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The RLIN Reports System: A Tool for MARC Selection and Listing

Walt Crawford

The RLIN Reports System began as a question: Was it possible to develop generalized programs for selecting MARC records and preparing bibliographic lists? The answer is a qualified yes. The RLIN Reports System is not wholly generalized but does provide flexible new capabilities for RLIN users. The RLIN Reports System is a major tool for future development within RLIN and can be used extensively in a distributed processing system.

All batch processing for the Research Libraries Information Network (RLIN) uses the RMARC format, a superset of US MARC. Until late 1981, each new product required new programs. Programs for different products had a high degree of overlap and used common source modules.

During 1981, we tested the feasibility of generalized software for selection and listing of MARC records. Could programs written in PL/I and controlled by an uncompiled run-time control language do selection based on complex criteria (using Boolean operators)? Could such programs do *efficient* selection? Would the overhead of a generalized system (and of run-time control parsing) make it too expensive to do listings? Would a generalized system allow support of small, specialized listings without unsupportable overhead?

As a background task, we designed and implemented a sophisticated selection mechanism, incorporating Boolean logic and a wide range of MARC selection criteria. The results were favorable. We already had most of the elements of a generalized listing system, developed for production of orders, claims, and other printed output. We were able to move quickly from the prototype selection program to a full-scale list production system. Figure 1 shows some of the results: it is a partial page from the *New York Public Library Interim List.*

This paper describes aspects of the RLIN Reports System (RRS) design and implementation.

SOME DEFINITIONS: RLG, RLIN II, AND PRODUCT BATCH

The Research Libraries Group, Inc. is a consortium of universities and independent research institutions involved in a number of cooperative ventures. RLIN is the set of computer hardware and software supporting the programs of RLG. RLIN has more than fifteen million records and more than six hundred terminals installed.

RLIN II commonly refers to the Integrated Technical Processing System: the online component of RLIN, providing acquisitions, cataloging, and search capabilities for the bibliographic files supported on RLIN.

Product Batch is the set of PL/I software that provides printed and tape output from RLIN II activities: catalog cards, supplier orders, claims, cancellations, transaction tapes, and other output. Product Batch also provides statistical analysis of logged activ-

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  Development.
•Geographical distribution of financial flows
  to developing countries :
  disbursements-commitments-external debt
                        (Continued next column)
```

Fig. 1. Dictionary Catalog Produced by the RLIN Reports System.

ity and supports the accounting and information needs of RLG.

The RMARC Format

Product Batch uses a single format for almost all operations. That format is called "RMARC." An RMARC record consists of two parts, both optional:

1. *A variable length prefix* of not less than 3 and not more than 2,048 characters, beginning with a binary halfword giving the length of the prefix itself, and ending with a field terminator (ASCII or EBCDIC hexadecimal "1E").

2. *An RLIN MARC record*, that is, a MARC record that may include RLIN extensions to the US MARC formats. This record may be up to 30,000 characters long.

RMARC records are stored in EBCDIC (Extended Binary Coded Decimal Interchange Code, IBM's standard character set). RMARC records are stored in variable blocked format, spanned or unspanned. Special Product Batch software can also accommodate standard MARC records, in ASCII. Both character sets are extended to allow for standard ALA diacritics and special characters.

The benefits of using a single format are discussed in greater detail in an article on Product Batch to be published in the next issue of *ITAL*. For the RRS, as elsewhere, a single format allows simple, robust debugging facilities and simplifies programming. The same MARC directory and subfield routines can be used in all programs. If a problem occurs, a standard RMARC/MARC listing program can be inserted at any point to show the state of the records (including sorting prefix, if any) at that point.

EARLY WORK: FEASIBILITY

Early RLIN Product Batch involved forms such as orders, claims, and work sheets. We knew that listings would be needed later and that some libraries could use special listings. We felt that we could support overall needs for bibliographic listings and extend support to small, specialized needs, if we could develop a generalized selection and listing system.

We knew PL/I could be used for efficient

selection of MARC records, given a known set of selection criteria. We also knew that we would need a variety of tests, and the ability to use Boolean logic, in order to make a selection mechanism flexible enough for general use. We could not write and compile a new PL/I program for each specialized list: we needed a run-time control system.

The first crucial step, then, was to develop a selection mechanism to provide flexible, run-time controlled selection of MARC records, with some Boolean logic. This required development of a control language and a substantial amount of experimental coding. We developed the language and code as a background task during 1981. We were reluctant to suggest implementation of a generalized system without some idea as to its feasibility.

We were able to develop a coherent language and implement it in fairly efficient PL/I. The system worked and worked quite well. With a flexible selection routine actually implemented, we proposed development of a generalized list production facility: the RRS. The proposal was approved. An informal working group was formed to advise the programmer/analyst on library, production, and other issues, and to assist in the nonprogramming aspects of developing the system.

OVERVIEW OF LIST PRODUCTION

Any bibliographic list requires six steps:

1. *Selection:* Determining which bibliographic records are of use for a particular list or report.

2. *Generation:* Determining access points to be generated from each bibliographic record and producing those access points.

3. *Sorting:* Arranging the generated access points into a desired order.

4. *List Format:* Determining the overall format requirements for the list. This includes type size, page size, number of columns, positioning of columns. It also includes information to appear at the top and bottom of each page, margins between records (and between heading information and records). Finally, it may include special actions to be taken at certain breakpoints: for instance, insertion of a descriptive heading each time the LC classification changes in a call-number-order list. (In some cases, breakpoint activities may include summing some information in records to provide totals prior to the breakpoint.)

5. *Entry Format:* Specifying the layout of each entry. This includes field, subfield, leading text, and punctuation specifications, treatment of indicators, special line breaks, and other characteristics of an entry. Within a single list, different entries may require different formats. For example, in a combined author/title/subject list, subject entries can be briefer than author entries.

6. *List Production:* Specifying when and how often a list is to be produced and seeing that the list *is* produced.

A single-purpose list production program must deal with these six steps, as must a person preparing a list manually. In order to prepare a generalized listing and report facility, we needed to establish a set of run-time control capabilities.

ESTABLISHING THE CONTROL LANGUAGES

There are two basic approaches to building a control language. The first involves compiled controls: WLDCARD, the RLIN catalog card production system, uses this approach. The compiled approach is efficient for relatively stable controls used frequently but is difficult to modify and test. We used an alternate approach for the RRS: controls stored in source form (as text lines) and interpreted by the programs during each run. This approach is slightly less efficient for each production run but allows much faster testing and modification. The second approach calls for a terse language, which can be parsed without too much overhead.

The second approach requires a syntax, a set of rules for specifying and recognizing control statements. It also requires a vocabulary, recognized within the syntax. The combination of syntax and vocabulary forms a non-procedural programming language.

The RRS is controlled by two such languages: one for selection, generation, and sorting; the other for list and entry format. List and entry formats use two different vocabularies within a single syntax.

We had designed a simple entry format language for RLIN Product Batch in order to speed testing. We found that the overhead of repeated parsing was nearly trivial. Given this, and realizing that regular changes in US MARC would require changes in lists, we decided to use run-time control parsing as an ongoing part of production.

The Product Batch entry format language is quite terse and assumes intimate knowledge of US MARC. It uses positional parameters for tags or ranges of tags and keyword parameters to specify subfields, print constants, spacing requirements, and special routines. The language does not attempt to include all special routines, as this would require much more extensive run-time parsing. Special routines required for MARC fields (such as indicator-based print constants) are included in the programs and activated by run-time controls.

We developed the RRS listing language by extending the syntax of the Product Batch entry format language and by adding vocabulary to cover list format and some additional special routines.

The selection, generation, and sorting language is similar to the listing language in many ways but has a somewhat richer syntax. Selection capabilities require information about "type of test," repeatability, test position, and other aspects irrelevant to list production. Developing a workable language for record selection was more difficult than writing the selection routines.

The resulting languages are terse and possibly arcane. Samples of some control statements appear in the figures and are discussed in some of the following sections. At the current state of development, it would be difficult to imagine direct entry of RRS controls by users. For one who is familiar with US MARC and full RLIN Reports System documentation, control specification is fast, flexible, and convenient. A translation scheme (user interface) will be needed to support direct specification of RLIN Reports by users.

SELECTION

Within the RRS, selection breaks down into three areas: library and status filtering, logical filtering, and record modification.

Library and Status Filtering

A list is usually produced for a single library (identified by an RLIN "library identifier," or "LI"). Lists normally exclude deleted records. Certain RMARC records in a batch file are not bibliographic records (lack a MARC portion) and should be excluded.

Library, RMARC "record type," and MARC status filtering is done before any other filtering. All three types of filtering can be done without preparing a record for full analysis (establishing the base address and setting directory pointers).

Logical Filtering

Logical filtering is the process of rejecting records that, though for the right library, are not of any use for this report. Such filtering is also called "selection," and in many cases the two are synonymous. In other cases, there is no need for filtering: all records in a file, for a given library and with appropriate statuses, are used in a report.

If filtering is used, an overall Boolean operator is specified: OR (:) or AND (&). If the overall operator is OR, a record is included if it meets at least one of the filtering criteria. If the overall operator is AND, a record must meet each of the filtering criteria in order to be included.

A second level of Boolean logic is provided by the ability to group individual tests into group criteria. A group criterion consists of two or more individual tests. The tests within a group take on the opposite Boolean operator of the overall operator. A group of tests within overall ANDing is ORed: the group succeeds if any test succeeds.

In some circumstances, a third level of Boolean logic is available. Certain tests are for the existence of one string within another string: for instance, the existence of the record's language code within the string "eng fre ger." In this case, a record with

any of the language codes "eng," "fre," or "ger" will pass the test. A positive test of this sort is inherently an OR test. A negative test (where the item requires that one string NOT be found in another: in the case above, rejecting English, French, and German publications) is inherently ANDed.

Each individual test examines some portion of the record: the prefix, the leader, a single tag or range of tags (such as 600–651), or a specific subfield. A test can be specific to a certain position within any of these—or can examine the entire record.

Each test can be for existence or absence, greater-than or less-than comparisons, date comparisons on elements that are in either of two date formats (mm/dd/yy or yymmdd), or string lookups. Greater-than and less-than comparisons must be on text strings; existence and absence tests can be on tags, subfields, or strings.

Figure 2 is an example of logical filtering. The first line of this set delimits the filtering section of the controls and specifies Boolean ANDing. The second line is a test: if the portion of the "first" leader at position B, length 1 is found in the string "m," the record passes. (This selects for monographs.) If the list was to include serials as well as books, the last operand would be "@Tms\."

The third line is another equality test, this time for the language of publication code. If the list should include materials published in English, French, and German, the last operand could be changed to "@Teng fre ger\". Note that coding "@Tengfreger" would also accept language codes "ngf," "gfr," "reg," and "ege"; while there may not be any such codes, the blanks make the test more rigorous.

The fourth and fifth line are a criterion group: if a record passes either of the two tests, it passes the group. The "G" on the fifth line indicates a group: all but the first test in a group have "G" in the first column.

The fourth line is a test for the old LC subject heading for World War I. Most probably, only field 650 needs to be checked. This test looks for multiple occurrences of any tag in the range 600–699, stopping as soon as a tag has the desired text. Note also that the text begins with "@F" rather than "@T," thus reversing the meaning: this test is passed if the string "European War, 1914–1918" is found anywhere within a 6xx field. (If "@$a" had been included in the line, the string would be looked for only in subfield a of each field.) The fifth line tests for the new LC subject heading for World War I. As it happens, a more efficient specification would combine both tests into

" = M600–699 @FWar, 1914–1918\."

The final line looks for the string "World War II" anywhere in the record and rejects the record if it is found.

Figure 8 shows records selected from a day's work in RLIN, using the selection criteria in figure 2.

Record Modification

Record modification was recently added to the RLIN Reports System to cover cases where certain portions of records should be invisible to the listing operation. Records are usually modified to suppress holdings. RLIN records include detailed local holdings information. A record belongs to a library (each LI has a separate record), but some "libraries" are actually consortia of libraries. If one library within a consortium has several locations and needs its own list, holdings for other libraries within the consortium must be suppressed.

While record modification was added to solve this problem, it can also be used for

```
FLT &
 =FL          @P8 @L1 @Tm\
 =F008        @P36 @L3 @Teng\
 =M600-699    @FEuropean War, 1914-1918\
G=M600-699    @FWorld War, 1914-1918\
 ~FR          @FWorld War II\
```

Fig. 2. Filtering for English-Language Books on World War I.

```
DEL
 ~A950          @$1 @P1 @L1 @TM\
 ~A955          @$1 @P1 @L1 @TM\
 =A600-699      @P1 @L1 @T1235678\
```

Fig 3. Record Modification.

cases where a library wants other fields suppressed in ways not normally handled in listing. Figure 3 shows both uses. This segment instructs the program to delete certain fields. The first line will delete any 950 (holdings: location level) in which the first character of the subfield 1 (location) is *NOT* "M." It would also delete any 950 without a subfield 1. The second line does the same thing for 955 fields (holdings: copy level), which have the same subfield 1 values.

The third line will delete any subject entries with a first indicator of 1, 2, 3, 5, 6, 7, or 8—in other words, all subject headings other than LCSH and local.

GENERATION

Generation of access points overlaps with sorting. Generation also overlaps with selection to some extent. To generate different access points for a list, a record must pass selection criteria for each type of access.

A list may include multiple access points for several different reasons. In some cases, single alphabetic lists provide more than one form of access; the *New York Public Library Interim List* provides seven different varieties of access: main entry, title entry (245), other title added entries, added entries (7xx), subject entries (6xx), series entries (8xx and 400–440), and publisher number entries for music (028).

In other cases, a "list" is actually a number of smaller lists combined into a single run. A typical case is a set of lists for new holdings in each location or a set of lists for selectors.

The RRS provides for multiple types of access by entry types: three-letter codes that group controls for each access point and that can form part of the sorting hierarchy. The "type codes" are used in the listing step to specify entry format and may also serve other functions.

Entry types within a multiple-type list tend to have common sorting characteristics. Most types have a secondary sort consisting of the main entry, title, and edition. The RRS provides sort segments, sets of sort controls that are defined once and can be used in many entry type definitions.

Sort segments serve two purposes. First, they reduce the amount of control handling (parsing, analysis, etc.). Second, for cases where a record actually generates several access points, they speed handling. When a segment is used in a record, the sort string (normalized to ALA filing rules with minor exceptions) is stored; if other access points within the same record use the same segment, the sort string is simply copied in, and need not be formed from scratch.

One additional concept is significant here: the directory pointer. In many cases, an access point is generated for a single instance of a multiply occurring field (such as subject headings or location). The entry as listed may need to reflect that particular instance: for a subject entry, the specific subject heading should be listed above the entry. The directory pointer stores a single address in the RMARC prefix, which refers to the field that actually generated this entry.

Generation controls are grouped in two ways. Segment definitions appear first. Each generation type appears as a group, with selection criteria (if any) appearing first, followed by sort criteria. A generation type can be defined to generate a single access point or multiple access points. If a multiple-generation type has ANDed selection criteria, only the last criterion can actually serve as a "generator."

Generation control examples

Figure 4 shows the most commonly used sort segment. The first line gives the segment a name (ENT) and a maximum length (two hundred characters). The second line specifies the first field in the range 100–130, taking subfields as they appear (but only the subfields listed). The third line specifies all fields in the range 240–245, taking subfields a, b, and h of each. The last line takes subfield c of field 260. All subfields are passed through a sort generator to prepare a proper sort string.

Figure 5 includes the first three access

```
SEG ENT @SL200
S F100-130 @$Labcdefghklmnopqrst\
S A240-245 @$Labh\
S F260     @$c
```

Fig. 4. Sort Segment for Main Entry.

points for a dictionary catalog. Most of the control statements should be fairly obvious, but some of them illustrate special features of the generation controls.

TYP ME: Every record has a main entry. No selection criteria are needed, and the ENT segment is used for sorting. The ENT sort string is stored at this point.

TYP TIT: Only one title entry can be generated (F), and a record must pass all of the criteria listed (&). There must either be a 1xx field or a 240 with first indicator 1 or 3, or a 243 with first indicator 1 or 3. There must also be a 245 with first indicator 1. If both criteria (the first group and the second) are passed, subfields a, d, e, h, n, and p of the 245 start the sort string, followed by the entry sort string (already built for the main entry). If the first criterion fails, the record has a title main entry and cannot have a separate title entry; if the second fails, the 245 does not call for a title entry.

TYP TAE: There can be several title added entries (A), and one is made each time any one of the criteria is passed (:). Note that OR has a slightly different meaning for a multiple TYP. Each criterion is inspected and may cause entry generation. The remainder of the controls are typical, testing first indicator contents (except 740, where the second indicator is tested).

Limits for Selection and Generation

The RRS allows up to 200 total items for all selection and generation criteria combined: these may be grouped as frequently as desired. No more than 200 sort items are allowed, and no more than 10 sort segments can be defined. Up to fifty entry TYPes may be defined in a single run. The total of all TYP criteria and filtering criteria cannot exceed 200, but since most TYPes have one or two criteria, this is not a severe limit. Within a given criterion, a text string can be up to 156 characters long. The longest set of criteria so far has been 70 to 80 lines.

SORTING

The RRS builds sort strings based on current ALA filing rules. The triple backslash technique for embedding sorting equivalents is supported. (This technique is not part of US MARC but is supported by several institutions.) Call numbers, which are

```
TYP ME  F
USE ENT
TYP TIT F &
 =M100-130
G=M240     @P1 @L1 @T13\
G=M243     @P1 @L1 @T13\
 =F245     @P1 @L1 @T1\ @SRT @$Ladehnp\
USE ENT
TYP TAE A :
 =A210-212 @P1 @L1 @T1\ @DIR @SRT @$Ladehnp\
 =A241-242 @P1 @L1 @T1\ @DIR @SRT @$Ladehnp\
 =A246-247 @P1 @L1 @T1\ @DIR @SRT @$Ladehnp\
 =A740     @P2 @L1 @T 012\ @DIR @SRT @$Lahnp\
USE ENT
```

Fig. 5. Multiple Access Points.

not directly covered by ALA filing rules, are normalized to sort correctly. (LC call numbers require normalization. Dewey call numbers are sortable without modification.)

The sort string for an entry is placed in the RMARC prefix, followed by the RLIN MARC record. The record is not modified for sorting (except as noted under "Record Modification," above). The actual sorting is done by standard sort utilities. SyncSort, a proprietary software package, is used by RLG.

No sort algorithm is perfect. The RRS algorithm has sufficed for good quality sorting of a list encompassing more than 200,000 entries (the second edition of the *New York Public Library Interim List)*, with only a few departures from the ALA standard.

LIST FORMAT

After the complexities of selection and generation, list format options seem relatively simple. Decisions on list format or page layout are bounded by external factors. For most lists, a very simple set of options suffices.

The list format includes width of entry column(s), number of columns, and where each column should begin. It also includes the number of lines per page and how those lines are to be used. Lines may be needed for headings, space below headings, body lines, space between entries, footing lines, and space above footings. The contents of the headings must also be specified, including location of the page number.

RRS listing capabilities include breakpoint processing: special actions to be taken when specified fixed portions of the sort string change. Such portions typically include the LC or Dewey class (one digit for Dewey, two characters for LC), the location code, and similar fixed-length items. For fiscal listings, the portions can include selector, fund, or vendor.

Breakpoint changes can force a new page (and, optionally, restart the page numbers), force a new column, or cause a heading to be generated within a column. The headings are always repeated on continuation pages and can be repeated on continuation columns.

Most lists use a single page heading line, but the system will allow up to three heading and three footing lines. We can provide "dictionary headings" giving part of the first (and optionally last) entry appearing on a page.

The standard RRS character set prints 13.6 characters per inch and 8.1 lines per inch. We normally provide two 42-character columns with 1-inch side margins, or three 31-character columns with $^2/_3$-inch side margins. After allowing for page heading lines, most lists provide 75 to 78 lines per page for bibliographic entries.

The widest possible line is 132 characters, allowing for microfiche output. The longest possible page is 150 lines, though products rarely require more than 80 lines. We currently translate special characters to equivalents within the standard ASCII character set and do not print diacritics. Support of full diacritics is solely a question of user needs and program space.

Run-time controls for list formatting are quite straightforward. Except for breakpoint controls, all such controls are on "FMT" lines, expressed in any order desired. Figure 6 shows a typical set of controls.

These controls, used for the standard "compact LC" list, include the list format and one level of breakpoint handling. The first line specifies that the first column begins in position 10; that the column width is 31 characters; that the second and third columns begin at 44 and 77 (the number of columns used is derived from the position specifications); that up to 78 body lines should be used; and that widowing is reduced to 3 lines. "Widowing," in this case,

```
FMT @BDL:78 @CL1:10 @COL:31 @CL2:44 @CL3:77 @WDW:3 @MGB:1 @MGR:1
FMT @HD1:15\New Holdings\ @HD1:70&DT @HD1:92&PG10
BKA @POS:8 @LEN:2 @EXP:1 @HDL:1 @HMA:1
```

Fig. 6. Format Controls.

is the number of lines that must be available at the bottom of a column if formatting is to begin for a new entry. One blank line is left below the heading, and one blank line appears between records.

The second line gives three pieces of the heading line: literal text, a formatted date (specified at run-time or generated from the system date), and the page number, not to exceed 10 characters including the characters "Page."

The third line specifies that the first breakpoint is at position 8 of the sort string and is 2 characters long. A change in the breakpoint (LC class) causes a heading line, starting at the left of the column (@HDL:1).The heading line should contain an expanded form of the breakpoint, found by appending the code to "1" and looking it up in a code expansion list (also provided at run time.) Finally, one blank line is to be provided above the breakpoint line.

ENTRY FORMAT

The library analysts working with the developer of the RRS established specifications for four levels of bibliographic completeness: least, limited, more detailed, and most detailed. The "most detailed" format is comparable to a comprehensive main-entry catalog card, including all notes and tracings. "Least" consists only of author, title, and edition (and only some of the author and title subfields) and is offered in two versions, one of which prints the title in capitals and does not force the title to a new line.

The five different standard formats (including the two forms of "least") are fully supported by the RRS. All special routines required for ISBD punctuation, indicator-based print constants and field suppression, numbering of tracings, and other listing requirements are contained in the standard RRS listing program. The five formats are stored as entry format controls in a common data set, together with four formats for holdings information and four formats for acquisitions information. All standard formats, and the supporting code, are maintained to meet the changing requirements and options of US MARC.

Most lists use standard formats, drawing from the common definitions. A user may specify a different format if needed. Many variations are possible, including nontraditional "labeled" listings. Figure 7 shows two entry format segments, the standard "more detailed" segment and a special "labeled" format. Figure 8 shows records listed using the two entry formats.

RLIN MARC includes complex and varied structures for holdings data, local data, and acquisitions data. Given this wealth of information, and the potential uses for RRS, the system must support varied methods of handling fields and subfields. Subfields may be used as they appear, or may be required in a specified order. Some subfields require specific print constants, and some require other special handling. The handling requirements are even more complex at the field and field-range level.

The entry control format is similar to the generation format, and only slightly more complicated. The primary differences are two: the need to deal with multiple subfields in various orders, and the need to be able to specify calls to special routines at various points. Special routines are all contained in a set of PL/I procedures containing "select" statements; each special routine is a specific case of the select, usually recognized by tag or subfield. Special routines can be specified:

1. When *no* occurrence of a field or range is found;
2. *Immediately* after finding an occurrence of a field or range;
3. Before *listing* the first subfield used;
4. *After completion* of the field;
5. *Before* a specific subfield is listed;
6. *After* a specific subfield is listed.

Fields can force new lines, have specified indentation, and have specified leading text. A paragraph control can also be specified; this is a locking control, which causes a new paragraph when the next field is encountered (even if no occurrence of the field in question appears).

As in the generation step, defined segments are used heavily in listing. Up to 50 such segments can appear. A listing segment does not save processing time; the segments serve to group commonly used con-

```
SEG MOR                  *More Detailed Bibliographic Format
100-190 @FL @FI2 @FB @$Labcdefghklmnopqrst\
240-243 @FL @FB @FCE @FA
245     @FL @PP @FB @FCE
250-254 @FB
362     @FX @FB @FL @FCE
255     @FB
260-262 @FB
300-305 @PP @FL @FS2
400-490 @FX @FCN @FT(\ @FA @$Labcdefghklmnoprstv\ @$x @ST ISSN \
400-490 @FL @FS2 @FB @FCP @$Labcdefghklmnoprstv\ @$% @ST%\
800-899 @FX @FCP @FB @FL @FS2  @$Labcdefghklmnopqrstv\ @$% @ST%\
001     @FX @FI2 @FL
028     @FS2 @FCN @FX @FB @$X @$b @$a @ST : \
024     @FS2 @FI2 @$a @STSRN: \
027     @FS2 @FI2 @$a @STSTRN: \
020     @FX @$Lbc\ @$a @STISBN \ @FS2 @FI2
022     @$a @STISSN \ @FS2 @FI2
010     @FI2 @FS2 @FB @$a
; (end of MOR segment)
SEG LB1                  *Special labelled format
100-110 @FL @FI8 @FTAuthor: \ @$Labchnp\
245     @FL @FI8 @FCL @FT Title: \ @$Labh\
260     @FL @FI8 @FCL @FT  Date: \ @$c
```

Fig. 7. Entry Format Segments.

trols, and to reduce the number of control lines required. Up to 500 field definitions may be used, but without segments even this might not be enough for a complex listing.

Three hundred slots are provided for leading text to handle fields and subfields. Most fields and subfields do not use print constants, and many fields which do use print constants require indicator checking in order to provide the correct print constant.

The controls in figure 7 include a number of special routine calls (such as @FX, @FN, @FB) and characters to specify the nature of the call (such as @FCL). Some fields, such as series statements (400–440, not 490 or 800–840), require special handling in different areas of a bibliographic listing.

We would need several additional pages to describe everything specified by the controls in figure 7. Figure 8 does show some of the effects of the controls.

EXPLAINING THE SYSTEM

The analysis and examples above show the RRS as it exists today. During its development, a survey of RLIN users was taken to see which of the new listings they could use best. Based on that survey, two dozen lists were brought to production status: some alphabetic new holdings lists, some classified lists, and a variety of acquisitions and fiscal reports.

The RRS was an experiment. RLG was responding to known needs, but ones that had not been stated explicitly. The early results were not encouraging. Few users ordered the reports.

At least four factors seem to be involved in the low use:

1. The initial offering included so much detail, and assumed so much knowledge of RLIN and MARC, that many who received it could not connect it to their own needs.

2. Only "standard" lists were included in the first offering, and many libraries have needs that are similar but not identical.

3. A sense had grown that RRS listings were very expensive, due partly to some badly informed criticism early on in the development, and partly to difficulties in estimating actual costs of lists.

4. RLG's normal procedures for com-

```
New Holdings: World War I

Author: Ashworth, Tony.
 Title: Trench warfare, 1914-1918 : the
        live and let live system.
  Date: 1980.

Ashworth, Tony.
  Trench warfare, 1914-1918 : the live and
let live system / Tony Ashworth. -- New
York, N.Y. : Holmes & Meier, 1980.
  xi, 266 p., [8] leaves of plates : ill.
; 23 cm.
[ID: NYCX82-B43015]  ISBN 0-8419-0615-7.
  LCCN: 80-13696.

Author: Avalov, Z.
 Title: The independence of Georgia in
        international politics, 1918-1921
  Date: [1981]

Avalov, Z. (Zurab)
  [Nezavisimost Gruzii v mezhdunarodnoi
politike 1918-1921 g.g. English]
  The independence of Georgia in
international politics, 1918-1921 / by
Zourab Avalishvili. -- Westport, Conn. :
Hyperion Press, [1981]
  xxi, 286 p. ; 22 cm.
[ID: NJPG82-B53963]  ISBN 0-8305-0059-6 :
  $23.50.  LCCN: 79-2890//r82.

