heading Compatibility between LCSH and Catalog Files of a Large Research Library: A Suggested Model for Analysis

Carolyn O. Frost and
Bonnie A. Dede

Assigned topical and geographic subject headings from a sample of 3,814 bibliographic records in the University of Michigan Library's catalog were analyzed to determine the degree of match with LCSH, 10th edition and to identify types of heading conflicts that lend themselves to automated subject authority control. The findings showed a surprising degree of agreement: 44 percent of headings matched LCSH 10th completely. For headings without subdivisions, the match was 88.4 percent. Since 93.6 percent of the topical subdivisions that did not match LCSH were found on the free-floating lists, some consideration should be given to developing a machine-readable file of free-floating subdivisions for matching purposes.

During the past few years advances in automated systems for creating and maintaining subject authority files have made available machine-readable subject authority records as a part of the Library of Congress' MARC Distribution Service.¹ The service began in April 1986 with an initial file of approximately 150,000 records in the USMARC authority format and a weekly tape. At the time of this writing, approximately 162,000 records are in the file.²

Such developments promise more efficient control of the mechanical processes needed to update and control files and offer long-term cost benefits by providing li-

braries with a file of machine-readable subject authority records. However, the power of these capabilities will depend on how easily a library's file will lend itself to automated control.

Some problem areas become immediately apparent. For example, the *Library of Congress Subject Headings (LCSH)* is limited by the types of matches it can provide for individual libraries' files. A large number of terms are not enumerated in *LCSH* but are authorized to be added by the cataloger, as are many headings that name geographic regions or ethnic groups. In addition, the LC file will not include records for subdivisions, unless the heading occurs with a subdivision in *LCSH*. Authorized "free-floating" and pattern subdivisions allow new headings to be created by the cataloger. There are about 3,000 such subdivisions.³ A related problem is the geographic areas that may be added as subdivisions to main headings.

At present, however, there is a mechanism for online control of subdivisions if the library or a vendor uses a "parts matching" process and adds the subdivisions to its file. For example, if the heading "Folk drama—United States—Bibliography" is not found on the LC tape but the parts are present in other headings, the system assumes that this assigned heading is an authorized new combination and can add it to the authority file.⁴ An additional means for automated control of subdivisions could be created if finite lists, such as the "Free-Floating Subdivisions" in the *LC Subject Cataloging Manual: Subject Headings (SCM:SH)*, were used as a machine-readable source of matching parts.

A more difficult problem occurs when LC invalidates an *LCSH* term and creates more than one valid heading, as in the case of invalidating *Negro* and establishing *Blacks* for use in a worldwide context and *Afro-Americans* for use only in a U.S. context. For this type of change, the contents of the bibliographic record—and in some cases the item itself—must be examined to determine the correct subject term. This judgment can be made either by a library's cataloging staff or by a vendor.⁵ The appropriate decision must first assess the extent of such changes and the relative costs of in-

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house versus vendor services.

As they plan for the selection, implementation, and management of online subject authority control systems, libraries must consider the extent to which their manual catalog headings are consistent with the authorized LC headings found in the machine-readable LC *Subject Authority File (SAF)*. This study, conducted in 1986-87, examined a sample of subject headings from the catalog of the University of Michigan Library to determine

(1) the extent of catalog headings matching those in the *LCSH*, 10th edition;

(2) how easily conflicting headings can be converted through automated authority control; and

(3) which conversions require human judgment and intervention. The study also attempted to identify levels of difficulty in implementing automated subject authority control, to determine the extent to which these levels are present in the file of a large research library, and to offer a model for analysis of subject files. Such a model should be of value to other libraries gathering information and making decisions for implementing automated authority systems.

PREVIOUS STUDIES

In another discussion, Markey considered the MARC format for subject authorities and its implications for use in online public catalogs.⁶ Ludy compared the percentage of exact matches of topical headings between the LC *SAF* and the Ohio State University's online catalog.⁷ O'Neill examined errors in subject-heading fields of a sample of OCLC records and identified four major categories of inconsistencies between an assigned heading that had been normalized for automatic processing and an established heading.⁸ Most of O'Neill's error categories can be addressed with relative ease by present automated authority control systems.⁹

This study further develops the type of analysis begun by O'Neill and Ludy and focuses on identifying heading conversions requiring human judgment. To our knowledge, no studies similar in scope and focus have appeared in the professional literature, although much emphasis has been

placed on the importance of subject authority control in library catalogs. However, two models do exist from internal research conducted at the University of Michigan Library. In 1985-86, staff members carried out two studies describing the nature and content of the library's name and subject authority files.¹⁰ In the subject authority analysis, headings were examined to determine congruence with *LCSH* and with the library's MARC bibliographic records in RLIN. The studies were conducted to make decisions for providing an online authority file and automated authority control in Michigan's integrated library system.

RESEARCH DESIGN AND IMPLEMENTATION

General Research Questions Addressed

The study's objective was to determine characteristics of assigned subject headings and *LCSH* that will influence the feasibility of automated subject authority systems. We assume that the availability of *LCSH* in machine-readable form through the distribution of LC *SAF*, combined with automated subject authority control systems available from vendors, offers great potential provided that the following questions are considered:

(1) To what extent will the subject headings in the library's manual file match directly with the *LCSH* 10th edition?

(2) To what extent can headings that do not match *LCSH* be converted through automated means, e.g.:

(a) When heading changes do occur, to what extent will they be on a one-to-one basis? (I.e., term A can be replaced directly with term B, thus facilitating global changes.)

(b) To what extent can terms that do not match *LCSH* be converted from a readily available list that can form the basis for a machine-readable file?

(c) To what extent can terms that do not match *LCSH* be converted from cross-references to valid terms already present on the LC *SAF* tapes?

(3) To what extent will a reconciliation of nonmatching terms require human intervention?

Sample Characteristics, Population, and Size

The sample was pulled from the University of Michigan Library's union shelflist, with the following categories excluded:

- (1) local or specialized subject headings (e.g., MeSH),
- (2) all Dewey classified items,
- (3) literature,
- (4) microforms,
- (5) spoken books,
- (6) Braille, and
- (7) incunabula.

From a measurement of the union catalog's 870 drawers, the total population was estimated to be 2,338,072 records. After the removal of 521,925 records classed in literature and the 75,500 in other excluded categories, the total sampling population was 1,740,647. A sample of 2,401 was decided upon to give a 95% confidence level and an error rate of 2%. The records from the sample yielded 4,264 assigned subject headings.

The number of cards in the library's public catalog is estimated to be 10 million, representing a collection of approximately 6 million volumes. The library's integrated library system will include automated authority control and will be implemented in 1988.

Gathering the Sample

After a random start was chosen, cards were pulled from the shelflist at 7.25-inch intervals and then photocopied onto coding sheet forms. Cards produced from the RLIN system (including OCLC records tapeloaded into RLIN) were searched on the RLIN database. Shelflist cards were checked against the main entry cards in the public catalog for congruence of subject headings.

Coding and Data-Gathering Procedures

A data sheet was created for each subject heading. The total number of data sheets analyzed (including 120 records with no subject headings) was 4,384. The heading analysis was limited to topical (MARC tag 650) and geographic (MARC tag 651) subjects only. We noted the presence of names of persons, corporate bodies, conferences,

and uniform titles but did not include these in our analysis since these are contained (or could potentially be included) in the *LC Name Authority File*. A total of 3,814 topical and geographic assigned subject headings were analyzed.

For each record analyzed, the following information was recorded on coding sheets:

Text of main headings and subdivisions.

For main headings, a designation of whether it was a topical, geographic, or name heading.

For topical and geographic headings, presence of match against *LCSH* 10th (including supplements beginning with 1985).

If not found in *LCSH* 10th, presence of match in the 9th or 8th editions.

A designation of whether the heading was listed as "Direct" or "Indirect" in *LCSH*.

For first listed subject headings, the local call number was recorded. (Note: Call numbers are assigned by catalogers on the basis of the first subject heading only.)

A designation to indicate presence of a suggested LC classification number given in *LCSH* in parentheses after the subject heading.

For headings found only in the 9th or 8th editions, the type of change was coded (e.g., a one-to-one match, two or more headings collapsing into a new heading, etc.).

If a heading change occurred, *LCSH* 10th was checked for the presence of a cross-reference linking the old and new headings.

Subdivisions were coded to note: abbreviations on the record (e.g., "Hist."); whether topical/form (e.g., "History and criticism," "Bibliography"), geographic or chronological subdivision presence of match with *LCSH* 10th (only if preceded by a main heading found in *LCSH* 10th).

Topical/form subdivisions were checked to note: presence of match in the "free-floating" and other pattern subdivision lists in the *SCM:SH*; whether the *SCM:SH* listed the subdivision as being "Direct" or "Indirect."

In a pilot study, students in a Subject Access Systems course coded a sample of 260

records. Students' evaluations and recommendations helped refine the coding sheets used in the study. Students recruited from the University of Michigan's School of Information and Library Studies and the two coinvestigators of the project coded the remaining data used in the study.

FINDINGS

General Characteristics of the Sample

Some general characteristics of the sample are shown in table 1.

Records in the sample contained from 0 to 10 subject headings. The average number of subject headings for all of the records analyzed was 1.8.¹¹ There were 120 records without headings. For the records containing headings, the average number of headings was 1.9.

Fifty-six percent of headings occurred on the library's RLIN MARC records.

Subdivisions

It can be seen that over two-thirds of the geographic and topical main headings had subdivisions and that 63.2% of the subdivisions were topical or form. However, only 17.8% of the 2,352 topical/form subdivisions were unique. Seventy-two percent of the topical subdivisions appeared as the first subdivision, 20.8% as the second, 6.6% as the third, and 0.4% as the fourth.

While the geographic subdivisions constituted 29% of the total subdivisions, only 24.6% of these were unique. Seventy-seven percent appeared as the first subdivision, 22.3% as the second, and 0.3% as the third.

Direct/Indirect Headings

Authorization for the cataloger to add a geographic subdivision after a main heading is indicated in *LCSH* by the terms "Direct" or "Indirect." Topical/form subdivisions indicated as "Indirect" are also capable of further geographic subdivision. Sixty-one percent of the topical main headings found in the 8th, 9th, and 10th editions of *LCSH* were direct or indirect, but only 29.9% actually had such subdivisions in the library's bibliographic file.

Over 99% of the direct and indirect headings were indirect. (Note: The study also discovered 17 topical headings which are neither direct or indirect but which had geographic subdivisions supplied without authorization.)

Number of Subdivisions per Heading

Forty-three percent of the assigned headings had one subdivision, and 20% had more than one subdivision. In the case of headings with two subdivisions, geographic and topical headings showed substantial differences. For topical headings, only 15.3% of the total had two subdivisions, but for geographic headings, this was true for 39.4%.

Sixty-one percent of the topical subject headings contained subdivisions, with an average number of 1.4 subdivisions. In sharp contrast, 94.5% of the geographic headings had subdivisions.

Order in Which Headings Were Listed on the Bibliographic Records

In terms of the order in which headings were listed as tracings on the library's bib-

Table 1. Characteristics of Sample Population

Topical main headings	71.5%	(3,050 of 4,384)
Geographic main headings	17.9%	(764 of 4,384)
Name main headings	10.5%	(450 of 4,384)
Topical and geographic headings with subdivisions	67.9%	(2,590 of 3,814)
Topical and geographic headings with no subdivisions	32.1%	(1,224 of 3,814)
Topical subdivisions	63.2%	(2,352 of 3,724)
Geographic subdivisions	29.1%	(1,084 of 3,724)
Chronological subdivisions	7.7%	(288 of 3,724)
"Direct" or "Indirect" topical headings (i.e., capable of geographic subdivision)	61.5%	(1,876 of 3,050)
Topical headings actually containing geographic subdivisions	29.5%	(912 of 3,050)
"Indirect" topical subdivisions	11.6%	(272 of 2,352)

liographic records, 53.5% were listed first, 29.2% were listed second, 11.7% were listed third, 3.8% were listed fourth, and 1.1% were listed fifth. The remaining categories sixth through tenth were each less than 1%.

HEADINGS THAT MATCH *LCSH* 10TH: EXACT MATCH OF COMPLETE HEADING

Research Question

What is the overall percentage and number of direct matches between the subject headings in the library's bibliographic records and the machine-readable headings on the LC SAF (as represented by *LCSH* 10th edition)?

Forty-four percent of all the topical and geographic headings in the sample matched *LCSH* exactly (see table 2). Since *LCSH* does not supply all possible subdivisions and since headings with subdivisions are thus a potential source of nonmatching terms, we were particularly interested in determining the extent to which combinations of main headings and subdivisions were already enumerated in *LCSH* and thus could be drawn directly from the LC SAF. As we expected, most of the headings that matched *LCSH* (64.5%) were main headings without subdivisions. For the 32% of topical and geographic headings

with no subdivisions, the rate of match was very high: 88.4%. By comparison, only 23% of the headings with subdivisions matched *LCSH* exactly.

Topical Headings

Forty-seven percent of all topical headings matched *LCSH* (see table 3). While 34.9% of the topical headings matched *LCSH* exactly and had no subdivisions, this was true for only 11.8% of the topical headings matching *LCSH* that had subdivisions. For the 38.7% of topical headings with no subdivisions, the rate of match was 90.1%. For the 61.2% of topical headings with subdivisions, 19.3% matched *LCSH* exactly.

These findings differ markedly from Ludy's comparison of Ohio State's online bibliographic file (LCS) of 410,000 subject headings with the LC SAF. In this study, only 10% of the LCS topical subject headings were an exact match of SAF. However, an additional 54% of headings with subdivisions matched SAF main headings.¹² An even smaller degree of match was found in Markey and Vizine-Goetz' preliminary analysis of assigned subject headings from bibliographic records in the OCLC union catalog. They found that "less than one half of one percent exactly matched an *LCSH* subject heading."¹³

Table 2. *Match of Complete Heading with LCSH 10th*

Topical and geographic headings matching <i>LCSH</i>	43.9%	(1,676 of 3,814)
Topical and geographic headings matching a subdivided <i>LCSH</i> heading	15.6%	(594 of 3,814)
Topical and geographic headings matching an unsubdivided <i>LCSH</i> heading	28.4%	(1,082 of 3,814)
Topical and geographic headings matching <i>LCSH</i> which are subdivided	35.4%	(594 of 1,676)
Topical and geographic headings matching <i>LCSH</i> which are not subdivided	64.6%	(1,082 of 1,676)
Topical headings matching <i>LCSH</i>	85.1%	(1,426 of 1,676)
Geographic headings matching <i>LCSH</i>	14.9%	(250 of 1,676)
Subdivided topical and geographical headings matching <i>LCSH</i>	22.9%	(594 of 2,590)
Unsubdivided topical and geographic headings matching <i>LCSH</i>	88.4%	(1,082 of 1,224)

Table 3. *Matches of Complete Topical Headings with LCSH 10th*

Topical headings matching <i>LCSH</i>	46.7%	(1,426 of 3,050)
Topical headings matching subdivided <i>LCSH</i> headings	11.8%	(361 of 3,050)
Topical headings matching unsubdivided <i>LCSH</i> headings	34.9%	(1,065 of 3,050)
Subdivided topical headings matching <i>LCSH</i>	19.3%	(361 of 1,868)
Unsubdivided topical headings matching <i>LCSH</i>	90.1%	(1,065 of 1,182)

Table 4. *Matches of Complete Geographic Headings with LCSH 10th*

Geographic headings matching <i>LCSH</i>	32.7%	(250 of 764)
Geographic headings matching subdivided <i>LCSH</i> headings	30.5%	(233 of 764)
Geographic headings matching unsubdivided <i>LCSH</i> headings	2.2%	(17 of 764)
Subdivided geographic headings matching <i>LCSH</i>	32.3%	(233 of 722)
Unsubdivided geographic headings matching <i>LCSH</i>	40.5%	(17 of 42)

Table 5. *Match of Heading Components with LCSH 10th*

Main heading components matching <i>LCSH</i>	87.7%	(3,346 of 3,814)
Topical main heading components matching <i>LCSH</i>	92.9%	(2,384 of 3,050)
Geographic main heading components matching <i>LCSH</i>	67.0%	(512 of 764)
Subdivision components matching <i>LCSH</i>	31.2%	(1,162 of 3,724)
Topical subdivision components matching <i>LCSH</i>	35.2%	(829 of 2,352)
Geographic subdivision components matching <i>LCSH</i>	11.6%	(126 of 1,084)
Chronological subdivision components matching <i>LCSH</i>	71.9%	(207 of 288)

Geographic Headings

While only 2.2% of the geographic headings without subdivisions matched *LCSH* exactly, 30.5% of the geographic headings with subdivisions matched *LCSH*. Almost a third (32.3%) of the geographic headings with subdivisions matched *LCSH* exactly (see table 4).