Author: Franklin, Miles.
 Title: On Dearborn Street.
  Date: c1981.
```

Fig. 8. List Example (partial): Figure 2 Selection, Figure 7 Formats.

munication and publicity apparently failed to reach the librarians who could benefit most from RRS listings, or reached them in such a way that they failed to appreciate the possibilities.

While the RLIN Reports System meets a number of outstanding requests from RLG members and RLIN users, it was not part of the original RLIN II services. As a new function, its use has been limited, but most libraries who have signed up for listings are enthusiastic about them.

In the spring of 1983, RLG staff moved to provide "custom listings" ahead of the original schedule, but without any formal support of formal documentation. This informal approach allows us to solve special problems without major expense. With the availability of lists specifically tailored to the needs of individual libraries, and with word of mouth from the present users, we expect that the system will be used more heavily in the future.

The success or failure of the RRS does not wholly depend on the number of users. The system was developed without outside funding or any major commitment of staff. Most of the system is needed for other projects. The proposed RLG *Union List of Archival Microform Masters* and nearly all of the Archival and Manuscript Control printed products will be generated by the Reports System.

The most surprising aspect of RRS to date has been the difficulty of introducing something new. Observers have noted that some bibliographic services seem to be growing sluggish and inflexible. The RLIN Reports System is an attempt to respond to library needs in a nonmonolithic, flexible, small-scale manner. To date, the results suggest that only a massive, expensive pro-

gram of publicity, education, and training can succeed in introducing a new product or function. If this is true, the perceived inflexibility of bibliographic services may be a realistic response to the sheer difficulty of introducing new functions.

That is the negative side. The positive side is that a number of libraries, including some very small libraries, are now receiving prompt, attractive reports at a reasonable cost: a service that few could provide for themselves as quickly or as well.

CONCLUSIONS

Is it possible to build a fully generalized selection and listing system for MARC records? Yes and no.

YES. The RLIN Reports System tools allow nearly all selection and generation needs to be handled without special subroutine calls and by straightforward control specifications. Boolean logic works well in this situation, and the combination of PL/I and MARC is such that moderately large databases can be handled quickly and cheaply. While such a system could never replace indexing and online retrieval for very large databases, it works quite well for specialized retrieval from a batch MARC file small enough to fit on a single disk drive (that is, up to half a million records or so).

The RRS is designed for sequential batch processing as opposed to random-access interactive processing, as in large online systems.

The page formatting tools allow very flexible formatting without special subroutines, with generally pleasing results. While the listing system is not as efficient as the selection system, it is still relatively efficient.

Most simple bibliographic listings actually require very few special routine calls. Most such "hard coded" routines are for fiscal listings or for the extra work needed for tracings and related-entry fields.

NO. The RLIN Reports System, as a given set of programs, is not fully generalized and probably never will be. The most detailed bibliographic listings require many special functions. The RRS includes the known special functions within the program, rather than extending the control language to handle them in a fully generalized manner.

For the RRS to provide full generality at the run-control level, the control syntax and handling would be so burdensome that it would become difficult to use. At present, a new custom list can usually be installed in half an hour or so; with full generality, it might require hours or days for each one. As a result, any given set of programs establishes a set of limits for listing possibilities. The fundamental tools of the RRS are code modules and can be used in new programs to meet new needs.

The system, as it now stands, is a conceptual success, and has been quite useful for those libraries taking advantage of it. Its use is growing slowly, partly because the availability of somewhat customized new title and other lists from RLG is unusual enough to require some rethinking within libraries.

The RRS, which began as an experiment, is the basis for most growth in RLIN Product Batch services. The extension of RLIN for archival processing will require a number of new printed products. All of these will be new sets of controls for the RRS—if necessary, with a new set of programs adding needed special routines.

As a possible support package for distributed processing, the future of the RRS appears particularly bright. Written in PL/I, the system could eventually become part of an exportable RLIN, providing an enormously flexible tool for bibliographies, alerting reports, and other special lists to extend library services.

Even within the era of online catalogs, there will always be a need for printed products (or, in some cases, fiche equivalents). The uses for specialized bibliographic listings may well grow, and the RRS is a powerful tool to meet such needs. ■■

Printing and the Online Catalog

Bennett J. Price

The ability to print catalog records is a feature unique to online catalogs—a feature much appreciated by library patrons. What is to be printed and how it can best be done are questions that have hardly begun to be faced. This paper discusses the issues involved in offering printing for online catalogs and weighs, in particular, the advantages and disadvantages of screen printing versus remote printing. Certain other technical issues are also covered, particularly buffered versus unbuffered asynchronous printer ports.

The recent CLR online catalog user survey has confirmed what was obvious to all—online catalog users want to print what they see at the terminal. Indeed, printing is one of those features unique to the online catalog; our book, card, and microform catalogs only can be reproduced. By offering printing we can enhance the utility of our online catalogs considerably.

THE CHALLENGE

What should be printed? A title and a call number, or a list of all holdings which have the author United States? Should we print the location and call number of every copy in our library system including those checked out, noncirculating, at the bindery, or at a member library two hundred miles away?

Obviously certain types of bibliographic information may be unprintable. For example, online catalogs that are not part of circulation systems cannot print circulation information. Circulation systems that do not have subject tracings as part of their database cannot print subject bibliographies. It seems safe to say that if a system cannot get the information onto a screen it will not be able to get it onto a piece of paper. Note, conversely, that certain lists are virtually useless on the screen; a shelf inventory needs a list of call numbers with a tick next to those books known to be "not-on-shelf." The same information on the VDT screen is just about useless—at least until portable cordless terminals become available.

What to Print

But what do our patrons wish printed? At the very least they will take whatever they can get. But we should try to provide for their needs (and our own) in some more rational fashion. Simply think of the reasons people use the catalog and the library. They wish to locate and perhaps check out a known item—the screen will notify them of the item's status, but it would be nice to have the call number printed on a slip of paper. If they wish to locate several known items then abbreviated author-title information plus call number needs to be printed. They may have a list of twenty known items from which they wish to consult or borrow whatever is on the shelf; these patrons need a list of call numbers and abbreviated bibliographic information, sorted by call number, or, in some library

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systems, sorted by branch and then subsorted by call number within each branch. Such a printout is a "picking list" that enables an orderly stack search. Some users will have a few good known items and will want other works on the same topic; after examining the subject tracings, these users will then do a subject search. And some patrons will wish to see all the editions of Shakespeare owned by the library or want a complete bibliography on World War II. The patron who wanted a few call numbers yesterday may want a two-hundred-item subject bibliography tomorrow.

Print Formats

Many online catalogs could simply print what they now display on the screen and thereby do their patrons a great service. But to fully integrate printing into the catalog will take extra thought and effort. Consider some of the opportunities awaiting us. Many online catalogs have records that span two screens; on paper such a record ought not be split into two "screen images." VDTs typically display lines 80 characters in length while many printers can print lines of 132 characters. A 132-character 14-inch-wide line is certainly not easy to read, but programming can enable two columns of 60 characters to be printed on each page. The sort order used to present records on the screen may not always be the best when records are printed. The pride of place that we devote to call numbers may be inappropriate in records printed primarily for their bibliographic, as opposed to their locational, value.

It may be desirable to print records within the boundaries of a 3-by-5-inch outline; such records can be sliced up by the user and integrated into an existing handwritten card file. Only "cards" can be readily used in personal bibliographies built up over a period of months or years; printed lists cannot be easily integrated into existing files. A 3 by 5–like printout does not necessarily entail a catalog card look-alike; some online catalog systems may not have all the data elements necessary to produce a "typical" card, while other systems may choose to print all the data but in an order and format very different from that which we have come to expect on catalog cards.

Special Services

Libraries may wish to offer a current awareness or SDI service to their patrons. The library might each month print out recent acquisitions in a subject area and mail such lists to users. Online catalogs that process LC-MARC distribution tapes could offer an expanded service. Libraries would help users establish an interest profile based on certain class numbers, keywords, or subject headings. Ideally this sort of printing would be done automatically. The patron, after establishing a profile, need do nothing more; certainly not sit at terminal every month and press a PRINT button.

In the not-too-distant future, much of this SDI activity and catalog inquiry will be done remotely; patrons will use their personal computers to talk to our online catalogs. These personal computers will save results on their floppy disks; printing then becomes the problem of the PC's owner—at least until libraries start to offer a floppy-to-paper copy service.

THE RESOURCES

First, it is important to distinguish between two types of printing—screen printing and remote printing. A screen printer (or slave printer) is one that is connected to one terminal and located near that terminal. When a PRINT button is pressed, a "picture" of the screen is transferred to paper. This configuration will be familiar to technical services staff who may have such a printer connected to the back of an OCLC or RLIN terminal. Ideally in this configuration each terminal has its own printer. It is possible, however, by use of a switch mutually convenient to all terminal operators, for several contiguous terminals to share a printer. (When configured this way the printout of the various operators will be intermingled and must be manually separated.)

Remote printing—the means by which OCLC prints catalog cards for a library—is well known to public service staff who search Dialog, Orbit, BRS, etc. Here little printing is done at the terminal, even if the terminal is a printing terminal. Instead,

once a search is successfully completed, a PRINT command is issued. The system then prints the results (often hours after the search was completed) and mails them to the searcher or the patron.

In sum, a screen printer is driven by a terminal (which is in turn connected to a computer) while a remote printer is directly driven by (and connected to) a computer.

ADVANTAGES AND DISADVANTAGES

Speed

Two different kinds of speed must be considered. One is printing time, the other delivery time. The types of printers most likely to be used for screen printing print anywhere from 30 to 200 characters per second (cps) and cost from $200 to $2,000. These typically use daisy wheel or dot matrix print mechanisms. A remote printer, one driven directly by a computer rather than by a terminal, typically prints from 200 lines per minute (lpm) to 10,000 lines per minute, costs anywhere from $3,000 to $150,000, and uses print chains or bands, or laser technology. While 200 lpm may be about the same speed as 200 cps, this does not mean that a fast dot matrix screen printer and a slow print chain remote printer will do the same amount of printing. The remote printer works virtually full time while a screen printer may sit idle much of the time as patrons learn to use the system, read what is on the screen, take notes, etc.

Although most remote printers are faster than screen printers by an order of magnitude, this may not always help our patrons much; we also must consider delivery time. A screen printer may take several seconds to print one screen; the patron then walks away with printout. The remote printer may be able to print the same information in a fraction of a second but it may take minutes, hours, or days for the patron to get the piece of paper. On the other hand, a screen printer might take 5 to 20 minutes (or even much longer) to produce a bibliography of 200 items, each 600 characters long. (For reference, most VDT screens display 24 lines of 80 characters, or 1,920 characters.) This is wasted time for the patron who might well prefer to receive this printout in the mail after a wait of several days.

Quality

Generally speaking, if the cost of the equipment is held constant, as speed goes up, print quality goes down. IBM ball writers (and other electric typewriters) print at about 15 cps; daisy or thimble wheel printers (capable of letter-quality printing) typically print from 30 to 60 cps. To attain speeds above 60 cps when screen printing, dot matrix printers are used, whether impact, thermal, electrostatic, or inkjet.

Printers with print chains or print bands (the sort most commonly used for remote printing) impress fully formed characters onto the page. Their character sets are often identical to those found on office typewriters and, if loaded with film ribbons rather than cloth ribbons, their printing is often of letter quality. With long-lived cloth ribbons, their print quality lies somewhere between that of a letter-quality typewriter or printer and a dot matrix printer.

Some remote printers use laser technology and are capable of very high quality printing at quite high speeds. Because of their high-quality output, many laser printers are designed to use cut sheets, (8.5 by 11, e.g.) rather than tractor feed fanfold paper. Some laser printers can print on both sides of a page.

The ALA character set is available on some higher-priced dot matrix printers and some print chain and laser printers.

Privacy

Screen printers deliver their paper directly to the user; no log on or sign on is needed to identify the printout for subsequent handling, distribution, delivery, or mailing.

Convenience

For the librarian, screen printing will often be inconvenient since there will be ribbons and paper to replace, trash to throw away, and paper jams to clear. Moreover, there may be numerous printer breakdowns. A remote printer will generally take

these tasks off of the shoulders of public service staff and burden back-room staff instead. On the other hand, while it is possible to operate remote printers on a burst-it-yourself basis, in all likelihood library staff will have to burst and distribute remote printout. This distribution may involve envelope stuffing and mailing expenses.

For patrons, screen printing "while-u-wait" will generally be most convenient since a return visit is not necessary. When large amounts of printing are needed, however, it may be more convenient for the patron to have it done remotely and then mailed.

Noise

Most printers are quite noisy. Accessory soundproofing hoods, which cost from $100 to $500, dampen the noise considerably but are far from perfect. Thermal printers use the quietest technology. (Their special heat-sensitive paper, however, is about 1.5 times more expensive than conventional paper. Moreover, it comes in rolls of 300 feet at most while fanfold paper comes in much longer lengths; the exact length is dependent upon the weight of the paper. The longer the paper the less often the printer will run out of it.) Remote printers, no matter how noisy, can usually be put somewhere where they will not be intrusive. Screen printers should be close to the patron's terminal. Coincidentally, while all printers take up space, screen printers need space in public areas.

Control

Users can see what is happening at a screen printer. If the bibliography proves truly irrelevant, printing can be stopped and the search redone. If the paper jams, the patron knows it immediately and can have it fixed or go to another machine. Additionally, with control comes responsibility—screen printing may deter some patrons from printing dozens of pages since the patron must sit at the terminal until printing is completed. In remote printing, on the other hand, once a patron has issued a PRINT command to the computer control is lost. If the search proves faulty and delivery takes inordinately long, the patron will have to return to the library to redo it.

Costs

First, for comparable quantities of output, the cost of one high-speed remote printer should be compared to that of several lower-speed screen printers. It is possible, of course, that the printers are already owned. Printing terminals used for database searching can often be connected to a video terminal and used as a slave (i.e., screen) printer. Similarly, online catalogs running on municipal or campus mainframe computers most likely already have remote printers attached. Turnkey circulation systems often have printers; they may be able to be used for bibliographic purposes.

Second, to the cost of hardware must be added salaries for analysts, librarians, and programmers who will implement special printing formats, whether these formats are designed for screen printers or remote printers. If the screen printer simply copies exactly what is on the screen, these salaries will not be necessary.

To these substantial start-up costs must be added paper and ribbon charges, routine and reactive maintenance charges, possible mailing and distribution costs. Such costs should not markedly differ whether remote printing or screen printing is offered provided both systems are printing the same number of pages. The computer that schedules and queues printing jobs for a remote printer can easily calculate a billing charge. Similarly, it is possible to add coin-operated vending to screen printers, (twenty-five cents for five minutes perhaps); these cost-recovery efforts raise once again the question of fees for service. Unlike database searching, however, these fees are not simply being passed along. Whether or not printing will be considered a library service as basic to the library as lending books or maintaining a catalog remains to be seen.

Accessibility and Service

It is obvious that screen printing is faster than manual transcription, but this does not fully exhaust the service implications caused by the addition of a screen printer.

While it is likely that a screen printer will speed catalog traffic and allow fewer terminals to be used in a given location, this may not always prove true. First, while patrons in the past might jot down notes on half a dozen books while looking through the screens for two dozen, the addition of a printer may result in their inspecting and printing all two dozen with very little saving in terminal time. In libraries that are simultaneously maintaining online catalogs and card or microform catalogs, the addition of a printer may add to the number of online catalog users rather than simply speeding up those already using terminals. Consider, too, that the addition of a printer may just move the waiting queue from the more numerous but printerless terminals to the less numerous terminals with printers.

Screen printers may also adversely affect a system's response time because the terminals to which they are connected demand far more data in a given time than do other terminals. Printerless VDTs spend much of their time being read by humans rather than communicating with a computer. Remote printers, on the other hand, can be scheduled for night or weekend periods when computer or telecommunications use is light, provided the library is willing to institutionalize such delay.

Other Considerations

In as much as these functions are less directly related to the public's use of online catalogs, I merely mention them; their financial implications are clear.

Printers, whether screen or remote, may be able to support other library activities. Today ILL/ILB transactions and acquisitions activities require printing support. Additionally, it is useful to be able to print subsets of the catalog to aid in collection development. Tomorrow we will need to supply paper copies from electronic databases and document delivery systems. Add, too, the increasing use of microcomputers to store and manipulate down-loaded information from the large commercial database searching services. Once manipulated, this down-loaded data will need to be printed. Word processing systems sometimes run on the same computer as online catalogs; these systems also need printers.

TECHNICAL COMPATIBILITIES

This section discusses certain often overlooked technical points in planning printing for online catalogs. Programmers and analysts should find it generally useful. Librarians without a computer background will find the discussion of buffered and unbuffered printer ports important.

There are two basic types of RS-232-C ASCII asynchronous printer ports on the back of terminals—buffered and unbuffered.

Buffered Ports

Buffered printer ports (such as those found on the OCLC Beehive 105 and RLIN Zentec ZMS 90) store the contents of the screen within a small buffer memory inside the terminal. When the PRINT button is pressed, the contents of the screen, as represented in the buffer, are sent to the printer. A buffered printer port *requires the data to be on the terminal screen* before it is sent to the printer. Often the terminal will not be able to accept new data from the computer while it is sending data to the printer. The practical consequence of this is that printing must be done a screen at a time; a command like PRINT 1-25 (and wake me when you're done) most likely cannot be issued; rather, each record must be put on the screen by the patron, and then printed by the patron. At the very least this will substantially increase the time it takes to retrieve and print records.

One advantage of the buffered printer port is that it permits the printer to operate at a baud rate different from that of the terminal—an important consideration for printers with limited baud rate and buffering capabilities. The other major advantage of the buffered printer port is that it permits the modifications that a keyer has put on the screen to be printed—clearly a necessity in any technical processing system using a fill-in-the-form approach.

Note, too, that some terminals with buffered printer ports send a signal to the host computer just before they start sending data to the printer. This signal (X-OFF, for example) is designed to tell the host computer that the terminal is busy with other

business; such signals can cause problems for some computers and their telecommunications handlers.

Unbuffered Ports

An unbuffered printer port operates at the same data rate as the terminal and sends data to the printer *as it arrives* on the screen. As a consequence, printing is faster with unbuffered ports than with buffered ports since the data goes without interruption from computer to terminal to printer. Some terminals allow data to be sent to the printer port while not changing the contents of the screen. For example, a menu of command options can remain steadily on the screen while data is being sent to the printer. With such an unbuffered printer port either (1) the printer must have buffering, or (2) the printer must print at least as fast as the terminal's data rate, or (3) the computer/terminal/printer combination must be able to accept a signal from the printer that in effect says "stop sending data until I catch up—I'll let you know when I'm ready to accept more." Such a signal can either be the change of state of a Printer Busy or Printer Ready pin or may be special control characters (X-On and X-Off, e.g.) sent by the printer to the terminal. The terminal must be able to respond to such a signal and relay it to the host computer or communications controller. Much equipment cannot do this.

Terminal-Printer Compatability

Yet another difficulty can arise when a printer receives certain Escape and Control characters that have been embedded in the data stream in order to control the VDT. Escape J, for example, is used to clear the screen of many different brands of VDTs; it also makes at least one brand of printer go offline. Linefeeds (Control J) can be sent to the terminal (and subsequently to the printer) by the host or they can be generated within the terminal after receipt of a Carriage Return. The printer, if it does not receive Linefeeds from the host, will have to generate them itself; some printers cannot do this.

Another problem, different in source but similar in effect, can arise when lines exceeding eighty characters are sent to terminals lacking wraparound capability. On such terminals, characters past the eightieth will not appear on the screen; they will, generally speaking, be passed along to the printer however.

It is possible, moreover, to add printers to terminals that lack a printer port or that have an unsuitable buffered printer port. The ground and receive data pins of the printer (#7 and #3) can be attached to the ground and receive data pins on the terminal (#7 and #3); other printer pins may have to be strapped together as well. The Online-Offline button of the printer is then used to turn the printer off and on. In some systems, however, the terminal must be set to half-duplex or local echo; in such systems the printer will only print half of the "conversation"—that from host to terminal. What is keyed onto the screen will not be printed.

In sum, it is fairly easy to get a printer and a terminal to somehow work together and thus provide printing of some sort in some way. It may be impossible, however, to get certain equipment to work together in the desired manner. Instruction manuals are of some help but it is imperative to actually try out the terminal-printer combination while it is connected to a particular online catalog system. Such a trial is the only assurance that a printer will do what is wanted.

WHAT TO DO

From the preceding, I hope it is clear that no method of printing is universally best. The optimum solution for many libraries may be to use both screen and remote printing; other libraries may find one method or other wholly suitable. Of course, costs must be figured into the whole picture; what is best may simply cost too much. ■■

Identification and Evaluation of Software for Microcomputer-Based In-House Databases

Carol Tenopir

One of the most important aspects of creating an in-house database using a microcomputer is the choice of software. There are an increasing number of software packages available that are appropriate for library databases, but the choice of the one that best meets your needs is not always simple. This paper examines the growing literature on the topic to provide help in the identification of microcomputer software for library database applications and to assist in the evaluation process. Appendixes list selected microcomputer software directories and specific software packages.

INTRODUCTION

In-house online databases, created by a library or information center to meet the special information retrieval needs of its clientele, are becoming increasingly popular. These databases serve many purposes. They can replace print versions of such locally created tools as referral directories, indexes to vertical file materials, or abstracts of literature on a specific topic. They can be indexes to special types of materials or collections (e.g., audiovisuals, engineering drawings); full text or abstracts of internal corporate reports; or a central access system for all of the information resources in the information center. What in-house databases have in common is that they are all created with the library's own unique constituency in mind. The databases are created for a given situation and thus tend to be narrowly focused and very patron-oriented. They offer online retrieval to materials that are sometimes accessible nowhere else; allow easy updating of often rapidly changing information; and provide increased control over all information resources.

Until recently, however, the high costs of hardware made in-house databases out of reach for the small information center. The proliferation of small, powerful, but relatively inexpensive microcomputers since the late 1970s is changing this, and many managers of small libraries or information centers are now creating (or considering) online information retrieval systems for in-house materials.

The creation of an in-house database is not merely a matter of identifying the application and purchasing a microcomputer. Many decisions and plans must be made to create a successful database system, both in conjunction with and independent from the hardware choice. Some of the most important of these decisions relate to software, for poor software can cost information managers and end users more than the cost of the hardware in terms of wasted time, extensive modifications, and frustration. Without good software that is suited to the application, the system will

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never perform as it should. Appropriate software is so important that many experts urge potential microcomputer users to first shop for software to meet their needs, then purchase hardware that can run this software.[1]

Information managers must decide whether to purchase a prewritten, off-the-shelf software package, lease or purchase a hardware/software turnkey package, write their own programs, or have custom programs written for them. They must be familiar with existing packages in order to see all options open to them. Finally, they must feel comfortable with their ability to evaluate the many choices in order to develop or select the software that best meets their needs.

Unfortunately, no definitive formula for choice of microcomputer software for in-house databases is possible because software choice is ultimately dependent on each individual situation. The literature on the topic is sparse and uneven in quality, and "most reports deal with isolated techniques and system features."[2] There is a growing body of literature, however, that can provide help in choosing software for the creation of a microcomputer-based in-house database in the information center. This article will review and evaluate that literature, including sections on purchasing versus programming; directories of software; evaluation of software; and sources for software descriptions or reviews. It will not discuss literature that deals only with microcomputer characteristics or choice of hardware, nor will it include most descriptions of specific in-house database applications. Literature from related fields will be included only as it supplements the library literature.

PURCHASE OR PROGRAM

One of the first software decisions that must be made is whether to purchase a prewritten software package, lease or purchase a turnkey system, or create custom programs. Custom-created programs may either be written by the library or data processing department staff or by consultants hired for that purpose.

The debate over whether to purchase or program is not unique to microcomputer systems, but it surfaces repeatedly with microcomputers because they have been sold as "personal computers" that are especially easy to program and because commercially available microcomputer software has the reputation of being poor.

Until very recently, little microcomputer software for library applications was available, so programming in-house may have been the only alternative. As recently as 1980, the fact that there was little software for libraries and information centers was a real problem in the use of microcomputers in libraries. Pratt said in that year, "There does not seem to be anything presently on the market aimed at libraries. Thus it is necessary for libraries to write, or have written, their own programs for their own purposes."[3]

Lundeen noted in 1980 that "much of the applications software being marketed for micros is of mediocre quality, and it is often very poorly documented. The librarian eager to use a micro in a library application will usually have to write (or have written) the software to do the job."[4] Lundeen went on to point out, however, that "the librarian who is contemplating using micros to automate should realize that the programming is not likely to be a trivial task. Software may well cost much more than the system hardware."[5]

Pratt also realized that the complexity of many library applications complicates in-house programming. He believed "it is unlikely that any library would have sufficient in-house capability to develop an adequate system. To have one custom-designed by outside consultants will probably prove more costly than acquiring one of the already available commercial turnkey systems."[6]

In the last year, a growing recognition of the complexity of the in-house database programming task, together with an increase in the number of available software packages and turnkey systems, has led to a swing away from recommending customized programming. In spite of Rowat's fear that "packages suitable for use in libraries will not be developed by the commercial sector until the library and information market is perceived to be one of sufficient coherence and size to warrant the considerable investment needed,"[7] more and more writers are realizing that "an astonishing

number of companies . . . are now competing frenetically to anticipate and fulfill all conceivable needs of consumers of software," including libraries.[8] The number of packages suitable for creating in-house databases has grown tremendously in the last year. The introduction of the de facto standard operating system CP/M, together with the availability of standard higher-level languages on microcomputers, has allowed the proliferation of prewritten software packages.[9]

Programs for in-house databases are complex and expensive to develop, making it less advantageous to do in-house development when something good is available commercially. Complicated "total library systems" are compared to home building in *Small Computers in Libraries.*

> These total systems are much too elaborate and complex to consider writing them "in-house," at least for libraries that do not have NLM-style budgets. This is not to imply, as some think, that computer programming "is too complicated for librarians". . . . It's not that librarians can't write complex programs, it's that doing so is not their job.
>
> You could build your own home, but hardly anybody does. It's simpler, and probably cheaper, to have somebody else build it.[10]

The *Library Systems Newsletter* estimates that programming costs more than 80 percent of the total cost of developing a new system.[11] This article cites another disadvantage of doing your own programming or having it written for you—"the customer pays directly for the developer's mistakes. In contrast, when one purchases a software package from an established firm, one normally gets a working product that has already been installed and which can be investigated before purchase."[12]

Rorvig, in his 1982 book *Microcomputers and Libraries*, takes exception to the trend away from in-house programming when he states that "the best way for librarians to get the software they need is to learn BASIC or other languages and then to program functions for themselves. . . . In the final analysis librarians will not receive the applications software of greatest benefit to their institutions unless they themselves learn to program microcomputers. This is not as formidable a task as it might first seem."[13] These statements are not in tune with the growing current consensus and were met with an outcry of dissension.

In a review of Rorvig's book, Gordon says that for librarians to write their own application programs is "neither a practical nor financially feasible approach." She points out that "major computer manufacturers . . . spend two thirds of their engineering dollars on software development; and typically 30 percent of a large corporation's total data processing budget is spent on software."[14] Clearly, small libraries cannot afford such an investment.

Schuyler advises that the "expertise needed to program a sophisticated application is quite substantial; the time necessary is considerable." He goes on to warn that "information such as this, written with a tone of authority, may set the reader on the wrong path from which it may be time consuming (and therefore costly) to recover."[15]

Even favorable reviews of Rorvig's book by Grosch and by Pratt take exception to his opinion on programming. Grosch advises, "It still is true that a certain class of serious professional users will find that they must do some software development; however many librarians will find an assortment of software to enable them to use their micro as a professional support tool."[16]

Pratt warns:

> Except under unusual circumstances this [writing your own program] is not a good idea. The writing of a fully debugged and operational system to perform any library task is not something to be undertaken without a strong commitment of resources and time. It is difficult to do, especially by inexperienced programmers. Librarians simply do not have the time to become good programmers in addition to their normal duties.[17]

The consensus in the library literature seems to have changed in two years to favor the purchase of existing microcomputer software or turnkey systems rather than developing programs from scratch. This may not always meet every need in all situations, however. Turnkey systems especially allow no local modifications, and the application must be tailored to meet the constraints of the software. A middle ground that combines both options is often desirable.

Modifying an existing software package to meet individual needs may provide the best of both options. Kelley recommends

purchase of "modular software" for applications that are "fairly complex and unique." Modular software is defined as a "program that acts as a tool, enabling someone with very limited programming skills to develop useful programs which are somewhat specific to the user's situation."[18] Database management systems (DBMS) are well-known examples of modular software.

The literature contains many descriptions of DBMS software, including examples of libraries or information centers that have adapted different DBMS programs for the creation of in-house databases. (See, for example, *Small Computers in Libraries.*) The DBMS literature is too extensive to be covered completely in this article, but the adaptation of DBMS for use in libraries is addressed, as DBMS software allows information managers to create customized database systems without having to do extensive programming. There are many commercially available DBMS programs suitable for library/information retrieval applications to varying degrees. Kelley believes a "DBMS program is the most important piece of software one can purchase."[19]

Another, more difficult, way to combine prewritten software and customized programming is to purchase a package written in a known programming language and to write additional routines "to layer over the preprogrammed ones."[20] The problems with this approach are that the information center must then also be responsible for programming and that modification of an existing program may affect other parts of the program in unexpected ways. Plans for any such modifications should be made cautiously.

If prewritten software is the best option for the creation of microcomputer-based in-house databases, how can information managers find out what is available? Vickery and Brooks saw the need for a directory of available software for use in libraries in 1980.[21] Even in January 1982, there was "no easy way of discovering what software was available."[22] Garoogian calls this a "variation on the familiar library problem of bibliographic control."[23] In the last year, several publications have appeared that help to meet this problem.

SOFTWARE SOURCES

Until 1982 there were no microcomputer software directories targeted to library or information applications, although there were directories of microcomputer software applicable to other special interest areas (notably education and business). Several general microcomputer software directories have had to serve the information manager's needs. Myer's 1982 book includes an annotated list of software directories of all types. Garoogian covers sources for identification of software (pre-1982) in her article in the premiere (February) issue of *Software Review*.

Datapro Directory of Microcomputer Software began publication in 1981. In its section on "Data Management and Database Management," it includes information about DBMS, file management, storage and retrieval, and specialized storage and retrieval software packages. *Small Systems Software and Services Sourcebook* describes more than thirteen hundred small-computer software packages. *International Microcomputer Database* is available online via DIALOG. It is a combined online file that includes the *International Minicomputer Software Directory* and the *International Microcomputer Software Directory* and describes more than ten thousand commercially available software packages. Management Information Corporation, Cherry Hill, New Jersey, publishes an annual survey on small business computers, peripherals, and software.

Many other microcomputer software directories include only programs for a specific type of computer or operating system. (See, for example, *The IBM Personal Computer Software Directory*, Farmingham, Mass., International Management Services, second quarter, 1983.)

Database management system software for microcomputers is included in general DBMS directories, notably *A Buyer's Guide to Data Base Management Systems* (Delran, N.J.: Datapro Research Corp.) and *Datamation* magazine's regular DBMS software surveys. Appendix A lists some general microcomputer software sources.

These general directories include more software packages that are inappropriate

for library applications than are appropriate. They therefore provide an information glut and can be frustrating to use. Recently published directories that are limited to library applications software are briefly reviewed by Tenopir.[24] These directories are a welcome addition to the field and will be examined more closely here. Publication information for each is given in appendix A.

Online Micro-Software Guide and Directory: 1983–84 includes descriptions of more than seven hundred microcomputer software packages, ninety of which are database management systems. A chart compares the major features of the most popular DBMS packages, although not enough information is given to allow real evaluation.

Information for each package includes:

- name, address, phone number of company
- contact person
- software name and version and date released
- cost
- applications
- operating environment
- hardware requirements
- documentation (a list and prices but nonevaluative)
- product description (several descriptive sentences)
- where purchased.

The arrangement of the *Online Micro-Software Guide* is alphabetical by company, with indexes by software name and producer. An addendum provides a much-needed index by applications, but an index by operating systems or hardware would be another useful addition.

The arrangement of this directory is straightforward and easy to follow. Four packages are listed on each page with a reduced typescript that keeps the size of the total directory manageable but causes some eyestrain.

A large number of microcomputer software packages are added to the market each month. Supplements to the directory in October 1983 and 1984 include hundreds of these new packages. The microcomputer software market changes so rapidly, however, that a printed publication can never be up-to-date. The *Online Micro-Software Guide and Directory* is also available online in a BRS as "File Soft."

A nice feature of this directory is the inclusion of nontechnical articles on various aspects of software use and a bibliography of articles on microcomputer software. These additions make this directory more than just a listing of hundreds of packages.

Micro Software Report: Library Edition (Jeanne Nolan) came out in July 1982. This directory contains almost three hundred software packages, approximately sixty of which are DBMS. It does not claim to be selective, so it is difficult to explain why there are four hundred fewer packages in it than in the Online, Inc., directory. One explanation is that the Nolan directory is more focused on the library market; the Online directory contains many general-purpose software packages that might be used in information work. Another reason is that information on packages in the Nolan directory was gathered from printed sources, while Online contacted software vendors directly.

Micro Software Report is arranged alphabetically by software-package name with an index by application. Information for each package includes:

- package name
- producer
- description (one to two sentences)
- equipment requirements
- source of reviews if any
- whether or not the review was favorable
- installations (this element is usually missing)
- price
- address.

Citations for reviews is a nice idea that was expanded in the fall of 1983 with the publication of *Microsoftware Evaluations.* (See "Software Description and Reviews," in this article.) No articles or guides to evaluation are included in the directory.

A 1983 edition of *Micro Software Report* includes many new software packages, additional review citations, an index to software by producer, an index to producers, and an index to software by type of equipment. The new edition is better than the first, since the first seems to have suffered

from the hurry to get it out. Three pages of addenda and errata arrived with the 1982 edition.

The Online and Nolan directories are limited to microcomputer software for information work, but other directories of library/information software also include some microcomputer software. *Directory of Information Management Software: For Libraries, Information Centers, Records Centers* covers only commercially available software packages for the creation of in-house databases. Detailed information on more than fifty packages includes:

- software name
- address and phone number of vendor
- contact person
- hardware and operating system environment
- capabilities and components of the package
- total price based on several typical library scenarios
- sample installations
- evaluative comments.

The information is more comprehensive than that given in the two microcomputer software directories because the scope of this directory is limited to in-house database software. A hardware index allows ready identification of the microcomputer packages. Additional lists of special application software and general-purpose DBMS suitable for information work include only name of package and address and phone number of vendor.

The *UNESCO Inventory of Software Packages*, to be published soon, will contain descriptive and comparative information about many software packages for information work. It will not be limited to microcomputer software, nor will it be limited to software for one type of library application, but it will attempt to be a comprehensive international summary of all software for information work.

Information on software for this directory was solicited from libraries and information centers around the world. Information managers were asked to notify the National Center of Scientific and Technological Information about computer applications in their centers. The information about the software used in their applications was then verified with the software vendors. Locally developed software, as well as commercially available packages, will be included.

In addition to these directories, several journals have published listings of library applications software. Results of the second annual survey of the library automation market by J. Matthews in the March 15, 1983, *Library Journal* include a directory of all active systems, including microcomputer systems. The October 1982 *Software Review* includes descriptions of five microcomputer packages for library applications. The July 1982 issue of *Program* profiled several British software packages for in-house databases. *Monitor* surveyed interactive online software in April and May 1982. An early issue of the new periodical *Electronic Library* will contain an international directory of mini- and microcomputer software for library and information applications.

Appendix A lists all of these directories and periodicals that will help the information manager identify software packages for the creation of microcomputer-based in-house databases. Other new directories can be expected now that the microcomputer software market is growing so rapidly.

EVALUATION OF SOFTWARE

Software directories allow available packages to be located, but they as yet provide little help in the evaluation of these packages. This is in part because of the lack of critical or evaluative information in the directories, but it is also because, as mentioned earlier, software evaluation is so dependent on individual situations. There is no one best microcomputer software package for every library's in-house database system because "best" will vary with varying needs. However, some general guidelines for software evaluation are applicable to every in-house database.

The literature on evaluation of software for library applications is still sparse, unlike the extensive literature on educational software evaluation. Library and general computing literature does contain enough information to allow formulation of

guidelines, however. In many cases, these guidelines are not unique to microcomputer software selection. Many general principles of selection of automated systems or software evaluation for libraries are applicable to evaluation of software for microcomputer-based databases.

The first step in any software evaluation should be analysis of needs and preparation of general specifications. Tenopir advocates the preparation of formal, written specifications whether or not they are required by the parent organization.

> The exercise of identifying the library's needs and determining specifications to meet these needs is the best way to formulate specific questions to be asked, to communicate needs to the vendor, and to ensure that a software package will be able to deliver all the things expected.[25]

She goes on to outline the things that must be included in the specifications. These include both general and specific library and data processing requirements.

Matthews stresses that each information manager must identify and emphasize "my needs" before thinking about purchasing microcomputer software.[26] "These requirements should be written and reviewed by various shareholders in the selection process."[27]

Emard cautions that the "first, and maybe the most important, thing to remember when you set out on your quest for software is to have your applications (or your problems if you like) firmly in mind—and preferably on paper."[28]

Blair echoes these feelings when he advocates that "you sit down with your staff and outline several major needs before reading the computer journals or visiting a computer store."[29] The questions he suggests answering in the initial phase are:

1. Is there any reason to store retrieval from online database searches?
2. Will editing of reports and other documents be attempted?
3. Are there records that need cross-indexing for retrieval via several keys?
4. Would exchanging files with several other companies be advantageous?
5. To what degree would online accounting and budgeting enhance operations?
6. Do statistics and graphs play a significant role in your reporting procedures?
7. Who will be in charge of the application?

General guides to needs analysis and specification writing for library automation projects are also applicable to the purchase of microcomputer software. Matthews' *Choosing an Automated Library System*, Corbin's *Developing Computer-Based Library Systems*, and Boss' *Library Manager's Guide to Automation* are mentioned by Tenopir as some of the sources that can help in this phase.[30]

When the needs assessment is completed and preliminary specifications have been written, it is time to evaluate how individual software packages meet these needs. Suggested evaluation strategy varies in the literature from the extremely simple to an involved process. Because the requirements of software for in-house databases are complex, the prices are usually higher than other microcomputer software, and because so much staff time is involved in implementing a database system, the evaluation of software for in-house databases should not be overly simplified.

Matthews summarizes possible evaluation techniques for choosing any automated library system. He outlines five possible ways to approach evaluation: subjective judgment, cost-only technique, weighted-scoring technique, cost-effectiveness ratio, and least total cost.[31]

Subjective judgment follows no strategy or set procedure and is not recommended. The cost-only technique also should not be used as it considers only which system has the lowest cost and does not draw distinctions based on priorities of system features. Weighted-scoring allows distinction to be made as to the relative importance of different features, but according to Matthews, "This approach suffers because there is no way to establish a meaningful and understandable relative value among the desired items, and, in addition, there is no way to incorporate the system-life costs for each vendor."[32] In an attempt to solve this perceived deficiency, cost-effectiveness ratio divides the total systems cost of each vendor by the sum of the weighted-scoring score. The least total cost technique looks at all present and ongoing costs of each system

and assigns a dollar value to each feature, allowing dollar comparison of all components. No one of these evaluation methodologies is clearly the best way to evaluate software packages. Evaluation should incorporate all of them.

Garoogian includes a lengthy discussion on evaluation with many practical examples.[33] Before the product and the vendor are evaluated, she advises examining possible hardware or software constraints. The software must be compatible with the computer and peripherals in use, and possible software constraints such as operating system and programming language must be identified. If these things do not pose a problem in the individual situation, the software characteristics can then be evaluated.

Among the characteristics of the software that should be evaluated are the following:

- How easy is it for users to interact with the program?
- Instruction manuals should allow interaction with the program. If not, will the vendor provide training?
- Do modifications need to be made, and, if so, do they require a programmer?

Will you receive new versions (releases) of the program as they become available?

- Does the system have expansion capabilities (e.g., modules)?
- Is complete and accurate documentation included?[34]

Evaluation of the vendor is also important. Gargoogian recommends answering the following questions about the vendor in the evaluation process:

- How long has the vendor been in the software business?
- Does the vendor maintain a research and development program directed at the constant enhancement of the product you are considering?
- Does the vendor have an active user group?
- Can the vendor provide references for the companies who use the software you contemplate using?
- Can the vendor offer other packages that interface with the one you want?
- Does the vendor provide technical support?
- Can the software be purchased "on approval"?
- Is there a warranty or some sort of maintenance agreement?[35]

Tenopir advises formalizing the evaluation process by using some sort of form or checklist to ensure consistency with the weighted-scoring technique. Major areas that should be examined and rated in the evaluation include:

- vendor or producer
- software constraints and flexibility
- query language
- security
- output capabilities
- input capabilities and procedures
- documentation
- training
- hardware constraints
- costs.

Specific concerns to be considered in the evaluation are discussed under each area.[36]

Datapro Research Corporation includes information on general evaluation of application software in their *Applications Software Solutions*. They too urge use of a standard questionnaire and rating form to ensure consistent evaluation. They break evaluation into a two-stage process—first evaluation on a technique basis, then comparing the "survivors" on a "management basis, including cost, timetable and risk."[37]

Datapro recommends paying close attention in the evaluation to the following considerations:

1. comparison of the capabilities of the package with user requirements;
2. hardware constraints that may affect use of the package;
3. software constraints such as operating system, compiler;
4. throughput timing, ease of installation, ease of operating, clarity of operating instructions;
5. ease-of-use;
6. maintainability (including documentation, programming language);
7. flexibility of the package in meeting changing needs and growth.[38]

Site visits and benchmark tests or demonstrations are emphasized.

Other authors give hints to help with evaluation of microcomputer software without providing the level of detail in

Garoogian, Tenopir, and Datapro. Kelley urges evaluators to preview the software if possible, look for reviews in computer magazines, and tap the experience of both vendors and professional colleagues.[39] *MIS Week* advises securing modification rights and paying careful attention to negotiating performance guarantees.[40]

Blair emphasizes the vendor-user relationship. He says to look for such things as the ability to get software updates, a vendor hot line for customer questions, or a company newsletter. He recommends seeing the package run on a hardware configuration identical to yours if possible (with at least a demonstration) and buying a copy of the documentation before buying the software.[41]