HEADING COMPONENTS THAT MATCH *LCSH* 10TH

Main Heading Components Matching *LCSH* 10th

The previous discussion looked at matches of complete headings. In addition, the data were analyzed to determine the degree of match on components of headings, i.e., matches on main heading elements and matches on subdivision elements (see table 5).

The degree to which topical and geographic main heading components matched *LCSH* 10th was 87.7%, a percentage almost identical to that mentioned earlier for main headings without subdivisions (88.4%). For topical main heading components the degree of match was 92.9%. We expected a lesser degree of match in the case of geographic main headings that can be supplied by the individual cataloger as needed by following AACR2 and are therefore less subject to control in an authorized list. In fact the findings showed a match of 67%.

The above figures apply to all main headings in the sample and thus include

both headings with subdivisions as well as headings without subdivisions.

Subdivision Components Matching *LCSH* 10th

The study found 31.2% of all the subdivisions matched *LCSH*. Thirty-five percent of the topical subdivisions matched *LCSH*, while this was true for 11.6% of the geographic subdivisions and 71.9% of the chronological subdivisions. (Note: Headings with a main heading not matching *LCSH* were not coded further for *LCSH* subdivisions.)

Match of *LCSH* Subdivisions with the Free-Floating Lists

Twenty percent of all the subdivisions were found both in *LCSH* 10th and in the free-floating lists. Thirty-one percent of the topical subdivisions were in both lists. The topical subdivisions enumerated in *LCSH* for the most part reflect subdivisions already authorized by the free-floating lists: 89.5% of the topical subdivisions found in *LCSH* were also on the free-floating lists. Only 3.7% of the topical subdivisions were in *LCSH* but not on the free-floating lists; this was true for 70.1% of the chronological subdivisions.

HEADINGS NOT MATCHING *LCSH* 10TH

Research Question

What is the number and percentage of nonmatching headings?

Fifty-six percent of the complete headings conflicted in some way with *LCSH* 10th (i.e., either the main heading or subdivision did not match). While only 12.3% of the topical and geographic main heading components were not in agreement with *LCSH*, 68.8% of the subdivisions did not match (see table 6). Those main heading components that conflicted were largely geographic: almost one-third (33.0%) of the geographic main headings did not match *LCSH*, while this was true for only 7.1% of the topical headings.

CONFLICTING HEADINGS THAT CAN BE CONVERTED THROUGH AUTOMATED SYSTEMS

Research Question

What is the degree and number of non-matching headings that can be converted through automated means, that is:

(a) headings with "see" cross-references in *LCSH* 10th, or

(b) headings on lists that could form the basis for a machine-readable file to be used for matching?

Main Headings with Cross-References

Headings without a direct match in the *LCSH* 10th edition but with "see" references linking the old and new headings would constitute a category of headings that could be brought under control in automated systems. "See" references were provided for 27.4% of the conflicting headings and for 39.9% of the headings with

changes found in *LCSH* 10th. Forty-one percent of the conflicting headings were found in the 8th or 9th editions of *LCSH* but had no cross-references.

Abbreviated Subdivisions

In our coding, headings with abbreviated subdivisions were counted as matches if the full subdivision matched *LCSH* 10th, but we recognize that these subdivisions do not actually constitute direct matches of *LCSH* 10th. The subdivisions with abbreviations constituted only 9.6% of the total number of subdivisions. This figure becomes even more encouraging in view of the fact that only 8.4% of the abbreviated subdivisions were unique.

Conflicting Subdivisions Not in *LCSH* but on the Free-Floating Lists

Since *LCSH* does not enumerate all of the topical subdivisions in combination with main headings, the lists of free-floating subdivisions found in LC's *SCM:SH* can serve as a source for topical subdivisions not found in *LCSH*. These lists will be primarily of value for topical subdivisions, since 99.8% of the subdivisions found on the free-floating lists were topical.

The likelihood of a topical subdivision appearing on the free-floating lists was very high: 92.1% of the topical subdivisions were on these lists, while this was true for only less than 2% of the chronological subdivisions. Thus, the free-floating lists were indeed a likely source for topical subdivisions not matching *LCSH*. While almost

Table 6. *Headings Not Matching LCSH 10th*

Complete topical and geographic headings not matching <i>LCSH</i>	56.1%	(2,138 of 3,814)
Main heading components not matching <i>LCSH</i>	12.3%	(468 of 3,814)
Main heading components not matching <i>LCSH</i> 10 but found in <i>LCSH</i> 9 or 8	46.8%	(219 of 468)
Main heading components not matching <i>LCSH</i> 10 but with "see" references in <i>LCSH</i> 10	27.4%	(128 of 468)
Main heading components not in <i>LCSH</i> 8, 9, or 10	6.5%	(249 of 3,814)
Subdivision components not matching <i>LCSH</i>	68.8%	(2,562 of 3,724)
Topical subdivision components not matching <i>LCSH</i>	64.7%	(1,522 of 2,352)
Geographic subdivision components not matching <i>LCSH</i>	88.4%	(958 of 1,084)
Chronological subdivision components not matching <i>LCSH</i>	28.1%	(81 of 288)
Topical subdivision components not matching <i>LCSH</i> but on free-floating lists	94.6%	(1,424 of 1,522)
Topical subdivision components neither in <i>LCSH</i> nor on free-floating lists	4.2%	(98 of 2,352)

two-thirds (64.7%) of the topical subdivisions were not in *LCSH*, 93.6% of these conflicting topical subdivisions were on the lists. These constituted 38.2% of the total subdivisions, and while they are not direct matches with *LCSH*, they are relatively amenable to control since "matching" lists could be constructed.¹⁴ In sharp contrast, less than 1% (0.7%) of the conflicting chronological subdivisions were found on these lists.

CONFLICTING HEADINGS REQUIRING HUMAN INTERVENTION

Headings from the 9th and 8th Editions

While it is theoretically possible to use previous editions of *LCSH* as a list from which automated conversions could be made, the likelihood is that such changes will be made through human intervention. Still, these changes can be made more easily than is the case where headings are not found in any source.

A little less than half (46.8%) of the main headings not matching *LCSH* 10th edition were found in the 9th or 8th editions, with the majority of these (79.0%) appearing in the 9th edition. While 53.2% of the conflicting headings were not in any *LCSH* edition, it should be noted that 41.0% of these nonmatching headings did appear in the 10th edition in a slightly altered form, mostly notably as pattern headings, as with the 9th edition heading "Jews in Canada" appearing in the 10th as "Jews—Canada."

As expected, there was a higher percentage (55.1%) of conflicting topical headings found in previous editions than was true for geographic headings (39.7%).

Types of Changes from 8th or 9th to 10th

Nonmatching headings found in earlier *LCSH* editions were analyzed to determine how easily they could be converted to an authorized form. The type of conversion lending itself best to automated conversions is one involving a one-to-one change, as, for example, from "Mohammedans" to "Muslims." We were encouraged to discover that the majority (59.0%) of all the conflicting

headings were one-to-one changes. Of the one-to-one changes in the topical headings, 83.2% were unique. This was true for only 34.5% of the one-to-one changes in geographic headings.

The other types of heading changes are more problematic and would require human judgment for conversion, but they were relatively infrequent. Less than 5% of the conflicting headings were canceled and not replaced by any other heading. The same percentage applied to headings canceled and records split between two or more new headings, e.g., "Nurses and Nursing" becomes "Nurses" and "Nursing." Other problematic categories posed even less of a threat. There was only one occurrence of a heading that continues but also has some records split off into a new heading, e.g., "Molecular spectra" becomes "Molecular spectra" and "Molecular spectroscopy." There were zero occurrences of two or more headings collapsing into a new heading.

Less than a third (31.4%) of the conflicting headings were not found in any form in any edition of *LCSH*. When taken in the context of the total number of headings, the conflicting headings appear even less formidable. Of the total 3,814 headings, even the one-to-one changes constituted only 7.2% of the sample. The headings not found in any form in any edition of *LCSH* are 3.9% of the total. The remaining categories are each less than 1%

Research Question

Which conflicting headings requiring human intervention will be most difficult to convert, due to the complexity of the heading change or the absence of a source list?

Main Headings Not Found in Any Edition

As stated earlier, the analysis of heading changes showed that 31.4% of the conflicting main headings were not found in any form in any edition of *LCSH*; this represented 3.9% of the total headings.

Subdivisions Neither in *LCSH* nor on Free-Floating Lists

Subdivisions not found in neither *LCSH*

or on the free-floating lists are not an easily controllable category, since no finite source list can be used for matching. For the 2,352 topical subdivisions, however, few problems will be posed since only 4.2% were neither in *LCSH* nor the free-floating lists.

Conflicting Headings Resulting from Data Input Errors

Only 30 conflicting headings (0.8%) were found to contain data input errors resulting from either manual typing or from OCLC or RLIN input. Twenty-six of these involved spelling, punctuation, or capitalization, while only 4 were more substantive errors, such as missing words or incorrect heading formation. Twenty-one of the cases occurred with a main heading.¹⁵

CLASSIFICATION MATCH

The suggested LC Classification numbers attached to some LC subject headings could be of potential value in an online authority file that directed users from subject headings to corresponding classifications. In our study, we were interested to see the extent to which the call number from records in the bibliographic file matched the suggested LC classification as indicated in *LCSH* for main and subheadings.

Headings were analyzed for classification match between the local call number and the suggested LC number in *LCSH*. The analysis applied to headings that were listed first on the bibliographic records and were not analytic. As stated earlier, over half (53.5%) of the headings in our study were listed first. Over three-fourths (76.2%) of the eligible headings had a classification match. There were no substantial variations between topical (76.0%) and geographic (80.8%) headings.

The average number of subject headings for each LC broad class ranged from 1.4 for the A's to 2.6 for the U's, with an average of 1.8.

SUMMARY

Purpose and Scope of the Study

As libraries plan for the implementation of automated subject authority control, it will be necessary to determine which areas of subject authority control lend themselves

best to automated processes and which require human intervention. To provide a model for gathering data needed for such an assessment, this study sampled the bibliographic files at the University of Michigan Library to determine the extent to which topical and geographic headings matched headings in the *Library of Congress Subject Headings (LCSH)* 10th edition—and thus matched the *LC Subject Authority File (SAF)*—and analyzed the incongruent headings to ascertain the extent to which headings could be easily converted to authorized terms.

In addition, a classification notation was recorded for each heading in order to ascertain the degree of match between the LC classification numbers suggested in *LCSH* and those assigned by the University of Michigan Library.

A sample of 2,401 bibliographic records, yielding 4,264 subject headings, was chosen to achieve a confidence level of 95% and an error rate of 2%. A total of 3,814 topical and geographic headings were coded for match with *LCSH* 10th.

Summary of Findings

Exact Matches with LCSH 10th

The results were encouraging: forty-four percent of the complete topical and geographic headings matched *LCSH* 10th exactly, and for those complete headings without subdivisions, the rate of match was 88.4%. A corresponding high degree of match (87.7%) was discovered for main heading components. It can be said that, in terms of main headings alone, *LCSH* is likely to be largely consistent with headings in a library's catalog, assuming that there is a policy of adhering relatively closely to Library of Congress practice.

Nonmatching Main Headings Found in LCSH 9th and 8th

Conflicting main headings found in a previous edition of *LCSH* would require human intervention but could still be matched with valid *LCSH* 10th headings with relative ease. Forty-seven percent of nonmatching headings in our sample were in the 9th or 8th editions, and an additional 22% appeared in *LCSH* 10th in a slightly

altered form of heading from that found in a previous edition.

Forty percent of the headings located in a previous edition had cross-references in the 10th edition that would lead back to the earlier form. Thus, data would be available in machine-readable form on the LC SAF tapes for making a match.

If a nonmatching heading can be matched directly with a previous heading on a one-to-one basis, as with "Mohammedans" to "Muslims," global changes can be readily made in an automated system. We were therefore very encouraged to see that, of the nonmatching terms, 59% were one-to-one changes, and the more complicated types of changes requiring human intervention constituted only a small percentage (5% or less). As stated earlier, direct matches occurred with 88% of the main headings, so when considered in the total framework of all headings—both those with changes and those that match *LCSH*, the number of one-to-one changes constitutes only 7% of the total, the complicated changes constitute less than 1%, and those headings not found in any edition constitute only 4%.

Headings with Subdivisions Match

Since over two-thirds of the headings in the sample contained subdivisions and since *LCSH* does not list all of the main heading-subdivision combinations that will be found in a library's catalog, we were interested in the degree of match between subdivisions in *LCSH* and the catalog headings. The study found that 31% of the total 3,724 subdivisions matched *LCSH*.

Nonmatching Subdivisions on the Free-Floating Lists

Topical Subdivisions. While 69% of the subdivisions in the sample did not match *LCSH* and thus could not be derived directly from the LC SAF tapes, automated subject authority control systems could still effect a match if the nonmatching subdivisions were available from a source such as the "Free-Floating Subdivision" lists found in LC's *Subject Cataloging Manual: Subject Headings*. Such lists could be used to derive a file for matches on free-floating subdivisions. Since the free-floating lists

contain no geographical subdivisions and only a tiny percentage of chronological headings (less than 2% of the subdivisions in our sample), only topical subdivisions are likely candidates for a match on such lists. Topical subdivisions constituted 63% of the total number of subdivisions.

Our study revealed that 93.6% of the topical subdivisions that did not match *LCSH* were found on the free-floating lists. It seems apparent, therefore, that topical subdivisions might be controlled in automated systems with files of free-floating or pattern lists.

Chronological Subdivisions. Seventy-two percent of the chronological subdivisions were in *LCSH*. Less than 1% of the non-*LCSH* headings were on the free-floating lists. However, the 28% of chronological subdivisions that match neither *LCSH* nor the free-floating lists becomes less formidable when we consider that the chronological subdivisions constitute less than 8% of the total number of subdivisions. Thus, the chronological subdivisions would seem to be essentially controllable through *LCSH* despite the fact that a free-floating list would not serve to effect matches in any significant number.

Geographic Subdivisions. Less than 12% of the geographic subdivisions were found in *LCSH*. Since the free-floating lists cannot be used as a source for matching geographic subdivisions and since geographic subdivisions constituted 29% of the total subdivisions in our sample, it seems reasonable to conclude that this aspect of subject heading control will pose difficulties for automated systems.

CONCLUSIONS

The findings of this study strongly suggest that LC SAF and automated authority control systems offer promise when applied to main headings and topical and chronological subdivisions. Geographic subdivisions, however, will pose a problem unless free-floating lists of some kind can be developed for these as they have been for topical subdivisions. Since geographic main headings are available in the *LC Name Authority File*, it seems reasonable to explore the feasibility of developing an authorized list—at least in part—for geographic subdivi-

visions. Such a list would hold promise of helping automated systems move closer to the goal of achieving full authority control.

The high rate of match between *LCSH* and the assigned headings in the catalog of the University of Michigan Library differs sharply from the rate of match found in Ludy's study of the Ohio State online public catalog and the *SAF*. It is clear that further studies are needed to determine the reasons for such differences.

This study has been limited to a particular type of library: a large research library that has attempted to remain relatively

consistent with Library of Congress subject heading practice. It would be useful to undertake similar studies of libraries in other environments and to examine the effects of an automated subject authority system at the University of Michigan a few years hence.

ACKNOWLEDGMENT

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File," to appear in a forthcoming issue of *Library Resources & Technical Services*. She suggests that "the Library of Congress explore the feasibility of generating a file, apart from [SAF] which would contain all headings, including unprinted headings, that have been assigned to LC/MARC records."

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Integrating the Machine-Readable LCSH into Online Catalogs

Karen Markey

In April 1986 the Library of Congress Subject Headings (LCSH) became available in machine-readable form through the Cataloging Distribution Service of the Library of Congress (LC). The availability of the machine-readable Library of Congress Subject Headings (LCSH-mr) provides libraries with the opportunity to improve the online catalog with what online catalog users want most—the ability to view a list of words related to their search words. Soon, large-scale development efforts by bibliographic utilities, library systems staff, and integrated library system vendors will be undertaken to incorporate LCSH-mr into the authority control, reference inquiry, and online catalog components of their systems.

Research findings from the online catalog-use studies of the eighties can assist system designers who are planning to add LCSH-mr to their systems. Research findings do not specifically address online access to LCSH, because this tool was not yet available in machine-readable form. How-

in topical and geographic subject heading fields of OCLC records, see Anna E. Lantz, Edward T. O'Neill, and Diane Vizine-Goetz, "'Addrsses, Elctures, Essays' and Other Variant Subject Headings" in *Academic Libraries: Myths and Realities, Proceedings of the ACRL Third National Conference, Seattle, April 4-7, 1984*, p.183-86.

ever, findings can be consolidated into the following four generalizations that have serious implications for the design of patron access capabilities to LCSH in online catalogs:

1. The majority of subject access points entered by online catalog users fail to match the catalog's controlled vocabulary.

2. Library catalog users do not know that the source of the catalog's subject terms is a controlled vocabulary.

3. Online catalog users want lists of related terms incorporated into the catalog.

4. A fraction of the assigned subject headings in a library's database match subject headings from LCSH-mr bearing cross-references.

These generalizations are compelling evidence that an effective system design for patron access capabilities to LCSH must enable users to find appropriate controlled vocabulary describing their topics of interest, regardless of their ability to match the terms they enter with the catalog's controlled vocabulary. This paper discusses the specific research findings connected with each generalization. It recommends patron access capabilities that will forge LCSH-mr into an online catalog user's tool to

- gain access to the catalog's controlled vocabulary,
- explore relationships between LCSH headings, and
- penetrate the rich subject vocabulary of bibliographic records.

GENERALIZATION 1: FAILING TO MATCH CONTROLLED VOCABULARY

Virtually all online catalogs require users to enter or select exact matches of subject headings or words in subject headings and/

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or titles to retrieve bibliographic records. Yet, online catalog-use studies show that few users enter subject access points that exactly match the catalog's controlled vocabulary.

Transaction log analyses have been performed on keyword searches and/or alphabetical searches entered by SULIRS users at Syracuse University, MELVYL users at the University of California, and NOTIS users at Northwestern University. Fifty-three percent of keyword searches of subject heading fields and 40% of keyword searches of subject heading and title fields entered by SULIRS users at Syracuse University resulted in zero retrievals.¹ Thirty-five percent of keyword searches of subject heading fields entered by MELVYL users resulted in zero retrievals.² Alphabetical searches conducted by NOTIS users resulted in zero retrievals in 39% of searches.³

When subject searchers retrieve bibliographic records, there is no guarantee that retrieved records are relevant to their topics of interest. In the Dewey Decimal Classification (DDC) Online Project, researchers collected relevance assessments in patron and staff searches. Thirty-four percent of keyword searches of subject heading and title fields conducted by patrons resulted in zero retrievals. Keyword searches that retrieved one or more citations produced *relevant* citations in 53% of such searches. Seventy-two percent of alphabetical subject heading searches conducted by patrons resulted in zero retrievals. Alphabetical searches that retrieved one or more retrievals produced relevant retrievals in only

18% of such searches. Comparable results were obtained in keyword and alphabetical searches conducted by library staff (see table 1).⁴

GENERALIZATION 2: NOT KNOWING THE SOURCE OF CATALOG'S CONTROLLED VOCABULARY

Efforts to explain why so many subject searches result in zero retrievals reveal that users are not entering assigned subject headings or subject headings from LCSH. Only 29.8% of the subject searches entered by ILS searchers at the University of Maryland's Health Sciences Library matched assigned subject headings in the library's bibliographic records.⁵ In a sample of 188 SULIRS searches from transaction log data, terms entered by subject searchers were distributed into a half-dozen categories.⁶ Subject access points that matched assigned subject headings or subject headings from LCSH represented only 18% of the total subject access points in the sample, and 93% of these access points retrieved one or more bibliographic records. In contrast, 35% of the total subject access points in the sample fell into the "whatever popped into the user's mind" category, and 65% of these access points resulted in zero retrievals.

Searchers' failure to match subject headings in LCSH may be attributed to the fact that they do not know that the library catalog employs a controlled vocabulary. In a survey of SCORPIO users at the Library of Congress, respondents identified the source

Table 1. *Retrieving Relevant Records in Online Catalog Searches*

<i>Search Results</i>	<i>Patrons</i>	<i>Staff</i>
Selection of the keyword search	371	284
Percentage of searches resulting in zero retrievals	34	21
No. of keyword searches resulting in one or more retrievals	245	225
No. of keyword searches resulting in one or more retrievals and relevant items	130	139
Percentage of keyword searches resulting in one or more retrievals and relevant items	53	62
Selection of alphabetical search	260	260
Percentage of searches resulting in zero retrievals	72	71
No. of alphabetical searches resulting in one or more retrievals	73	75
No. of alphabetical searches resulting in one or more retrievals and relevant items	13	17
Percentage of alphabetical searches resulting in one or more retrievals and relevant items	18	23

of their subject terminology from a list of six choices. Half of the 125 respondents said that they "browsed randomly under a word they knew."⁷ When VTLS users at Virginia Polytechnic Institute were surveyed about their knowledge of the catalog's controlled vocabulary, only 29% of the users knew that subject searching required the entry of an assigned subject heading based on LCSH, and 42% plainly did not know the source of subject terms.⁸ University of Houston students were surveyed about the sources of terms that could be used when searching the card catalog and the library's GEAC online catalog. "Only 40% of respondents indicated 'only those terms listed in the Library of Congress Subject Headings.'"⁹ The findings of these separate studies are evidence that the majority of online catalog users do not know that the subject terms in the online catalog come from a controlled vocabulary. Thus, they enter subject terms that come to mind rather than consulting LCSH.

When a user fails to retrieve relevant items or match a subject heading, most online catalogs fail to provide proper guidance for continuing the search in a successful or fruitful way. To make matters worse, users respond to unsuccessful searches in ways that frequently have an adverse effect. For example, a user whose search results in zero retrievals terminates the search, thinking that the library does not have any material on the topic of interest. A user whose search retrieves no relevant items reformulates the access point in terms that are broader than the specific topic of interest.¹⁰ Following the rule of specific entry, library catalogers assign the most specific subject heading to express the subject matter of library material; consequently, users who enter broader terms retrieve output that is broader than their topics of interest.

To overcome these difficulties, system designers must equip online catalogs with ameliorative capabilities such as word normalization or spelling correction algorithms that try to effect a match between the terms users enter and the controlled vocabulary of the catalog. Once a match is made, the online catalog should guide users to related or narrower subject headings to

pinpoint material specific to their topics of interest.

GENERALIZATION 3: WANTING LISTS OF RELATED TERMS

When presented with a list of fourteen online catalog improvements, the majority of the approximately eight thousand respondents in the nationwide Online Catalog Project sponsored by the Council on Library Resources (CLR) chose a capability "to browse a list of words related to their search words."¹¹ Some subject searchers erroneously assume that the alphabetical lists of assigned subject headings displayed in alphabetical searches are lists of *related* terms. This conclusion was drawn by interviewers in the DDC Online Project who observed and queried searchers about their online search strategies. For example, a searcher looking for items on "Women in U.S. Colonial History" responded to the following alphabetical list of assigned subject headings by selecting the heading "Wood-engraving, American" on line I:

```
>>>>>YOUR REQUEST. . .sa:women in
col history
*CHECK THIS LIST OF SUBJECTS IN AL-
PHABETICAL ORDER. IF YOUR SUBJECT IS
NOT LISTED, TRY ANOTHER SEARCH OP-
TION.
A 3 Wolfe, James—1727-1759
B 1 Women as mathematicians
C 1 Women in literature and art
D 1 Women in New York (City)
E 1 Women—Biography
F 1 Women—Legal status, laws, etc.—New
  York (State)
G 1 Women—New York (City)
H 2 Wood, Fernando—1812-1881
I 1 Wood-engraving, American
```

When asked why she selected this heading, she said that she thought this list contained related terms, i.e., terms that were related conceptually to terms she entered. By selecting the heading "Wood-engraving, American," she expected to retrieve an item about a renowned, female, American wood engraver in U.S. colonial times.¹²

Now that LCSH-mr is available, system designers can incorporate LCSH subject headings and term relationships into online catalogs to provide users with the initial

stimulus to browse subject headings and refine their subject access points accordingly. No longer do online catalog users have to *know* that they must first examine the printed *LCSH* (i.e., the big red books located near public access terminals) to find appropriate subject headings to express their topics of interest. Rather, *LCSH-mr* can be an online tool to guide users to appropriate subject headings or related terms in *LCSH* or to assigned subject headings in bibliographic records.

GENERALIZATION 4: A FRACTION OF ASSIGNED SUBJECT HEADINGS MATCH LC SUBJECT HEADINGS

The availability of *LCSH-mr* provides system designers with the opportunity to improve the online catalog with what online catalog users want most—the ability to view a list of words related to their search words. However, not every subject heading in *LCSH* or assigned subject heading in bibliographic records is associated with a list of related terms.

Various researchers have estimated that 20% of *LCSH* are orphan headings (i.e., subject headings that are not accompanied by one or more cross-references or suggested LC class numbers). This means that one of every five headings is not connected to the syndetic structure of *LCSH* and does not provide term relationship information.¹³

When building subject authority records based on *LCSH-mr* for LCS at Ohio State University, Ludy reported that 10% of topical subject headings in *LCSH-mr* had been assigned to bibliographic records in LCS. At best, 10% of the assigned subject headings in LCS now provide the system's users with cross-references. Results of a study of assigned subject headings from the University of Michigan library's shelflist are encouraging: in this study, 44% of assigned subject headings matched *LCSH* subject headings.¹⁴

Reasons for the low percentage of *LCSH* headings that appear in assigned subject headings are

1. Catalogers' addition of free-floating subdivisions to main headings, e.g., Pho-

tography, Artistic—Exhibitions

2. Catalogers' addition of geographical subdivisions to main headings, e.g., Architecture—New York(State)—Buffalo

3. Catalogers' assignment of subdivisions and references to a heading governed by a model or pattern heading, e.g., Basketball—Coaching (pattern for sports)

4. Out-of-date headings from previous *LCSH* editions

5. Catalogers' assignment of unauthorized main headings and/or subdivisions

6. Spelling and typographical errors

7. Subfield coding errors¹⁵

Mary K. D. Pietris, chief of LC's subject cataloging division, gives additional reasons:

1. LC's creation of subject headings to maintain the reference structure

2. Creation of subject headings for filmstrips or nonbook materials

3. Subject headings in a non-MARC record

4. "Multiple" subject headings, e.g., Etching, American [Belgian, etc.]

5. Subject headings divided by place for which their unsubdivided form has not been assigned

6. Authority records for main headings created to attach a subdivision¹⁶

MAJOR IMPLICATIONS OF GENERALIZATIONS FOR ACCESS

Simply adding *LCSH-mr* into local online catalogs will provide users with extremely few opportunities to tap *LCSH* as a source of related terms for two reasons:

- few users enter terms that match *LCSH*, and

- few assigned subject headings from bibliographic records match *LCSH*.

In the rare instances when users match a subject heading from *LCSH-mr*, chances are that the subject heading will be posted (i.e., it has been used in one or more of the catalog's bibliographic records) and retrieve bibliographic records, some of which will be relevant. Such a search outcome will be satisfactory for the majority of users; most will record a few book titles and call numbers at the catalog, terminate the search, then proceed to the bookshelves. In

such searches, patrons will probably not need cross-references associated with the heading they matched.

In a far more typical scenario, the user enters a term that does *not* match a subject heading in LCSH or in bibliographic records, and the search results in zero retrievals. The system responds with a "NO ITEMS FOUND" message and prompts the user to enter another term. Online catalog users who have had this experience are undoubtedly the many users clamoring for related term lists. What they are really asking is, When I can't match my terms with those in the catalog, why can't the system provide a list of terms related to the ones I entered?

TRANSFORMING LCSH INTO AN ONLINE CATALOG USER'S TOOL

The potential of LCSH-mr as an online catalog user's tool can be realized if online systems are equipped with

- ameliorative techniques that effect links between the terms users enter and the catalog's controlled vocabulary and
- searching capabilities that effect links between the subject information in bibliographic records (e.g., titles, subject headings) and subject headings in LCSH.

EFFECTING MATCHES BETWEEN USER-ENTERED TERMS AND SUBJECT INFORMATION

This section presents various ameliorative techniques that can be implemented to match user-entered terms with the subject information in LCSH or in bibliographic records. When users enter their terms into the catalog, the system searches for exact matches of the following subject information in LCSH or bibliographic records:

1. Posted LCSH
2. Unposted LCSH
3. Assigned subject headings in bibliographic records
4. "Free text," i.e., words from subject headings, titles, contents notes, summary notes, or series titles in bibliographic records

The system maintains the above order of precedence when searching the term that

the user has entered. The order is intended to improve the precision of the system's response to the user and the end result of the search.

The system's initial response is to find a posted LCSH that exactly matches the term the user entered. If an exact match is not found, the system looks for an exact match of an unposted LCSH followed by an exact match of an assigned subject heading, and finally performs a "free text" (or keyword) search to find an exact match of words in the user-entered term with words from subject-rich fields of bibliographic records.

As soon as the system finds an exact match of the user-entered term, the system responds with a report of the number of items retrieved and the option to display retrieved records. In most searches, users will be satisfied with the results, record some titles and call numbers, terminate the search, then proceed to the bookshelves. However, users who are not satisfied can explore LCSH and/or assigned subject headings to refine their search through information search tactics such as those presented in subsequent sections of this paper.

Previous research studies have demonstrated that few users enter terms that exactly match the catalog's controlled vocabulary or keywords from bibliographic records. When a user-entered term fails to match LCSH, assigned subject headings, or other subject-rich information in bibliographic records, the system should employ one or more of the following ameliorative techniques to effect a match:

- disregard capitalization,
- disregard punctuation,
- correct the spelling,
- apply "intelligent" truncation that takes into account frequently occurring suffixes and word length,
- normalize word order, and
- employ the best match (e.g., match of two of three words in a three-word term).

The techniques are not listed in any order of precedence. Research with such techniques could suggest both an order of precedence and particular fruitful combinations of techniques for effecting a match.

As soon as the system approximates a match of the user-entered term, the system

responds with a report of the number of items retrieved and the option to display retrieved records. In most searches, users will be satisfied with the results, record some titles and call numbers, terminate the search, and browse the bookshelves. However, a user who is not satisfied can explore LCSH and/or assigned subject headings to refine the search through various information search tactics.

EXPLORING THE CATALOG'S CONTROLLED VOCABULARY USING INFORMATION SEARCH TACTICS

Systems can offer users various information search tactics to improve the precision of search output through the users' exploration of the catalog's controlled vocabulary, i.e., LCSH subject headings or the assigned subject headings in bibliographic records. Marcia Bates defines a search tactic as "a move made to further a search" and promotes information search tactics for improving search effectiveness and precision in both manual and online environments.¹⁷ Bates' information search tactics SUB, RELATE, SUPER, and TRACE can guide online catalog users from the terms they enter to relevant LCSH or assigned subject headings and thence to relationships among subject headings.

Relationships among subject headings are represented by the cross-reference structure of LCSH. In LCSH-mr subject authority records, MARC tags 150 and 151 designate established topical and geographical subject headings, respectively. LCSH cross-reference structure is designated by MARC tags 450, 451, 550, and 551 of subject authority records. Topical and geographical terms that are not used in LCSH are found in MARC tags 450 and 451 and called "see" references in the printed LCSH. When processed into online bibliographic systems, "see" references guide searchers from a nonpreferred term to the established LCSH heading in MARC tags 150 or 151.

In MARC tags 550 and 551 of subject authority records, topical and geographical subject headings are enumerated that are broader than or related to the established

heading in MARC tags 150 or 151. In the printed LCSH, these headings are called "see also from" tracings.

References to narrower headings are not explicitly tagged in subject authority records. Narrower headings are reciprocals of tracings in MARC tags 550 and 551 and as such can be machine generated in online bibliographic systems. Narrower subject headings are explicitly designated in LCSH as "see also" references.

Related subject headings are enumerated in both "see also" references and "see also from" tracings in LCSH. In subject authority records, related headings are designated by specific coding in the w-subfield of MARC tags 550 and 551 and as such can be machine generated in online bibliographic systems.

Subject Headings or "See From" References in LCSH

When the user-entered term is an exact or approximate match of a subject heading or "see from" reference in LCSH, the system responds with a report of the number of items retrieved and the option to display bibliographic records. At this point, most users will be satisfied and terminate their online catalog search. When they are not satisfied, the system can offer various paths for refinement through the SUB, SUPER, and RELATE information search tactics (see figure 1).

When the user views displays of a few retrieved records or makes a move to enter a different search term, the system can query the user about possible dissatisfaction with retrieved records. If the user feels the retrieved records are too broad, the system invokes the SUB tactic "to move downward hierarchically to narrower headings."¹⁸ The catalog responds with a display of narrower ("see also") subject headings from LCSH. The user can select listed headings and display retrieved records. The system can also respond to the user's need for narrower terms by displaying assigned subject headings categorized by the four various types of LC subdivisions, i.e., geographical, form, topical, chronological, or subdivision mixtures.