Emard stresses building a relationship with the computer store that sells software and evaluating the store just as you would a software package. (This approach will work with general-purpose software, but library-specific packages are generally not sold through the computer stores.) He also discusses at length the importance of documentation, suggesting the following evaluation criteria:

- Is the manual of appreciable length?
- Are there any illustrations and detailed examples?
- Is the documentation organized in a coherent fashion?
- Is there an index?
- Are "cheat sheets" enclosed (i.e., cards that summarize system commands)?
- Is there a glossary?[42]

Boss also stresses the importance of complete documentation, even with inexpensive packages. He concludes that modifications are difficult to make without good documentation, and new employees can be trained more rapidly if the documentation is good.[43]

Matthews gives suggestions to help librarians become wise microcomputer-software shoppers. He advises reading the microcomputer literature, but be sure to insist that all jargon be explained by vendors and ask them to show you how desired features work rather than just asking if it can be done. Reading and comparing vendors' literature and software manuals will also help in the evaluation process.[44]

Dowlin believes that "service is the most important element in selecting a system. This service should not only cover hardware repair and maintenance, but should include software assistance and handholding. It is extremely important to have a reliable, *and interested*, local dealer."[45]

Norris and Marincola's "Guidelines for Developing an Online In-house Database through a Commercial Vendor" are also applicable to evaluation of prewritten software or turnkey systems. Under "Selecting a Vendor," they advise comparing:

- cost
- system/software capability
- support mechanisms
- responsiveness
- organizational features
- customer satisfaction.[46]

All of these authors emphasize the importance of the vendor and the documentation—two things that are often overlooked in practice. They also recognize the importance of the opinions of colleagues and users of the packages. Personal contacts at conferences, user groups, and vendor lists of installations are all essential to the evaluation process.

Other recommended evaluation criteria vary but usually include such things as hardware constraints, how the various features of the software meet your needs, expandability, and the opinions expressed in reviews or by colleagues.

Evaluation is not a simple process. It involves time and rigorous application of consistent criteria. Datapro summarizes the problems with evaluation of applications software:

> Package evaluation is hard—each package has hundreds, even thousands of features. No two packages are alike, or even close. Each has its strengths and weaknesses. It becomes mind-boggling to compare packages in a rational way.[47]

Rational evaluation is not impossible, however, and can be done successfully if the proper commitment of time is made. If evaluation seems too difficult or time-consuming, it is also possible to get help in this phase. Hayes emphasizes that the "consultant's advice will be of even greater value than ever before, since the array of al-

ternatives will be vastly increased and the complexity of effect upon the library deeper."[48]

There are a growing number of both library and software consultants who can aid in software evaluation. Also, there are now many workshops being offered by SLA, ASIS, graduate library schools, and others on the identification and evaluation of software for in-house databases.

SOFTWARE DESCRIPTIONS AND REVIEWS

Printed descriptions and reviews of specific software packages help in the evaluation process. Several new journals now feature reviews of microcomputer software for in-house databases. (These journals are reviewed by Tenopir and Beisner.)[49] Two periodicals that are dedicated to microcomputers in libraries often contain descriptions and reviews of software. *Small Computers in Libraries (SCIL)* has been published monthly since 1981. It is in a newsletter format with short software reviews often written by librarians who are using the packages for their own applications. SCIL is up-to-date and easy to read and is especially strong in descriptions of DBMS software adapted to library use. It is a valuable tool in the evaluation of microcomputer software for library applications. *ACCESS: Microcomputers in Libraries* is a quarterly journal that includes articles on software and library applications among its longer subject-oriented articles. Unlike SCIL, it publishes programs as well as software reviews.

Other journals include information about software for database and other library applications for all types and sizes of computers. *Software Review* (v.1, no.1, Feb. 1982) "seeks to provide an overview of software products and the way they can be used in library and educational settings."[50] Software reviews are lengthy and intermixed with substantive articles on all aspects of library and education software management. The two Online, Inc., magazines, *Online* and *Database*, now often contain descriptive information about microcomputer software. Blair's "Micro Magic" column often features information on database applications development and software. His columns and articles are consistently well written and easy to understand. Online, Inc., is actively expanding its coverage of microcomputer applications. *Library Hi Tech*, first published in the summer of 1983, includes a column on library software.

Three recent monographs include information about specific software packages for microcomputer-based in-house databases. Grosch's *Minicomputers in Libraries* and Rorvig's *Microcomputers and Libraries* both describe Warner-Eddison's Inmagic software, Cuadra Associates' STAR, and the Cooperative Library Agency for Systems and Services' (CLASS) Golden Retriever. (Rorvig's description of Golden Retriever is actually a description of the CLASS serials control package, Checkmate, one of many errors in his text.) Grosch's book is about minicomputer systems but includes these micro packages. Woods and Pope's *Librarian's Guide to Microcomputer Technology and Applications* has information on all types of library applications of microcomputers, including software used in more than four hundred libraries. It includes users' opinions of commercially available microcomputer software. It is also a good source for identifying locally developed software that a library will share with other libraries.

Appendix B lists some of the major microcomputer software packages for the creation of in-house databases as of spring 1983. DBMS not specifically aimed at the information center market are excluded.

Proceedings of the International Online Meeting, National Online Meeting, Online, Inc., yearly meetings, Aslib conferences, and the American Society for Information Science twice-yearly meetings are other fruitful sources for microcomputer software descriptions. Increasingly, traditional library journals such as *Special Libraries* and *Library Journal* carry descriptions of microcomputer database applications.

A publication from Nolan Information Management Services is devoted to evaluations of microcomputer software for information work. *Microsoftware Evaluations* is

a compendium of evaluations solicited from current users of the software. Sample screen displays and printouts highlight the narrative reviews. This new publication should be of great help in the evaluation process.

Two new online databases, BRS/DISC (Data Processing and Information Science Contents) and DIALOG's Microcomputer Index, help with the location of general microcomputer software reviews that have been published in the microcomputer journal literature. Both cover more than thirty microcomputer periodicals.

In addition, there are a growing number of business-oriented services that scan and summarize the microcomputer literature. PrimeStar, for example, offers a monthly printed SDI service that scans most of the micro magazines, in addition to general business sources such as the *Wall Street Journal*, *Business Week*, *Fortune*, etc. *Business Systems Update* includes abstracts and citations to articles about microcomputer business systems, general software solutions, specific business solutions, turnkey systems, outside services, specific business topics, hardware news, and systems software. Articles cover all types of special applications on microcomputers, not just business applications.

Microcomputer Software Letter is another of a growing number of new publications aimed at the microcomputers-in-business market. It provides information on new business-oriented software packages, how to modify prewritten programs, and evaluations of different packages for the same application. Like PrimeStar's service, *Microcomputer Software Letter* is a synthesis of longer articles found in the microcomputer and business literature.

CONCLUSION

Microcomputers are allowing even small special libraries and information centers to create in-house databases, but the success of the system is very dependent on the software chosen. Thanks to standardization of operating systems, availability of higher-level languages, and a growing software market, many prewritten or turnkey software packages are now available for microcomputer-based in-house database systems. These programs are complex and often more expensive than other microcomputer software. Identification of all possibilities and careful evaluation are thus important steps. Luckily, there are a growing number of consultants, directories, and reviews that can help with both of these steps.

No publication or consultant, however, can create a magic formula to allow information managers to choose the best microcomputer software package. The various new directories can be used to identify software possibilities, but a clear understanding of each situation together with a written set of specifications are necessary in order to use the tools and to evaluate the software packages. Software choice is ultimately a personal and somewhat subjective process, but there is an increasing number of guidelines and aids that can assist in this important decision-making process.

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APPENDIX A. SOFTWARE SOURCES

Directories Specific to Library/Information Applications

The Aslib library maintains a continuously updated list of commercially available software packages for library and information applications. Write to: The Librarian, Aslib, 3 Belgrave Square, London SWiX 8PL, England.

Cibbarelli, Pamela; Tenopir, Carol; and Kazlauskas, Edward, eds. *Directory of Information Management Software: For Libraries, Information Centers, Record Centers*. Studio City, Calif.: Cibbarelli and Associates, Inc., 1983. $45.

Information on commercially available software for in-house databases.

Gordon, Helen, ed. *Online Micro-Software Guide and Directory*. Westport, Conn.: Online, Inc., 1983. $40.

Directory and guide to more than seven hundred software packages for all types of information center applications.

Nolan, Jeanne, ed. *Micro Software Report: Library Edition*. Torrance, Calif.: Nolan Management Information Services, 1982. $49.95. 2d ed., 1983.

Includes descriptions of nearly three hundred microcomputer programs of interest to libraries.

UNESCO Inventory of Software Packages. Tel-Aviv, Israel: National Center of Scientific and Technological Information, 1983. (P.O. Box 20215)

International software directory for information work.

General Directories: A Selected List

Auerbach Software Reports. Auerbach Publishers. 2 v. Updated monthly, looseleaf. $475/year.

A Buyer's Guide to Data Base Management Systems. Delran, N.J.: Datapro Research Corp., 1974– . Updated annually. Selected from *Datapro 70*.

Datamation regularly surveys software packages. Of special interest to information center applications are: May 1982 "Application Software Survey," December 1981 "System Software Survey," and September 1981 "The DBMS Market Is Booming."

Datapro Directory of Microcomputer Software. Delran, N.J.: Datapro Research Corp., 1981–

Datapro Directory of Software. Delran, N.J.: Datapro Research Corp., 1975– . Updated monthly, looseleaf.

Datapro 70. Delran, N.J.: Datapro Research Corp. 3 v. $755/year. Updated monthly, looseleaf.

Guide to hardware and software.

ICP Software Directory. Indianapolis, Ind.: International Computer Programs. Semiannual. 5 v. $65 per volume.

Minicomputer Software Quarterly. Wayland, Mass.: Applied International Management Services. Quarterly. $48/year.

Small Systems Software and Services Sourcebook. Available from J. Koolish, Information Sources, Inc., 1807 Glenview Rd., Glenview, IL 60025. $135; $125 if prepaid.

Describes thirteen hundred packages.

Available online:

International Software Database. DIALOG, file 232.

File Soft, BRS.

Other Useful Sources

Access: Microcomputers in Libraries. P.O. Box 764, Oakridge, OR 97463. Quarterly, $11/year.

The Electronic Library will devote one issue to a directory of mini- and microcomputer software. Learned Information Ltd., Besselsleigh Rd., Abington, Oxon OX13 6LG, England.

Library Hi Tech. Pierian Press, P.O. Box 1808. Ann Arbor, MI 48106.

Began summer 1983 and includes information on software.

Monitor surveyed interactive online software in April and May 1982. Learned Information, Box 550, Marlton, NJ 08053.

Nolan, Jeanne. *Microsoftware Evaluations*. Torrance, Calif.: Nolan Management Information Services, 1983.

Evaluations of library-oriented microcomputer software by users.

Small Computers in Libraries. Graduate Library

School, College of Education, University of Arizona, 1515 E. First St., Tucson, AZ 85721. $20/year.

Software Review reviews information applications software. Meckler Publishing, 520 Riverside Ave., Westport, CT 06880.

Available online:

BRS/DISC (Data Processing and Information Science).

Microcomputer Index, DIALOG, file 233.

APPENDIX B. SOFTWARE PACKAGES

GOLDEN RETRIEVER

CLASS, 1415 Koll Circle, Suite 101, San Jose, CA 95112, (408) 289-1756; or Capital Systems Group, Inc., 11301 Rockville Ave., Kensington, MD 20795, (301) 881-9400; or Gaylord, P.O. Box 4901, Syracuse, NY 13221, (800) 448-6160.

Operates on a TRS-80 Model II with three floppy disk drives or a Winchester hard disk and 64K memory. This package has been widely reviewed in the literature and is in use in many libraries. A demonstration disk can be obtained from CLASS for $50. Software costs for a database of up to forty-five hundred records are under $2,000.

STAR

Cuadra Associates, Inc., 2001 Wilshire Blvd., Suite 305, Santa Monica, CA 90403, (213) 829-9972.

Operates on an Alpha Micro with a hard disk. It has been described in the library literature and is a powerful and highly regarded software package. It incorporates sophisticated searching features of the large commercial systems and can accommodate large or small databases. Software price is approximately $20,000.

BRS/Search for Micros

BRS Software Group, 1200 Rte. 7, Latham, NY 12100, (800) 833-4707.

Introduced late last year, this package is a micro/mini version of the powerful BRS/Search software. It runs under the UNIX operating system and currently runs on the Onyx and WICAT microcomputers as well as PDP/11 and VAX minicomputers. Software costs vary with the hardware configuration but are in the $5,000–$30,000 range.

INMAGIC

Warner-Eddison Associates, Inc., 186 Alewife Brook Pky., Cambridge, MA 02138, (617) 661-8124.

A new CP/M micro version of the popular minicomputer software, Version 1 of Inmagic for micros was first available in April of 1983. Version 2 runs on Televideo, Superbrain, and DEC Rainbow micros; a version for the IBM Personal Computer was introduced in the fall of 1983. Cost for version 1 is under $1,000, plus $250 for a separate report generator.

Other microcomputer software (mostly in the $2,000–$3,000 range) for in-house databases include:

CARD DATALOG

DTI Data Trek, 121 W. E St., 2d floor, Encinitas, CA 92024, (714) 436-5055.

For any microcomputer with CP/M operating system, it is based on the dBase II database management system (DBMS). Also includes acquisitions, circulation, and series modules.

COMPUTER CAT

3005 W. 74th Ave., Westminster, CO 80030, (303) 426-5880.

For Apple II Plus or Bell and Howell computers.

GAYLORD System

Gaylord, P.O. Box 4901, Syracuse, NY 13221, (800) 448-6160.

For Apple II Plus computers; includes acquisitions, circulation, film booking, and the CLASS Checkmate serials system modules.

SCI-MATE

Institute For Scientific Information, 3501 Market St., University City Science Center, Philadelphia, PA 19104, (215) 386-0100.

Personal data management software for IBM-PC, Vector 3 and 4, Apple II, TRS-80 Model II with CP/M-80, $540. (Universal Online Searcher software $440, or both for $880.) ■■

A Comparative Evaluation of the Technical Performance and User Acceptance of Two Prototype Online Catalog Systems*

Elliot R. Siegel, Karen Kameen, Sally K. Sinn, and Frieda O. Weise

The National Library of Medicine (NLM) conducted a comparative evaluation of two prototype patron accessible online catalog systems within the same operational environment. The study design provided for the assessment of both systems on the basis of technical performance and user acceptance by NLM's patrons and staff. This article describes the study's research strategy and methods, some aspects of which are unique to the evaluation of online information systems. Included is a description of verification and limits testing that were used to determine and document the extent to which both systems met the technical performance requirements specified a priori for an NLM-based online catalog. User acceptance was addressed in three ways, each complementary in scope and methodology: a Sample Search Experiment designed to provide control over potentially confounding variables; a Comparison Search Experiment intended to maximize the authenticity of study conditions; and a User Survey characterizing users' catalog information needs and searching behavior. The results of technical performance testing were separately corroborated by a strong and consistent pattern of findings from the three studies of user acceptance. Overall, users of the online catalog at NLM are relatively infrequent library visitors and represent a broad cross section of professional roles and occupations. Most users of the online catalog come with subject-related information, are looking for books on a subject, and search by subject. The decision to adopt one of the two prototypes tested was largely based on that system's relatively superior performance in conducting subject-related searches that, as has also been reported recently in other studies of online public access catalogs, is the most important determinant of user satisfaction and acceptance of this new technology.

*Portions of this paper were presented at the Fourth National Online Meeting, New York, New York, April 12–14, 1983; and the Eighty-third Annual Meeting of the Medical Library Association, Houston, Texas, May 27–June 2, 1983.

BACKGROUND

Movement toward the design and development of patron accessible online information systems is receiving substantial im-

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petus from the nation's library community. An important aspect of this trend is the increasing availability of computer-based public access catalog systems, developed either as part of an integrated effort at library automation or as a separate patron service. The economic incentive is frequently significant given the increasingly prohibitive costs of maintaining, updating, and revising the conventional card catalog.

To the credit of the library community, the proliferation of "homegrown" and commercially available public access catalog systems has also seen the advent of several noteworthy attempts at conducting formalized assessments of these systems. See, for example, the Council on Library Resources' nationwide survey of user responses to public online catalogs,[1] Hildreth's detailed analysis of user interface features,[2] and Markey's study using the focus group interview technique with library patrons and staff.[3] However, as with other studies of online information systems, these frequently suffer from a methodological weakness in which the confounding influence of a "novelty effect" can make even a relatively poor system appear better than whatever it is replacing. This is especially true for single system studies, but it also applies to studies purporting to assess multiple systems, but which for a variety of political, logistical, or economic reasons are unable to examine the technical performance and/or user acceptance of more than one system within a single operational environment.

Recently, the National Library of Medicine (NLM) was fortunate to be in a position in which it was feasible to mount a comparative evaluation of two prototype patron accessible online catalog systems within the same operational environment. This study was intended to provide an objective, comparative assessment of the candidate systems, using the same physical space, library staff, computer terminals, database, and user populations. This paper describes the study's research strategy and methodology, some aspects of which are unique to the evaluation of online information systems. The major study findings that led to the adoption of one of the two prototype online catalogs are summarized.

APPROACH

Initial study plans specified that the study would be performed in-house over the course of nine months. While this placed a heavy burden on already busy library staff, we were in a position to draw upon the unique technical skills and capacities of persons from nearly all divisions of the library who were familiar with one another and their respective job functions. The learning curve for those involved was probably shorter than if the study had been delegated to an outside group.

In January 1982, the study group undertook as its first task the specification of requirements and capabilities of an NLM-based online catalog system intended for use by NLM patrons and nontechnical staff. Existing publications and NLM staff members were consulted. What resulted was a detailed list of specifications that addressed the key areas of database content, composition of records, search/access features, user cordiality, and display features. Each area was further categorized as to whether a feature or attribute was to be "required" for the prototype test version; "necessary" for a fully implemented system, but not required for the initial test version; or "optional," its need not yet having been determined for an NLM-based system. These specifications were organized as a "technical requirements" or criteria document, against which the candidate online catalog systems would be evaluated.[4]

Two experimental in-house systems were selected for test and evaluation based upon their potential for meeting the technical requirements as specified. They are CITE (*C*urrent *I*nformation *T*ransfer in *E*nglish), incorporating a user-friendly front end to the CATLINE* system operating on the library's IBM 3033 multiprocessor; and the public access catalog module of the ILS (*I*ntegrated *L*ibrary *S*ystem), which, for this study, uses the current contents of the

*Designed for staff access, CATLINE is used by the library's reference and technical staff for information retrieval and file maintenance. At the time of the study, the database contained some 225,000 current and an additional 245,000 retrospective machine-readable records for the library's collection of printed materials.

CATLINE database and operates on a dedicated Data General S230 minicomputer. CITE and ILS are going research-and-development efforts in NLM's Specialized Information Services division and the Lister Hill National Center for Biomedical Communications, respectively.[5] In March, the designers of both systems were requested further to develop and equip their prototypes to conform to the technical requirements for an NLM-based online catalog. In the case of CITE—hereafter referred to as System A—this involved continuing with the production and refinement of new software. For ILS—hereafter referred to as System B—the principal hurdle was to create a functionally acceptable database suitable for operational use by library patrons during the test period. This involved the conversion of nearly one-quarter of a million current (post-1966) CATLINE records to MARC format, and their loading and indexing on the host minicomputer. The time allotted for these activities was very short given the planned duration of the study. System A was successfully established and made ready for testing in April, and System B in June.

Concurrently with the above, another working group proceeded with the development of context-specific online HELP facilities for both systems, printed instruction materials, signs informing patrons of the impending experiment, and modification of terminals to highlight certain function keys (e.g., RETURN), and disable others (e.g., BREAK). A battery of six Hewlett-Packard 2626A CRT terminals, with internal printers, was assembled immediately adjacent to the main entrance of the public catalog area. A separate working group focused on refinement of the preliminary study design and construction of the several data collection instruments that would be used during the various phases of the study.

The study design provides for the independent and comparative assessment of System A and System B as to both technical performance and user acceptance (i.e., effectiveness from the users' standpoint). The assessment of technical performance deals primarily with the systematic determination and documentation of the extent to which the candidate systems meet the technical specifications for an NLM-based online catalog system, as defined by the study group in its "requirements" document. This approach has the virtue of making known to the systems designers, in advance, the criteria against which their systems would be evaluated; ensuring that both systems would be evaluated against the same performance criteria; and ensuring that if shortcomings were discovered, documentation would be sufficient to identify clearly the weakness or malfunction and, whenever possible, suggest a strategy for improvement. In addition, "stress" or "limits" testing would seek to elicit additional data on the outer ranges of system search capabilities, should the above methods prove insufficiently sensitive to discriminate between the two systems.

The concept of "user acceptance," while more difficult to operationally define and measure, is addressed in three ways—each complementary in scope and methodology: (1) a questionnaire User Survey characterizing the nature of users' catalog searching requirements, relevant demographic factors, and satisfaction with search outcomes on Systems A and B, judged separately and independently; (2) a partially controlled but authentic Comparison Search Experiment in which members of a smaller sample of library patrons conduct a search of their own choosing—sequentially—on both Systems A and B and briefly record comparative system preferences in several key areas relating to search outcome; and (3) a controlled field experiment, the Sample Search Experiment, utilizing a panel of NLM staff conducting equivalent—but different—searches on both systems, simulating representative uses of an online catalog. The Sample Search Experiment controls for important variables that the Comparison Search Experiment does not; namely, the searcher's professional role/occupation, type of search performed, database size, and a potentially confounding "transfer effect" stemming from the conduct of identical searches on both systems.

The research strategy underlying this approach to user acceptance seeks to produce a comprehensive data set pertaining to online catalog use at the NLM; distribute equitably and realistically the response

Table 1. User Acceptance of System A and System B: Key Variables Measured in the Three Study Methods

Study Variables	Sample Search Experiment (n = 20)	Comparison Search Experiment (n = 60)	User Survey (n = 600)
Dependent Variables			
Amount of information retrieved	x	x	x
Proportion of retrieved items judged relevant	x		
Number of known relevant items retrieved	x		
Time to complete search	x		
Ease of system use	x	x	x
Satisfaction with search results	x	x	x
Satisfaction with terminal display	x		x
Satisfaction with online instructions, prompts, HELP messages	x		x
Satisfaction with system response time	x		x
Overall satisfaction with system	x	x	x
Independent or "Predictor" Variables			
Type of search performed	x*	x	x
Professional role/occupation	x	x	x
Primary use for information			x
Frequency of library and catalog use			x
Prior experience with other computer systems			x
Age, sex, education			x

*Variable manipulated by experimenter.

burden among participating patrons and staff; and weave across the three study methods a common thread of similarly worded questions relating to a core set of dependent and independent variables (i.e., measures defining the nature and extent of user acceptance of Systems A and B, and definable user attributes or behaviors thought to be potentially related to, or predicting, user acceptance and system preference). Assigning these variables in an overlapping fashion across the three study methods would, it was hoped, yield a high degree of confidence in the strength and reliability of study findings obtained under different experimental conditions with different user populations. Table 1 lists the study's dependent variables and selected independent or predictor variables, and their respective usage in each of the three study methods. The approach taken is not unlike that advocated by Shneiderman, who makes a strong case for the use of controlled field experimentation in the study of human-computer interaction.[6]

METHODS AND PROCEDURES

Data collection activities relating to the user acceptance dimension took five months, beginning with administration of the System A User Survey of patrons and staff in late April and May; administration of the System B User Survey in early June through August; conduct of the Sample Search Experiment with staff in August; and conduct of the Comparison Search Experiment with patrons in September.* Technical performance testing was carried out by a separate data collection team during the period July through September.

Assessing User Acceptance

Sample Search Experiment

The Sample Search Experiment provided the most effective control over potentially confounding variables. In this experiment, a panel of twenty NLM professional staff, comprising librarians and nonlibrarians uninvolved in the development of either candidate system, was randomly se-

*It should be noted that hardware downtime, both planned and unplanned, was the source of several interruptions to the data collection schedule. Prudent investigators will make allowances accordingly, especially when attempting to evaluate prototype systems within an operational environment containing a heavy service obligation. On the other hand, we were fortunate to experience a minimum of disruptions due to software malfunctions.

lected, assigned to one of two experimental conditions (odd/even), and scheduled for individual search sessions. Fourteen specially selected paired search queries, simulating representative uses of an online catalog across six common search types, were presented to each respondent for execution. Each sample search pair was selected from a larger group that had undergone thorough pretesting on both candidate systems using uninstructed searchers. Those assigned to the "odd" condition performed the first half of the paired searches on System A and the second on System B ("even" condition respondents used the two systems in reverse order), thus respondents did not repeat the same search query on both systems. While the order of system use varied according to experimental condition, the order of search query pairs remained constant. Search query pairs were matched by type (i.e., personal and corporate author, conference, series, title, and subject), by level of search difficulty, and by size of the expected retrieval. Respondents were instructed to base their judgments of retrieval relevance to post-1974 records to control for the unequal size of the two systems' database. Conduct of the Sample Search Experiment took place in the NLM's public catalog area where two adjacent terminals, separately hard-wired to the System A and System B hosts, were reserved for the experiment. Following execution of each search pair on Systems A and B, which was stopwatch-timed by the experimenter, the respondent was instructed to check relevant records on the hard-copy printouts retrieved and to answer a series of structured questions dealing specifically with system preference when conducting that particular type of search. Upon completion of all fourteen searches, global attitude measures of user satisfaction and comparative system preference were obtained. Individual, open-ended interviews, probing specific user interface features liked and disliked, were also conducted by the experimenter.[7] The time burden for this in-depth system comparison was high, averaging 1 1/4 hours per respondent.

Comparison Search Experiment

In contrast to the more controlled but less realistic Sample Search Experiment, the Comparison Search Experiment served to maximize the authenticity of study conditions. In this experiment, sixty library patrons conducted a self-initiated search of their own choosing on both System A and System B, sequentially. The procedure was that patrons entering the public catalog area during randomly selected periods were asked to participate in the experiment; approximately 75 percent agreed to participate. Each was assigned to one of two odd/even experimental conditions; "odd" numbered respondents began their search on a terminal connected to System A and "even" numbered respondents started with System B. The experimenters, the same two-person team conducting the Sample Search Experiment, closely monitored the respondents' searches and recorded them on hard-copy printouts for subsequent analysis. The experimenters determined when it was appropriate for respondents to switch systems and repeat their searches. They also conducted brief postsearch interviews with each respondent, using a subset of the same structured questions used in the Sample Search Experiment (see table 1). Total completion time for each respondent, including a short orientation to both systems, was under thirty minutes.

User Survey

The User Survey was intended to provide a detailed characterization of the information needs and behaviors of the NLM's computer catalog users and to indicate their acceptance of each candidate system. A self-administered sixty-item survey questionnaire, requiring fifteen minutes to complete, was given to all patrons and staff who conducted a computer catalog search during the test periods in which System A, and later System B, were available for use in the public catalog area. Initial plans to counterbalance the availability of Systems A and B (an ABBA design) and, thus, to help ensure equality of the two user samples, were abandoned due to scheduling difficulties and the need to adhere to a tight study timetable. Also, the relatively limited number of visitors to the public catalog area precluded a sampling protocol—for example, every tenth person—if the quota of three hundred respondents per system

was to be achieved. (A compliance rate in excess of 80 percent was a plus in this regard.) In all other respects, data collection procedures mirrored those established for the Council on Library Resources' (CLR) noncomparative study of fifteen online catalog systems.[8] Use of the CLR instrument, slightly modified to provide more precise demographic data concerning NLM's user population, permits comparisons with the findings of that study. The companion CLR nonuser questionnaire was also administered to a sample of three hundred patrons who had not used either online catalog. However, its principal value for the NLM study proved to be that of a control instrument, indicating that despite the nonrandom selection of catalog users surveyed, they did not differ appreciably from nonusers on such important demographic variables as professional role/occupation and frequency of library use.

Assessing Technical Performance

The assessment of system performance was intended to be a comprehensive and in-depth comparative examination covering all categories of system features and attributes:

- database contents (e.g., number and type of records, currency)
- composition of records (e.g., author, title, call number)
- search/access (e.g., searchable data elements, indexes, truncation)
- user cordiality (e.g., prompts, menus, HELP messages, leniency of punctuation and spacing)
- display (e.g., full and abbreviated records, paging forward and backward).

Performance testing was carried out by a two-person team highly skilled in and knowledgeable about the technical aspects of cataloging and online searching and who were uninvolved in the design and development of System A and System B. Because these testing activities were time-consuming and physically fatiguing, they were carried out over an extended period. Results were periodically reviewed to resolve discrepancies in findings and to ensure consistent interpretation of the recommended procedures.

Verification Testing

Using specially constructed verification protocols and checklists, each tester—independently of the other—systematically exercised both systems so as to verify the presence or availability of all "required" and (selected) "necessary" system features and attributes, as specified by the study group. They also documented, with detailed annotation, the strengths and weaknesses of each system with respect to the listed features and attributes. For example, in the course of obtaining information on the availability of prompts, the testers noted all junctures at which a system automatically generates prompts or HELP messages and those which must be user-generated. Verification of user cordiality also included testers' comments on the appropriateness and clarity of all HELP messages.

Limits Testing

Deliberately complex and ambiguous test queries were conducted for the purpose of "stressing" the limits of both systems in an effort to determine the systems' abilities to handle a variety of potential search problems. These included common and compound surnames, incomplete titles, and long titles beginning with generic words.

FINDINGS

The results of technical performance testing were separately corroborated by a strong and consistent pattern of findings from the three studies of user acceptance. The major evaluation findings are summarized below:[9]

- *Users of the Computer Catalog.* Users of the online catalog at NLM (survey data merged for System A and System B users) represent a broad cross section of professional roles and occupations: one-third students, one-quarter researchers, and one-tenth health care practitioners, with the remaining third distributed across several categories of "other." Most users of the online catalog are infrequent visitors to the library: 80 percent report visiting monthly or less often, and one-quarter are first-time visitors. This latter finding underscores the need for effective instructions, prompts,

Table 2. Amount of Information Retreived when Using System A and System B

Corresponding Questionnaire Items	% Respondents System A	System B	No Difference
Sample Search Experiment (n = *20*)			
"Considering only current items published since 1974, in general do you think you found more of the information you were looking for using . . ."	75	5	20
Comparison Search Experiment (n = *35*)*			
"Do you think you found more of the information you were looking for using . . ."	71	18	11
User Survey (n = *600*)			
"In this computer search I found:			
More than/all that I was looking for . . .	50	36	N/A
Some of what I was looking for . . .	44	49	N/A
Nothing of what I was looking for . . ."	6	15	N/A

*A total of sixty patrons participated in the Comparison Search Experiment; of these, thirty-five conducted subject searches and were asked this question.

and HELP messages, inasmuch as most catalog users will be novices. Such users are also unlikely to benefit from quick search techniques (i.e., use of a command language rather than menus) that are better suited to more practiced users.

• *Characteristics of Catalog Searches.* Most online catalog users (53 percent) come with subject-related information, are looking for books on a topic (68 percent), and search by subject or topic (57 percent). This finding obtained in the User Survey and confirmed in the Comparison Search Experiment is consistent with other studies of computer catalog systems; it is inconsistent with studies of the conventional card catalog that generally report a proportionately greater incidence of known-item searching.[10] This may well represent an instance in which the availability of a technology conducive to subject searching has brought about a behavior change in the user.

• *Online Catalog versus Card Catalog and COMCAT.* The online catalog is clearly preferred to the library's card catalog and computer output microform catalog (COMCAT). System A users preferred the computer catalog to the card catalog in higher numbers, with 91 percent of the System A users surveyed rating it "better," as compared to 76 percent of the System B users.* Among patrons who have used COMCAT (50 percent of those surveyed), preference for the computer catalog is equivalent for System A and System B users, with 83 percent and 75 percent rating it as "better."

• *User Satisfaction with System A and System B.* A consistent pattern of findings indicates that more information was generally found by users of System A. As shown in table 2, 75 percent of staff users in the Sample Search Experiment and 71 percent of patrons in the Comparison Search Experiment selected the searches performed on System A as yielding more information. Similarly, 50 percent of the System A users as compared to only 36 percent of the System B respondents in the User Survey indicated that they found "more than" or "all the information" that they were looking for.

Satisfaction with search results was also higher among users of System A. Fifty-two percent of the patrons in the Comparison Search Experiment thought their search results were most satisfactory on System A, while 23 percent preferred System B and 25 percent indicated no difference. In the user survey, 62 percent of the System A users rated their search results as "very satisfactory" compared to 39 percent of the System B users; in the other extreme, only 4 percent of the System A users rated their search as "very unsatisfactory" compared to 10 percent of the System B users.

Overall satisfaction was higher among System A users. As may be seen in table 3,

*All User Survey findings in which System A and System B are reported to differ have a statistically significant chi-square value of at least $p > .001$.

Table 3. Overall Satisfaction with System A and System B

Corresponding Questionnaire Items	% Respondents System A	System B	No Preference
Sample Search Experiment (n = *20)*			
"Overall, do you have a preference for . . ."	60	15	25
Comparison Search Experiment (n = *60)*			
"The next time you need to conduct a catalog search, will you want to use . . ."	55	20	25
User Survey (n = *600)*			
"My overall or general attitude toward the computer catalog is:			
Very Favorable . . .	84	65	N/A
Somewhat Favorable . . .	13	22	N/A
Somewhat Unfavorable . . .	2	8	N/A
Very Unfavorable . . ."	1	5	N/A

60 percent of Sample Search Experiment respondents expressed a moderate to strong preference for System A; only one-quarter of the staff persons queried expressed a preference for System B. Fifty-five percent of the patrons participating in the Comparison Search Experiment indicated that they "would use System A again," whereas 20 percent selected System B and 25 percent had no preference. In the User Survey, 84 percent of those who had used System A responded that they had a "very favorable" attitude toward the computer catalog; in contrast only 65 percent of the System B users did so. Whereas 13 percent of the System B users surveyed indicated an unfavorable overall attitude, less than 3 percent of the System A users expressed this view.

What accounts for this observed preference for System A? The professional role or occupation of the user appears to be unrelated to satisfaction with System A and System B. In the Sample Search Experiment, preference for System A was equivalent for librarian and nonlibrarian staff persons. In the Comparison Search Experiment and in the User Survey, researchers, educators, practitioners, and students did not differ appreciably from one another in their preference for System A over System B. Other demographic variables thought to be potentially related to, or predicting, user acceptance, and that were not found to be related to satisfaction with one system as compared to the other, included such variables as the intended use of the information, frequency of library use, frequency of card catalog use, previous computer experience, age, gender, and education.

• *Preference for System A/System B and Search Type.* Preference for System A among patron and staff users is clearly related to the type of search performed. Table 4 shows that two out of three respondents in the Sample Search Experiment thought that they "found the largest proportion of relevant information," and four out of five reported that their "search was easier" and "most satisfactory" using System A to conduct subject searches. Significantly, only one of forty sample subject searches failed on System A; nearly half failed on System B. A sample search was termed a "failure" under one of two conditions: the searcher gave up, deciding to discontinue searching for relevant records; or the search was terminated by the experimenter, elapsed time having exceeded ten minutes. Among patrons conducting subject searches in the Comparison Search Experiment (see table 5), nearly three out of four favored System A, stating that they "found more information," that their search was "most satisfactory using [this system]," and that they "would use that system again." Postsearch interview comments made by both patrons and staff indicated that system users were aware of the presence or absence of specific system interface features that are supportive of subject searching and that they perceived them to be related to the conduct of a successful search. System A, for example, supports common treatment of controlled vocabulary and text word searching, an ability to search on multiple terms simultaneously, and provides for an automatic weighting and ranked display of closest matching

Table 4. Acceptance of System A and System B among Staff Conducting Subject Searches in the Sample Search Experiment (n = 20)

Dependent Variables and Corresponding Questionnaire Items	% Respondents System A	System B	No Difference
Proportion of Retrieved Items Judged Relevant "Considering only current items published since 1974, of the information retrieved, would you say that the largest proportion of relevant information was found using . . ."	65	10	25
Ease of System Use "In terms of user friendliness, did you find it easier to conduct this type of search [subject] using . . ."	80	10	10
Satisfaction with Search Results "In relation to what you were looking for, would you say that this type of search [subject] was most satisfactory using . . ."	80	5	15

Table 5. Acceptance of System A and System B among Patrons Conducting Subject Searches in the Comparison Search Experiment (n = 35)*

Dependent Variables and Corresponding Questionnaire Items	% Respondents System A	System B	No Difference
Amount of Information Retrieved "Do you think you found more of the information you were looking for using . . ."	71	18	11
Ease of System Use "In general, did you find it easier to use . . ."	46	11	43
Satisfaction with Search Results "In relation to what you were looking for, would you say your search was most satisfactory using . . ."	71	20	9
Overall Satisfaction with System "The next time you need to conduct a catalog search, will you want to use . . ."	66	14	20

*A total of sixty patrons participated in the Comparison Search Experiment; of these, fifteen persons limited their searching to known items only and are not included in this analysis.

items by frequency of the search terms' occurrence within the records. All are features demonstrated to be consistent with and supportive of user preferences and actual searching behavior. Comparable findings favoring System A in performing subject-related searches were also obtained in the User Survey (see table 6). In the present study, and as was reported in the CLR study,[11] the most important determinant of user satisfaction with the online catalog is effective subject searching.

In contrast to the clear preference for System A in performing subject searches, both systems were generally preferred equally well in performing known-item searches. A possible exception is the title search, due largely to the requirement that the System B user know the first word of the title sought. This restriction does not apply to System A in which a user may execute a multiword title search without regard to word order. Table 7 displays the verification testers' findings vis-à-vis system leniency with regard to inconsistencies in syntax, including "order of words." The importance of this difference, observed and documented in verification testing, was subsequently corroborated by the finding that no title search failures occurred in the Sample Search Experiment using System A, whereas thirteen of twenty such searches failed on System B.

• *System A and System B Displays.* Although substantially different in appearance, with System B emulating the conven-

Table 6. Acceptance of the Online Catalog among User Survey Respondents Using System A (n = 222) and System B (n = 182) to Conduct Subject Searches

Dependent Variables and Corresponding Questionnaire Items*	% Respondents System A	% Respondents System B
Amount of Information Retrieved		
"In this computer search I found:		
More than/all that I was looking for . . .	44	27
Nothing I was looking for . . ."	5	13
Satisfaction with Search Results		
"In relation to what I was looking for, this computer search was:		
Very Satisfactory . . .	55	30
Very Unsatisfactory . . ."	4	10
Overall Satisfaction with System		
"My overall or general attitude toward the computer catalog is:		
Very Favorable . . .	84	61
Very Unfavorable . . ."	<1	6
Ease of System Use		
"A computer search by subject is difficult:		
Strongly Agree . . .	6	12
Strongly Disagree . . .	36	21

*Only "extreme" ratings are shown; total responses on these 4- and 5-point scales equal 100%.

*Table 7. Technical Performance Testing: Excerpt From Verification Testers' Report**

Feature/Attribute	Status	System A	System B	Comment
System is lenient with regard to inconsistencies in syntax				System A: Will tolerate some inconsistencies in spacing and punctuation only in subject search. It is rigorous in requiring exact input for series, names, call numbers, etc. System B: Intolerant of inconsistencies in spacing and punctuation for all searches except term (which must be single word).
Spacing	Required	No	No	
Punctuation	Required	No	No	
Order of words	Required	Yes—for subject and title searches.	No	
Completeness of name	Required	Yes	Yes—to a degree.	(See truncation) Neither system will tolerate incomplete terms imbedded in a name or series search, e.g., Natl. Lib. of Med.
Variant spelling	Required	Yes—to a degree, only under subject search. Terms not found in the index are displayed to user for response—they may be retyped in case of typo or misspelling, or omitted from the search at the user's discretion.		

*The interested reader is referred to the study's technical report (*Siegel, Online Catalog Study Final Report*) for a detailed presentation of all available study data, including the results of technical performance testing as it relates to the "required" and necessary system features and attributes specified in the Study Group.

tional card catalog image and System A utilizing a continuous "wraparound" array of record elements, both displays were found to be equally acceptable (or unacceptable) to patron and staff users. That is, just as many respondents in the Sample Search Experiment and the User Survey preferred one display format as the other.

• *Other Measures of User Acceptance.* Although System A operates on a large mainframe computer and System B on a minicomputer, users were equally satisfied with computer response time on both systems. User ratings and comments concerning the adequacy of online instructions, prompts, and "help" messages, however, suggest the need for additional work in this area, with System A's user aids being perceived as somewhat more effective. Finally, Sample Search Experiment data pertaining to "number of known relevant items retrieved" and "time to complete search" were collected but only partially analyzed, inasmuch as preliminary examination indicated their consistency with other dependent measures of user acceptance favoring System A.

CONCLUSIONS

1. From a methodological standpoint, the present study has demonstrated the feasibility of conducting an objective, comparative evaluation of two prototype online catalog systems within the same library. The research strategy and methods developed and used here should prove useful elsewhere in evaluating other patron accessible online information systems.

2. The study findings resulted in a decision to adopt CITE (System A) for in-house use by the NLM's patrons and nontechnical staff. This decision was based on the determination that CITE has no critical shortcomings and is essentially acceptable as is to the large majority of online catalog users at the NLM. ILS (System B) was also found to possess most system features and attributes required for an NLM-based online catalog. However, its performance on subject-related searches, an especially important requirement for online catalog users, was not equal to that of CITE. Specific suggestions for enhancing the user interface in this area (some of which had already been planned by the system designers) have been identified and documented.

3. While this evaluation study was designed primarily to provide an objective basis for choosing among the candidate online catalog systems, it has also yielded important insight into catalog users' information needs and searching strategies. In this instance, it has provided an empirical basis for pursuing continued development of both systems. In the larger sense, it illustrates the value of conducting formal evaluations—with actual user groups—as a logical step within the overall system development process.

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EDITOR'S NOTE

Regarding the article by Tamas E. Doszkocs, "CITE NLM: Natural-Language Searching in an Online Catalog," which appeared in the December 1983 issue of *ITAL*, v.2, no.4: No copyright is claimed on this article, which was written as part of the author's official duties as an employee of the U.S. government.

Special Section: The IBM PC as a Terminal

Editor's note: Since its introduction in the fall of 1981, the IBM Personal Computer has had a tremendous impact upon the microcomputer and personal computer market. While microcomputers usually function as independent machines running a word processor, a database manager, or a spreadsheet program, the IBM PC has become increasingly popular as a terminal in a network and can be configured to emulate many different types of terminals. In 1983, OCLC and WLN both selected the IBM PC as their choice for a new model terminal because of the ability to customize the machine for their purposes and because of the potential for local processing. Two of the articles in this section discuss the selection of the IBM PC by OCLC and WLN. A third article deals with work at Faxon to incorporate the IBM PC into the DataLinx network. The fourth and final paper concerns a project at the University of Illinois to use the IBM PC to provide a user interface to an online bibliographic system.

The OCLC M300 Workstation

Debbie Harman and Kate Nevins

On June 7, 1983, OCLC President Rowland C. W. Brown announced that IBM had been selected as the supplier for the new OCLC M300 Workstation. Speaking at the Special Libraries Association Conference in New Orleans, Brown stated that, through its selection of the IBM Personal Computer (PC) with OCLC-provided custom modifications, OCLC would be offering its member libraries "powerful new local options in library automation." The new OCLC terminal would enable libraries to access OCLC's central Online System for OCLC processes and products as well as allowing them to run IBM-compatible software locally. Through special hardware and software enhancements, the IBM PC would give OCLC the opportunity to make the "use of OCLC's online bibliographic subsystems even more cost-effective and convenient" and provide "yet another indicator of OCLC's commitment to distributed systems architecture." Brown added that OCLC would become a value-added dealer of the IBM PC for the library community and would continue to develop and enhance its own microcomputer software product line.

PROJECT TEAM FORMATION

Brown's announcement of the selection of the IBM PC as the new OCLC terminal model marked the culmination of fourteen months of activity by OCLC staff. In April 1982, a project team had been established to define a state-of-the-art terminal for use by OCLC members and to recommend a vendor to produce that terminal once its functions and capabilities had been defined. This project team consisted of representatives from many areas of OCLC's organization: telecommunications, product development, computer systems engineering, research, marketing and user services, quality assurance, documentation, legal, operations, purchasing, and finance.

PROPOSAL PREPARATION PROCESS

In May 1982, the M300 project team sent a two-page request for information (RFI) to thirty-two potential vendors of the new

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OCLC terminal model. In the RFI, OCLC requested each vendor to provide a description of current offerings, a financial statement, and a point-by-point response to OCLC's outline of desired terminal characteristics and capabilities. Outlined in the RFI were features essential for the terminal to be used on the OCLC Online System:

- Custom synchronous polled protocol
- Asynchronous character and blocked protocols
- Daisy chaining for up to fifteen terminals at one location
- Custom keyboard (with special function keys and key-cap engraving)
- Custom character set of at least 256 characters
- Serial printer support

While the above features would allow the new terminal to emulate other terminals already in use on the OCLC Online System (OCLC Model 100, 105, and 110 terminals), the RFI also listed characteristics and capabilities that represented a significant departure from the technology used in previous OCLC terminal models.

First and foremost, the Model 300 was to be a *microprocessor-based*, programmable, intelligent, communications terminal. As such, the terminal would include the following features:

- Bus architecture incorporating an industry-standard bus
- RS-232 and RS-422 interface support
- Capability of supporting local mass storage devices (floppy-diskette or hard-disk drives)
- Standard operating system
- Nonvolatile memory for feature configuration

It is the inclusion of these microcomputer features that later influenced OCLC in its selection of a name for the new terminal model, the *OCLC M300 Workstation*, a name chosen to emphasize that this was not simply a terminal, but rather a computer with stand-alone processing capabilities and flexibility not available in earlier OCLC terminals. The RFI also included some general terminal characteristics that were necessary for compliance with statutory regulations and industry standards and that reflected OCLC's concern for the design ergonomics of the terminal.