If the user feels the retrieved records are

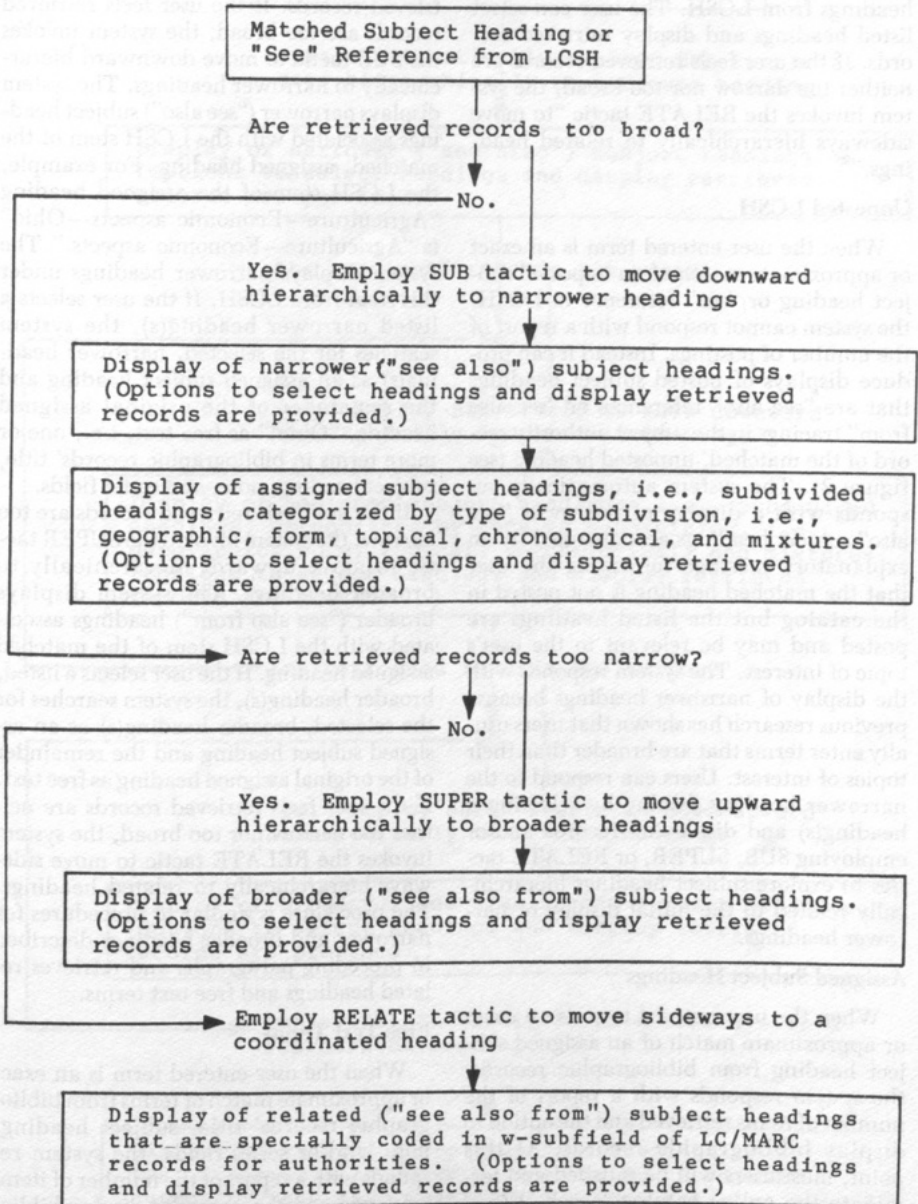


Fig. 1. Search Tactics for Refinement of Searches When a User-Entered Term Matches LCSH.

too narrow, the system invokes the SUPER tactic "to move upward hierarchically to broader headings."¹⁹ It responds with a display of broader ("see also from") subject headings from LCSH. The user can select listed headings and display retrieved records. If the user feels retrieved records are neither too narrow nor too broad, the system invokes the RELATE tactic "to move sideways hierarchically to related headings."²⁰

Unposted LCSH

When the user-entered term is an exact or approximate match of an unposted subject heading or "see" reference in LCSH, the system cannot respond with a report of the number of postings. Instead it can produce displays of posted subject headings that are "see also" references or "see also from" tracings in the subject authority record of the matched, unposted heading (see figure 2). The system automatically responds with a display of narrower "see also" subject headings accompanied by an explanatory message informing the user that the matched heading is not posted in the catalog but the listed headings are posted and may be relevant to the user's topic of interest. The system responds with the display of narrower headings because previous research has shown that users usually enter terms that are broader than their topics of interest. Users can respond to the narrower heading display by selecting a heading(s) and displaying records and/or employing SUB, SUPER, or RELATE tactics to explore subject headings hierarchically related to the initial display of narrower headings.

Assigned Subject Headings

When the user-entered term is an exact or approximate match of an assigned subject heading from bibliographic records, the system responds with a report of the number of items retrieved and the option to display bibliographic records. At this point, most users will be satisfied and terminate the online catalog search. When they are not satisfied, the system can offer various paths for refinement through SUB, SUPER, and RELATE tactics (see figure 3).

When a user displays a few retrieved records or makes a move to enter a different search term, the system can query the user about possible dissatisfaction with retrieved records. If the user feels retrieved records are too broad, the system invokes the SUB tactic to move downward hierarchically to narrower headings. The system displays narrower ("see also") subject headings associated with the LCSH stem of the matched, assigned heading. For example, the LCSH stem of the assigned heading "Agriculture—Economic aspects—Ohio" is "Agriculture—Economic aspects." The system displays narrower headings under this stem from LCSH. If the user selects a listed narrower heading(s), the system searches for the selected, narrower heading(s) as an assigned subject heading and the remainder of the original assigned heading, "Ohio," as free text, i.e., one or more terms in bibliographic records' title, subject heading, note, and series fields.

If the user feels retrieved records are too narrow, the system invokes the SUPER tactic to move upwards hierarchically to broader headings. The system displays broader ("see also from") headings associated with the LCSH stem of the matched assigned heading. If the user selects a listed, broader heading(s), the system searches for the selected, broader heading(s) as an assigned subject heading and the remainder of the original assigned heading as free text. If the user feels retrieved records are neither too narrow nor too broad, the system invokes the RELATE tactic to move sideways hierarchically to related headings. The procedure is similar to procedures for narrower and broader headings described in preceding paragraphs and retrieves related headings and free text terms.

Free Text Terms

When the user-entered term is an exact or approximate match of terms from bibliographic records' title, subject heading, note, and/or series fields, the system responds with a report of the number of items retrieved and the option to display bibliographic records. At this point, most users will be satisfied and terminate the online catalog search. When they are not satisfied, the system invokes the TRACE tactic "to

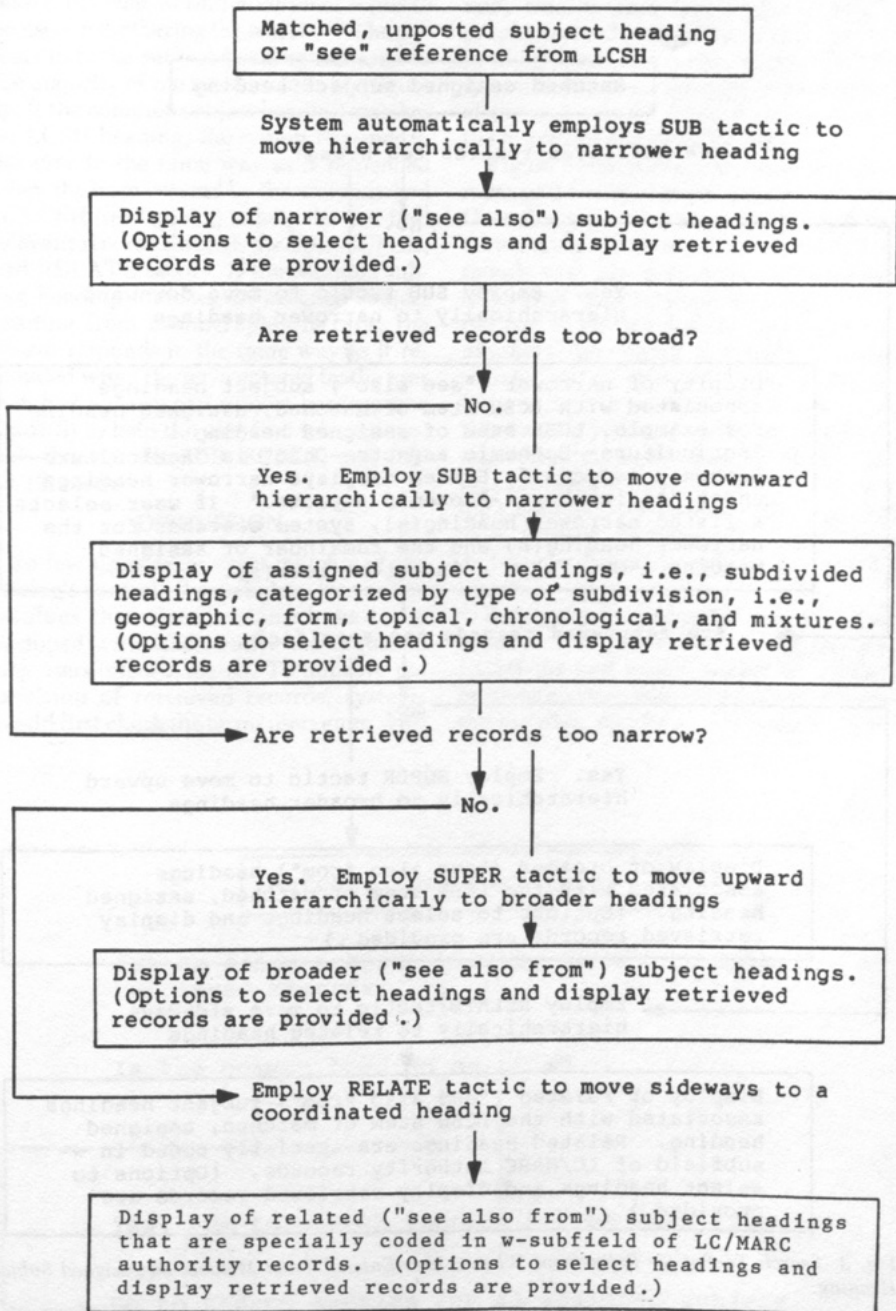


Fig. 2. Search Tactics for Refinement When a User-Entered Term Matches an Unposted LCSH.

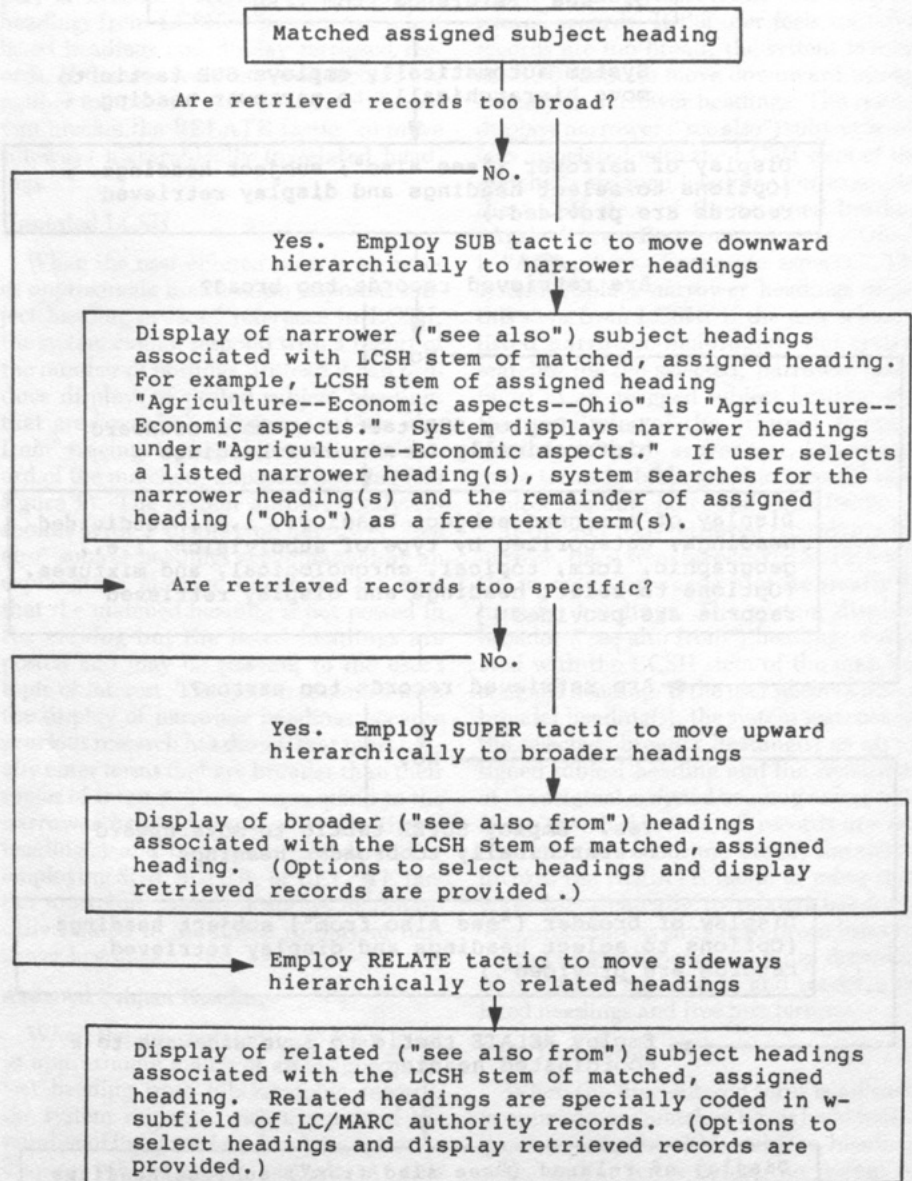


Fig. 3. Search Tactics for Refinement When a User-Entered Term Matches an Assigned Subject Heading.

examine information already found in the search in order to find additional terms to be used in furthering the search."²¹ The system finds the subject heading common to the majority of retrieved records (see figure 4). If the common subject heading matches an LCSH heading, the system responds to the user in the same way as it responded when the term entered by the user matched an LCSH (see figure 1) to help the user find relevant records through the SUB, SUPER, and RELATE tactics. If the common subject heading matches an assigned subject heading from bibliographic records, the system responds in the same way as it responded when the term entered by the user matched an assigned subject heading (see figure 3) to help the user find relevant records through the SUB, SUPER, and RELATE tactics.

DISCUSSION

So few users enter exact matches of the catalog's controlled vocabulary into online catalogs that these systems have to be equipped with ameliorative techniques to help users effect a match. To improve the precision of retrieved records, systems should first check the terms users enter with

LCSH, then assigned subject headings, and, finally, free text terms in bibliographic records, e.g., title words, subject heading words, series title words. Once the system finds an exact or approximate match of the user-entered term, it responds with the display of retrieved records.

Figure 5 summarizes the various refinement paths offered to online catalog users. Once the system makes an exact or approximate match of the user-entered term, it responds with the display of retrieved records. Most searchers will be satisfied with the result, record several titles and call numbers, terminate the online catalog search, and proceed to the bookshelves. Others will continue their searches. Whether they have matched subject headings or free text terms, they can employ various refinement paths to browse the catalog's controlled vocabulary through the SUB, SUPER, or RELATE search tactics and eventually improve the precision of the search.

Because no intellectual evaluation of references was done when LC released LCSH-mr and a new policy on making cross-references was introduced in 1985, the broader, narrower, and related head-

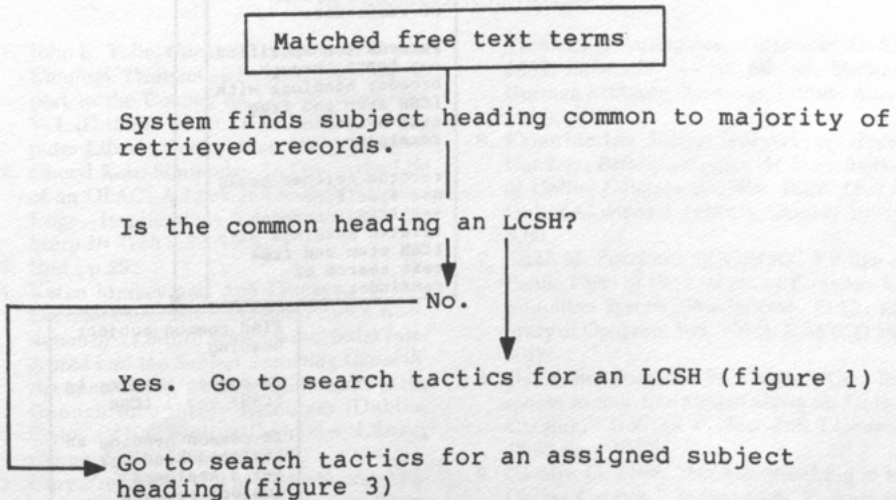


Fig. 4. Search Tactics for Refinement When a User-Entered Term Matches Keywords in Bibliographic Records.