Eleven vendors responded to the RFI. The M300 project team reviewed and evaluated the responses during the summer of 1982 and used them to expand and refine the initial list of terminal characteristics into detailed functional specifications, a sort of wish list for the new terminal. OCLC's top management and technical advisors reviewed the functional description and further defined pricing and possible applications. They then directed the project team to revise the specifications to differentiate between desired and required terminal features and to prepare the M300 request for proposal (RFP).

The OCLC M300 RFP was completed and mailed to selected vendors in February 1983. It defined a number of issues—technical, development, quality, legal, financial, and marketing—that vendors were to address in their proposals, and it included sample test plans and contracts, as well as the functional description of the OCLC M300 Workstation. Vendors were given about one month to submit proposals and price quotations in response to the RFP.

EVALUATION OF M300 PROPOSALS

As soon as the vendor proposals had been received at OCLC, the M300 project team began the process of matching OCLC requirements with vendor solutions and then evaluating and comparing alternatives. Three terminals were selected as final candidates, and their vendors were invited to demonstrate prototype systems for consideration by OCLC. After extensive evaluation and comparison of the finalists, the project team recommended that OCLC adopt the IBM PC as the new OCLC M300 Workstation (see figure 1). This recommendation was accepted enthusiastically and resulted in Brown's announcement of June 7.

HARDWARE SELECTION FACTORS

Major factors in OCLC's selection of the IBM PC included the following.

Product Conformity to OCLC Requirements

Point by point, the IBM PC most nearly matched the capabilities and functions specified by OCLC in its RFP. Of particu-

The OCLC M300 Workstation consists of the following standard components.

IBM PC SYSTEM UNIT CONTAINING—

- IBM System Board. Contains 40KB (40,960 bytes) read-only memory and 256KB (262,144 bytes) random-access memory.
- Three adapter boards
  1. IBM Monochrome Display and Printer Adapter—includes parallel printer port and OCLC Character Set installed on a memory chip by OCLC
  2. IBM Diskette Drive Adapter—controller for diskette drives
  3. OCLC I/O Communications Board
- OCLC Interface Panel. Has ports for serial printer, synchronous communications, and asynchronous communications
- Two unused expansion slots for additional adapter boards
- Two IBM 360KB (368,640 bytes) Diskette Drives
- Shielded cable (for attaching the workstation to a modem or to another terminal in a chain of terminals)

IBM MONOCHROME DISPLAY

The display unit is an 11½-inch (diagonal) CRT. It presents light green characters on a dark background in an eighty-character by twenty-five-line display.

OCLC KEYBOARD

The OCLC keyboard generates all characters that the IBM keyboard does and additional characters used in communicating with the OCLC Online System.

OCLC also offers the following ***options*** for the M300 Workstation:

IBM PC EXPANSION UNIT THAT INCLUDES—

- 10MB (10,240,000 bytes) Fixed Disk Drive
- Fixed Disk Drive Adapter Board
- Attachment Card
- Six unused expansion slots for additional adapter boards

10MB FIXED DISK DRIVE

This is in addition to that provided in the Expansion Unit.

KEY TRONIC IBM-COMPATIBLE KEYBOARD

Although not necessary for efficient operation, this keyboard is provided as an option for use of the M300 Workstation in PC mode.

Fig. 1. M300 Product Description.

lar concern to OCLC was that the product, selected for modification and enhancement for use on the OCLC Online System, have an industry-standard operating system and bus architecture and that it provide upward expansion capabilities. OCLC found these features in the IBM PC.

- Industry-standard operating system. The availability of the PC Disk Operating System (PC–DOS) was an important factor in OCLC's selection of the IBM PC. Because PC–DOS has become an industry standard, a vast array of applications software has been developed to run under it and will thus be readily available to library users of the new OCLC terminal. In addition, permission to use PC–DOS was readily obtained.

- Bus architecture. The PC System Unit includes the Intel 8088 processor, a high-speed, high-performance microprocessor with 16-bit internal architecture (that is, it has an 8-bit bus, but supports 16-bit operations). Because of the IBM PC's early introduction and popularity in the microcomputer market, the Intel 8088 has become a *de facto* industry standard. Bus architecture was important to OCLC both for obtaining technical training and documentation and for ensuring optimal compatibility with peripherals.

- Expansion capabilities. The IBM PC is a modular system (consisting of separate system, display, and keyboard units) and as such offered OCLC upward expansion capabilities necessary for meeting both the

current and ongoing needs of OCLC library members. For example, OCLC sought a terminal that could accommodate a custom keyboard with special function keys and diacritics, display of the OCLC Character Set (256 characters), and installation of additional expansion boards and storage devices.

Vendor Dependability, Flexibility, and Support

- Dependability of vendor production. OCLC desired and obtained, through its selection of the IBM PC, vendor assurances of production quantities sufficient to ensure an adequate supply of terminals for OCLC library members. Vendor financial stability was also an important consideration in selecting a product whose availability would not be threatened by the vicissitudes of the microcomputer market.
- Flexibility. Early in the selection process, it became fairly obvious to the M300 project team that no single off-the-shelf product could meet OCLC's unique communications requirements. For the terminal to provide synchronous access to OCLC system services, it was essential that OCLC find a vendor sufficiently flexible to accommodate OCLC's desired hardware modifications. As an IBM value-added dealer, OCLC was granted the right to develop and install on the PC such custom features as the OCLC Input/Output Communications Board, the OCLC Character PROM (a programmable read-only memory chip containing the OCLC Character Set), and the OCLC Interface Adapter (containing four EIA RS-232-C connectors: two synchronous serial I/O ports, one general serial I/O port, and one asynchronous serial modem I/O port).
- Availability of documentation and technical support. OCLC desired to find a terminal vendor that would provide quality documentation to OCLC system users and technical staff. The IBM PC is complemented by a complete set of manuals—covering user operations, software and hardware development details, and maintenance instructions. In addition to its own user documentation, OCLC will ship with each OCLC M300 Workstation three IBM manuals: the *Guide to Operations*, *BASIC*, and *Disk Operating System*. The availability of these and other IBM publications will allow OCLC members to derive the full benefit of owning a microcomputer workstation. In addition, OCLC has obtained, with its selection of the IBM PC, access to a fully staffed dealer support network capable of providing rapid responses to questions concerning the enhancement and maintenance of PC hardware and software.

Product Reliability and Marketability

- Pricing. Of great significance in the selection of a new OCLC terminal was the determination of whether the product's cost would equal potential user benefits. It was necessary that the product—state of the art or not—be affordable and that its price be justifiable by the improved services or decreased operating expenses that it offered to OCLC member libraries. The IBM PC met this requirement.
- Quality. OCLC also required that the product selected for development as its new terminal model have a proven track record of reliable performance and that its manufacturer have a firmly established, quality-assurance and control function. Introduced in 1981, the IBM PC has acquired a reputation for quality and dependability in the field.

M300 PRODUCT DEVELOPMENT ACTIVITIES

Since the announcement of its selection of the IBM PC, OCLC moved forward in its development efforts toward production release and shipment of the first OCLC M300 Workstations, in February 1984. Major activities and accomplishments have included the following.

Hardware Modifications

After the IBM PC had been selected for development as the OCLC M300 Workstation, it was necessary to secure reliable vendors to produce such custom hardware components as the OCLC Keyboard, Input/Output Board, Interface Panel, and Character PROM. Key Tronic, Inc., manufacturer of the OCLC Model 105 Keyboard, was contracted to produce the new M300 Keyboard. Another vendor, Micro

OCLC M300

Industries, has been contracted to produce I/O communications boards and interface panels conforming to specifications developed by OCLC telecommunications engineers. Finally, OCLC has contracted Divelbiss to manufacture, for installation on the IBM Monochrome Display Adapter, a daughter board that will include both the IBM Monochrome Character Set and the OCLC Character Set on a single PROM chip, as well as software-controlled circuitry to switch automatically from one set to the other.

In-House Design and Coding of Terminal Software

OCLC staff have developed the OCLC Terminal Software package for operating the OCLC M300 Workstation as a synchronous and asynchronous terminal in communication with the OCLC Online System and as an ASCII asynchronous terminal for accessing other systems. The OCLC Terminal Software consists of the following components: synchronous initialization routine, screen formatter, host I/O module, keyboard translator, printer spooler module, error detection module, shutdown module, asynchronous block routine, and configuration menus. This software performs such functions as handling communications received from the host system, translating and formatting data passed from the keyboard to the display unit, controlling the allocation of memory for the printer spooler, and storing user-specified configuration values (for example, access mode, baud rate, parity, stop bits, and printer communications protocol).

Preparation of Documentation and Workstation Accessories

OCLC has prepared for distribution to its library members a number of documents intended to inform libraries of features, options, and ordering procedures related to the OCLC M300 Workstation. Among these have been the OCLC M300 "Questions and Answers" brochure, the OCLC Software License Agreement, and instructions for ordering OCLC computer products. In addition, OCLC will provide with each workstation the *OCLC M300 Guide to Operations* (a user manual that gives detailed information about care and use of the workstation), two keyboard templates, and a box of blank diskettes.

Contracting for Installation and Maintenance Support

OCLC has arranged for Western Union to provide installation and maintenance

service for the OCLC M300 Workstation as it does for other OCLC terminals.

Establishment of In-House Assembly, Testing, and Packaging Facilities

OCLC has established in its product packaging area facilities for installing additional memory chips, boards, and interface panels in the OCLC M300 Workstations. Special equipment has been procured for testing M300 hardware and software and packaging the M300 for shipment.

Final Testing

In November 1983, M300 field testing began on twenty-five development workstations. Of these, seventeen workstations were strategically distributed at such sites within OCLC as the bibliographic conversion and maintenance areas, the user contact desk, Quality Assurance and System Support departments, and the OCLC Library; and eight workstations were installed in various Ohio libraries. The field test was designed to examine terminal functions in all operating modes and to identify and resolve any major problems before production release of the M300.

In addition to undergoing thorough field testing, the OCLC M300 Workstation has been submitted to an independent laboratory for testing and was found to be in compliance with applicable FCC regulations.

M300 SOFTWARE DEVELOPMENT PLANS

The introduction of the OCLC M300 Workstation provides OCLC with the opportunity to take a new approach to providing products and processes to libraries. Before the advent of the M300 Workstation, OCLC had relied on the centralized computer power located at OCLC for provision of its services to member libraries. The M300 Workstation places significant computing power in the libraries themselves, and this localized computer power can be used independently of or in conjunction with that of the central system. OCLC can now review and develop library services in light of which functions are best centralized, best decentralized, or best linked between centralized and decentralized processing.

OCLC MICRO ENHANCER SERIES

OCLC's first project for M300 Workstation software development is the Micro Enhancer Series. Under development and scheduled for release in 1984 are four communications packages, one for use with each of the four OCLC Online Subsystems: Cataloging, Interlibrary Loan, Acquisitions, and Serial Control. Each package is designed around the principle of local processing for subsequent interaction with the Online System. This local processing involves both preprocessing (designating online searches and functions to be performed previous to logging on to OCLC) and postprocessing (local manipulation of data automatically downloaded from OCLC). Each package will also support timed, unattended processing: the terminal operator will designate the time at which the Micro Enhancer should access OCLC, and the Micro Enhancer will automatically perform the specified processing at the designated times. Specifically, each package will operate as follows:

Cataloging Micro Enhancer

The Cataloging Micro Enhancer is designed to support batch searching of the Online Union Catalog and local editing of bibliographic records for subsequent interaction with the Online System. The batch-searching feature will allow users to enter and store numeric search keys (LCCN, ISBN, ISSN, Coden, and OCLC numbers) on disk. The Cataloging Micro Enhancer will automatically access the Online Union Catalog for each search entered. For every search successfully performed, the Cataloging Micro Enhancer will download the bibliographic record to a data disk in the M300. The local editing feature will allow users to edit the downloaded bibliographic record as appropriate and indicate the UPDATE or PRODUCE command to be performed on the Online System. The Cataloging Micro Enhancer will automatically perform the necessary editing and processing online as indicated on the disk by the terminal operator. When released, the Cat-

aloging Micro Enhancer will streamline the cataloging process by minimizing repetitive searches by terminal operators and by supporting local editing without user interaction with the Online System.

Acquisitions Micro Enhancer

The Acquisitions Micro Enhancer is designed to support batch updating of acquisitions order records by allowing users to enter and store on disk the numbers for acquisitions orders to be updated. The Acquisitions Micro Enhancer will automatically access the acquisitions orders, perform the specified UPDATE command, and record the system response. When released, the Acquisitions Micro Enhancer will streamline order record keeping.

Serials Control Micro Enhancer

The Serials Control Micro Enhancer is designed to support batch updating of serials local data records by allowing users to enter and store search keys for local data records. In addition, users will be able to indicate whether each searched record should be updated to received, missed, or claimed. The Serials Control Micro Enhancer will automatically access each local data record, perform the appropriate command, and record the system response. When released, the Serials Control Micro Enhancer will reduce repetitive interaction with the Online System and streamline serials check-in record keeping.

Interlibrary Loan Micro Enhancer

The Interlibrary Loan Micro Enhancer is designed to support batch updating and batch printing of ILL records. Its batch-updating feature will allow users to enter and store record numbers for ILL records to be updated. In addition, users will be able to indicate the UPDATE command to be performed on each searched record. It will automatically access each ILL record, perform the appropriate command, and record the system response. Its batch-printing feature will allow users to print out their entire pending files automatically without direct interaction with the OCLC Online System. When released, the Interlibrary Loan Micro Enhancer will reduce the amount of staff and terminal time necessary to perform record-keeping functions in the ILL subsystems.

MICRO ENHANCER BENEFITS

Use of the Micro Enhancer packages will result in the following benefits to libraries and OCLC:

- Reduced terminal operator interaction with the OCLC Online System
- Elimination of repetitive, time-consuming terminal functions
- Reduced staff and terminal time necessary to utilize each subsystem
- Efficient use of OCLC Online System resources through redistribution of message traffic throughout the hours of system availability
- Improved OCLC ability to offer subsystem enhancements.

OCLC is already planning for future Micro Enhancer packages for use with the Online System.

ADDITIONAL MICROCOMPUTER SOFTWARE PACKAGES

In addition to the Micro Enhancer Series, OCLC is looking toward additional microcomputer software that could be of value to the OCLC membership. These packages will come both from OCLC development efforts and from outside software developers with whom OCLC contracts for development services. OCLC's first outside software package offering will be the Asiagraphics Chinese-Japanese-Korean (CJK) package. The Asiagraphics package includes the Library Support package, which is a CJK character set cataloging package and a CJK word processor. Packages such as that under development for OCLC by Asiagraphics will help OCLC to meet some of the specialized needs of its users without making major changes to the Online System.

With the development and procurement of microcomputer software and with the adoption of the OCLC M300 Workstation itself, OCLC is continuing its commitment to improve and enhance central system services while seeking to offer new local options to its member libraries. ■■

The WLN PC: Local Processing in a Network Context

David Andresen

The Washington Library Network (WLN) is a multiservice automated bibliographic utility that provides its member libraries with sophisticated database-searching capabilities, shared cataloging and catalog maintenance, automated acquisitions, resource sharing information, and retrospective conversion. The database consists of approximately 3 million unique bibliographic records, 3.2 million authority headings, and nearly 8 million holdings records.

At present WLN has 120 participants who are geographically dispersed between Arizona and Alaska. They access WLN computer services either over high-speed leased lines using dedicated terminals or via normal low-speed telephone lines using a variety of equipment, including microcomputers equipped with modems and communications software.

WLN currently bases its online services on a combination of a large, centrally located computer and a network of terminals in libraries to access the database on the mainframe.

In 1984 WLN will begin offering participants a modified IBM Personal Computer to replace customized Hazeltine Modular One terminals, which have been the mainstay of WLN service since 1977 when the Bibliographic Subsystem entered production. The change marks WLN's move into both microcomputers and distributed processing.

AGENTS OF CHANGE

The central mainframe-terminal arrangement has been attractive to libraries because it has provided them with a cost-effective way to gain entry into automated cataloging, acquisitions, interlibrary loan, and database searching. A few libraries have had the resources to set up their own automated systems, primarily for circulation control. The majority, however, have not had this option in any real sense.

By necessity they have sought the cost-spreading benefits of automated networking. Other benefits have also been derived and, in some cases, come to the fore: increased staff productivity, creation of regional databases, and message routing between libraries are the more important ones. Not many libraries today would want to go back to the time when there was no detailed data about regional resources or when interlibrary loan was a hit-or-miss operation that could only be done by mail.

The advent of minicomputers and, especially, low-cost microcomputers is changing the situation. A portion of many currently networked services (cataloging, acquisitions, and interlibrary loan) have the potential of being done locally on inexpensive machines.

The amount of work microcomputers can accomplish is still small compared to the need. That is certain to change over the next few years. A day will soon come when many libraries will be able to use microcomputers for all local processing and, in addition, have room left over for entire databases such as WLN.

WLN CHANGES

WLN believes libraries will benefit from the increased local processing capability that micro- and mini-computers provide. Libraries will have new capabilities, and WLN itself can advance to a new level that is appropriate to the changing mainframe-microcomputer world and that is qualitatively superior in terms of product range and depth.

In particular, WLN is in a unique position to play a role in helping libraries move toward local systems by providing design guidance, especially as it relates to the need to continue to have a regional database and provide links to a national database. It will be important that local systems be able to mesh smoothly with such databases.

WLN knows that its role will shift in the types of services it will be called on to supply. Circulation, online catalogs, acquisitions, serials control, local databases—these will move from the purview of the

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WLN-like systems to local systems in the next few years. WLN's role will change to focus on the need for shared cataloging and catalog maintenance based on comprehensive and consistent authority control, shared collection development, gateways to other systems and databases, interlibrary loan and interinstitutional information switching in a broad sense, access to entirely new types of databases formed by government agencies, and the distribution of data and software to local systems.

SEARCH FOR A MICROCOMPUTER TERMINAL

WLN has been aware of the potential of microcomputers for some time. However, it was only with the introduction of fast 16-bit machines at reasonable costs that WLN began actively to explore the possibility of using one as a high-speed network terminal. Earlier 8-bit microcomputers generally were too limited in terms of speed and processing power.

A number of criteria were used in the search for a microcomputer suitable for use as a network terminal: ample internal and mass storage, availability of hardware and software for terminal conversion, state-of-the-art design, ongoing manufacturer support, cost comparable to that of the Hazeltine terminal, and the availability of a broad range of software and hardware peripherals for use of the terminal as a microcomputer.

The search led via a formal bidding process to the IBM Personal Computer. WLN's experience parallels that of many business, educational, and government organizations: the IBM PC is a powerful and affordable microcomputer that is well supported by IBM and a large array of third parties.

NECESSARY CUSTOMIZATION

An off-the-shelf IBM PC does not have all the features needed to operate as a WLN bibliographic terminal. WLN has modified the PC to work as a terminal while, at the same time, retaining its capabilities as a microcomputer.

Specifically, three areas required customizing: communications; display driver and CRT monitor; and the keyboard.

The communication modification consisted of a specially manufactured circuit board and two software programs. The board plugs into one of the empty slots inside the PC, and it contains both the circuitry and sockets to hook the PC directly into the WLN communications lines. The two programs operate the board and let the user engage in his or her normal dialogue with WLN. The 3270 communications protocol will be used with the PC. When the programs are halted, the PC returns to its original state as a microcomputer. The circuit board, however, continues to answer polls so that the WLN system can keep the line active.

The communications modification was carried out in a way that allowed the IBM PC to work on the same lines and with the same equipment (including modems and printers) as the present Hazeltine terminals. The practical effect is that libraries are able to integrate the new WLN PC at their own pace as budget and other priorities allow. No disruption of the current equipment setup is required to bring a PC on line. WLN hopes that the staged conversion from Hazeltine terminals to WLN PCs will be completed by 1986.

The display modification consisted of a new display driver and a high-resolution monitor. The new driver permits high-resolution characters with diacritics appropriately placed. In addition, it allows implementation of special character sets, such as the ALA characters, Cyrillic, and others. The new display board and the high-resolution monitor, an NEC JB 1410P2(A) with a fourteen-inch screen, provide the capability of showing high-resolution graphics on the screen—graphics that are fully compatible with those normally produced by the PC.

The standard keyboard has been replaced by a specially manufactured keyboard that is embossed with the ALA character set in addition to the normal characters of the PC. The ALA character set is operational in the WLN terminal mode, or it may be selected by a software switch from other programs. While functioning as a terminal, the ten function keys on the PC are assigned to special operations: four-way cursor movement; home; clear; clear to end of line; page one/two;

delete/insert characters; and delete/insert line. This eliminates the sometimes confusing dual function that IBM gave its numeric keypad. In appearance, the new keyboard looks like the one supplied by IBM, but functionally it is closer to the Hazeltine.

WLN offers participants several options for their WLN PCs. The minimum configuration is 128k of memory (RAM); one double-sided, double-density disk drive (320k storage); a high-resolution monochrome monitor; a custom keyboard; associated electronics to support communications and graphics; a parallel printer port compatible with a wide range of printers; and an asynchronous serial port to use with a modem for communications with other databases (e.g., DIALOG), serial printers, or other serial devices. The system can be expanded for more memory, an additional disk drive, color monitor, or hard disk.

WLN has also implemented a scheme whereby one WLN PC can support up to three slave terminals, which deal through the master terminal for communications with WLN. This arrangement results in somewhat lower hardware costs and increased communications efficiencies for libraries that have several terminals. The master must be on at all times in order to maintain correct polling; however, it does not have to be in the communications mode; indeed, it can be doing other library tasks, such as word processing or accounting. The slaves may be turned off without affecting communications. Like the master, they can be used for a wide range of general library functions.

TERMINAL FUNCTIONS

WLN's modifications to the IBM PC are intended to minimize the amount of retraining operators must undergo in making the transition from the Hazeltine terminals to the new WLN PC. While some changes were desirable or unavoidable in the keyboard and screen layout, they were kept to as few as possible. Since much of the screen format is software dependent, changes can be made in the future as desired enhancements are identified.

Operators immediately will notice one significant difference between the WLN PC and the Hazeltines: the WLN PC has the ability to save information onto a disk as it is received. This is accomplished by pressing a key to save a screen of data.

Libraries can manipulate the resulting disk file for whatever local purposes they want. Some of the anticipated uses are record pass-through to local circulation or cataloging systems; generation of bibliographies or small local databases; printing of catalog cards and purchase orders; and manipulation of WLN accounting reports. Areas of future development include interactive support of bibliographic maintenance and acquisitions.

NONTERMINAL USES

One of the truly attractive features of using a microcomputer as the WLN bibliographic terminal is its ability to function as a local small computing facility. This opens many new horizons to WLN participants.

Software that works on the standard IBM PC will also work on the PC modified as a network terminal (a WLN PC). This includes myriad word processing, spreadsheet, database management, accounting, and specialized library programs. Graphics software designed for the standard PC will also work on the new terminal, as will communications programs to access DIALOG and other databases.

In brief, the new terminal can act as three types of machines: a WLN bibliographic terminal, a full-capability microcomputer, and a dial-up terminal for other database services. Data files saved on disks are transferable between functions. This means that bibliographic records saved on disk in the bibliographic terminal mode can be accessed and manipulated by programs in the microcomputer mode. Similarly, by using appropriate software, sign-on routines and search strategies can be placed on diskette and later used when working with a database service.

WLN supports its participants in the microcomputer aspect of the new terminal by providing a variety of general and specialized consulting services. The purpose of the consulting services is to provide participants with a pool of experience, information, and expertise so that they can make

the most effective use possible of the computing abilities of the microcomputer terminal.

On the hardware side, WLN may design and install equipment configurations to meet special needs, such as local area networks. Equipment purchase, setup, and operator training are also services offered. In addition, WLN publishes factual information to help participants make equipment selections, especially of items such as printers, modems, hard disks, OCR equipment, and plotters.

With regard to software, WLN works with participants to identify, install, and provide training on commercially available programs. It may develop custom software on a contractual basis to meet special local requirements. WLN may also produce general library software on its own for use by participants.

To accomplish this, WLN has increased its staff to include a full-time microcomputer specialist, is establishing a software library, and has instituted ongoing communications with participants regarding their microcomputer needs.

EXPECTATIONS

Widespread use of microcomputers in a network of libraries is a new phenomenon. Expectations are high, but experience is still low. WLN has premised its move to microcomputers on plans to help libraries turn these expectations into reality.

In concrete terms, some of the outcomes WLN expects to occur within the first year are:

1. Microcomputers will be used intensively for administrative tasks such as budgeting, record keeping, and work analysis. The main reasons for this will be the microcomputer's clear superiority to manual methods in terms of timeliness, accuracy, flexibility, and analytical sophistication. WLN expects to see many of the new terminals functioning to support library managers and administrators when not in use as network terminals.

2. Word processing will become widespread as participants gain experience with all the capabilities of microcomputers. The demand for this function will begin to impinge on use of the microcomputer as a network terminal. WLN expects that many of its participants will use the new terminal to gain initial experience in word processing and then to acquire a compatible standalone microcomputer dedicated exclusively to word processing.

3. Most small, local databases will be transferred and many more will be created for the first time on microcomputers. Microcomputers are ideally suited for keeping files such as vertical file indexes, resource files, desiderata lists, binding and mending files, special collection catalogs, donor files and lists of difficult reference questions. Initially, these small databases will be placed on the new terminal. Over the long run, however, WLN believes they will migrate to dedicated microcomputers or microcomputers in a local area network.

4. Use of a standard microcomputer by members of the WLN network will make it possible for them to exchange and share information easily. This is expected to be of particular use to libraries that want to exchange resource files and management statistics for comparative purposes.

5. Over the next year, as libraries gain experience, there is likely to be increasing demand for a wide variety of peripherals beyond the usual printers and modems. The group in demand will probably include plotters, light pens, and analog-to-digital devices.

6. The same phenomenon is likely to occur with regard to software. Specialized, perhaps esoteric file management, graphics, and statistical packages will be sought by libraries wanting to exploit the flexibility of their equipment.

7. WLN expects high interest in local area networks using common hard disks, printers, and other peripherals. One pictures librarians using terminals at their desks to switch between WLN, word processing, resource scheduling, budgeting, and local database management via hardware and data files that can be shared by other terminals in the library. At present, local area networking on microcomputers still has blue-sky aspects, but there is little doubt that it will become a reality in the next twelve to eighteen months.

8. Downloading of WLN records by full WLN participants will become commonplace. Such downloaded records will be used for local databases and to pass through to local minicomputer-based circulation systems.

In conclusion, WLN has high expectations of the new microcomputer bibliographic terminal. It foresees and intends to support its use in new, more powerful ways of utilizing the WLN database as well as in local processing functions that will aid libraries in serving their clientele. ■■

Personal Computers and Faxon's LINX Network

Rebecca Lenzini and George Rakauskas

The microcomputer revolution has brought with it a range of possibilities that are at the same time exciting and confusing. One major emerging role is that of the micro used to complement the mainframe in its role of data storage, data handling, and data sharing. As the presence of micros spreads, the mainframe becomes increasingly the central point of value-added networks and serves to pull together information from a variety of sources that can then be downloaded and manipulated locally, in a "handshaking" approach.

Micro applications will enable vendors to deliver inexpensive systems that take advantage of more local processing and more customization while relieving both the mainframe work load and the user's mainframe dependency. At the same time, the benefits of interaction with and access to the vendor's extensive databases are not lost.

Even today, when used in conjunction with a network, the personal computer can serve as a fully functional remote terminal while at the same time laying the groundwork for future uses involving data handling in partnership with the mainframe.

This article will discuss use of the personal computer in conjunction with a mainframe-based network and specifically will describe this process as it currently occurs on Faxon's LINX network.

INTERFACING THE PERSONAL COMPUTER AND THE MAINFRAME

In general, interfacing the personal computer with a mainframe system requires coordination to ensure compatibility with a telecommunications network and the hardware supported on that network.

First, the modem, needed to convert the telephone signal into a digitally recognizable signal, must be compatible with the modem used at the host site. In many cases, if a remote terminal of some type is being used to access a host system, the modem already in place can also be used with the personal computer.

The personal computer also requires a second piece of equipment—a communications interface board. This board converts the digitized phone signal into a signal that the personal computer's operating system can use and, therefore, must be as complex as the specific communication network protocol requires.

For example, higher-level data communications protocols such as SYNCHRONOUS DATALINK CONTROL (SDLC) will require a more complex board. However, with this board, the personal computer will take on desirable network characteristics, such as full-screen transmission and error checking.

It is important to note that the personal computer provides the gateway to multiple types of systems, so that both ASCII and SDLC networks may, in fact, be accessed using the same device. Add to that fact its own personal computer capabilities for word processing, spreadsheeting, or even game playing, and the personal computer becomes a cost-effective alternative to a traditional CRT terminal.

At the present time, most microcomputers already have or will have emulation capabilities to allow them to function as ASCII or other network terminals. However, future uses that take advantage of

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data uploading and downloading require more complete compatability of software at both ends. Since this software is not yet standardized, the safest approach for any IBM mainframe environment is that of the IBM PC or PC-compatible micro, and, indeed, the IBM PC is fast becoming the de facto standard in the industry.

PC'S AND LINX: SYSTEM DESCRIPTION

Traditionally, vendor databases have housed valuable data compiled to support a basic business. At Faxon, this fact inspired the creation of a telecommunications network that supports LINX, first made available to libraries in December 1980 as an online interactive serials management system.

Five separate yet interrelated services are available through the LINX network:

- *DataLinx* offers online access to Faxon's databases and files as well as LINX Courier, an electronic mail service that allows users to place orders and transmit claims online. Current information is available for viewing, giving complete title and publisher data for 200,000 serials records, up-to-date serial prices, current machine-readable cataloging for serial publications (MARC-S), and customer financial information.
- *Infoserv*, available as part of DataLinx or on a stand-alone basis, is a database of new serial titles that may include publisher-supplied contents and descriptive notes. These titles are full-text searchable and include thorough subject headings.
- *SC-10* is an interactive serials check-in and claiming service. With SC-10, users can automate their entire serials operation. SC-10 is designed to contain the title records for the library's complete collection of periodicals and serials, including monographic series and dailies. SC-10 clients receive full service claiming for Faxon-placed titles as well as regularly issued reports to assure up-to-date records.
- *Route* enables users to control locally the online creation, updating, and printing of routing slips. Complete reader files and route slip records are maintained online; slips are automatically generated simultaneously with issue check-in.
- *Union List* provides online maintenance capability to groups of libraries for sharing holdings information about the serial titles in their collections. Products available include public access lists for the group and for each member, with extensive cross-referencing and keyword indexing.

LINX NETWORK TECHNICAL DESCRIPTION

LINX services are available through Faxon's dedicated line LINX network or through dial-up access to Faxon's computer facilities at Westwood, Massachusetts. Satellite transmission through RCA's CYLIX, a shared usage network specializing in high-speed data transmission, is also available.

All lines are connected to Faxon's IBM 3081-D computer, which also supports an internal network of more than four hundred terminals. All terminals are IBM 3270 type or are given IBM 3270 characteristics through protocol conversion (see figure 1).

The network can be accessed by three telecommunications modes: leased line, synchronous WATS dial, and asynchronous dial (TELENET or WATS). IBM modems are used on AT&T Long Lines, transmitting at 9600 bps. VSM modems are used on the CYLIX leased lines transmitting at 9600 bps. Terminals used on the leased lines transmit EBCDIC code using SDLC protocol.

Two local ASCII networks are currently supported through the use of protocol converters at the client site, which are tied to a leased line running at 9600. Two WATS lines for synchronous dial service are also available. A combination of GDC-201C and Bell modems are used, transmitting at 2400 or 4800 bps. Terminals used on the synchronous dial WATS lines transmit in EBCDIC code using SDLC protocol.

Faxon also offers asynchronous dial service, transmitting at 1200 bps. Terminals used transmit in ASCII code using asynchronous protocol. Recognizing both the widespread availability of ASCII devices and the advantages of a high-speed network with the error-checking capabilities of 3270 terminals, Faxon maintains a protocol converter to enable standard ASCII models to appear and function as 3270-type terminals. At present, any of the following terminals, or any terminal that can emu-

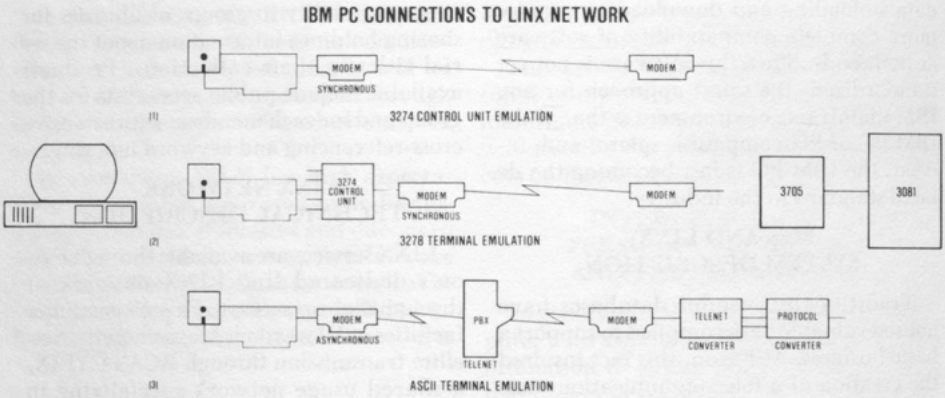

Fig. 1. IBM PC Connections to LINX Network.

late one of these, is supported: DEC VT 100; Televideo 920, 925; Lear Seigler ADM-3A, ADM-5; Hewlett-Packard 262X Series; Hazeltine 1520; Zentech 40; IBM 3101; Xerox 820 Model 2 (micro). Other ASCII terminals will be added to this list in the near future.

INTERFACING THE PERSONAL COMPUTER TO FAXON'S LINX NETWORK

Faxon first demonstrated the IBM PC linked to the LINX network at ALA Midwinter, in San Antonio, January 1983. Since that original demonstration, Faxon has continued to investigate the growing number of boards and devices that can effectively be used as a part of the network. Any personal computer used to access a network, even when dedicated, can still be used for strictly local applications, such as word processing or spreadsheeting.

Concentrating on the IBM 3270 environment, we have identified and tested two types of 3270 emulation software available. The first is actually 3274 or 3276 control unit emulation, called simply 3270 emulation in the IBM package. In this case, the interface board and software combine to replace a 3274/3276 control unit and one 3278 terminal. Other packages are expanding this capability to allow several personal computers to connect together locally as a cluster of 3278 terminals and to give intelligent printer capabilities to a standard personal computer printer.

Listed below is equipment required to exercise this option. Please note that the list is not exhaustive and that prices given are approximate and set by the vendor or manufacturer.

3274 Control Unit Emulation (Dial-Up at 2400 Baud)

Prerequisite:
An IBM PC with 128K memory and one disk drive.
Hardware Needed:
IBM SDLC Communication Board no. 1502090. $300
IBM Communication Cable no. 1502067. $ 75
Software Needed:
IBM SNA/3270 Emulation Software no. 6024036. $700
Example of Modem Needed:
GDC (General Data Comm.) synchronous modem 2400 baud 201C. $745

A second option is actually emulation of a 3278 terminal. In order to exercise this option, the 3274 or 3276 control unit must already be in place. The user can then replace an existing 3278 terminal with a personal computer by disconnecting the terminal's coaxial cable and connecting it to the Personal Computer's interface board.

3278 Terminal Emulation (9600 Baud and Higher; Dial-Up or Leased Line)

Prerequisite:
An IBM PC with 96K memory and one disk drive.
A 3274 Control Unit.

Hardware and Software Needed:

Technical Analysis Corp. "Irma"—3278-2 emulation interface board and software.	$1,195
IBM PC 3278/79 Emulation or Adapter (1602507); shipment planned April 1984 (128K memory is required).	Unavail.

Since the LINX network also supports ASCII terminals, as described earlier, a third option for the PC is emulation of a compatible ASCII device. Listed below are software packages with which we have had experience. Others are available for IBM PCs, Apples, TRS-80s, and most other microcomputers, though the user is advised to check out compatibility requirements with Faxon's Network Center.

ASCII Terminal Emulation (1200 Baud Maximum; Dial-Up)

Prerequisite:
An IBM PC with 64K memory and one disk drive.

Hardware Needed:

IBM no. 1502074 Asynchronous Communications Adapter.	$120

Software Needed:

Persoft, Inc., TE100 VT100 Emulation Software or IBM 3101 Emulation Software no. 6024042.	$125 $140

Example of Modem Needed (must be Bell or Vadic compatible):

Racal Vadic 1200 baud modem or Acoustic Coupler.	$700

PERSONAL COMPUTER FUTURES

The future for personal computers in libraries, both in general and in conjunction with the LINX network, is tied to the development of distributed systems. Newer products will define and refine the interface between micros and mainframes. Users will be able to control data locally, accessing the mainframe only for storing large amounts of data and running longer maintenance and reporting programs. More customized programs will be developed at each user site.

As micros become more sophisticated, they will take on many of the functions of the mainframe-based systems. Programs written on mainframe systems will be able to be run successfully on the micros, thus freeing the mainframe. Already many database management systems running on mainframes are developing versions that will run on personal computers. This will mean that a transaction or series of transactions on the micro can be processed first locally, before transmission to the main system. Smoother uploading and downloading of data will result, bringing with it better local response while relieving the mainframe work load.

IBM's recent announcement of the PC XT/370 indicates graphically that the future described above is nearly here:

> IBM announces the IBM Personal Computer XT/370, an extended version of the IBM Personal Computer XT. The IBM Personal Computer is a System/370 workstation which can interact with a System/370 host system. When the new IBM Virtual Machine/Personal Computer (VM/PC) licensed program is installed, many unaltered CMS System/370 programs can run on the workstation. The 3277 Model 2 emulation capability which allows the workstation to be an interactive terminal to a System/370 host system is provided. The System/370 functions have been achieved while maintaining compatibility with the IBM Personal Computer.[1]

Although systems like LINX cannot yet take advantage of these capabilities, modifications are already in the works to carry the XT/370 forward to more sophisticated levels, and we can safely assume that other manufacturers will follow suit.

In addition, fourth-generation software, now available in the marketplace and in place at Faxon, promises to provide a solution to the problem of integrating the management and usage of information between mainframes and personal computers.

Until there is a standardized and stable approach to this integration, the "handshaking" between mainframe and micro should be approached with some caution. However, IBM's clear progress in this direction, combined with the promise of new software approaches, can and should lead us to optimistic conclusions.

In preparation for the above scenario, it is wise for libraries and other users to begin

to exploit the current possibilities for personal computers as network terminals whether local, national, dial-up, or dedicated. In this way, we can lay the foundation for future distributed systems in partnership with value-added networks.

REFERENCE

1. International Business Machines Corporation, "IBM Personal Computer XT/370, 5160 Model 588 and 568," *Product Announcement* (White Plains, N.Y.: IBM, Oct. 18, 1983). ■■

The IBM PC as a Public Terminal on LCS

Chin-Chuan Cheng and Kurt R. Murphy

In November of 1978, the University of Illinois implemented a modified version of Ohio State University's Library Control System (LCS).[1] Renamed the Library Computer System, LCS in Illinois is a full inventory and circulation control system supporting a network of libraries that share a common computer but retain separate databases. LCS currently supports nearly 500 terminals and a database of more than 7 million records, representing the holdings of twenty-one academic libraries throughout the state.

LCS contains records and complete holdings for each of 2.7 million titles at the University of Illinois at Urbana-Champaign (UIUC). Currently, the UIUC Library has 169 terminals connected to LCS, of which 74 are public terminals. While LCS in Illinois is an automated library network of twenty-one academic libraries, this paper deals specifically with the use of LCS at the UIUC Library.

Individual LCS records, derived through weekly batch processing of OCLC subscription tapes, consist of an abbreviated bibliographic description along with detailed holdings information and circulation status. Terminals available to library staff provide the capability to charge, discharge, renew, save, recall, and to perform a variety of other circulation functions. Terminals installed in public areas enable library patrons to search LCS and to perform some circulation functions.

From any public terminal, patrons can search LCS by author, title, author/title combination, or call number. While LCS does not provide a true subject search, library patrons can simulate such an approach by using the LCS Shelf Position Search, which retrieves and displays records with adjacent call numbers immediately preceding and immediately following any given class number. Valid LCS searches consist of a three-letter mnemonic command followed by a slash and the appropriate search key. Printed instructions are provided with sample searches at public terminals.

LCS is a complete inventory control system and therefore contains a record for each title held by the library with complete holdings information. Patrons often use LCS in preference to the card catalog because for known-item searching, LCS provides quick and convenient access to the library's complete holdings and because each LCS record supplies complete location information and circulation status. Furthermore, if a locally held item is charged out or otherwise unavailable, one can search any of the other LCS libraries and borrow the item through the statewide delivery system.

While LCS continues to serve well for circulation, known-item searching, and resource sharing, it lacks a number of features essential to a true online catalog—most conspicuously, a full MARC record format, subject access, and authority control. Following an investigation into the alternatives for providing these and other essential features, the library decided to acquire the bibliographic subsystem of the Washington Library Network (WLN) as the basis for an Online Catalog and to demonstrate the potential for an integrated system of library automation for Illinois.[2] With Library Ser-

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vices and Construction Act (LSCA) funds appropriated through the Illinois State Library, the WLN software was acquired and installed. The River Bend Library System, one of the eighteen regional public library systems in Illinois, agreed to participate with the UIUC Library in the development of system design modifications and enhancements.

When the Online Catalog becomes operational early in 1984, it will contain approximately seven hundred thousand full bibliographic records. Derived from OCLC tapes dating back to late 1974, these records represent the combined holdings of the UIUC and River Bend libraries. In addition to subject access, the Online Catalog performs keyword searching of many fields, truncated searches, and Boolean search strategies. Following a major software development effort, the full Library of Congress name and subject authority files were loaded into the Online Catalog database. New headings are automatically added to this file as incoming bibliographic records are loaded into the database during weekly processing. Thus, for all author, subject, and series title searches, the heading can first be verified by consulting the online authority file.

Both LCS and the Online Catalog (WLN version 2.0) run on an IBM 3081, located at the university's Administrative Computer Center in Chicago, under IBM's OS/MVS operating system. Database management for the Online Catalog is handled by Software AG's ADABAS (version 4.1.1) while terminal communications are run under IBM Customer Information Control System (CICS 1.5). The LCS software includes its own database management system and uses IBM Telecommunications Access Method (TCAM 10) for communications. Network terminals are linked to the host computer through a series of multiplexors, modems, and phone lines using standard ASCII codes.

Access from the same terminal to both LCS and the Online Catalog was made possible by modifying the WLN communications software so that it could operate under the same teleprocessor (TCAM) as that used by LCS. The TCAM software was expanded to include a message handler that enables it to identify the appropriate system destination for incoming transactions, thus allowing the patron to issue LCS or Online Catalog commands interchangeably from a single terminal. An additional feature enables one to automatically retrieve and display the corresponding LCS circulation record for any full bibliographic record retrieved through the Online Catalog.

While the message handler and the automatic link feature allow the patron to search either LCS or the Online Catalog much more conveniently, the presence of two distinct command languages and record formats can make the combined systems somewhat confusing for public use. It soon became clear that for typical patrons, who do not use the library every day and are not proficient in the use of LCS and the Online Catalog, some sort of simplified approach was needed.

Such an approach should capture the natural processes of the search and provide a graceful interaction between the patron and the computer. Also, it should be easily modified and not interfere with the very good response time that has been achieved on LCS. After much discussion and investigation, it was decided that the best way to make the combined systems easier to use was to develop a user interface on an intelligent terminal or microcomputer. Further investigation led to the choice of the IBM Personal Computer (PC) to house this interface. The most economical way to configure the IBM PC for this purpose, it was decided, is to purchase a standard IBM PC with 128K of memory but with no disk drives. The interface program could be loaded using a cassette recorder and thus save the costs of the disk drives. As long as the machine is not turned off, the interface program will remain in the memory. The standard keyboard and monochrome display monitor are also required as is the IBM Asynchronous Communications Adaptor, which provides a standard RS 232C communications interface.

In the summer of 1982, the library acquired an IBM PC for one of the authors (C. C. Cheng) to develop the interface in two stages: (1) an interface to LCS and (2) a set of interface programs for the combined

LCS/Online Catalog system. The first stage of this development has been completed and will be discussed in detail below.

The microcomputer is used in place of a standard ASCII terminal to intercede between the patron and the mainframe. An interface program written in BASIC and residing in the IBM PC prompts the patron for information about a desired search and then forms the appropriate commands to communicate with the mainframe, thus freeing the patron from having to construct commands. In March 1983, the interface was first released for public use on an IBM Personal Computer in the circulation area of the main library. In November, the library acquired thirty additional IBM Personal Computers to be installed in the main library and in various departmental libraries for public use. The library plans to acquire more PCs to replace dumb ASCII terminals in the near future.

In terms of protocol, the multiplexers linking the host computer and the local sites communicate at the speed of 4800 bits per second with mark parity, 7-bit data, and 1 stop bit in synchronous mode at half-duplex with no echo. The site multiplexers, however, communicate with terminals at the speed of 1200 bits per second with mark parity, 7-bit data, and 1 stop bit in asynchronous mode. Each IBM Personal Computer connected to the multiplexer is equipped with an Asynchronous Communications Adaptor, which provides standard RS 232C interface features. The speeds of the adapter range from 50 to 9600 bits per second. It supports 5-, 6-, 7-, or 8-bit characters with 1, 1½, or 2 stop bits.[3] Essential to communication operation is its interrupt system that controls transmit, receive, error, and communication line status.

The interrupt system of the asynchronous communication adapter makes the communication between the personal computer and the mainframe much easier to handle. The communication line is treated as a file. When this file is opened, the address of the routine that handles communication is stored in an appropriate memory location called the interrupt vector. When a character is ready to be received or transmitted, the adapter interrupts the central processing unit of the microcomputer, and execution is transferred to the communication routine. This routine collects characters from the communication line and stores them in a receive buffer for retrieval by the main program. It also transmits to the communication line the characters stored in a transmit buffer by the main program. These communication activities are interrupt-driven. The main program does not need to spend time polling the communication line for a signal. Moreover, the processing speed of the main program does not affect communication. In other words, the characters in the line are never lost because of the execution speed of the main program. It is this interrupt system that allows the interface program to be run in interpretive BASIC. While the program can be compiled for faster execution, the interpretive BASIC is fast enough to meet the optimal requirements of man-machine interaction.

The interface carries on a dialogue to query the user about the nature of the search, accepts the responses, formats an appropriate command, and sends the command to the mainframe for processing. It then receives and displays the search results on the screen, interprets the various codes on the records if so requested by the patron, and helps the user charge, renew, and save the selected item. When this cycle of interaction is complete, the interface is ready for another search. Initially, a ready prompt is displayed along with the following one-line instruction:

```
See the bottom-line to search; press <?> if you need help.
```

Upon pressing the question mark, the interface explains how to use certain keys and other relevant points. Although these points are presented one at a time, they are given in only one screen. At the end of the help sequence, the user is returned to the initial ready prompt. At this time the user may press one of the specified numerical keys for the corresponding search as shown in the bottom line of the screen:

```
Press 1 for Author-Title 2:Title 3:Author 4:Call No. 5:Subject Call No.
```

The numerals are displayed in high intensity while the search types are given in low intensity for easy reading. At this juncture, if the user presses a key that is not one of those designated, then the interface assumes that the user wishes to use the command mode and displays "You are on your own" in the bottom line of the screen. The user may continue to complete the command or press the <Esc> key to start all over. If the user chooses to type on at this point, the complete string is sent to the communication buffer as it is. The mainframe response is then collected and displayed without interpretation. Once the response is completely displayed, the program returns to the initial ready prompt for another search.

The main function of the interface is to help the patron find a book without being burdened by the computer commands. As one of the designated numerical keys is pressed, the interface queries the user with one or two sentences, typically not in excess of one display line of eighty characters, for each piece of information. Usually, the interface starts to communicate with the mainframe with one (in the case of call numbers) or two pieces of information. Thus the dialogue between the interface and the user is fairly succinct. For example, when the numeral 1 is pressed for an author-title search, the patron is first asked to:

```
Type the author's last name and then press the <ENTER>
key:
```

The patron enters the last name of the author as requested. The patron may, for example, type CHENG as a response. The interface then asks for the title:

```
Type the first important word of the title and <ENTER>:
```

After a word is entered, the interface checks to see if it is a stop word such as *a, an, the,* etc., in which case the user is requested to enter the second important word of the title, if one exists. The interface constructs an LCS command to search the circulation records first. The LCS command for the author-title combination search requires the command identifier ATS followed by // followed by the first four letters of the author's last name and the first five letters of the first important word of the title. The interface constructs the command string accordingly while freeing the user from counting the number of required letters while typing. The interface pads the string with the appropriate number of blanks if words are shorter than the required length. All these activities are internal to the interface and are transparent to the user. For example, if the user types SYNCHRONIC in response to the title query, then the command formed by the interface is ATS/CHENSYNCH.

The constructed command is then sent to the communication buffer and on to LCS on the mainframe. The main program of the interface then waits for the search results. The communication routine is activated by an interrupt to forward the command and to receive the response. The main program starts to retrieve the response from the receive buffer and stores each line as a string in an array in the microcomputer's memory for later processing. A line in this case is a string of characters followed by carriage return (ASCII code 13) and line feed (ASCII code 10). As each line is retrieved, it is also examined by the program. The examination serves two purposes. First, it identifies control codes, such as XON (ASCII 17), and discards them so that they will not be displayed. Second, the examination identifies search messages (such as NO MATCHING SEARCH CODES) and translates them into phrases more meaningful to the user (such as NO ITEMS WERE FOUND).

The sample search given above and issued during the writing of this paper in December 1983 had the following result:

```
495.1C423S CHENG, CHIN-CHUAN
A SYNCHRONIC PHONOLOGY OF MANDARIN
CHINESE$THE HAGUE 72-88180
    229625  1973  1  ADDED:  780303
01  001  4W  MDX CHGD 831205/840203 UC
```

All the query dialogue lines are displayed in high intensity. The search results, on the other hand, are shown in low intensity. This distinction in display makes reading the information easier because the user can

easily separate these two types of information on the screen and focus on the information of interest.

When an item is found in LCS, the interface asks the patron if interpretation of some abbreviation codes is needed. If the user presses the <Y> key (for yes) then the interface uses the lines stored in the array in the memory to interpret the codes of the records. It explains, in plain English, what the call number is, how many copies are owned, where the copies are located, and what the circulation status is. For example, the interface interprets the above search results as follows:

```
The call number is 495.1C423S.
The library has 1 holding.
Line 01:  Copy 1 is in Modern Languages and Linguistics—
          425 Library.

          The loan period is 4 weeks.

          But it is charged out. And it is due February 03,
          1984.
```

The interpretation is done entirely within the interface program and does not involve the mainframe. Immediately after the interpretation the interface asks the user to:

```
Press <C> to charge out, <R> to renew, <S> to save,
<ENTER> to go on.
```

If one of the keys C, R, or S is pressed, the interface again checks the stored lines to make sure that the circulation status allows for the selected request. If the request is allowed, it asks the patron to provide his or her identification number and forms an appropriate command to send to the communication buffer. The mainframe response is then displayed.

The interface next asks if the user wishes to end this round of searching or to search the same item across the participating libraries. If the search is terminated, the interface returns to the initial ready prompt with the search types displayed in the bottom line of the screen. The search across participating libraries is a particularly useful feature of the interface. With a standard terminal in command mode, the patron must look up the code for each library, compose the search command, and append the proper library code. This has to be done for each library and therefore is both time-consuming and memory-taxing. With the interface, the patron is only asked to respond to the following query:

```
Type an institution name, city name, library code, or <EN-
TER> for all:
```

If a specific location or name is given, the interface constructs the appropriate command to search the library or libraries and displays the results. If no name or location is given, then it randomly selects a library to start the search. It also allows the user to remotely charge an item and have it sent through the statewide interlibrary delivery system. All the commands are constructed by the interface and sent to the mainframe; the user need not formulate any commands. If the item is not found in one library, the interface automatically constructs the command to search the next library on the list. During a search, the user may press <ENTER> to interrupt the process and return to the initial ready prompt.

During the search session, the user may terminate processing at any time by pressing the <Esc> key. When this key is pressed, the interface returns to the initial program unit to examine the communication line buffer. As it is in a half-duplex mode of communication, the microcomputer does not send BREAK or other similar keys to the mainframe to actually terminate the impending processing. Therefore, before the initial ready prompt is displayed, the interface examines the buffer to determine the processing status. If the buffer contains any characters, then it is cleared. The program then waits for two seconds to see if more characters are coming in from the communication line. If characters are being received, it displays "One moment . . ." to the user. If no characters are received after a two-second wait, then the interface is ready for another round of searching.

The interface also waits for two seconds at the end of every search response from the mainframe to determine the actual end of transmission. Although some multiplexers

in the LCS network may send XON (ASCII code 17) to indicate the end of transmission, not all terminal lines receive this control character. Moreover, this character is not a sure sign of the end of transmission because the mainframe may send a public message preceding or following the search results.

Equally important in the design of the interface is the determination of the lack of response by the mainframe. Studies have shown that the response time on LCS is generally very good, averaging less than four seconds. Under some conditions, however, our observations have shown that response time may be as long as thirty seconds. The interface, therefore, waits for forty seconds before informing the patron that the mainframe computer has failed to respond. At the end of this time, the interface returns to the initial ready prompt. In this way, the interface will not wait indefinitely if the mainframe system goes down.

As for the user, the interface waits for three minutes for the user to respond to its query. If no key is entered after this period, then the interface assumes that the user has walked away without completing the search, and it returns to the initial ready prompt. In the initial ready state, if no key has been entered for five minutes, the interface erases the entire screen and displays Press <B> to Begin for three seconds at a randomly selected screen position. This same process of screen clearing and display is repeated until a key is entered, in which case the initial ready prompt is displayed. This process of clearing the screen and displaying a short message at random locations is intended to prevent screen burnout and prolong the life of the screen.

The interface with LCS was first released for public use on one IBM Personal Computer installed in the circulation area of the main library. Response from users was extremely encouraging. Although at the beginning some users took it to be an ordinary standard terminal and used the command mode, many quickly discovered the convenience of the interface and were willing to wait in line to use it even though standard terminals nearby were not occupied. Since the interface also provides the option of using the command mode, errors in search commands did occur. The mainframe computer center tabulates the transaction statistics. Table 1 presents some statistics showing the number of transactions on the microcomputer with the interface and the number on the standard terminal, which consistently had the highest number of transactions of all the standard public terminals. Invalid commands were counted in the total. The number of valid transactions are also given for a more meaningful comparison. The number of transactions of 40,197 on the interface microcomputer in October was the highest number in the history of LCS in the entire state.

As stated above, beginning in November 1983, the library began installing an additional thirty IBM PCs with the LCS interface for the public to use. With this first stage completed, i.e., the development of an LCS interface, work continues on the combined LCS/Online Catalog interface, which will be ready when the Online Catalog becomes operational early in 1984.

The success of the LCS interface is encouraging. It represents an inexpensive way to make complicated, command-driven systems easier to use without taxing

Table 1. Statistics Showing the Number of Transactions

	1983							
	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.
Standard								
Total	31,614	31,071	16,126	17,054	19,617	19,360	25,698	34,726
Invalid	6,614	6,420	3,181	3,433	3,902	4,184	5,948	7,964
Valid	25,000	24,651	12,945	13,621	15,715	15,176	19,750	26,762
IBM PC								
Total	26,970	29,537	20,793	20,063	24,123	23,691	31,375	40,392
Invalid	741	292	117	155	89	129	170	195
Valid	26,229	29,245	20,676	19,908	24,034	23,562	31,205	40,197

the mainframe system. The fact that the interface resides in the microcomputer used by the patron points to even greater promise in the future because the microcomputer can be enlarged, enhanced, and reprogrammed to do more processing locally. It may be possible, for example, to download search results for local manipulation and even to give users bibliographies on diskettes that can be used on their own personal computers. Other possibilities will become evident as more experience is gained.

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Communications

LC Name Authority Tapes Used by Ohio State University Libraries

Lorene E. Ludy

The Ohio State University Libraries has loaded the Library of Congress Name Authority tapes into its online catalog (LCS, or Library Control System) to provide *see* and *see also* references in the online catalog and to change automatically many pre-AACR2 headings to AACR2 form.

The Library of Congress has been creating machine-readable name authority records since 1977. The names in these records came from catalog records created by LC during this period and from the retrospective conversion of LC authority records for frequently used (twenty-five or more times) names. The retrospectively converted name records and many of the new records created before the implementation of AACR2 (January 2, 1981) included the AACR2 form of the name, so identified. In March 1981 LC prepared the Name Authority master tape, containing about 520,000 machine-readable records. When the AACR2 form of names was available it became the established heading (1xx field) in the records; the pre-AACR2 form was changed to a reference (4xx field). Thus, even though the authority records were created before AACR2, the Name Authority master tape contains AACR2 forms of names. Since March 1981, update tapes have been issued weekly and cumulated quarterly. The Ohio State University Libraries used the master tape (1977–March 1981) in March 1983 and the update tapes (for April 1981 through September 1982) in August 1983.

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LCS contains circa 1.9 million short records (call number, author, title, edition, and date) for all cataloged titles in the libraries and approximately six hundred thousand full bibliographic records for those titles cataloged (and many retrospectively converted) through OCLC since 1974. In order for this collection of discrete records on LCS to serve as a catalog, it was necessary to collocate records sharing the same name (or topical subject, series, etc.) heading and to incorporate references between and among these headings (*see* references, which refer from unused to used headings, and *see also* references, which refer to related headings). Toward this end, LCS was modified in December 1981 to create a headings file containing all name headings which are access points to both short and full bibliographic records, as well as the subject, series, and uniform title headings from the full records.[1] Each heading is stored in full form only once in this headings file and linked by heading number index to each short and full bibliographic record. Any change to a heading thus may be applied in all associated records (global change). In addition to the headings themselves, the file also contains a structure which allows LCS to store and display *see* and *see also* references. It is the linking of the heading with relevant bibliographic records and the presence of a structure to store and display references that have enabled Ohio State to use the LC authority data in machine-readable form to update headings and add cross-references to the local online catalog.

LC's Name Authority data enhanced names in LCS (including names used as subjects) in the following ways: (1) changing many name headings to the form used by LC; (2) identifying and coding any headings in AACR2 form; (3) substituting the AACR2 form for headings on LCS in other forms (thereby changing headings to the correct form); (4) consolidating variant

forms of many names on LCS; and (5) adding *see* and *see also* references to many headings represented in LCS. Table 1 shows the types of changes and the number of headings involved in each.

In the loading process, headings were changed when an existing LCS heading matched a *see from* reference (4xx field) to a heading in AACR2 form. Headings were added as *see also* references (5xx field) to and from existing LCS headings (programming prevented acceptance of references to headings not used on LCS). When an approved heading on the Name Authority tapes matched the main element of an LCS heading (that is, the LCS heading had further subdivisions, such as form subdivisions to name subject headings or subordinate bodies in corporate name headings), the undivided heading and its references were added to LCS. (Ohio State's card authority file has included cards for these "grandfathers"; and they were thought to be necessary in the online authority file.) The partial match of a *see* reference in such cases caused a heading to be created with the referred- to form and its subdivisions. Changes to these created headings occurred in only a limited number of instances. For example, it was assumed that the subdivisions would be appropriate to the new form of heading for names as subjects but not for corporate name headings. The remainder of the created headings were not used, but reported for staff evaluation. Appropriate changes were made manually. (These grandfathers and headings created with subdivisions are the "added headings" on line 4 of table 1.) It should be noted that since the relationships between and among headings on LCS are themselves stored and controlled by treating them as headings, *see* and *see also* references on LCS are counted as "unused" headings. The total number of headings (both established headings and references) added to LCS was 185,718.

Preliminary analysis of Ohio State's experience shows that 30 percent of the headings on LC's Name Authority tapes were present on LCS. (The unused records from LC are being retained until it is determined whether it would be useful to process them

Table 1. Results of the LC Name Authority Tape (NAT) Load onto LCS

	Number of Headings		
	Master Tape (added 3/83)	Update Tapes (added 8/83)	Total
1. Heading records on NAT	ca. 520,000	310,089	ca. 830,000*
2. Headings on LCS† at time of load	1,296,337	1,464,308	
3. LCS headings changed	15,674	8,860	24,480
4. LC-established NAT headings (1xx fields) added to LCS (AACR2 forms, grandfathers, and headings with subdivisions)	24,785	15,867	40,652
5. Total headings added to LCS (established headings and references)	105,041	80,677	185,718
6. *See* reference links created from NAT	98,949	76,678	162,530‡
7. *See also* reference links used from NAT	14,350	5,031	14,391§

*The number of unique headings is smaller inasmuch as 20–30 percent of the update tapes are corrections to existing records.

†All types of headings, including ca. 73 percent names, 23 percent subjects, 4 percent series, and 1 percent uniform titles. Some headings have multiple types, e.g., both name and subject.

‡Figure takes into account 13,095 *see* references deleted by the update tapes.

§Figure takes into account 4,990 *see also* references deleted by the update tapes.

again in the future.) More than 20 percent of the names used on LCS were found on the Name Authority tapes. The percent of the total LCS headings file which matched the LC data is lower (16.2 percent for headings from the master tape, 9.9 percent for headings from the update tapes) because the LCS headings file also includes series, topical subjects, and uniform titles.

The Name Authority tapes helped Ohio State to deal with a major part of the changes caused by the implementation of AACR2. Over twenty-four thousand headings in LCS changed form; in 72.6 percent of these cases the AACR2 form was added to LCS (in the other cases both headings—old and new—were present on LCS, and the tapes consolidated the records and established references between the headings). Approximately seventy-two thousand short and full bibliographic records (2.9 percent of the records on LCS) were changed to new headings as a result of the tape load.

The addition of references and the upgrading of headings to AACR2 form has substantially improved the capacity of LCS to serve as Ohio State's online catalog. A similar effort is planned, using machine-readable subject authority data from LC, as it becomes available.

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Reports and Working Papers

In the Matter of: Investigation of Access Charges and Divestiture-Related Tariffs

Joseph B. Ford

Editor's note: The following is a formal petition filed with the Federal Communications Commission on behalf of CAPCON libraries requesting that the FCC deny or curtail the tariff request filed by AT&T Communications, Inc. CAPCON is a libary system cooperative that represents sixty-five libraries in Washington, Baltimore, and northern Virginia. The tariff request as filed would effect an 84 percent price increase for leased line telecommunications for the CAPCON member libraries. The petition was submitted in a required format containing headnotes. For the purpose of this publication, these headnotes have been deleted. If the tariffs are implemented as requested, they will take effect April 3, 1984.

SUMMARY

The proposed private line tariffs (FCC Tariff 3, Section 8, et al.) filed by the American Telephone and Telegraph Company (AT&T) and the other telecommunications companies work an unreasonable and inequitable hardship on one class of users: libraries in general, and those libraries which are affiliated with the CAPCON Library Network in particular. The CAPCON member libraries will pay approximately 84% more for private-line telecommunications services than their current charges if the proposed tariffs are implemented.

Such drastic price increases are unreasonable and discriminatory, and represent an unwarranted reallocation of public funds away from library service and toward the private sector.

The Commissioners of the Federal Communications Commission are requested to deny the tariff request.

INTRODUCTION

In the past fifteen years, beginning with the development of a standardized data format for encoding bibliographic records, libraries in the United States have quietly created a technological revolution. Much of the technology has been developed by nonprofit, member-supported cooperatives, or by the academic community. Regardless of the origin of the technology, it has been driven forward by one single unifying objective: Reduce the labor-intensive nature of library materials processing by sharing information with the rest of the community.

The combination of low-cost computing power, and the need for shared resources has produced one of the most remarkable developments of the twentieth century. More than six thousand libraries, serving perhaps 50% of the nation's population, use and adapt data derived from their colleagues' efforts, and shared with and among the library community. The cost savings, and the growth in efficiency of service among libraries of all types and in all states, has been enormous, but estimated by one study to be in excess of three billion dollars ($3,670,000,000) per year in savings.*

For the CAPCON libraries, the estimated dollar figure in savings is in excess of one million dollars ($1,005,480).

The single factor which permitted this growth and change was low-cost telecom-

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*OCLC, Inc., estimates as presented in their petition to the FCC in the same matter.

munications. Specifically, the availability of voice-grade multi-point telecommunications circuits allowed libraries in many locations to access a single shared data-processing facility, use the data stored there, and achieve substantial economies of scale. With the availability of low-cost telecommunications came the development of various types of library-related hardware, including cathode-ray-tube terminals which could process and display the unwieldy but necessary special character set associated with library data processing; companion printers for labelling materials; telecommunications hardware to facilitate the sharing of data circuits; and associated peripheral devices such as light pens, bar code generators, and data switches.

Nationally, the library stake in telecommunications, if the hardware expense alone is calculated, would easily exceed $50 million. That is, libraries in this country have modified their operations and purchased or leased more than $50 million in data-processing telecommunications hardware. For the CAPCON libraries, the estimated figure is $500,000. The cost in staff time to adapt to the new technology, whether nationally or locally, is incalculable.

What is most important is that these efforts were undertaken by publicly funded and supported institutions, a segment of the community that in many respects is the most vulnerable to economic disruption, and therefore least able to take risks. On behalf of their users, however, libraries developed and became dependent on resource sharing through data processing and telecommunications.

II. IMPACT ON LIBRARIES OF ACCESS CHARGES AND TARIFF FCC NO. 3

Since the mid-1960s, libraries have been caught in a classic squeeze brought about by inflation and the "information explosion." They have faced increased materials and labor costs, and increased demands from their users. The response from the library community was to reduce unit costs by sharing resources. The availability of low-speed analog circuits, with modems to convert digital to analog signals, has permitted libraries to cope with their problems, within the constrained budgets available to them. As expressed elsewhere, the role of affordable telecommunications cannot be overemphasized as the key to the success libraries have had in achieving efficiency of service.

The potential impact of the access charge ruling and the new private-line tariff would be drastic. Estimates prepared by AT&T indicate increases of 84% for circuits used by CAPCON member libraries for data transmission. For example, the CAPCON Library Network, a non-profit library cooperative with its headquarters in Washington, D.C., has sixty-five member libraries which use an online system located in Columbus, Ohio. A CAPCON member with one terminal and one modem pays an aggregate amount of approximately $103.50 per month to have a telecommunications link to the computer system, plus a $75 monthly lease cost for the modem. The system, operated by another nonprofit organization called Online Computer Library Center (OCLC), is the chief source of data-processing support for libraries attempting to continue service delivery in the face of mounting costs and reduced budgets. Using OCLC, CAPCON's members reduce unit costs while speeding materials processing. If the access charge and the tariff are implemented as currently stated, the telecommunications cost for a CAPCON library with a single terminal and modem would increase to approximately $190 per month, plus the cost of the modem, still at $75. The increase would come about purely as the result of access charges and tariff, with no improvements or enhancements in service. The library would face an increase of $86.50 per month, from $178.50 to $265, overnight. The total monthly increase for CAPCON libraries has been estimated at $6,758, or 84% more than current bill.

Libraries with multiple terminating channels would simply multiply the number of channels by the monthly increase, and thus would face even higher charges.

By examining the impact on a circuit-by-circuit basis, the effects may be easily seen. For example, circuit FD4998-028 (circuit 028) is one of the approximately twelve data circuits serving CAPCON members and other OCLC participants in the Washington-Baltimore area. Circuit 028 is

typical of data circuits terminating in a metropolitan area, since the circuit connects comparatively few exchanges, and the exchanges it does connect are primarily in lower-tariff class A areas. The interexchange (IXC) mileage, and IXC costs, are rather low. It should be noted that circuits serving the Midwest and Far West may have considerably longer "backbone" mileage, and that circuits serving class B or rural areas may have greater IXC mileage, higher IXC tariffs, and higher costs.

The attached tables, 1A and 1B, identify the circuit and its configuration and costs under the current tariff, and under the proposed tariff as filed by AT&T on October 3, 1983. Please note that since much of the detail associated with the new tariff, such as the exact relationship of the new Local Access and Transport Areas (LATA) to Serving Offices and Rate Areas, is not known, the costs will probably exceed the estimated charges. Despite the lack of full details, an increase of at least 62% can be identified, with the probable charge increases much higher.

For the purposes of displaying the data, the following definitions are used. An originating point, exchange, or serving office (ORIGIN/EXCNG and SECOND EXCNG in table 1A, ORIGIN/SO and SERV OFF in table 1B) is the primary point of telephone office service for a rate area or LATA; interexchange channel (IXC) is circuit between exchanges, as interoffice channel (IOC) is in table 1B; LATA distribution channel (LDC) is the local circuits running within the new Local Access and Transport Areas; and terminating channel (TC) is the rough equivalent of the local loop termination.

Applying the new rate structure to the

*Table 1A. Details of Circuit 028 (One Month)**

Origin/Excng	Second Excng	IXC Miles	IXC Cost	No. Loops	Loop Cost
Dublin, Ohio	Washington 8	332	$ 563.03	4	$144.20
Washington 8	Manassas, Va.	23	177.54	1	36.05
Washington 8	Washington 1	4	81.33	1	36.05
Washington 1	Washington 3	8	91.69	1	36.05
Washington 3	Washington 14	13	132.24	1	36.05
Washington 3	Baltimore	31	141.14	4	144.20
Baltimore	Towson	8	108.13	1	36.05
Totals		419 Miles	$1,295.10	13 Loops	$468.65
Total Circuit Cost		$1,763.75			

*Cost figures valid for circuit 028 only, as of July 1983. Other circuits have higher costs, bringing total aggregate cost to $103.50 per terminal/modem.

Table 1B. Details of Circuit 028 Under Proposed Tariff (One Month)

Origin/SO	Serv Off	IOC Miles	IOC Cost	LDC Miles	LDC Cost	No. Tc	Tc Cost
Dublin	Columbus	—	—	11	$ 54.45	1	$ 143.00
Columbus	Washington 8	332	$412.40	?	$?	4	572.00
Washington 8	Washington 1	4	$ 38.40	?	$?	1	143.00
Washington 8	Manassas, VA	—	—	23	$113.85	1	143.00
Washington 1	Washington 3	—	—	8	$ 39.60	1	143.00
Washington 8	Washington 14	—	—	17	$ 84.15	1	143.00
Washington 8	Baltimore	31	$ 81.60	?	$?	4	572.00
Baltimore	Towson	—	—	8	$ 39.60	1	143.00
Totals		367 Miles	$532.40	59	$331.65	14	$2,002.00
Total Circuit Cost		$2,866.05					
Increase		$1,102.33					
% Increase		62.5% *					

*This increase is the least possible increase, with the probable amount even higher. AT&T's own estimate is 84%.

circuit shown, we note the changes labelled below the B table. Please note that expenses have been moved much closer to the ends of the circuits, and that some reductions occur in channel charges. While IOC plus LDC charges are not exactly analogous to the IXC charges, the new tariff creates a similar billing configuration when IOC and LDC are combined. When the new channel components are combined, they show an estimated IOC plus LDC channel reduction of 33.2% (table 1B). It is important to recognize that table 1B does not display all the LDC charges which might be applied, and which would raise the costs higher by increasing the IOC plus LDC charges. It should also be noted that the modest reductions in IOC channel charges are more than offset by the dramatically increased terminating channel costs.

The information about channels, loops, and hardware has been included to develop a baseline telecommunications charge for the libraries on 028. This baseline gains meaning when the application of these components of the library telecommunications service are described as a function of the library's activities. For example, the libraries on circuit 028 performed 13,994 transactions in the month of October 1983, with an average telecommunications cost-per-transaction of $0.126. Under the proposed tariff, the average cost per transaction for the same number of transactions would be $0.204, or 61% greater.

The following tables, 2A and 2B, detail the transactions costs for libraries on circuit 028 before and after implementation of the proposed tariff.

In order to make the information in the tables more easily understood, the following brief definitions are used: a transaction is a billed use of the system for any type of service activity, including cataloging a book, borrowing a book, or verifying a location; a station (STN) is a terminating channel; a terminal (TERM) is the library computer terminal; the LOOP COST is the current (table 1A) and proposed (table 1B) cost to have the loop terminate in the library; and channel cost (CHANL COST) is the shared cost of the IXC circuit (table 1A) and IOC plus LDC circuit (table 1B).

In addition, the commissioners are directed to the two values at the bottom of the right-most column, where the mean cost per billed transaction is displayed, as it has been computed in two different ways. The wide variance between the two values results from the methods themselves: The lower number is calculated by dividing the total telecommunications charges by the total number of transactions, giving a mean of $0.126 per transaction in table 2A, and $0.204 in table 2B. The other calculation produces the mean of the means, or $0.251 per transaction in table 2A, and $0.366 in table 2B. For the purpose of clarity, both methods are displayed. The wide variance between the individual libraries' mean costs per transaction is due to the economies of scale which result from performing many transactions on one or more terminals.

An example which focuses on a particular library will yield further relevant data. One of the libraries identified in tables 1A and 1B has used OCLC as its sole means of processing materials to make them available to its patrons. In 1983–84, the library's annual materials purchasing budget is $45,000 and its processing budget is $7,450. The library has budgeted approximately $0.165 per item as the telecommunications cost to process the item.

At the current tariff rate, the cost of telecommunications represents 28.8% of the total processing budget, or $2,142 out of the total of $7,450. If the proposed tariff is allowed, the cost of telecommunications will increase to approximately $3,180 per year, and consume approximately 42.7% of the processing budget. The loss of budgeted funds for processing represents the total charges for processing approximately 400 books, or 17% of the total processing budget.

Comments received by the American Library Association and included as appendix A underscore the drastic effects the new tariffs will have on libraries.

III. ARGUMENTS

The initial purpose of the divestiture and the related access charges was to develop a competitive environment for telecommuni-

Table 2A. Monthly Telecommunications Costs per Transaction (Current Tariff)

Libr	No. Stn	No. Term	Loop Cost	Chanl Cost	Total Telcost*	No. Trans	Telcost/ Trans
1.	1	1	$ 36.05	$ 56.31	$ 92.36	220	$0.420
2.	1	1	$ 36.05	$ 56.31	$ 92.36	430	$0.215
3.	1	1	$ 36.05	$ 56.31	$ 92.36	294	$0.314
4.	1	7	$ 36.05	$ 394.14	$ 430.19	2,460	$0.175
5.	1	1	$ 36.05	$ 56.31	$ 92.36	154	$0.600
6.	1	1	$ 36.05	$ 56.31	$ 92.36	743	$0.124
7.	1	1	$ 36.05	$ 56.31	$ 92.36	724	$0.128
8.	1	2	$ 36.05	$ 112.62	$ 148.67	1,091	$0.136
9.	1	1	$ 36.05	$ 56.31	$ 92.36	69	$1.339
10.	1	2	$ 36.05	$ 112.62	$ 148.67	2,235	$0.067
11.	1	2	$ 36.05	$ 112.62	$ 148.67	4,399	$0.034
12.	1	1	$ 36.05	$ 56.31	$ 92.36	935	$0.099
13.	1	2	$ 36.05	$ 112.62	$ 148.67	240	$0.619
Total	13	23	$468.65	$1,295.10	$1,763.75	13,994	**$0.251**†
							$0.126‡

*Communications channel charges only, without modem lease.
†The mean of the means method.
‡The mean cost of all transactions divided by the total telecommunications cost.

Table 2B. Monthly Telecommunications Costs per Transaction (Proposed Tariff)

Inst	No. Stn	No. Term	Loop Cost	Chanl Cost	Total Telcost*	No. Trans	Telcost/ Trans	% Chng†
1.	1	1	$ 143.00	$ 37.57	$ 180.57	220	$0.821	+ 95.2%
2.	1	1	$ 143.00	$ 37.57	$ 180.57	430	$0.420	+ 95.3%
3.	1	1	$ 143.00	$ 37.57	$ 180.57	294	$0.614	+ 95.5%
4.	1	7	$ 143.00	$262.93	$ 405.93	2,460	$0.165	− 05.7%
5.	1	1	$ 143.00	$ 37.57	$ 180.57	154	$1.173	+ 95.5%
6.	1	1	$ 143.00	$ 37.57	$ 180.57	743	$0.243	+ 95.9%
7.	1	1	$ 143.00	$ 37.57	$ 180.57	724	$0.249	+ 94.5%
8.	1	2	$ 143.00	$ 75.14	$ 218.14	1,091	$0.200	+ 47.0%
9.	1	1	$ 143.00	$ 37.57	$ 180.57	69	$2.617	+ 95.4%
10.	1	2	$ 143.00	$ 75.14	$ 218.14	2,235	$0.098	+ 46.2%
11.	1	2	$ 143.00	$ 75.14	$ 218.14	4,399	$0.050	+ 47.0%
12.	1	1	$ 143.00	$ 37.57	$ 180.57	935	$0.193	+ 94.9%
13.	1	2	$ 143.00	$ 75.14	$ 218.14	240	$0.909	+ 46.8%
MSTR‡		1	$ 143.00	$ 0.00	$ 143.00			
Total	14	23	$2,002.00	$864.05	$2,866.05	13,994	**$0.366**§	+ 41.8%
							$0.204‖	+ 61.9%

*Communications channel charges only, without modem lease.
† % CHNG indicates the percentage change in telecommunications cost per transaction when the proposed tariff is applied.
‡MSTR is the loop from the OCLC computer center to the long-lines circuit.
§The mean of the means method.
‖The mean cost of all transactions divided by the total telecommunications cost.

cations. The library community in general, including the CAPCON Library Network, is not opposed to a competitive telecommunications industry. In a truly competitive environment, libraries could choose the manner and mode of their resource-sharing communications systems.

The new tariffs proposed by AT&T, its regional operating companies, and the independent phone companies, however, are far from competitive. In fact, they are unreasonable and discriminatory. Wherever AT&T has actual competition, as in long-distance channels, it proposes to reduce

costs. Where it has no competition, however, it proposes to raise costs by as much as 400% for some components of the service.

These rate increases are unjustified and work serious, perhaps irreparable, damage on the nation's libraries. As a class of users, the libraries have made an enormous contribution to the scholarly and social needs of the nation, and have paid fair rates for their use of the telecommunications facilities they have leased. It is impossible to expect libraries to absorb overall rate increases of 84% and still deliver the essentially *pro bono* services they provide to the nation.

An element of the divestiture related to competition was the anticipated development of alternative technologies, perhaps more effective, or less expensive, or both. Again, the library community in general and the CAPCON Library Network in particular are not opposed to alternative technologies and would welcome them for reasons of enhanced service or reduced costs. It must be noted, however, that libraries have no alternatives which will either enhance service or reduce costs. Libraries are currently totally dependent on AT&T and similar service.

It is important to note that the federal government has supported library development, and that the new tariff will work to subvert other federal programs. A quote from Representative William Ford of Michigan, speaking in the debate on telephone legislation (HR 4102) in the House, identifies the problem libraries face.

> The Federal Government encourages libraries to share resources through programs such as the Library Services and Construction Act, the Higher Education Act, and the library postal rate. Much of this progress will be reversed if, through disproportionate and unanticipated cost increases for telecommunications, libraries must discontinue their automated services or choose between paying data communications bills or buying new books. (November 10, 1983, *Congressional Record*, p.H9650)

The anticipated effects of the new tariffs will be as follows:

1. An overnight increase in the cost of telecommunications service, with the increase for CAPCON libraries estimated by AT&T at 84%.
2. No budgeted funds available to libraries to pay these increased charges, leaving only the reallocation of materials budgets, staff salaries, or other program funds; or the emergency allocation of other state or local funds to pay the increases.
3. Whatever the source of funds used to pay for the increases, the result will be a sudden and dramatic reduction in the quality and quantity of library service delivered to the nation in general, and to the patrons of CAPCON libraries in particular.
4. A reduction in the number of items acquired and processed by libraries and thereby made available to their patrons. CAPCON's members include three medical school libraries which will necessarily reduce the services they offer physicians and medical school students.
5. A substantial reordering of the plans libraries have developed for further resource sharing and automation of information services.

IV. CONCLUSION

Based on the information developed in this petition, the petitioner concludes that the tariffs filed by AT&T et al. are unreasonable and discriminatory. They work a hardship on one class of users, i.e., libraries.

Based also on the material included in this petition, the petitioner respectfully requests:

1. The commissioners deny AT&T et al. the right to impose the tariffs as filed.
2. In addition, the commissioners are requested to extend the period of comment and review beyond April 3, 1984, so that the Federal Communications Commission, the library community, and the scientific and scholarly communities can assess the long-range impacts of the proposed tariffs.
3. In the event that rejection of the tariff or extension of the review period are not found to be substantiated by the evidence, then the commissioners are requested to propose that the tariffs be phased in over a period of time long enough to reduce the immediate impacts of the tariffs. Libraries would then be able to develop technological strategies and revised budgets to deal with the increases.

APPENDIX A. EXCERPTS FROM REACTIONS OF LIBRARIANS TO PROPOSED INCREASES IN LIBRARY TELECOMMUNICATIONS COSTS

ALABAMA—Alabama Public Library Service: APLS, the State Library Agency, pays for three WATS lines which make it possible for all Alabama citizens to have equal access to library service whether it is at their own local library, by sharing resources with over two-hundred public libraries in the state, or by receiving service from APLS. One of the WATS lines makes it possible for the blind or physically handicapped to get service from us. We also have line charges to SOLINET (Southeastern Library Network) in Atlanta, which makes it possible for us to share cataloging services with approximately thirty-five hundred other libraries throughout the country. Our total telecommunications charges amount to $7,000 per month, or $84,000 per year. A 60% increase would just about eliminate those essential items. How do I adjust my budget—by eliminating the WATS lines, by reducing staff, or by reducing our library materials acquisitions? If we are forced to do any or all of the above, you will just about wipe out three-fourths of our libraries.

ARIZONA—Casa Grande City Library: Our telephones are used to provide a variety of services—telereference for those either unable to physically visit the library or in need of immediate reference assistance; verification of available library resources in other libraries in order to complement the interlibrary loan process; notification of patrons, indicating that books are being held for them or that the patron has overdue books; outgoing reference calls to major Arizona research libraries on behalf of our patrons who may be unable to physically use those research collections; confirmation of the availability of library facilities for use by community groups and organizations; etc. Our present telecommunications abilities expand the library's capabilities and community impact well beyond our doors. We are publicly supported and operate on a fixed budget with no way to pass additional unbudgeted costs on to our patrons.

ARIZONA—Scottsdale Public Library: During the past five years my staff and I, along with the National library community, have turned to automation and telecommunications to more efficiently and economically provide library service. We have participated in building a national bibliographic database, which is used for cataloging; we order material online for better, less expensive service; we share our resources with other libraries through online terminals; and we provide reference service from online databases. We have justified our moves in this direction because telecommunication capability has been affordable to nonprofit institutions such as libraries.

The proposed 60% increase will seriously affect Scottsdale Library's delivery of library service. We budget very closely to meet information demands of our community. We cannot absorb this type of increase and we will be left trapped between our obligation to provide current information to our community and the economics of rising telecommunication costs and/or return to manual systems.

ARKANSAS—Harding University, Searcy: Technical processing and interlibrary loans through the Online Computer Library, Inc., and the Computer Reference Service make our small library nationwide in scope. For a small private academic library this capability is without a doubt the greatest way of broadening horizons for our students and faculty that has ever been invented. As a nonprofit institution there is no way to pass on all additional expenses for increased telecommunications services to patrons and continue to be a service institution.

COLORADO—Colorado State University: In the case of Colorado State University we are currently operating a budget in the transfer of bibliographic data via library networks in the proportions of $100,000 to $150,000. An increase of 60% would price our services out of the market for students and faculty.

CONNECTICUT—Yale University: We presently operate some thirty-one CRT display terminals on dedicated lines served by the Research Libraries Information Network (RLIN) from a central computer located at Stanford University in Palo Alto, California. The present annual cost of the communications linking required to support these terminals is $83,844. The Yale library depends on RLIN for a considerable range of services all of which are extremely important to the provision of high-quality library service at a reasonable cost to the scholarly community.

ILLINOIS—Southern Illinois University at Carbondale: We believe the effects of the proposed tariff for telecommunications charges will have a major impact upon our library's expenditures, especially if the preliminary reviews indicating increases averaging 60% are accurate. Libraries have limited resources and are already hard-pressed because of the continuing effects of inflation in book prices. Involvement with regional and national library networks has resulted in increasing dependence upon telecommunications for our daily operations.

INDIANA—Allen County Public Library, Fort Wayne: As a member of the Indiana Cooperative Library Services Authority, we depend on leased interstate telephone lines linking us to the national

network headquartered in Dublin, Ohio, for major elements of library services. Our major data supplier, OCLC, estimates that nationwide increases for the private leased lines for data transmission will average about 60%. For the participating Indiana libraries the estimate is 78%. For the Allen County Public Library the estimated increase is 87%. Increases of this magnitude will result in erosion of library service throughout the nation. Our ability to tap into the database to find information, books, journal articles, and other sources of data for our users would be seriously impaired.

INDIANA—Wabash College: Costs to connect through the Indiana Cooperative Services Authority to our national online computer service (OCLC) would increase on an average of 75%. Online computer networks allow libraries to access data created elsewhere. For example, the record for a book cataloged by Notre Dame University is instantly available to my cataloger here or the person at Monroe County Public Library downstate, thereby eliminating our need to duplicate Notre Dame's work. As well, libraries are able to use the OCLC database to find out who has a needed book or periodical and can instantly online ask to borrow that item for our patron. The telecommunications linkage is dedicated AT&T long-line private/leased lines.

IOWA—State Library: I-LITE, the interlibrary loan program of the state of Iowa, pays for telecommunications costs which make it possible for all Iowa citizens to have equal access to library service by sharing resources with over five hundred public libraries in this state. We also have line charges to BCR in Denver, which makes it possible for us to share cataloging services with approximately thirty-five hundred other libraries throughout the country. Our total telecommunications charges amount to $8,400 per month, or $100,800 per year. A 60% increase would eliminate these essential services. We cannot adjust our budgets quickly enough to absorb this sort of increase. We could reduce staff, or we could reduce buying library materials, but then we wipe out the ability to serve the citizens of the state that need the access to this information.

MARYLAND—Prince George's Community College, Largo: The library staff in 1983 is essentially the same size as it was in 1970. The only way that the level of service can be maintained in the future is through automation. Automation for libraries requires access to a national bibliographic database (OCLC). Preliminary analysis indicates that an average of 60% in the cost of private leased lines will result from the new tariff rates being proposed. This will severely increase the cost of access to the OCLC database for us and may make it prohibitive. The college is not prepared to increase the library telecommunications budget without reducing the book budget, public services, or staff.

MONTANA—State Library: Nine libraries are connected with the Washington Library Network through special private lines. The proposed 60% increase, combined with the need soon for a second line, might well see us facing in 1984 a change from a telecommunications cost of approximately $35,000 to over $100,000 for our state's services. The Montana State Library plans grants to enable new libraries to join WLN. The tariff increases would come at a time when the other important libraries in the state are making decisions about network membership. I foresee a most serious blow to our attempts to encourage other libraries to join automated systems.

Montana is well aware of its geographical location and the long-term need for increased telecommunications at a reasonable cost. Our state officials in telecommunications development are working actively to explore solutions for us. The development of new technologies to reduce Montana's telecommunications costs certainly cannot be expected by April of 1984.

NEVADA—Washoe County Library, Reno: Preliminary analysis indicates that Nevada's libraries will face cost increases up to 60% for private/leased lines used for data communication. In 1978 the Washoe County Library paid $8.60 per leased line. We now pay $64 per leased line. Our telecommunication cost increases in five years are more than 600%. Nevada's libraries must share their resources; therefore, we face the problems of long distances and rural library delivery service. Additional increases in the cost of telecommunications will effectively destroy the statewide network and deny many Nevada citizens access to information.

Average costs for a dedicated line from rural libraries to the closest bibliographic data base (ELKO, Carson City, Reno, and Las Vegas) are $250 per month, or $3,000 per year. A possible increase of 60% for a library in White Pine County could be an additional $1,800 which could mean either the end of a book budget or the loss of a staff position. The approximate telecommunication costs to the twenty public libraries with dedicated lines and the ability to interconnect the four data bases are $65,000 per year. An increase of 60% would bring the statewide costs to $96,000. Obviously, Nevada's libraries cannot easily absorb this type of cost increase.

NEW HAMPSHIRE—New Hampshire State Library: The librarians of New Hampshire have recently managed to acquire a computer on which we proposed to mount four unique New Hampshire databases, a New Hampshire union catalog, an index to New Hampshire government documents, a status of legislative bills, and a directory of state agencies and their services. The state library provides In-WATS lines for our citizens so that they may access services to the blind and physically

handicapped and central governmental and general reference services. We also catalog for almost two hundred libraries through a processing center at the state library and have line charges to a bibliographic network based in Ohio.

We feel as though we are about to be set back ten years because of these proposed increased telecommunications costs. It hardly seems fair to levy such charges on publicly supported libraries when these libraries have been encouraged for years to provide modern information exchange systems for our citizens. We in New Hampshire have pooled our meager resources to do just that, believing that a well-informed society is the basis for a free and just society.

OKLAHOMA—Western Plains Library System, Clinton: With AT&T's divestiture approaching in January of 1984, we have been notified of the new telecommunications pricing schedules. While some costs will go down, a new service function fee has been added and the fee for station terminations/keys increased so that there will be a total increase of 62.5%. Our telecommunications costs will more than double in this fiscal year if this increase is allowed to proceed as scheduled.

Our goal in this western part of Oklahoma is to make available as good library service as can be found in a large city with many more information resources. To do that, we must use interlibrary loan, i.e., the AMIGOS Bibliographic Council in the Southwest and the OCLC system. Through them we have access for our library patrons to many public, private, and university and college libraries across the United States. The increasing charges proposed may well put us out of the interlibrary loan business. We simply don't have that kind of money.

PENNSYLVANIA—PALINET and Union Library Catalogue of Pennsylvania (a nonprofit broker of computer-based bibliographic services to three hundred libraries in Pennsylvania, New Jersey, Delaware, and Maryland): Based on preliminary information, we are estimating an approximate 70% increase in library telecommunications charges. PALINET member libraries spend over one-half million dollars annually on telecommunications line and equipment rental to access OCLC. An additional $50,000 is spent by PALINET's OCLC dial access users on TYMNET or TELENET, while an estimated $200,000 is paid each year by PALINET libraries to VANs for access to other reference database services such as DIALOG and BRS.

I estimate that a small library's annual OCLC telecommunications costs will increase from $2,700 to about $4,590. That may not appear as an exorbitant sum to other private data-line users, but for already fiscally strapped libraries, it promises to bar continued participation in the national library network that has developed over the past decade.