Exact or approximate match
of user-entered term with:

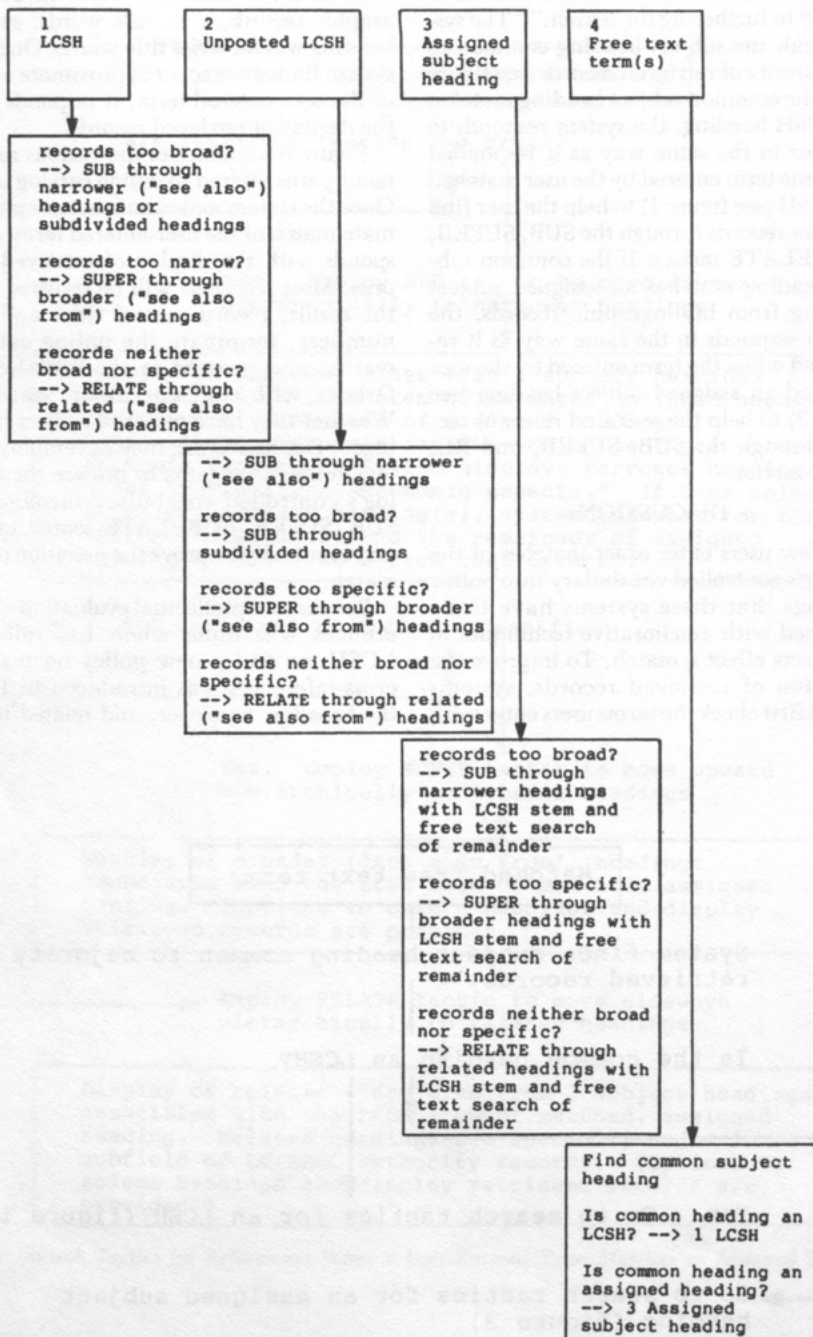


Fig. 5. Refinement Paths.

ing designations may be incorrect for certain headings.²² When users employ SUB, SUPER, and RELATE search tactics to browse LCSH, the catalog's response (i.e., displays of broader, narrower, or related subject headings) may not adequately describe the relationships between some subject headings. Instead these designations are an approximation of term relationships that may be used until LC completes an editorial review of LCSH.

Often LCSH subject headings are not accompanied by all three types of term relationships. For example, a subject heading may be accompanied by broader headings but no narrower or related headings. In this case, systems should provide users with only the SUPER search tactic because no other tactics are possible. When LCSH headings are orphans (i.e., accompanied by no cross-references) systems can still offer the SUB tactic by displaying the orphan heading with subdivisions. They can offer the SUPER and RELATE tactics by treating the heading as though it were an assigned subject heading, i.e., displaying broader or related headings for the LCSH stem of the orphan heading.

This is a critical time when system designers are planning to incorporate LCSH-mr into bibliographic services and

integrated library systems. In the absence of significant system enhancements, the addition of LCSH-mr will affect only those assigned subject headings in a library's database that exactly match subject headings in LCSH-mr. Online catalog-use studies show that few users match their terms with LCSH or assigned subject headings; experience with LCSH-mr reveals that a fraction of the assigned subject headings in a library's database will be exact matches of subject headings in LCSH-mr. Consequently, subject searchers will seldom retrieve and browse the related terms they want included in online bibliographic systems.

Ameliorative techniques, search refinement, and information search tactics have been presented in the context of online catalog searching to maximize users' chances of accessing and exploring the catalog's controlled vocabulary to find headings that best describe their topics of interest. Through these methods, LCSH can be forged into an online tool to ensure that searchers gain access to the catalog's controlled vocabulary, explore relationships between LCSH headings, and penetrate the rich subject vocabulary that resides in bibliographic records. ■■

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Twenty Years Ago in JOLA

The computer will play a major part in how libraries are organized and operated because libraries are part of the fabric of society and computers are becoming a daily accepted part of life.

Herbert S. White quoted by Jack W. Scott in "An Integrated Computer Based Technical Processing System in a Small College Library," *JOLA* 1, no.3:150 (Sept. 1968).

Contributed by Michael Gorman.

Twenty Years Ago in JOLA

- (1) That a national policy be formulated to further maximum utilization and exploitation of scientific and technical information.
- (2) Some agency, new or existing, should be given the authority to implement national policy decisions for the dissemination of scientific and technical information derived from public funds.
- (3) Subscriptions should be lowered or the services should be provided at no charge.
- (4) Dissemination should extend to all graduate students, industrial firms, and educational and nonprofit institutions that derive benefit from their use.

F. W. Lancaster summarizing I. M. Klemptner's recommendations in *Diffusion of Abstracting and Indexing Services for Government Sponsored Research*, *JOLA* 1, no.3:215-16 (Sept. 1968).

Contributed by Michael Gorman.

Reports and Working Papers

User Interaction with the Authority Structure of the Online Catalog: Results of a Survey

Julie Blume Nye

A survey was conducted during 1987 to identify how online catalog users interact with various aspects of the catalog's authority control structure. Questionnaires were sent to major online catalog system vendors and to selected university libraries and networks known to have developed in-house online catalogs; additional copies were distributed to ACIG meeting participants during the ALA Conference in San Francisco, June 1987. Twenty-one usable responses were received, twelve describing commercially available systems (hereafter referred to as vendor systems) and nine from locally developed systems (local).

This survey was directed at how online catalog users interact with the authority structure of the catalog while searching; what displays or messages relating to authority information are seen and what capabilities exist in the system to help users understand and make best use of the relationships between headings. We were par-

ticularly interested in whether commercially available systems and systems developed in-house took different approaches to these issues. The results indicate some healthy diversity but, for the most part, surprising commonality: the differences within each group were often greater than differences between groups. Responses from both groups have been summarized together here rather than attempting to characterize "the vendor approach" and "the local system approach" separately.

Not surprisingly, all systems control name headings, with a large majority also controlling series and uniform titles and subject headings (see table 1). Nine respondents reported that subject subdivisions are also controlled (but the questionnaire did not ask how). More than 80% of the systems can handle multiple authorities (LCSH and MeSH) but none have developed links across thesauri unless the library staff explicitly create cross-references between individual headings (e.g., to relate LCSH "Cancer" and "Tumors" to MeSH "Neoplasms").

Respondents were asked what kind of messages and displays are presented in the following situations: (1) user searches authorized heading; (2) user searches unauthorized heading when cross-reference exists; and (3) user searches unauthorized heading when no cross-reference exists. Other questions concerned the terminology used for "see" and "see also" references, the circumstances under which related headings are displayed, and displays of authority records themselves. Respondents were also questioned regarding the basis for some system design decisions, the type of information logged during system use, and aspects of the system that could be customized by the library. The results of these questions are summarized below.

Julie Blume Nye is Functional Design Manager, Triangle Research Library Network (University of North Carolina-Chapel Hill). This paper was prepared for the Ad Hoc Committee on Patron Interaction/Online Displays, LITA/RTSD Interest Group on Authority Control in the Online Environment.

Preliminary results of this survey were presented at the 1988 Midwinter Meeting of the Ad Hoc Committee in San Antonio.

USER SEARCHES AUTHORIZED HEADING

- 50% display an index or list of headings (usually with the number of items for each heading); user chooses from list to display item records.

- 50% retrieve and display items directly.

- Some systems will display either authority records, bibliographic records, or both, depending on user identification, terminal, or some other criterion.

USER SEARCHES UNAUTHORIZED HEADING WHEN CROSS- REFERENCE EXISTS

- 50% display only the cross-reference, requiring the user to do something before items are actually displayed.

- 50% display the cross-reference *and* the number of items retrieved or the items themselves.

- Only 1 system automatically redirects the search under the authorized form and displays items without explaining to the user what has happened.

Vendors were evenly split between (1) showing the user the preferred form of the heading while automatically retrieving the results and (2) showing the preferred form and allowing the user to redirect the search without having to rekey. In contrast, local systems were evenly split among (1) requiring the user to identify the authorized form of the heading before any search could be carried out, (2) showing the preferred form and requiring the user to rekey, and (3) showing the preferred form and allowing the user to redirect the search without rekeying.

USER SEARCHES UNAUTHORIZED HEADING WHEN CROSS-REFERENCE DOES NOT EXIST

- 5% display a related list of headings, usually the closest headings alphabetically to what the user searched; keyword-based systems do not provide this feature.

TERMINOLOGY USED FOR DISPLAY OF "SEE" REFERENCES

- "See _____" (6 systems).
 - "Known as _____" (2).
 - Library can customize wording (2).
- Other variations (each reported once) are shown in figure 1.

TERMINOLOGY USED FOR DISPLAY OF "SEE ALSO" REFERENCES

- "See also" (6 systems).
 - Some form of "related _____" (7 systems; variations include "related heading," "related name," "is related to," etc.).
- Other variations (each reported once) are shown in figure 2.

About half the systems reported using different terminology for related subjects than for related names or titles.

DISPLAY OF "SEE ALSO" REFERENCE INFORMATION TO USERS

- 50% display references automatically.
- 40% allow user to display related terms as an option (some automatically indicate that related terms exist, others do not).
- 10% (2 vendors) allow the library to choose either approach.

CHECK FOR BLIND REFERENCES

- 60% check and prevent blind references from being displayed.
- 40% do not check for blind references (but many respondents noted that the authority control system prevents the creation of blind references to begin with).

ACCESS TO AUTHORITY RECORDS

- All systems index authority records under the established heading (1XX) and cross-references (4XX and 5XX).
- 33% (6 vendors, 2 local) provide access by other fields in the record, usually some combination of 66X and 67X tags.

Table 1. Types of Headings Under Authority Control

	Total (%)	Vendors	Local
Names	100	21	9
Series	81	12	5
Uniform titles	81	11	6
Subjects	86	12	6
Subject subdivisions	43	8	1

Other variations (each reported once) include:

- "search ____"
- "search for ____"
- "search under ____"
- "look under ____"
- "found under ____"
- "try ____"
- "records will use ____"
- "are cataloged by this library under the term ____"
- "cross reference: ____"
- "____ is used instead"
- "____ is used for ____"
- "____ replaces ____"
- "also known as ____" (local; does not support see-also references)

Fig. 1. Terminology for "See" References: Variations Reported Once.

- "search also ____"
- "search also under ____"
- "also known as ____"
- "also found under ____"
- "also try ____"
- "also search for ____"
- "other entries:"
- "xx: "
- "earlier name:" or "later name:"
- "broader term:" or "narrower term:"

Fig. 2. Terminology for "See also" References: Variations Reported Once.

DISPLAY OF AUTHORITY RECORDS THEMSELVES

- 15% (3 vendors) display authority records only to technical services staff.
- 75% display authority records to any staff member.
- 10% (1 vendor, 1 local) cannot display authority records at all.

Fourteen systems (6 vendors, 8 local) also permit library patrons to view authority records. Nearly all systems have a MARC (tagged) authority record display. Systems that allow library patrons to see authority records are twice as likely to offer a simpler, labeled display in addition to a tagged display.

HOW QUICKLY ARE CHANGES TO HEADINGS REFLECTED IN THE CATALOG?

- 10 of 12 vendors (83%) update immediately or within a few hours.
- 4 of 9 local systems (44%) update immediately or within a few hours.
- 2 local systems cannot update authority records at all (so bibliographic records must be changed directly).

Four local systems volunteered comments about delays in reindexing to permit access by changed headings: indexes are updated overnight (1 system), on weekends (2), or monthly (1).

OTHER USER-INTERFACE ISSUES

- 33% include information about cross-references or the authority structure in on-line help information for users.
- Aspects of the authority system that can be customized by the library:

	Vendors	Local
Format of displays	5	6
Display/sort order	4	4
Terminology used	6	7
Help screen contents	10	6

Three local systems volunteered comments that any aspect of the system can be changed.

- Design of screen displays and user interaction was based on:

	Vendors	Local
Published literature	8	4
In-house experiments	9	4
Input from library staff	10	6
End-user studies	6	0
Minimize disk space	1	1
Minimize response time	9	2

Other comments referred to experience with other online catalogs and the need to be consistent with other components of the system.

- Information collected on interaction with authority system:

Many systems log all searches entered (with varying levels of detail about search results); others log only a sample of system usage.

One vendor logs all "no items retrieved" searches, so library staff can create appropriate cross-references.

CHANGES OR ENHANCEMENTS PLANNED

- Changes in displays (many systems mentioned this).
- More frequent updating (2 local systems).
- Placing other types of headings under authority control.
- Ability to restrict global change to specific tags and subfields.
- Permit local creation of authority records.
- Elimination of blind cross-references.

ACKNOWLEDGMENT

The assistance of the following members of the Ad Hoc Committee is gratefully acknowledged: Amira Aaron, Jinnie Y. Davis, Dee Michel, and Barbara B. Tillet. ■■

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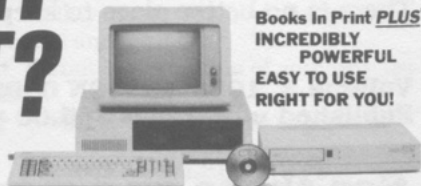
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News and Announcements

Colorado Alliance of Research Libraries Expands Marketing Activity: Initiates Serials Access and Control Project

The Board of Directors and Council of the Colorado Alliance of Research Libraries (CARL) has voted to create CARL Systems, Inc., an affiliated organization that will actively market CARL systems and services to libraries and information centers.

At the same time, CARL announced the appointment of Rebecca T. Lenzini to serve as president of the newly created company. Lenzini most recently held the position of vice-president and director of Academic Information Services for the Faxon Company in Westwood, Massachusetts.

CARL Systems, Inc., has announced plans to develop and implement online access to periodical articles. Over 10,000 journals representing the spectrum of disciplines will be included in the project. Plans call for the database to be available through the existing CARL network and, through subscription, to dial up users, dedicated terminals, and other networks.

The Colorado Alliance of Research Libraries was formed in 1978 to coordinate and extend the research resource provided by its members, which include Auraria Library, Colorado School of Mines, Denver Public Library, University of Colorado, University of Denver, and University of Northern Colorado. Arizona State University and Regis College are associate members.

CARL introduced its online system in 1981 and currently supports over 500 terminals and approximately three million bibliographic records. Over 30,000 people use the system each day.

The CARL system is installed in four additional locations: Arizona State Univer-

sity, Boulder Public Library, MARMOT (serving Colorado's western slope), and Pikes Peak Library District. ■■

INNOPAC Software to Run on DEC Equipment for the University of Maine System

The University of Maine System has signed contracts for a systemwide online public access catalog and circulation services with Innovative Interfaces, Inc., and Digital Equipment Corporation. The agreements provide for Innovative Interfaces to develop automated library services and Digital to cooperate with them in providing hardware that will operate in a multi-institutional environment for the University of Maine System libraries. This marks the first installation of INNOPAC on DEC equipment.

The INNOPAC software, written in the C language, will operate on Digital's VAX 8530, a midrange VAX system providing ULTRIX software for UNIX environments. The initial installation will support over 150 simultaneous users at the eight campus libraries linked to the VAX system located in Orono in the computer and data processing center. Access also will be available via existing switches and dial-up lines for other campus buildings and offices.

INNOPAC software will provide the libraries with a shared online public access catalog, circulation control, cataloging and maintenance subsystems, and electronic links to the INNOVACQ acquisitions and serials systems, as well as the OCLC and RLIN bibliographic utilities. The database load, scheduled for late June, will comprise the machine-readable holdings of five of the eight libraries, totaling over 600,000 copies. Plans to convert the remaining retrospective holdings of the libraries call for completion within the next

academic year, creating an estimated 800,000 unique titles and over a million copies.

The implementation schedule targets the availability of the online catalog for the start of classes this fall. Automated circulation services on the Orono campus also are planned for September, with circulation "start-up" scheduled for the other campus libraries throughout the fall semester. ■■

Personal Bibliographic Software, Inc., Announces Pro-Cite for the Macintosh

Personal Bibliographic Software (PBS) has announced the release of Pro-Cite for the Macintosh, the all-new successor to the Professional Bibliographic System. Pro-Cite is a database management system designed to manage references and format bibliographies automatically.

Pro-Cite for the Macintosh offers users options for building a personal database for bibliographic references. The program includes twenty predefined work forms such as journal, book, and dissertation and six work forms users can design for their own specific needs. After a work form has been chosen users can enter information or, using PBS Biblio-Links, automatically transfer records retrieved from an online database into Pro-Cite. Once in Pro-Cite, records can be searched, sorted, edited, indexed, and formatted into citations according to any bibliographic style. New features include: pop-up authority lists (lists of key names, journal titles, etc.); global find and replace; a new punctuation file interface; font/style/size support on the screen; support for the MacWrite document format; compatibility with data files from IBM

Pro-Cite; and the removal of copy protection. Users can search references using full Boolean logic and sort on up to six levels. Users can also prepare a bibliography from a manuscript using Pro-Cite's In-text Reference option.

Pro-Cite automatically formats bibliographies according to many standard punctuation styles. Punctuation for ANSI, APA, MLA, *Science* magazine, and over twenty other formats are preprogrammed. Pro-Cite also helps users modify existing punctuation or design their own.

Companion programs called Biblio-Links are also available for the Macintosh. Biblio-Links transfer records downloaded from BRS, Dialog, MEDLARS, and NOTIS directly into a Pro-Cite database, saving the user the task of manually entering records.

Pro-Cite for the Macintosh is available for \$395. The upgrade from the Professional Bibliographic System to Pro-Cite for the Macintosh is \$95 for registered owners. Biblio-Links programs are \$195 each. ■■

CLSI, Inc., and Altos Computer Systems Sign \$13 Million Marketing Agreement

CLSI, Inc., and Altos Computer Systems, San Jose, California, have signed a marketing agreement for Altos' Series 2000 processors. The Altos Series 2000 is a thirty-two-bit supermicrocomputer, using a UNIX operating system. The marketing agreement with Altos adds to CLSI's new UNIX-based product line, providing a cost-effective hardware platform for small and medium-sized libraries. ■■

WLN Releases LaserCat PAC

The Western Library Network has released a public access catalog on CD-ROM. LaserCat PAC can be produced for individual libraries and is designed to provide easy access for library patrons.

The custom-made one-disc database has a typical response time of two to four seconds per search. Each disc can hold up to 1.8 million library records.

LaserCat PAC can be set for five differ-

Correction

On pages 48 and 50 of the article "Laser Printing for a Variety of Library Applications" by Glen J. Kelly in the March 1988 issue (7, no.4), it is stated that costs savings per label was 91 cents. This should have read .91 cents or \$.0091.

ent levels of search sophistication to match the needs of library users.

Items in LaserCat PAC can be searched by author, title, subject, or standard book numbers. The system supports browsing, exact searches, and keyword searches. Searches may also be limited by material format, publication date, language, government documents, large print, and juvenile materials. LaserCat PAC can even print bibliographies.

LaserCat PAC is the second CD-ROM product released by WLN. The first was LaserCat, a three-disk union catalog released in early 1987. ■■

CD-ROM and NLC

LaserQuest, a CD-ROM cataloging system, is the first CD-ROM database to include library cataloging records distributed directly by the National Library of Canada

(NLC). LaserQuest has always included the Canadian and other foreign language records distributed by the Library of Congress. Canadian records received from NLC are more complete than those distributed by LC. LC routinely strips non-LC fields from the CANMARC format.

With the addition of NLC records LaserQuest has become a multinational MARC database. LaserQuest was introduced in January 1986 by General Research Corporation, Library Systems in Santa Barbara, California.

Titles added to LaserQuest from the National Library of Canada include more than 350,000 Canadian monographs, manuscripts, serials, music, and sound recordings. In addition, NLC records will be added to the bimonthly LaserQuest Supplement Disc. LaserQuest users may elect to display records in the CANMARC or LCMARC format.

EDITOR

Information Technology and Libraries

The Library and Information Technology Association is seeking qualified applicants for the position of editor of its journal, *Information Technology and Libraries (ITAL)*. The successful candidate will serve as associate editor for the last three issues of the 1989 volume and assume full editorial responsibility with the first issue of 1990, at the expiration of the current editor's term of office. The editor of *ITAL* serves a three-year term with the possibility of reappointment. In addition to editorial duties, the editor is responsible for making appointments to the *ITAL* editorial board, for monitoring the journal's budget, and for keeping the chair of the LITA Publications Committee and the LITA Board informed regarding the journal.

Applications should demonstrate the candidate's experience in writing, editing, and/or publications management, as well as familiarity with topics and issues in library-related technology applications. Each candidate should include with the application a statement of no more than 300 words outlining goals and objectives for the journal and reasons for seeking the editorship. Applicants must be members of LITA.

LITA will cover postage, phone, and copying costs associated with editing the journal. In addition, LITA will reimburse the editor's expenses for travel to and lodging at the ALA Annual and the ALA Midwinter conferences.

Send applications, no later than November 15, 1988, to Don L. Tolliver (chair, LITA Publications Committee), Director of Libraries, University Library, Kent State University, Kent, OH 44242. Questions about the editorship should be directed to the present editor, William Gray Potter, Associate Dean of Libraries for Technical Services, Automation, and Systems, Arizona State University, Tempe, AZ 85287 (602) 965-5889.

Candidate interviews will be scheduled for the ALA Midwinter Meeting in Washington, D.C., January 1989, with selection to be completed before the end of that month.

The first Canadian LaserQuest users to receive this new release include Memorial University in Newfoundland; Laurentian University in Ontario; Metropolitan Toronto Reference Library; Government of the Northwest Territories Public Library Services; Kwantlen College Library Services in Surrey, British Columbia; and Mount Royal College in Alberta. Canadian LaserQuest users have toll free access to customer support at GRC. ■■

Computer Database Plus Delivers Full Text of Computer Publications

Information Access Company (IAC) has announced a new online database that will provide the complete text plus abstracts of articles in forty-six widely read computer periodicals and abstracts of articles contained in an additional eighty-seven magazines and journals covering the computer industry. Designed as a reference and research source for computer product manufacturers, MIS departments, students, engineers, computer products buyers, industry watchers, analysts, and technology writers and marketers, the initial database will be available this summer on Dialog Information Service.

Called Computer Database Plus, this new information source will cover the full text of articles in forty-six journals. Eleven popular publications such as *PC Magazine*, *Electronic News*, and *Modern Office Technology* will be covered from January 1986; material from five publications including *Lotus Magazine* and *MacUser* will be available from January 1987; and thirty additional publications will be covered from January 1988. Indexes and abstracts of articles will be available for the remaining magazines in the databases, with full text added as rights are received from publishers. The new database will be updated daily with indexes, and the text of articles will be added monthly.

Beginning in 1989, Information Access will begin adding the full text of computer-related articles published in other trade and general-interest periodicals contained in other IAC databases. At the same time, IAC will begin adding the full text of com-

puter industry news releases carried on international wire services.

Cover-to-cover full text will be included for fourteen leading computer journals. Material such as calendars, question-and-answer columns, humor items, and other editorial pieces will be available but not indexed or abstracted. The current Computer Database (Dialog file 275) will continue to provide indexing and abstracting for 130 electronics industry publications. Searchers looking for substantive articles only may choose to begin their search on Computer Database, gathering citations and abstracts and identifying lengthy articles available on Computer Database Plus that they may want to retrieve in full text.

Students, shoppers, engineers, industry analysts, writers, and marketers can keep up with the latest news and opinions on computer subjects simply by accessing the database as frequently as daily to follow newly added citations, abstracts, and articles. The rigorously indexed database allows the user to search, for example, by computer, personal or product name, and by topic such as robotics, modems, satellite communications, and others.

The new full-text database, Computer Database Plus, will be available to Dialog Information Services subscribers (file 675). Computer Database is available to Dialog (file 275), Data-Star, and BRS users.

Information Access Company is the publisher of twelve online databases and offers a broad family of CD-ROM and microform reference products. In all, the company provides access to the contents of more than 3,000 magazines, journals, and newspapers with coverage back as far as twenty years and as current as yesterday's *Wall Street Journal*. ■■

In Memoriam Mary Ellen Clapper

For those who were privileged to know and work with Mary Ellen Clapper, her untimely death on May 3, 1988, can in no way dim the memory of her spirit and the lasting impression she left on every person she touched. Mary Ellen's warmth and positive outlook were exceptional. Her consistent "can do" approach was based, not on

any sense of self-importance, but rather on a genuine regard for the ability of others.

Born on July 17, 1940, Mary Ellen Kelly grew up in the Philadelphia area and earned her B.A. in chemistry at Rosemont College. Following her marriage to Charles Clapper, she worked as a research chemist for the Chevron Corporation in California.

She earned her master's in library science at the University of Denver, during a time her husband refers to as "full of the kids and school." Her two sons, Michael and Craig, are now both in college.

Mary Ellen continued her career in Boston, working initially at Warner-Eddison, then at Harvard in the systems office, and later at the Baker Library of Harvard Business School. She joined Faxon in 1982 as Union List Project Manager and later served as Manager of Library/Vendor Interface Services until her death.

In the world of serials and of automation, Mary Ellen's contributions were significant. She served on the ANSI Subcommittee for Serials Holdings at the Detailed Level. Chaired by Susan Bryntesan, the committee not only created a standard for

detailed holdings but also a revised standard for summary holdings. According to Susan, Mary Ellen attended every meeting and shouldered much of the detailed work, writing "example after example" and translating these to general statements. Active in both ALA and NASIG, Mary Ellen also served a pivotal role in SISAC, chairing the SISAC test and representing SISAC frequently as a spokesperson. According to Sandra K. Paul, of SKP Associates, "Without Mary Ellen's efforts, it would have taken SISAC five years to get this far."

Her battle with cancer began nearly two years ago. Throughout her illness, she maintained active professional involvement and, in fact, was called upon frequently to offer support by example to other sufferers. It is in character that Mary Ellen's last days and minutes were devoted to caring for others and that her last request was that we who attended her funeral sing a hymn that would fill us with "joy and hope," qualities she surely imparted often during her lifetime.—*Rebecca T. Lenzi*. ■■

Twenty Years Ago in JOLA

It was also decided to design a system which would duplicate as few as possible of the manual aspects of normal technical processing systems, but one which would, at the same time, permit the return to a manual system from a machine system with a minimum of trouble and tribulation if support for the library's automated system should be withdrawn.

Jack W. Scott, "An Integrated Computer Based Technical Processing System in a Small College Library," *JOLA* 1, no.3:151 (Sept. 1968).
Contributed by Michael Gorman.

Recent Publications

Book Reviews

Batt, Fred. *Online Searching for End Users: An Information Sourcebook.* Oryx Sourcebook Series in Computer and Information Science, no.1. Phoenix and New York: Oryx, 1988. 116p. \$37.50 (ISBN 0-89774-394-6).

This well-executed book, the first volume in a new Oryx Press series, will interest anyone working in electronic technologies in reference services. The bulk of the text is a selective, annotated bibliography of about 500 articles, books, documents, and conference papers that the author has chosen as most relevant to end-user searching and related areas. Each of its four chapters is introduced by a thoughtful narrative summarizing the trends and concepts necessary to understanding a particular aspect of searching; these brief essays include clear definitions of terms (*intermediary, database/databank, CD-ROM, front end, gateway, interface, etc.*).

Chapter 1, "Online Searching Using Intermediaries," sets the stage for the current interest in end users as searchers; the chapter overview includes a brief historical summary of online searching in libraries, lists a sampling of the many available vendors (including bibliographic utilities such as OCLC and RLIN), and outlines the advantages and limitations of computerized literature retrieval. The author also identifies the most significant journals and news periodicals in the field (*Online, Database Searcher, Information Today*, and so forth) and lists relevant conferences, annual publications, and information science and computer journals. He also stresses the importance of familiarity with vendor documentation. The chapter overview is followed by about forty selected, annotated references to books, journal articles, and

ERIC documents that are representative of significant materials published on database searching over the past ten to fifteen years.

Chapter 2 is the true "end user" portion of the book and includes approximately 160 references to sources dealing with this relatively recent aspect of searching (almost all were published since 1982). The author's overview emphasizes general trends and mentions some contradictions, including the fact that experiences with the same user-friendly systems can vary dramatically.

Chapter 3 is a sampling of relevant citations on various topics including equipment, ergonomics, databases and vendors, front ends/gateways, and various aspects of search strategy development and manipulation. There are also over fifty citations to articles on specific databases or subject groups (e.g., AIDS, patent databases) or types of information (e.g., current events, biographical information). This chapter concludes with some references to the future: CD-ROMs, the changing role of the search intermediary, what the databases of the future will look like, copyright questions, and the like.

Chapter 4, "Core Library Collection," is best used in conjunction with the journal listings and other sources mentioned in the chapter 1 overview; this is a selection of materials (some appearing elsewhere in the bibliography) that the author feels are important for reference use. These items include two Association of Research Libraries SPEC Kits (#122 on end-user searching and #133 on optical discs); a number of book-length and journal article bibliographies; a selection of general books on searching, microcomputers, communications, and other topics; and a sampling of directories (unac-

countably missing is the one I use most often, the *Encyclopedia of Information Systems and Services* published by Gale Research and now in its eighth edition, 1988).

For easy access to the annotated citations and other sources, indexes are provided by author, title, and subject; a few books are analyzed to the chapter level. Sources are primarily from the library/information science field but other subject disciplines appear as well (*Science* and *Academe*, for example). Most of the numbered citations are annotated and the author often provides a taste of the original work by including brief quotations.

The author has obviously kept abreast of the wide range of topics relating to electronic information retrieval, including the current interest in CD-ROM, WORM technology, gateway software, and mounting data tapes on institutional mainframes. There is a strong sense of currency about this book: the author does not state a cutoff date but it appears that all major references are present through about the first half of 1987 (with one item having a projected publication date of spring 1988). In such a changing subject area, this kind of bibliography can expect to remain current for a relatively short time. The value of Batt's work is that the citations have been thoughtfully selected and are augmented by other source materials; any library contemplating (or already involved in) an end-user service will have in hand enough references to support responsible management decisions.

This volume serves the author's stated purpose of being a practical source book for any end-user searching program, but is also that rare work, a readable bibliography. — *Linda Friend, Pennsylvania State University, University Park.* ■■

Crawford, Walt. *Technical Standards: An Introduction for Librarians.* Professional Librarian Series. White Plains, N.Y., and London: Knowledge Industry, 1986. 299p. \$36.50 (ISBN 0-86729-192-3); paper, \$28.50 (ISBN 0-86729-191-5).

Walt Crawford provides two important services for librarians in his work *Technical*

Standards: An Introduction for Librarians. First, he outlines the rather confusing and sometimes baffling standards development process, and second, he introduces librarians to the more important standards that affect librarians at work and in the home. This comprehensive reference work provides easy readability, with each chapter laying the framework for progression to the next.

Crawford's use of the ANSI Z85.1-1980: American National Standard for Permanent and Durable Library Catalog Cards is an example of the necessity of following standards, and his description of what can result when technical standards are "assumed but not verified" is an excellent choice. This particular technical standard is one to which every professional librarian can relate regardless of his or her area of concentration.

Chapter 2, entitled "Technical Standards in Action," relates technical standards to everyday life in and out of the library. I found this chapter to be the most enlightening and interesting even though the discussion only scratches the surface of the total number of standards affecting our daily lives. Again, Crawford's choice of examples (e.g., bibliographic citations and bibliographic record exchange) allows the reader to relate easily to the discussion of the problem with conflicting standards and the advantages of well-timed standards to the work environment.

Crawford devotes considerable attention to describing the standards development process, the organizations associated with standards development, and methods for interested individuals to become involved in the standards process. I found this section (chapters 7-9) extremely beneficial in crystalizing the interrelationships existing between individuals and the standards organizations as they relate to the standards development process.

The second half of the book is devoted to describing the current standards of interest to information industry professionals from the National Information Standards Organization (NISO), the Accredited Standards Committee on Information Processing Systems (ASC X3), and the International Organization for Standardization (ISO).

Since the standards-making process is a dynamic process with new standards being proposed, reviewed, and approved throughout the year, a few recent standards of interest to librarians were not included although they were under development at the time Crawford's book was released (1986). Of particular importance are the Volume and File Structure of CD-ROM (Z39.60-1988) and the Common Command Language (Z39.58-1988) with which all librarians should become familiar.

As one reads through Crawford's list of current standards, it becomes readily apparent that this book is of value to all librarians, not only those who deal with automation and technical services. Each standard listed includes a brief summary with information on the application of the standard, and problems associated with its implementation. This list alone is worth the price of the book, and one hopes an updated edition will be produced every two or three years.

The book includes two appendixes. First, appendix A lists over 150 standards applicable to online integrated library systems. For librarians preparing requests for proposals this list is an excellent source of identifying potential standards to include in the technical requirements section. Appendix B lists members and subcommittees of NISO, ASC X3, and ISO technical committees 46 and 97. The book includes two indexes, a conventional general index, and a special "Index to Standards" devoted to the standards addressed in the book. *Technical Standards* also contains an extensive glos-

sary addressing technical terms in addition to the acronyms used.

With the increasing importance that technical standards play in both our work and home environments this book is a must for all individuals associated with the information industry.—Gary Ross, *College of Charleston, South Carolina.* ■■

Software Reviews

MITINET/MARC. Information Transform, Inc., 502 Leonard St., Madison, WI 53711. Hardware requirements: IBM PC or compatible, 256K RAM, PC-DOS 2.1 or greater, 2 disk drives. Apple II, 128K RAM, ProDos, 2 disk drives. Price: \$495.

MITINET/MARC is software designed to allow libraries to create original cataloging records in MARC format at a reasonable cost. According to accompanying documentation, little or no knowledge of the MARC formats is required to successfully use the program. An understanding of basic cataloging rules and ready access to a copy of AACR2 are all that's necessary. Creation of full MARC records on floppy or hard disk for use in automated databases is accomplished with English-language prompts and realistic examples that guide the user through the entry of each cataloging element. Users learn the system in two to four hours, creating eight to twelve records per hour when proficient. How well does the

Twenty Years Ago in JOLA

It would seem difficult to defend (in the keyword index) the inclusion of words like "ourselves," with one page reference, or "author," with more than 40, or of phrases like "privately admitted" or "detached and mailed." This is indeed machine-like indexing by human beings, with all of the faults of both.

A. J. Goldwyn reviewing *H. P. Luhn: Pioneer of Information Science, Selected Works. JOLA* 1, no.3:213 (Sept. 1968).

Contributed by Michael Gorman.

program live up to its claims? Is *MITINET/MARC* a viable solution, especially for school, public, and special libraries facing the final phase of retrospective conversion, i.e., dealing with "no hits"? A closer look at the package is in order.

Let's begin by examining the quality of the documentation. If *MITINET/MARC* requires no prerequisite knowledge of the MARC formats, what can be said about the demands placed on users by the program's documentation? I must say that I was impressed by the user's manual. It leads the terminal operator step-by-step from the initial start-up procedures, through each of the menus, and down to the entry of individual cataloging elements. Essential instructions are highlighted, and helpful cataloging and data entry notes are sprinkled throughout the text. Each chapter is presented in a straightforward and logical fashion. The index at the end of the manual served me well on most occasions. In short, be prepared with *MITINET/MARC* to forego many of the initial headaches associated with learning a new software package. After one reading of the user's manual, I confidently began work on *MITINET/MARC*.

Installation on my IBM PC was accomplished in a dozen easy steps. Before using the program for the first time, the "custom profile" must be created. The profile asks for information about the library, determines how data will be formatted on the cataloging screens, and allows entry of branch or collection names (see figure 1). As in other areas of the program, options are selected by moving the highlighted block with the arrow keys to the appropriate choice and pressing the return key. Until becoming more familiar with the program, users will want to retain the "English prompts" and "show examples" options. After completing the "custom profile," we can go to the main menu and begin the procedure for entering a record.

Selection of the appropriate highlighted MARC format from the menu causes *MITINET/MARC* to generate customized screens and examples for that format. The program allows creation of bibliographic records in nine MARC formats ("book" and "report/document" formats are separate

here). Entry of cataloging data is performed in several stages. The "common fields" are displayed first. These include author main entry, title, edition statement, publication information, physical description, local subject heading(s), and LC card number. Screens for each of these fields are automatically displayed in sequence. The "optional fields," which accommodate entry of less used fields, follow. For the "book format" these would include the ISBN, notes, LC subject headings, etc. "Special data" screens then provide English-language choices for entering fixed field information. Call number and branch copy information screens allow input of these last two elements.

How easy is all of this? Let's look at the entry of title information. If "English prompts" and "show examples" were selected in the "custom profile," consecutive screens are displayed, prompting the user to type in title, subtitle, and the statement of responsibility (subfields *a*, *b*, and *c* of the MARC 245 field). The correct ISBD punctuation is supplied by *MITINET/MARC*. Even the GMD is generated in brackets by the program, when appropriate. Figure 2, taken from the user's manual, is an example of the subtitle screen. The subtitle "a history of the northern Minnesota lumber industry" has been entered into the cataloging workspace. Upon pressing the return key, the subtitle is added to previously entered author and title information with the correct punctuation. The statement of responsibility screen with its example then appears. The same procedure is used for the remainder of the "common fields."

The "select optional fields" screen allows cursoring through the list of remaining cataloging elements and marking those needed in the record (see figure 3). Marked fields are then displayed in screen-by-screen sequence. All other fields are eliminated. Repeatable fields such as general notes allow the user the option of printing one or more notes before moving on to the next element. Two "special data" screens promote speedy selection of fixed field values. The second screen is designed so that it can be easily bypassed and default values (such as "select lang.-English") accepted. The manual provides sufficient examples for entering both

```

MITINET/marc Wilson HS Lib.-WI                               30: Custom Profile: Basic Data
Created: :                               Revised: :                               32000+
Library Name:(Wilson HS Lib. ) NUC:(                               ) Region Code:(SC )
Screen format: *ENGLISH Prompts      TERSE Prompts      MARC Prompts
Show examples: *SHOW example on screen      DO NOT SHOW example on screen
ISBD notation: *INCLUDE ISBD notation      OMIT ISBD notation
Edit Fixed Fields: *DO NOT EDIT fixed fields      EDIT fixed fields
Indicators:      *USE DEFAULT Indicators      DISPLAY/REVISE Indicators

There are currently no branches. To change, select the CONTINUE option below.
Select the option you want:

CONTINUE: Add or change branch names      SAVE the Custom Profile Data
REVISE the information on this screen      Go to the UTILITY Menu

```

Fig. 1. *The Profile.*

```

MITINET/marc Wilson HS Lib.-WI 1183                          33: Add or Change cataloging data
Enter: Subtitle                               Entry: Title statement                               32000+
      Example: a global strategy for the 1990's
a history of the northern Minnesota lumber industry _____
_____

Blough, Joseph Henry, 1934-
Clearing the land

```

Fig. 2. *Subtitle Screen.*

```

MITINET/marc Wilson HS Lib.-WI 1183                          34: Select Optional Fields
Select the option you want:                               32000+

MARK optional fields to enter                          UNMARK the fields marked
ENTER fields, then ADD special data                   CONTINUE: Add Special data
ENTER fields, then RETURN here

Select the optional field(s) you want to enter (+, -, space), <ESC> when done.

International Standard Book no      Added entry: Personal name
Note: General                       Added entry: Corporate name
Note: Bibliography                 Added entry: Conference name
Note: Contents                     Added entry: Title traced diff.
Note: Abstract or annotation        Uniform title (not Main entry)
Note: Local                        Series statement: Title
Subject: Personal name              Series untraced, traced diff.
Subject: Corporate                  Series added entry: Personal
Subject: Conference                  Series added entry: Corporate
Subject: Geographic heading         Series added entry: Conference
LC subject: Topical heading         Series added entry: Title

```

Fig. 3. *Select Optional Fields Screen.*

Dewey and LC call numbers. Adding branch copy information is a snap, if the profile has been properly completed.

Before saving the finished entry, *MITINET/MARC* gives the user the opportunity to make corrections to cataloging, holdings, or special data. To correct a record already saved to disk, use *MITINET/MARC*'s load feature to make necessary modifications to individual fields. The "print data disk directory" function is a handy way to list data on disk without having to print the entire bibliographic record. The directory printout includes record number, date of creation, change date, brief author and title information, publication date, and MARC format used for each item cataloged.

Now that we've taken a look at the basic mechanics of the program, some fundamental questions about the ability of *MITINET/MARC* to deliver can be posed. First, what level of quality can actually be attained by *MITINET/MARC* users who have no knowledge of the MARC formats? Second, how successfully can MARC records created with the program be used in automated systems?

The first question might reasonably be raised by anyone who has worked with the MARC formats over the years. It's no simple matter to create high quality MARC records that conform faithfully to the standards. One could be tempted to say that *MITINET/MARC* is a slick package that provides libraries with a clever means of simulating the MARC formats. After all, not all libraries are bound to standards that demand strict adherence to every intricacy of MARC coding. That would sell *MITINET/MARC* short, however. Let's look at a few problematic areas of the MARC codes and see how the program deals with them.

MARC indicators would seem to be a major obstacle for those not acquainted with the formats. *MITINET/MARC* users are given the option to "use default indicators" in the "custom profile." But how well does this work? *MITINET/MARC* automatically supplies the correct filing indicator for appropriate fields, beginning with "a," "an," or "the." Title main entries generate a "0" first indicator (no added entry

for title), while nonmain entry titles generate a "1" (title added entry made). When LC subject headings are input, the program supplies the correct second indicator value "0." Other indicators in the record are handled in similar fashion, with the program choosing either the correct or most probable value. Libraries desiring to input strict I-level records may wish to select values other than the default values for some fields. In the "serials format," for example, alternative titles and linking entries require use of the "display/revise indicators" option and some knowledge of the MARC format to select the more exotic choices offered for these fields.

For libraries using LC subject headings, the possibility of numerous and repeating subfields could also present problems to novice MARC users. We have seen that the program does an excellent job of leading the user through the fields and subfields of the cataloging record. However, no program can anticipate the exact order in which subdivisions (*x*, *y*, *z*) will need to be used for a given subject heading. *MITINET/MARC* gives users two options. The "menu option" allows the user to select with the arrow keys general, chronological, or geographic subdivisions in the correct sequence. For users more familiar with the MARC formats, the "command option" allows more expeditious arrangement of subdivision prompts, such as `\zxx`. Similar options are available for the repeating subfields sometimes necessary for publication information (260 field).

What about entry of fixed field information? The "special data" screens deal with the more important fixed field elements in each format. A combination of the use of English-language choices, ease in retaining default values, and the manual's concise explanations of individual fields promotes smooth entry of the fixed fields for the novice. Even the description of the normally troublesome "dates" values is clear. References to supplementary MARC documentation are unnecessary because the most frequently used countries of publication and languages are listed in the "special data" fields for easy selection. Additional state, province, and regional codes are contained in the manual's appendix. More ad-

vanced users may complete optional fixed fields not represented on the "special data" screens by adjusting the "custom profile."

Although responsibility for the accuracy of the cataloging information itself must lie with the inputting library, the previous examples illustrate the lengths to which *MITINET/MARC* is prepared to accommodate the novice MARC user. The creation of K-level records for these users is easily attainable. But as we have seen, the program does not stop there. Its features also fully meet the needs of knowledgeable and even expert MARC users in the creation of I-level records.

Concerning *MITINET/MARC*'s use in automated systems, we can look at its track record thus far. The program was developed as a joint effort of Information Transform, Inc., and the Wisconsin Department of Public Instruction, Division of Library Services. *MITINET/MARC* was introduced in 1986 following the development of a companion package, *MITINET/Retro*, which has been used extensively in Wisconsin and other states. According to information that accompanied the package, *MITINET/MARC* is in use in more than 500 libraries. Each record created using the system is saved in the MARC format, including the leader and record directory. These data may be loaded into automated systems that accept the MARC format for use in online catalogs, circulation systems, CD-ROM catalogs, state databases, etc. Vendors have reportedly processed *MITINET/MARC* records without problems.

In conclusion, *MITINET/MARC* lives up to its claims in fine style. The program provides an easy and inexpensive means of putting original cataloging into the MARC formats. It is a well-conceived package accompanied by superior documentation. Smaller libraries, especially those with little or no exposure to the MARC formats, should seriously consider *MITINET/MARC*.—David A. Badertscher, *University of Virginia Library*. ■■

Sci-Mate Software System. Version 2.1 (1987). Institute for Scientific Information, 3501 Market St., University City Science Center, Philadelphia, PA 19104.

(1-800) 523-4092. List price: *Searcher*, \$150; *Manager*, \$295; *Editor*, \$195. *Dialoglink*. Version 1.20 (1988). Dialog Information Services, 3460 Hillview Ave., Palo Alto, CA 94304. (1-800) 334-2564. List price: \$149.

Two communication software packages of interest to the library community are the *Sci-Mate Software System* from the Institute for Scientific Information (ISI) and *Dialoglink* from Dialog Information Services. The primary focus of both is to provide easier access to the products and services of their respective producers. *Sci-Mate*, aimed at the scientist and the infrequent database searcher, provides search software that translates the natural language of the end-user into the search language and protocol of the vendor system. *Dialoglink* provides experienced online users with easier access to Dialog services. Both communication packages have the capability of building search strategies off-line, saving them and uploading them on command, and downloading and editing results off-line. The following is a review of the basic features of the two packages and a discussion of their strengths and limitations.

Sci-Mate Software System

Sci-Mate was first released in 1985; Version 2.1 (1987) is reviewed. Hardware requirements include an IBM or IBM-compatible microcomputer (or a Z-80 microcomputer that runs CP/M-80), at least 256K random access memory, PC-DOS or MS-DOS version 2.0 or higher, and a modem. There are three components to *Sci-Mate*: *Searcher*, which is the communications component; *Manager*, which provides database management; and *Editor*, which permits the creation of stylized and customized bibliographic reports. Each of these components can be used independently or together to allow database management or report generation from downloaded records. This capability is built upon *Sci-Mate*'s prefigured templates, which store data uniformly from one component to the next. It has some built-in limitations, however, as only records from specified databases can be searched and manipulated in this manner.

Major Features of Sci-Mate. Searcher's

communication software offers three different searching modes. In the "menu-driven search mode," search terms are selected using a series of standardized menu options, which are then automatically translated into the language and protocol of the host system. Users may search BRS, Dialog, NLM, ORBIT, and Questel. However, only a specified number of databases can be searched in menu mode in each vendor system. They have been chosen because they are the most heavily used. For example, in BRS one can search *ERIC*, *Biosis Previews*, *ABI/Inform*, *CA Search*, *Medline*, *PsycInfo*, *NTIS*, *Management Contents*, and *Compendex*, as well as ISI's databases *Social SciSearch* and *Arts & Humanities Search*. When searching these databases, the user has the option of qualifying sets as well as being able to search the database indexes. Context-specific online help screens are available. Also in the menu-driven mode, search statements can be created and saved off-line and uploaded during the search session. Results can be downloaded to an ASCII Work File and transferred to *Manager* and *Editor*.

The second search mode option is the "native search mode" where databases are searched using the language and protocol of the host system. In this mode, the user is not limited to a specified number of databases. However, search records resulting from a native search cannot be manipu-

lated in either *Manager* or *Editor*.

The third searching mode is the "passive terminal mode" where users can access host systems other than the five listed above. In this mode, the computer functions as a dumb terminal; there is no automatic log on or log off, and the user must employ the commands and protocol of the vendor system. No transfer to *Manager* or *Editor* is possible.

Manager is ISI's database management component. Records are downloaded to "user files" that are configured with templates to match vendor field tags and specified report functions that facilitate the creation of bibliographic citations, generation of status and columnar reports, and address labels. *Sci-Mate Manager* provides nine templates. Customized templates, as well as individual records, can be created at the keyboard. Files can be sorted, edited, and searched through the use of menu selection options.

Editor creates bibliographies in fifteen preset formats from records in *Manager* files, as well as from records entered at the keyboard, and also has the capability of creating customized formats. Bibliographies can be sorted by author and date (latest publication first or last) and by the order in which citations appear in the text of an article. It is possible to generate footnotes and in-text citations in *Editor*.

Sci-Mate Documentation. ISI provides a

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separate manual for each of the components of the system. Information is presented in a clear, concise manner with examples of menu screens on almost every page. There are tutorials for each of the vendor systems and chapters on each aspect of searching, such as display/download, search modes, and queries and sets. Within each chapter, there is information about what to do if a search is unsuccessful.

Installation. Installation and configuration of *Sci-Mate* is difficult. For a system that is aimed at the nonprofessional searcher, the installation itself requires detailed, technical knowledge of computer and online systems. In fact, all IBM-compatible microcomputers will not accept *Sci-Mate's* telecommunications configuration in the standard ways described in the manual. Some may also have display and print incompatibilities. (*Dialoglink*, however, seems to be more universally acceptable.) Fortunately, ISI does offer technical support by phone and will assist with installation and troubleshooting.

Ease of Use. Experienced online searchers will find the *Sci-Mate* menu-driven search mode tedious and slow. Limitations of the system include (1) too many menu screens to work through when developing a search profile; (2) inability to combine AND/OR logic in the same search statement; (3) a complex "list" function in order to display set history while online; (4) no indicator of time spent online (in an ironic choice of symbols, online connection is signaled with dollar signs (\$\$!)); and (5) limited choice of databases in the menu-driven mode.

However, *Sci-Mate* may still be of use to the experienced searcher when searching unfamiliar or little-used systems, such as Questel or ORBIT, since search statements can be developed off-line and the system offers automatic log-on and menu-driven search options.

In summary, the strength of the *Sci-Mate Software System* allows infrequent online searchers access to commonly used databases without having to master the command language and search protocol of the host system. There is a price to pay for this advantage, however, relating to the time spent in creating sets, limitations in the number of available databases, and the

complexity of the installation and configuration process.

Dialoglink

Dialoglink, the communications software package from Dialog Information Services, like *Sci-Mate*, is also a series of components: *Communications Manager*, *Account Manager*, and *OnDisc Manager* (for use with Dialog's CD-ROM products). This review considers the communications and accounting components of Version 1.20 (1988).

Hardware requirements for *Dialoglink* include an IBM or IBM-compatible microcomputer, at least 384K random access memory, PC-DOS or MS-DOS version 2.0 or higher, and a modem. For graphics capabilities, a graphics adapter card, graphics monitor, and specialized printer are required (Epson, Proprinter, HP ThinkJet, or HP Laser Jet or compatibles, for example).

Major Features of Dialoglink. With *Dialoglink's Communication Manager*, it is possible to log on automatically to Dialog and an additional twenty online vendors. The searcher is expected to utilize each vendor's unique command language and protocol. Online menu screens and function keys aid the search. Well-defined, logical function keys lead to menu screens for printing, uploading and downloading, and context-specific help screens. Searches can be created off-line and automatically loaded when online.

Dialoglink is filled with nice features. One of the most interesting and time-saving is its type-ahead capability. While the host system is processing a request, the searcher can formulate the next query. For easy correction of typing errors after a line has been sent, there is a "recall last line" function. Everything displayed in an online search is automatically saved in the "retrieve buffer." At any point in an online session, one can print the contents of the retrieve buffer, save it to a disk, or clear the buffer. There is also the capability to review, print, or save selected portions of the buffer after logging off. Another feature is the ability to scan records by scrolling up and down the retrieve buffer while online.

The newest version of *Dialoglink*, released in early 1988, supports viewing, printing, and saving graphic images from

the database *Trademarkscan-Federal* and other graphic image databases with the help of an added function key, F6. Other enhancements in the new version include (1) software compatibility with all IBM PS/2 series computers and 80386 computers; (2) software availability on 3¹/₂- and 5¹/₄-inch media; and (3) shortcuts for the experienced searcher, such as the capability to bypass some menu screens when selecting the first option on the print, display, and menu screens. For example, hitting the shift and F8 keys automatically turns the printer on without having to go to the menu screen.

The *Dialoglink Account Manager* stores and prints accounting reports for a single search session, multiple sessions, or searches for an entire month. Unfortunately, *Account Manager* only works for searches executed on Dialog. There are two types of accounting reports. Single session reports include an invoice with Dialog's detailed listing of connect, type, and print charges; connect time in each file; and a cover sheet that lists the subject of the search, the client's name, searcher, date, and up to ten lines of text. A second type of accounting report generates summary reports of monthly usage. These reports include client, searcher, database, Dialog services (Knowledge Index, Dial-Mail), charge code, and chronological use.

Documentation. In keeping with Dialog's reputation for excellent documentation, the *Dialoglink* manual presents information clearly and concisely, with a real understanding of the kind of information people need to have at their fingertips. The introduction provides an overview of the contents of the manual, with suggestions on when to read each chapter. There is even a "Quick Start" shortcut chapter! Within each chapter are step-by-step instructions with illustrations of online screens and suggested solutions to problems that may occur. Documentation for both *Dialoglink* and *Sci-Mate* present information in an easily understandable style for their respective audiences.

Installation. The documentation provides clear instructions for initial configuration. *Dialoglink* software has already prefigured many of the search parameters,

making it much simpler and easier than *Sci-Mate*. Adding an automatic log-on procedure for another vendor is not quite as easy, requiring specific knowledge of step-by-step log-on parameters and search particulars (such as being able to identify the vendor's prompt symbol).

Ease of Use. *Dialoglink* is easy to use. The function keys, menu screens, and special features such as the "type ahead buffer" and "recall last line" function require minimal learning on the part of the searcher. There are some shortcomings: for example, in *Account Manager* there are no online instructions for moving from one part of the screen to the next when defining a new session and no online prompts to show how to end an accounting session.

Nevertheless, *Dialoglink* is an easy software package to install and use, especially for Dialog customers. Designed with the experienced searcher in mind, it provides function key assignments and other aids that will certainly help the infrequent searcher as well. The major limitation is *Dialoglink's* emphasis on use of Dialog services. Installing other systems, while not automatic, is relatively easy, but it is unrealistic to suppose that large reference services will only be using Dialog. One entire component, *Account Manager*, is not functional for other host systems.

In summary, the *Sci-Mate Software System* and *Dialoglink* have a lot in common: both attempt to make online searching more successful, offer more than just a communications interface, employ menu screens and windows to offer user-friendly options, and have a targeted clientele for their packages, facilitating ease of use of their respective vendor's services: ISI databases for *Sci-Mate*, and Dialog customers for *Dialoglink*. Unfortunately, this comes across as self-serving and is certainly a disadvantage to the experienced searcher who would like to experiment with such value-added products as the *Editor*, *Database Manager*, and *Account Manager* but cannot because of the limitations of the two systems.

Suggested Further Reading

Badgett, Tom. "Search Software: Directory Assistance." *PC Magazine* 6, no.9:263-73 (May 12, 1987).

Brueggeman, Peter. "Converting Search Results into Search Statements: Using Dialoglink and Pro-Search Search Aid Software." *Database End-user* 2, no.9:26-28 (Oct. 1986).

Hawker, John. "Dialoglink: A Field Report." In *Online '86 Conference Proceedings*, p.98-102. Weston, Conn.: Online, 1986.

Hedden, Judy. "Sci-Mate and Searcher's Tool Kit: A Comparative Review." *Database End-user* 2, no.11:18,20-26 (Dec. 1986).

Lundeen, Gerald, and Carol Tenopir. "Microcomputer Software for In-house Databases . . . Four Top Packages under \$2,000." *Online* 9, no.5:30-38 (Sept. 1985).

Mundy, Catherine C. "The Sci-Mate Software System." In *Online '85 Conference Proceedings*, p.219-22. Weston, Conn.: Online, 1985.

Raeder, Aggi. "Dialoglink: Product Evaluation of a New Communication Software from Dialog." *Database End-user* 2, no.4:17-21 (Apr. 1986).

Rudin, Joan, and others. "Comparison of In-search, Scimate and an Intelligent Terminal Emulator in Biomedical Literature Searching." In *National Online Meeting Proceedings*, p.403-8. Medford, N.J.: Learned Information, 1985.

Stout, Catheryne, and Thomas Marcinko. "Sci-Mate: A Menu-driven Universal Online Searcher and Personal Data Manager." *Online* 7, no.5:112-16 (Sept. 1983).

Witiak, Joanne. "Dialoglink: A Review of Dialog's Search Assistance Software." *Online* 10, no.6:39-42 (Nov. 1986).—*Jill Newby and Charlene M. Baldwin, Science-Engineering Library, University of Arizona*. ■■

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.

Books and Periodicals Online: A Guide to Publication Contents of Business and Legal Databases. V.1, pt.1. Ed. by Nuchine S. Nobari. Med-

ford, N.J.: Learned Information, 1987. 376p. paper, \$125 (ISSN 0951-838X).

Carter, Sylvester P. *Writing for Your Peers: The Primary Journal Paper*. New York: Praeger, 1987. 129p. \$29.95 (ISBN 0-275-92630-3); paper, \$9.95 (ISBN 0-275-92229-4).

Cowley, Rod. *ALS: A Guide for Librarians and Systems Managers*. Brookfield, Vt.: Gower, 1988. 146p. \$49.50 (ISBN 0-566-03541-3).

Desmarais, Norman. *Acquisitions Systems for Libraries*. The Essential Guide to the Library IBM PC Series, v.11. Westport, Conn.: Meckler, 1988. 246p. spiralbound, \$29.95 (ISBN 0-88736-185-4).

Economic Commission for Europe—Geneva. *Software for Industrial Automation*. New York: United Nations, 1987. 208p. paper, \$35 (ISBN 92-1-11692-7).

Encyclopedia of Information Systems and Services. 8th ed. Ed. by Amy Lucas and Annette Novallo. Detroit, Mich.: Gale Research, 1988. 2,338p. 3vs. \$400 (ISBN 0-8103-2532-2).

Federal Statistical Data Bases: A Comprehensive Catalog of Current Machine-Readable and Online Files. Comp. by William R. Evinger. Phoenix, Ariz. and New York: Oryx, 1988. 670p. (ISBN 0-89774-255-9).

Gill, Suzanne L. *File Management and Information Retrieval Systems: A Manual for Managers and Technicians*. 2d ed. Englewood, Colo.: Libraries Unlimited, 1988. 221p. \$26.50 (ISBN 0-87287-625-X).

Handbook of Medical Library Practice. 4th ed. Ed. by Louise Darling. Health Science Librarianship and Administration Series, v.3. Chicago: Medical Library Assn., 1988. 593p. \$35 (ISBN 0-912176-21-0).

Hildreth, Charles R. *Library Automation in North America: A Reassessment of the Impact of New Technologies on Networking*. Munich, New York, etc.: K. G. Saur, 1987. 196p. \$35 (ISBN 3-598-10735-8).

Horowitz, Rosario Gassol de. *Librarianship: A Third World Perspective*. Contributions in Librarianship and Information Science Series, no.59. New York, London and Westport, Conn.: Greenwood, 1988. 140p. \$37.95 (ISBN 0-313-25507-5).

Intellectual Property Rights in an Electronic Age: Proceedings of the Library of Congress Network Advisory Committee Meetings April 22-24, 1987. Network Planning Paper, no.16. Washington, D.C.: Network Development and MARC Standards Office, Library of Congress, 1987. 66p. paper, \$7.50 (ISBN 0-8444-0592-2).

International Library Cooperation. Ed. by Ahmed H. Helal and Joachim W. Weiss. Essen Symposium Series, v.10. Essen, Germany: Essen Univ. Library, 1988. 337p. paper (ISBN 3-922602-11-8).

Jones, Glenn R. *Jones Dictionary of Cable Television Terminology*. 3d ed. Englewood, Colo.: Jones 21st Century, 1988. 108p. \$14.95 (ISBN 0-945373-007).

Katz, Raul Luciano. *The Information Society: An International Perspective*. New York, London and Westport, Conn.: Praeger, 1988. 168p. \$35.95 (ISBN 0-275-92659-1).

Library and Information Science Education: An International Symposium. Ed. by James S. C. Hu. Metuchen, N.J. and London: Scarecrow, 1986. 277p. \$27.50 (ISBN 0-8108-2111-7).

The Linked Systems Project: A Networking Tool for Libraries. Ed. by Judith G. Fenly and Beacher Wiggins. OCLC Library, Information, and Computer Science Series, no.6. Dublin, Ohio: OCLC, 1988. 138p. paper, \$13.50 (ISBN 1-55653-039-0).

Manheim, Jarol B. and Allison Ondrasik. *Data Map 1988: Index of Published Tables of Statistical Data*. Phoenix and New York: Oryx, 1988. 838p. paper (ISBN 0-89774-357-1).

Martin, Desmond D. and Richard L. Shell. *Management of Professionals: Insights for Maximizing Cooperation*. New York and Basel: Marcel Dekker, 1988. 367p. illus., \$39.75 (ISBN 0-8247-7847-2).

Palmer, Roger C. *Online Reference and Infor-*

mation Retrieval. 2d ed. Library Science Text Series. Littleton, Colo.: Libraries Unlimited, 1987. 189p. \$25 (ISBN 0-87287-536-9).

Person, Roland Conrad. *A New Path: Undergraduate Libraries at United States and Canadian Universities, 1949-1987*. New Directions in Information Management Series, no.17. New York: Greenwood, 1988. 160p. \$29.95 (ISBN 0-313-25303-X).

Telecommunications Systems and Services Directory: An International Descriptive Guide to More Than 2,000 Telecommunications Organizations, Systems, and Services. 3d ed. Ed. by John Krol. Detroit, Mich.: Gale Research, 1988. 1,116p. \$285 (ISBN 0-8103-2345-1).

Uppgard, Jeannine. *Developing Microcomputer Work Areas in Academic Libraries*. Small Computers in Libraries, no.5. Westport, Conn.: Meckler, 1988. 124p. \$37.50 (ISBN 0-88736-233-8).

What Is User Friendly? Papers Presented at the 1986 Clinic on Library Applications of Data Processing, April 20-22, 1986. Ed. by F. W. Lancaster. Urbana-Champaign, Ill.: Graduate School of Library and Information Science, Univ. of Illinois, 1987. 121p. \$15 (ISBN 0-87845-076-0). ■■

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Letters

To the Editor:

In response to "Remote Interactive Online Support" (*Information Technology and Libraries*, December 1987), I would like to comment that a considerably improved design of three-party telecommunications switch, the Triologue switch, is now available from TGM. The new model developed by Dr. Rodes Trautman allows not only SRS but also ISRS (interactive si-

multaneous remote search). In ISRS, the "master" site can turn over keyboard control to the remote (or novice) site, permitting direct contact with a host computer, and then observe, or intervene, as the novice and host interact. As the new model design is proprietary, I cannot share the wiring diagram.—*Deborah L. Graham, President, TGM Communications, Inc.*

INDEX TO ADVERTISERS

Bar Code Applications	page 271
Biological Abstracts	page 331
Blackwell North America	3d cover
R. R. Bowker	page 318
Carlyle	2d cover
Compusystem II	page 335
EBSCO	page 272
Faxon	page 222
Meckler Publishing	page 317
Midwest	page 220, 4th cover
H. W. Wilson	page 219

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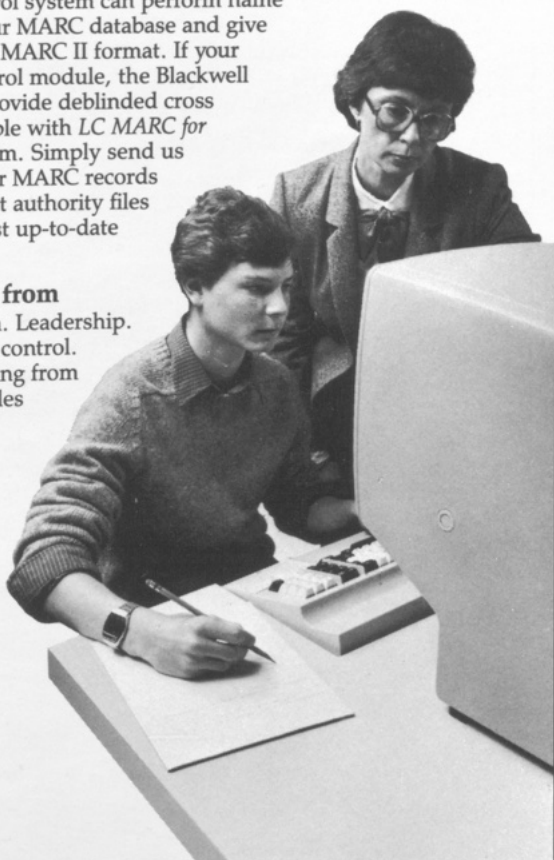
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