SOUTH CAROLINA—Greenville County Library: We receive catalog information and have labels for book pockets and spines automatically printed as the result of being linked by computer to a bibliographic utility (OCLC) in Ohio. We no longer have a card catalog because the catalog information has been converted to machine-readable form. Acquisitions information is relayed to a firm in Pennsylvania which now produces our catalog and updates it on microfilm (called a COM catalog). While this system is currently less costly than hiring librarians to produce catalog cards and file them, it still costs us over $70,000 per year. A 60% increase alone would bring the cost to $112,000, which would abolish our financial advantage. A local foundation is giving us a $300,000 grant to help computerize the remaining library functions. We are accepting the money under the assumption that we can afford line costs. Can we?

TEXAS—AMIGOS Bibliographic Council, a nonprofit organization of 253 libraries in the Southwest: AMIGOS leases multipoint data circuits to link terminals located in member libraries with the OCLC computers. By pooling the cost of these circuits and recovering on a per terminal basis, the effects of distance from OCLC and large users versus small users is leveled by the AMIGOS pricing algorithm. The current monthly cost to AMIGOS is approximately $66,000 for those circuits. The present data circuit cost per terminal makes it possible for many small libraries to have access to automation they otherwise could not afford, thus reducing the cost of many labor-intensive services. Many small libraries will not be able to continue using OCLC automated services if the proposed private-line tariff forces us to pass on a $36,000 monthly increase to member libraries.

Libraries are also confronted with other local tariff proposals which will also affect their automation costs as a result of the AT&T divestiture. Southwestern Bell has a tariff proposal before the Texas Public Utilities Commission which reportedly will double telecommunications costs. The divestiture appears to be producing cost impacts which are, from the user perspective, illogical. How can a corporate reorganization result in user costs rising 50–60% from the long distance component plus 100% from the local component?

VIRGINIA—University of Richmond: We have just begun (within the last five years) to take advantage of many automated projects which utilize data transmission. Our cataloging and bibliographic records are now online with OCLC. We provide online literature searching for faculty and students to over 150 databases through Lockheed Dialog, BRS, and SDC Orbit. Because of the affordability

of the technology in the recent decade, it has become possible, even necessary, for institutions the size of the University of Richmond (three thousand students and even smaller institutions) to provide this level of service. Indeed, it is not uncommon to find that some information, especially in the fields of business, economics, and science, will never see print and will only be available online.

Now, if we are faced within the next three to six months with a 60% or more jump in telecommunications costs, the impact will be very negative on our library. Among our alternatives would be a reduction of the level of contributions to the OCLC national database. This would result in (a) a reduction in bibliographic information to our own patrons about our collection and (b) a diminishing of the value of the national database, particularly if other libraries followed suit.

WEST VIRGINIA—Fayette County Public Libraries: We have recently joined the Southern West Virginia Library Automation Corporation to implement online, automated circulation control, bibliographic searching, and interlibrary loan cooperation, which greatly increases patron access to local and regional collections. As public agencies, FCPL and SWVLAC can't just pass on an impending 60% increase in leased line rates to our patrons. We would have to severely cut other essential items in our budget, i.e., book budgets, staffing, and other public services. The development of new technologies and competitive services will not be implemented by April of 1984 and in a rural area such as ours, there is reason to believe that competitive services might not be available at all, even in the future.

WEST VIRGINA—West Virginia Library Commission: The proposed tariffs, estimated to increase over 60%, could conceivably wipe out our services which link 164 public libraries and 26 college libraries to one another and to the headquarters in Charleston. This would leave us with a completed database which would be unable to be accessed or distributed.

(American Library Association, Washington office, 202/547-4440, November 1983.) ■■

News and Announcements

CJK Word Processor

OCLC has announced that OCLC and Asiagraphics of Mount Sinai, New York, have entered into negotiations leading toward the development of a Chinese-Japanese-Korean (CJK) library support package. The package and a CJK word processor already developed by Asiagraphics will be marketed and supported by OCLC.

The system allows users to retrieve transliterated Chinese records from the OCLC database and, using software developed by Asiagraphics, display on the terminal screen or print out these records in pictographic characters using a dot-matrix printer attached to the OCLC M300 workstation (a modified IBM PC). The software will be able to support both the pinyin and Wade-Giles transliteration schemes as well as full and simplified character sets of the Chinese language. Development of retrieval capabilities for Japanese and Korean records is under way. Production of catalog cards in Chinese, Japanese, and Korean characters is also being developed.

According to Andrew Wang, manager of OCLC's Online Systems Products and Services Department, OCLC and Asiagraphics are taking a user-oriented approach to developing non–Roman alphabet capabilities for the OCLC Online System. "OCLC users will be able to retrieve Chinese language records from an OCLC M300 workstation without a special Chinese-character keyboard," he said. "A terminal operator will be able to use the system after only four hours of training. They will not need to learn to use a Chinese-character keyboard." ■■

Mary W. Ghikas Appointed as USBE Executive Director

Mary W. Ghikas has been named executive director of the Universal Serials & Book Exchange, Inc. Ghikas was assistant commissioner for research/reference services at the Chicago Public Library and administered its Central Library and Cultural Center.

A member of the American Library Association, she now serves on ALA Council (1983–87) and is vice-chair/chair-elect of the Information Science and Automation Section of ALA's Library and Information Technology Association. She has also been the managing editor of *Information Technology and Libraries.*

Ghikas succeeds Alice D. Ball, who retired at the end of 1983 after serving as USBE's executive director during its thirty-five years of operation. ■■

Libraries Install INNOVACQ

Innovative Interfaces, the library automation company that was founded five years ago to integrate the bibliographic networks (OCLC, RLIN, UTLAS) with circulation systems such as the CLSI LIBS 100, has been installing its own integrated INNOVACQ acquisition and serials control system in libraries across the country.

The University of Michigan at Ann Arbor and Michigan State University have installed INNOVACQ. In both libraries the INNOVACQ is linked electronically to the bibliographic utility, and at MSU it is also linked electronically to the circulation system. Other recent installations include the Thomas J. Watson Library at the Metropolitan Museum of Art in New York City, the California State University in Sacramento, and the Law Library of the University of California at Berkeley. The UC Law Library is the first user of the INNOVACQ serials control system and is now checking-in, routing, claiming, processing invoices with complete fund accounting, etc., for all of its sixty-five hundred currently received titles on the INNOVACQ.

Other INNOVACQ users include the University of Oregon, the University of Montreal (the INNOVACQ is distributed in Canada by the Canadian national bibliographic network, UTLAS), the University of California at Riverside, Greenwich (Connecticut) Public Library, California State University at Long Beach, and special libraries in the Canadian provinces of Alberta and Ontario. ■■

UNIFACE Sale

The Tacoma Public Library and Midwest Library Service have announced the purchase by Midwest Library Service of the UNIFACE software from the Tacoma Public Library. The board of trustees of the Tacoma Public Library approved and executed the formal agreement on October 25, 1983. Under the terms of the agreement, Midwest has purchased all marketing rights to UNIFACE (other than those already reserved to the Washington Library Network) for a period of fifteen years.

Midwest Library Service is based in Missouri and wholesales books worldwide to college, university, special, corporate, and public libraries.

UNIFACE is an intelligent interface software system that is capable of capturing bibliographic data from a network in full MARC format and transferring the data for use in the appropriate circulation control system format. In addition, it allows storage of data on floppy disks, which can be used later to produce catalog cards, order forms, book lists, labels, and other products. UNIFACE has been operational since 1980, performing day-to-day technical service functions on an ongoing basis. ■■

Jaeger Company Now Online with Faxon's LINX

The Faxon Company has announced that Alfred Jaeger, Inc., of Commack, New York, has joined the LINX and information centers with back issues in a wide variety of fields, including the hard sciences, physical sciences, social sciences, humanities, and technology.

According to Faxon officials, this new association means that LINX network users can now forward orders for back issues online to Jaeger by using Faxon's electronic mail system, LINX COURIER.

LINX COURIER is one of the foundations of Faxon's Datalinx System, and since 1981 has allowed users to place orders or claims for current subscriptions online to Faxon. With LINX COURIER's free-form memo, users can communicate quickly with Faxon staff or with any other network users.

The Jaeger company is using this electronic communications tool to respond with information concerning the orders forwarded from LINX users. ■■

Smithsonian Institution Signs Contract with Geac

Geac Computers, Inc., and the Smithsonian Institution have signed a $1.4 million contract to install the Geac Library Infor-

mation System in the Smithsonian and its fifteen branch libraries.

The Smithsonian Institution Libraries support all Smithsonian Institution programs, with special emphasis on research activities. The collections number about nine hundred thousand bound volumes, plus approximately two hundred thousand microforms, one hundred thousand maps, and two million slides and pictures.

The automation project will be phased over a three-year period, commencing in April 1984, and will include installation of all modules that constitute the Geac Library Information Systems: the Online Catalog, Circulation Control, Acquisition with Serials Control, and the MARC Record Management System.

Initially, the system will be installed using a single Geac 8000 multiprocessor. A second 8000 will be linked to the first as transaction loads increase and additional modules are installed. The contract provides for the eventual expansion of the SIL network to more than 190 terminals. The total value of the sixty-month contract for hardware, software, and maintenance is approximately $1.4 million. ■■

The Official Washington Post Index

Now available online from Dialog

Research Publications has taken the search out of research by putting *The Official Washington Post Index* online from Dialog. This invaluable resource presents a massive database of recent historical information readily and easily accessible to the user through computer search. Information on any recent topic will be available instantly through basic "key-word" search techniques that allow the user to search virtually any area of the Index.

The Official Washington Post Index online file consists of approximately 250,000 entries with about 4,500 new entries added each month. Entries will consist of:

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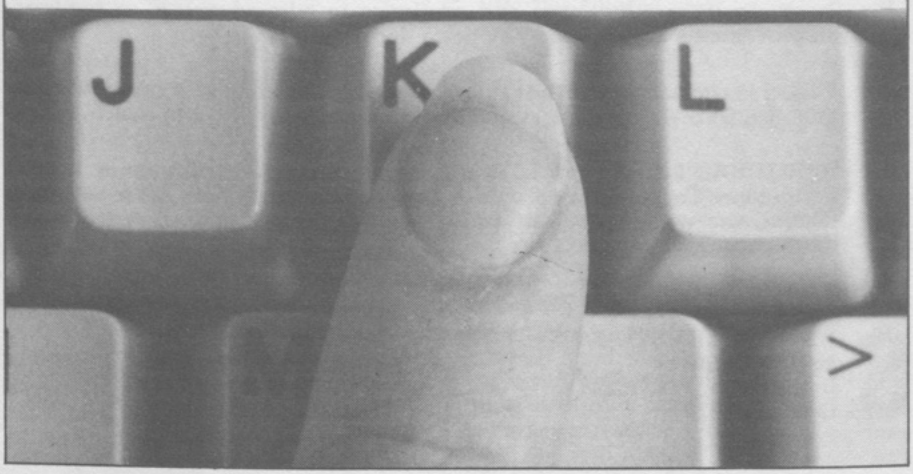
* *The Washington Post* on microfilm and *The Official Washington Post Index* in book form are available from Research Publications. For information contact: Research Publications, 12 Lunar Drive /Drawer AB, Woodbridge, CT 06525. Call: 203-397-2600; TWX: 710-465-6345; FAX: 203-397-3893.



Recent Publications

Bibliographic citations were produced with the guidance of María Clark, Yale University Library, New Haven, Connecticut, in accordance with the American National Standards for Bibliographic References. *New York: American National Standards Institute; 1977. 92p.* (American National Standards on Library Work and Documentation; *ANSI Z39.29-1977).*

Reviews

027.6 Access: deaf patrons in the library [Videorecording]. Washington, D.C.: The National Academy of Gallaudet College; n.d. 1 tape cassette; 25 min.; sd. Available in 3/4-inch U-Matic and in 1/2-inch VHS formats from Gallaudet College Press Distribution Office, 7th and Florida Ave., NE, Washington, DC 20002. $47.50 plus $3.25 postage and handling or $10 rental.

Assisting patrons is a commonplace activity in libraries. But how does one assist a patron who is deaf? *027.6 Access: Deaf Patrons in the Library* provides some insights and clues as to how library staff can identify and help deaf users. Produced by Gallaudet College, the only institution of higher education for the deaf, this videocassette illustrates tips and techniques that are easily incorporated into a public service routine.

Using a "tape-within-a-tape" approach, the program depicts a group of library staff viewing a videotape. Encompassing very common librarian/patron exchanges, the scenarios being watched highlight the deaf users' various needs ("I want some books on astronomy," "I need a library card," etc.) and the library staff members' responses, both correct and incorrect. Interspersed with the scenarios are shots back to the library discussion/viewing group, who ask questions of a discussion leader.

The program identifies the varied speech level skills of deaf persons and explains the speech characteristics of deaf persons. Illustrating ways to recognize deaf patrons, the program also demonstrates ways to communicate with the patron, such as finger spelling and simple gestures. A particular highlight is the explanation given for the various levels of speech ability as well as the clear illustration of ways librarians can communicate with the deaf in nonthreatening, non-stereotypic fashions.

The overall organization of this presentation is satisfactory. However, the program seems to plunge into the middle of things without preparing the viewer for the way in which the information would be presented. The "tape-within-a-tape" vehicle seemed disjointed at times and completely lost at other points. Particularly disconcerting was the "fantasy" sequence, in which a librarian provides the appropriate responses to the deaf inquirer. Half the responses were critiqued; the other half were not. It would have been helpful to have every scenario evaluated. The clarity of the overall presentation is somewhat muddled; the technical production is basic but satisfactory. The closed-captioning of the program works well.

What is excellent is the information provided. This program would be highly appropriate for staff development sessions, particularly in the public service area. The commonsense approach provided leads one to apply the techniques recommended to both deaf *and* hearing patrons. Professional actors were not used, so the situations illustrated appear very real and very typical of every library on a routine day. What is also intriguing is not necessarily the patrons' predicaments, but the automatic assumptions made by the librarians as to the patrons' needs and/or abilities. It seems that you could witness such patron-frustrating interactions with nonhandicapped library users as well.

The program mentions various techno-

logical advances (e.g., telecommunicative devices for the deaf, telephone typewriters) but does not advocate that each library invest in these types of equipment. What is advocated, however, is that library staff demonstrate a calm, sensitive demeanor, tempered by common sense and basic knowledge of deaf patrons' capabilities. Library service to handicapped patrons has usually revolved around the blind or visually impaired user. *027.6 Access* provides a focal point for librarians to begin to listen, understand, and realize the needs of deaf patrons. The purchase price or rental fee for this program would be well spent by a library in order to better serve *all* its patrons.—*Jamie Wright Coniglio, Iowa State University, Ames, Iowa.* ■■

Indexing specialized formats and subjects. Hilda Feinberg, ed. Metuchen, N.J.: Scarecrow; 1983. xviii, 288p. Includes bibliographies and index. ISBN: 0-8108-1608-3. $37.50.

Hilda Feinberg has compiled a solid volume covering widely ranging aspects of the indexing field. The fourteen chapters, written by authorities in equally varied fields, discuss many new concerns of information access through indexing (for example, videotex systems) as well as rehash the old definitions of *specificity, relativity, precision,* and *recall.* Billed as being devoted to specialized areas of study and structure, each chapter proves to use the specific to develop general concepts on indexing.

The book is organized with essays presenting general indexing design issues, followed by chapters on indexing by certain well-known services (Chemical Abstracts, ERIC, New York Times Information Service) and formats (newspapers, encyclopedias, videotex systems). The final chapters discuss some tools used in indexing, e.g., microcomputers and the thesaurus. Although this book is more likely to be approached by particular chapters of interest to a reader, the order of chapters does aid in understanding the full approach and value of the work as a whole. Feinberg offers a meaty introduction to all the chapters, which should be extremely useful in deciding how this work might be incorporated in an indexing course.

James Anderson, in chapter 1, offers a clear overview of the concerns of any indexing system, and he lays out ten points to be decided upon: (1) what is to be indexed, (2) use of symbols or concepts, (3) detail of indexing, (4) specificity of terminology, (5) controlled vocabulary versus free-text searching, (6) representation of the item in the index, (7) index record structure, (8) media of display, (9) file structure, (10) file display. Anderson deftly marches through these points using the Modern Language Association's bibliography to illustrate each one. The uniqueness of MLA's string indexing system and the growth in flexibility of this system through online development are a refreshing change from the usual Wilson-like examples we so often see.

Anderson's ten points are carried through the next thirteen chapters as topics related to all indexing systems. An enjoyable debate develops throughout the book on controlled vocabulary versus free-text searching. Anderson introduces the topic, and it is then more fully developed in chapter 2, "Is Indexing Obsolete? Keyword Indexing and Free-text Searching," by John Rothman. Rothman points to the trend of user subject specialists preferring free-text searching, thereby avoiding constraints of a controlled vocabulary which usually requires the intervention of an access specialist. Unfortunately, a concern not brought to the discussion is the added computer time for hit-and-miss, user-conducted free-text searches. Perhaps the increased sophistication of searching hardware will make this a moot point for future database systems.

Barbara E. Anderson and Carol B. Wilson next present a detailed discussion of indexing provided by "search service vendors" like BRS and SDC. The preparation of database indexes is carefully given, providing a needed deeper understanding of such services and their capabilities.

Chapters 4–11 are subject- or service-specific discussions designed to give insights into access to information in the appropriate fields. The sciences are represented in chapters 4 and 5 with discussion on "Indexing at Chemical Abstracts Service," by W. V. Metanamski and D. F. Zaye, and "Indexing the Biomedical Literature," by David F. Mayhew, which includes a look at

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Excerpta Medica, the National Library of Medicine, and the Institute of Scientific Information.

The softer sciences are then dealt with in chapters 6–9. Lynn Barnett offers a well-illustrated tour through the familiar ERIC information system. Access to the literature of the law is singled out by Dorothy Thomas as needing very special attention because of the unique nature and use of the literature. She claims that because of the voluminous material in the legal field, the index as access to the literature will never die. Two newspaper indexes are then considered by Alan R. Greengrass, "Indexing at the New York Times Information Service," and Jessica L. Milstead, "Newspaper Indexing: The Official Washington Post Index." It may seem redundant to include two chapters on newspaper indexing when it is obvious that many other disciplines have been left out, but the discussions in each of these chapters is unique enough to warrant inclusion of both.

The next two chapters—"Indexing Encyclopedias," by Barbara M. Preschel, and "Indexing for Videotex Systems," by John Rothman—are both refreshing forays into highly specific areas of indexing. Preschel offers the closest thing in this volume to back-of-the-book indexing, a necessary representation. Rothman looks at indexing in an entirely different way through videotex systems and menu selection indexes; his is truly a lesson in the creative use of indexing concepts.

A full design is examined by Edith Ward in chapter 12, "Starting from Scratch: The Design of a Periodical Indexing Service." Although this is to a degree a rehashing of the old concepts and methods, Ward deals with it freshly and uses this broad topic to pull together some old and new concerns.

"Use of Microcomputers in Indexing," chapter 13, by Theodore C. Hines and Lois Winkel, and "The Thesaurus in Indexing and Searching: A Review," chapter 14, by Hilda Feinberg, are in-depth examinations of a new and an old indexing tool and their uses in the specialized indexing of the future. It would seem that a concluding chapter on thesauri belies the editor's prejudice for a controlled vocabulary environment.

Indexing Specialized Formats and Subjects is a valuable work for anyone in any area of indexing. This is because of the many different views of the field presented by the authors. Its best use would be as a companion volume to a book like Borko and Bernier's *Indexing Concepts and Methods*. My one criticism of the work is a continuing one with Scarecrow Press publications, namely the poor type quality at a high price. The $37.50 price tag may result in its use as only a companion volume.—*Jill Sanders, Blackwell North America, Lake Oswego, Oregon.* ■■

Online searching techniques and management. James J. Maloney, ed. Chicago, Ill.: American Library Assn.; 1983. vii, 195p. "Based on the proceedings of a . . . program of the Machine-Assisted Reference Section (MARS) of RASD, held on July 11, 1982, at the annual conference of the American Library Association in Philadelphia." Includes bibliographies. ISBN: 0-8389-3285-1.

Video to online: reference services and the new technology. Bill Katz and Ruth A. Fraley, eds. New York, N.Y.: Haworth Press; 1983. 205p. (Reference librarian; 5–6). Includes bibliographies. ISBN: 0-86656-202-8. $14.95.

These two titles are significant additions to a growing volume of literature concerning automation and reference service and, more specifically, online searching of commercial databases.

Online Searching: Technique and Management is a comprehensive introduction to online searching, primarily of commercial databases. It is a compilation of seventeen individually written papers based on an RASD Machine-Assisted Reference Section (MARS) program held at the 1982 ALA Annual Conference in Philadelphia. The editor explains in the book's preface that, with three exceptions, the papers were selected by the Program Committee from close to one hundred abstracts that had been submitted for consideration. The committee requested keynote addresses from Sara Knapp and Peter Watson for each of the two parts of the program. Carol Fenichel volunteered "to fill any gap" and consequently was asked to speak on databases and database vendors and producers.

This book is beautifully organized in two

parts with each paper leading logically into the next. Part one, entitled "Technique," begins with Sara Knapp's "Online Searching: Past, Present, and Future," which should be of interest to everyone involved in even a peripheral way with online searching. Jane Thesing describes the advantages and limitations of online searching in the second paper, and Carol Tobin then proposes seven factors for consideration in selecting an online or manual search. The fourth paper, by Carol Fenichel, provides an overview of databases and their producers and vendors, including subjects covered and vendor addresses, telephone numbers, and services. Librarians planning or updating an online search service will find Janet Bruman's "Physical Requirements: Terminals, Printers, and Furniture" extremely helpful in deciding their equipment requirements and whether to purchase, lease, or rent. A short glossary of technical terms is included. The sixth paper, by Lawrence Maxted, is a detailed guide to the interview process under what most searchers would probably agree are the ideal circumstances (the end user present for the actual search as well as for the pre- and post-search interviews). It might have been useful if the program planners also had included guidelines for searching under less than ideal circumstances. The last paper in this part of the book, "The Mechanics of Online Searching" by Kristine Salomon, offers help on the basics of searching, including database selection, search strategy, command language, and Boolean logic.

Part two, "Management," begins with a discussion by Peter Watson of various organizational patterns for online searching including centralized versus decentralized services, a search unit integrated in the reference department versus a separate unit, and combinations of these patterns. In the second paper, Randolph Hock describes his views of the qualifications required in a good searcher. The third paper is a description by M. R. Dustin of applications of database searching using actual questions received by the Minnesota Interlibrary Telecommunications Exchange (MINITEX); and the fourth, by Gertrude Foreman, is a strong argument as well as

guide for preparing a policy manual. In the next paper Gayle McKinney provides practical information, including sample forms, for carrying out the business and record keeping for online searching. Nancy Grimes follows with "Costs, Budgets, and Financial Management" and then John Evans describes "Methods of Funding." James Rettig, in the eighth paper, thoroughly explores the often discussed topic, "Options in Training and Continuing Education." A table is included that lists advantages and disadvantages of various sources of training. Next to last in this second part of the book is "Publicizing an Online Search Service" by Maryjane Cochrane, followed by an appropriate concluding article by Rebecca Whitaker, "The Impact of Online Search Services on Libraries."

The MARS Education and Training of Search Analysts Committee provided the book's appendix, "An Introduction to Online Searching: A Suggested Outline." The two-page introduction to the outline explains that the outline was prepared to help librarians called upon to present introductory workshops for colleagues or library users. The actual outline is more than four pages in length and quite detailed. It was used to plan the program on which this book is based. Two annotated bibliographies follow the appendix. The first, "Online Reference Service: How to Begin," is a compilation of more than sixty titles selected and recommended by the MARS Use of Machine-Assisted Reference in Public Libraries Committee; and the second bibliography, on evaluation of search services, compiled by the MARS Committee on Measurement and Evaluation of Service, includes about fifteen titles. Contributors and the editor are identified in the back of the book by position title, institution name, and location. Unfortunately, there is no index, but the very descriptive titles of individual papers, listed in the table of contents, provide a general guide to topics covered.

The papers in this excellent compilation are consistently well written, readable, and substantive. The contributors, apparently without exception, have firsthand experience with, and are thoroughly knowledgeable about, their topics. Most of the papers include references to source material, and some of these lists are quite extensive (twenty to thirty titles).

This will be an extremely useful book for anyone new to online searching, practitioner or manager, and will serve as excellent review and inspiration for those currently involved in online searching who are contemplating evaluation and development of their online search service.

Video to Online: Reference Services and the New Technology, as indicated by its title, is broader in scope than *Online Searching*, but a major portion also covers database searching. There is no preface or introduction; the title and table of contents provide the only clues to the book's coverage and intended audience. *Video to Online* also lacks an index.

Similar to *Online Searching*, this is a collection of twenty-four articles by individual authors. The organization is a little difficult to understand. The first seven articles are without a heading, followed by "Online: Two Views," "Online: Two Vendors," "Online Reference Services" (five articles), and "The Online Search" (eight articles).

True to the book's title, the first two articles in the first section deal with video. Helen Gothberg's excellent essay is of particular note. Videodisc, videotex, and teletext are defined and their applications in libraries are forecasted.

The third article, on micropublishing, bibliographic control of microforms, and microform equipment by William Saffady, is surprising for its inclusion in a collection with the phrase "new technology" in its title. It will be, however, an especially useful article for library school students and beginning reference librarians.

The impact of online catalogs and bibliographic utilities on reference service is a topic included in three of the remaining four articles in the first section of the book. Trish Ridgeway and Laurence Mitlin's "The Reference Librarian's Role in the Selection and Implementation of an Online Circulation System" is a narrow approach to this topic (although no right-thinking reference librarian could possibly disagree with their argument that reference staff should have an important role). "Integrating Local Databases with Remote Files, Print Materials and Reference Services" by

Nolan Pope sheds additional light on patron-accessed online catalogs, among other topics. The impact of bibliographic utilities as well as of telefacsimile and electronic publishing on interlibrary document delivery is discussed in a superb article by Noelene Martin and Sandra Wood. In his article in "Online: Two Views," Robert Hauptman leans heavily on the bibliographic utilities as examples to support his view that "the reference revolution is here." Russ Chenoweth describes the use of OCLC and RLIN (as well as commercial databases) at the University of Pennsylvania's Van Pelt Library reference desk in his article, "Online Reference Services."

Microcomputers are discussed in two articles. Back in the first section of the book, Cynthia LaPier writes about the uses and security problems of microcomputers in "The Care and Maintenance of an Apple Orchard." In "The Online Search" section, Rodes Trautman and Helen Gothberg propose using a microcomputer at the reference desk to create and access "A Reference Tools Database."

The remaining articles deal almost exclusively with online searching of commercial databases, with the exception of the lead article in "Online Reference Services" by Rodney Phillips, "Keeping Records on the Monkeys: A Core Collection of Materials about Online Services for Reference Librarians." This bibliographic essay includes some coverage of online public access catalogs, microcomputers, and minicomputers, although it largely concerns commercial database searching. Forty-five references are listed at the end of the essay.

The integration of online searching with traditional reference service is a subject covered from a variety of perspectives in several articles. Of special note are Norman Stevens' "Skim Milk Masquerades as Cream: The Myth of Online Data/Base Searching" (the other half of "Online: Two Views"); Betty Unruh's "Online Reference . . . No Longer an Option" in "Online: Two Vendors"; the Chenoweth article mentioned earlier; and in "The Online Search," Maurita Holland's "Real-Time Searching at the Reference Desk." The latter concentrates on ready-reference searching.

Other topics covered in "Online Reference Services" include a sensible approach to the fee-or-free question by Carolyn Weaver, Douglas Cooper's "Start-up and the First Year in a Small Liberal Arts College," and "Management of Online Computer Services in the Academic Reference Department" by Cerise Oberman.

A detailed discussion by Sara Knapp on free-text searching begins "The Online Search" section. Other subjects included are a study of comparative costs of online and manual searches by Bruce Shuman, and database selection by Michael Halperin. The concluding article by Jitka Hurych, "The Professional and the Client: The Reference Interview Revisited," is a strong argument that methods of librarian-client interface learned in online searching should be applied to traditional reference service as well. All reference librarians, whether or not they are also online searchers, should find this article of great interest.

Video to Online contains many stimulating and well-written articles, but it is not as consistently readable and substantive as *Online Searching*. Articles are directed to a variety of levels of interest. While *Online Searching* can be read comfortably from beginning to end, readers will wish to select only those portions of *Video to Online* of special interest to them. Both books will be invaluable for future research on reference services and online searching.—*Adele Combs, Northwestern University, Evanston, Illinois.* ■■

Saffady, William. ***Introduction to automation for librarians.*** Chicago, Ill.: American Library Assn.; 1983. 304p. Includes bibliographies and index. ISBN: 0-8389-0386-X.

In writing an introduction to some aspect of computer technology, there is a risk of overwhelming the inexperienced reader with technical details or boring the advanced reader with elementary information. It takes a delicate balance of content or at least a readable style to deliver introductory material so that it is interesting and absorbing. Saffady has succeeded in preparing an introduction to library technology that is a model of clarity—careful in its attention to detail and definition and thor-

ough in its coverage of the basics of library automation.

Intended as a tutorial survey of library systems, *Introduction to Automation for Librarians* begins with four chapters on the fundamentals of data processing. A chapter on computer hardware presents a lucid summary of the development and state of the art of processing and peripheral equipment. This is followed by a chapter on software that in similar fashion describes the background and place of languages and programs as well as the role of the programmer in the operation of computer systems. Application software, system software, and the process of systems analysis are clearly described. The basics of hardware and software are brought together in a third chapter on data processing concepts, which addresses batch and online modes of data processing, the organization and management of data networks, and distributed data processing. To complete the fundamentals, there is a chapter on automated office systems encompassing word processing, micrographics, reprographics, message transmission systems, and other information-handling technologies.

Throughout the four chapters on the fundamentals, copious examples are drawn from library applications, and illustrations are up-to-date and helpful. Each chapter concludes with a well-rounded bibliography of approximately forty citations to monograph and periodical literature, historical and current.

The second half of the volume devotes one chapter to each of four major library computer application areas: circulation, cataloging, reference services, and acquisitions, including serials control. Each chapter offers an introduction to the operations under consideration and a discussion of the problems or other motivation for automating. Hence, the book is especially well suited for the library school student or nonlibrarian, as well as for the seasoned librarian interested in technology applications.

The applications themselves are rigorously described, starting with the earliest systems of their type and concluding with the most recent ones available. Presentations of commercial systems are scrupulously fair and without editorial comment or criticism. Although specific systems and prices cited will be outdated soon, the majority of material in the book transcends the kind of refinements and incremental advancements likely to take place in library automation for at least five years. It is a credit to Saffady that he has written excellent history and integrated it so effectively with the most current thinking and design in the field.

As one might expect, the major part of the attention given to computerized circulation control is devoted to turnkey systems. Custom-designed circulation systems are noted for their significance in library automation, but the turnkey concept and commercial configurations predominate. The chapter concludes with a description of integrated library systems as an outgrowth of the database concept and the expansion of circulation systems to include additional functions.

Automated cataloging is described in the context of MARC format development, the MARC Distribution Service, and the current REMARC retrospective conversion project. Commercially available MARC-derivative products and services are discussed and followed by intensive coverage of bibliographic utilities. Computer-based catalog production and the several forms of computerized catalog are effectively explored, including online catalogs and other bibliographic information retrieval systems.

The description of automated reference service begins with bibliographic and nonbibliographic databases as machine-readable reference sources. It continues with the concepts and methods of online retrieval, concluding with costs and the problem of document delivery.

The discussion of computer-based acquisitions includes turnkey, bibliographic utility, and vendor-provided systems. Finally, computerized serials systems are described against a background of need for bibliographic control of serial publications and effective management of library serials collections.

This is an excellent work and a valuable contribution to the field.—*Jerome Yavarkovsky, Adelphi University, Garden City, New York.* ■■

Other Recent Receipts

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

American folklore films and videotapes: a catalog, volume 2. Center for Southern Folklore. New York, London: Bowker; 1982. xii, 355p. Includes index. ISBN: 0-8352-1536-9, softcover, $39.95.

Arneson, D. J. *The official computer hater's handbook.* New York: Dell; 1983. 192p. ISBN: 0-400-56619-3, software, $3.95.

Authority control in the University of California Union Catalog. Dorothy McPherson, ed. Rev. ed. Berkeley, Calif.: Division of Library Automation, Office of the Asst. Vice President—Library Plans and Policies, University of California; Oct. 1980. 44p. (Division of Library Automation working paper; no.9) Order from: Editor, *DLA Bulletin*, Division of Library Automation, University of California, 186 University Hall, Berkeley, CA 94720 (softcover) $5.

AVMP 1983 = Audiovisual marketplace 1983: a multimedia guide. New York: Bowker; c1983. viii, 522p. ISBN: 0-8352-1577-6. ISSN: 0067-0553, softcover, $39.95.

Barnholdt, B.; Hojer-Pedersen, N. *The ALIS online circulation control system of Danmarks Tekniske Bibliotek.* Stockholm: Royal Institute of Technology Library; 1983. 25p. (Stockholm papers in library and information science) (Report TRITA-LIB-4086).

Bibliographic specifications for consolidation of records. Katharina Klemperer, comp. Berkeley, Calif.: University of California, Office of the Asst. Vice President—Library Plans & Policies, Division of Library Automation; July 1978. 26p. (Division of Library Automation working paper; no.2) Order from: Editor, *DLA Bulletin*, Division of Library Automation, University of California, 186 University Hall, Berkeley, CA 94729 (softcover) $5.

Bibliographic specifications for display, University of California Union Catalog. Arjun Aiyer [and others], Display Committee. Rev. ed. Berkeley, Calif.: University of California, Office of the Asst. Vice President—Library Plans & Policies, Division of Library Automation; Jan. 1979. 18p. (Division of Library Automation working paper; no.1) Order from: Editor, *DLA Bulletin*, Division of Library Automation, University of California, 186 University Hall, Berkeley, CA 94720 (softcover) $5.

Bibliographic specifications for MARC card conversion processing, University of California Union Catalog. Rev. ed. Berkeley, Calif.: University of California, Office of the Asst. Vice President—Library Plans & Policies, Division of Library Automation; Jan. 1979. 7p. (Division of Library Automation working paper; no.4) Order from: Editor, *DLA Bulletin*, Division of Library Automation, University of California, 186 University Hall, Berkeley, CA 94720 (softcover) $5.

Bibliographic specifications for processing campus OCLC records. Dorothy McPherson, comp. Rev. ed. Berkeley, Calif.: University of California, Office of the Asst. Vice President—Library Plans & Policies, Division of Library Automation; July 1980. 62p. (Division of Library Automation working paper; no.3) Order from: Editor, *DLA Bulletin*, Division of Library Automation, University of California, 186 University Hall, Berkeley, CA 94720 (softcover) $5.

Bibliographic specifications for processing campus RLIN records, University of California Union Catalog. Dorothy McPherson, comp. Berkeley, Calif.: Division of Library Automation, Office of the Asst. Vice President—Library Plans & Policies, University of California Systemwide Administration; July 1980. 61p. (Division of Library Automation working paper; no.8) Order from: Editor, *DLA Bulletin*, Division of Library Automation, University of California, 186 University Hall, Berkeley, CA 94720 (softcover) $5.

Duchesne, Roderick M. *Selected Canadian library network terms.* Ottawa: National Library of Canada; Nov. 1982. 8, 9p. (Canadian network papers; 4) Text in English and French. ISBN: 0-662-52107-2. ISSN: 0226-8760.

Educational films and video 1983: a rental catalog. Ann Arbor: Michigan Media, University of Michigan Media Resources Center; 1983. ix, 277p.

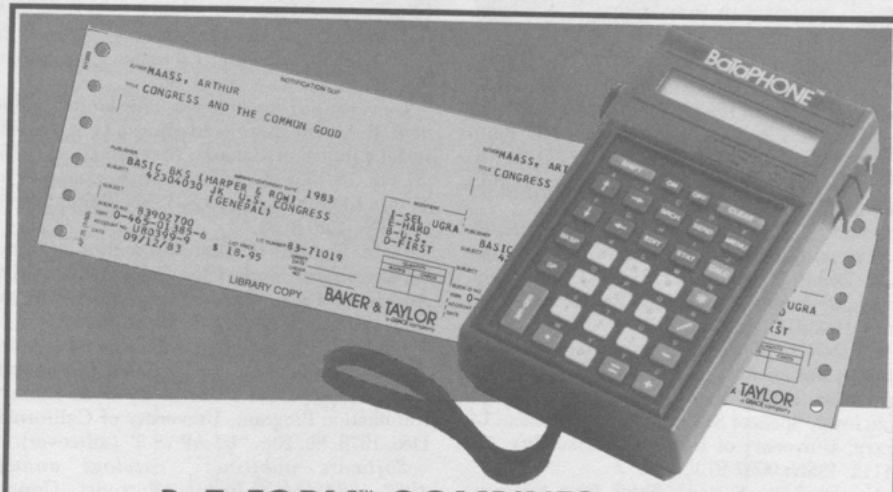
Garfield, Eugene. *Essays of an information scientist.* V.5: 1981–1982. Philadelphia: ISI Press; 1983. xxxiii, 848p. ISBN: 0-89495-023-1. Essays all originally published in *Current Contents.* $25.

A Guide to searching ONTAP ABI/INFORM. Louisville, Ky.: Data Courier; c1981. vi, 81p.

International film & television year book, 1982/83. 27th ed. London: Kemps Group; 1982. 1,245p. Dist. by Bowker, 1180 Avenue of the Americas, New York, NY 10036. ISBN: 0-86259-019-1, hardcover, $50.

Larsson, Rolf; Sunnebäck, Jan. *3RIP version 4.0: including the Euronet common command language.* Stockholm: Royal Institute of Technology Library; 1981. 48p. (Stockholm papers in library and information science) (Report TRITA-LIB-4071).

Löffström, Mats. *A description of the Text Data Base System TDBS.* Stockholm: Royal Insti-



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tute of Technology Library; 1982. 28p. (Stockholm papers in library and information science) (Report TRITA-LIB-4077) Bibliography: p.20. ISSN: 0346-9042.

McGrath, William E.; Hickey, Thomas B. *Multidimensional mapping of libraries based on shared holdings in the OCLC online union catalog.* Dublin, Ohio: OCLC; 1983. xi, 41p. Bibliography: p.30–31. Report no.: OCLC/OPR/RR-83/5. Available from: OCLC, 6565 Frantz Rd., Dublin, OH 43017 (softcover) $3.50.

Meadow, Charles T. *A study of user adaptation to an interactive information retrieval system.* Dublin, Ohio: OCLC; 1983. xiii, 106p. Available from: OCLC, 6565 Frantz Rd., Dublin, OH 43017 (softcover) $7.

MEDOC: index to U.S. government publications in the medical and health sciences. 10(1): Jan.–Mar. 1983. Issued quarterly by and available from: Spencer S. Eccles Health Sciences Library, University of Utah, Salt Lake City, UT 84112. ISSN: 0097-9732.

Newiss, Joan. *Systems design for a computer produced thematic index to world atlases.* Leeds: Leeds Polytechnic School of Librarianship; July 1982. 77p. (M.A. Librarianship occasional publication; 1). ISBN: 0-900738-33-2.

Output measures for public libraries: a manual of standardized procedures. Douglas Zweizig; Eleanor Jo Rodger. Chicago: American Library Assn.; 1982. 100p. ISBN: 0-8389-3272-X (softcover) Project directed by Goals, Guidelines & Standards for Public Libraries Committee, Public Library Association. $8.

Ownership of machine-readable bibliographic data. R. M. Duchesne [and others]. Ottawa: National Library of Canada: Mar. 1983. viii, 16, [5], viii, 18, [5]p. (Canadian network papers; 5). Text in English and French. ISBN: 0-662-52108-8. ISSN: 0226-8760.

Plate, Kenneth H. *Cost justification of information services.* Studio City, Calif.: Cibbarelli & Associates; 1983. [78]p. (Consulting report series). ISBN: 0-913203-03-3, softcover, $20.

Radke, Barbara; Berger, Mike. *Analysis of the 1977 University of California Union List of Serials.* Berkeley, Calif.: University-wide Library Automation Program, University of California; Dec. 1978. 80, 20p. "ULAP 78-3" (softcover).

Software publishers' catalogs annual 1983–1984. [Microform]. Westport, Conn.: Meckler Publishing; [1983] 41 fiche. Accompanied by: printed index; 31p. $97.50.

Statistical summary report of the 1979 Union Catalog data base, University of California Union Catalog. Blanche Grosswald, ed. Berkeley, Calif.: Division of Library Automation, Office of the Asst. Vice President—Library Plans and Policies, University of California Systemwide Administration; Sept. 1980. 99p. (Division of Library Automation working paper; no.10) Order from: Editor, *DLA Bulletin*, Division of Library Automation, University of California, 186 University Hall, Berkeley, CA 94720 (softcover $5.

UK library database system and union catalogues. "Proceedings of a seminar organised by the Cataloguing and Indexing Group and held at the Library Association on 12 January 1983." Leo Favret and Tony McSean, eds. London: Library Association; 1983. 95p. (LA conference proceedings series in library automation; 3) Available from: Oryx Press, 2214 N. Central at Encanto, Phoenix, AZ 85004. ISBN: 0-85365-806-4, softcover, $16.

University of California Prototype On-line Catalog: preliminary specifications for the patron interface. Katharina Klemperer; Mike Berger, eds. Berkeley, Calif.: University of California, Office of the Asst. Vice President—Library Plans & Policies, Division of Library Automation; July 1980. 58p. (Division of Library Automation working paper; no.7) Order from: Editor, *DLA Bulletin*, Division of Library Automation, University of California, 186 University Hall, Berkeley, CA 94720 (softcover) $5.

University of California Union Catalog: conversion of catalog cards to machine-readable

form, phase III: comparison study of existing data bases for the use of retrospective conversion. Katharina Klemperer; Kitty May Kit Shih, eds. Berkeley, Calif.: University of California, Office of the Asst. Vice President—Library Plans & Policies, Division of Library Automation; Jan. 1979. 35p. (Division of Library Automation working paper; no.6) Order from: Editor, *DLA Bulletin*, Division of Library Automation, University of California, 186 University Hall, Berkeley, CA 94720 (softcover) $5.

University of California Union Catalog system design overview. Berkeley, Calif.: University of California, Office of the Asst. Vice President—Library Plans & Policies, Division of Library Automation; Jan. 1979. 49p. (Division of Library Automation working paper; no.5) Order from: Editor, *DLA Bulletin*, Division of Library Automation, University of California, 186 University Hall, Berkeley, CA 94720 (softcover) $5.

Ya-Chun, Lian. *RAMAS: the RITL automated management system.* Stockholm: Royal Institute of Technology Library; 1982. 90p. (Stockholm papers in library and information science) (TRITA-LIB-4076). ISSN: 0346-9042. ■■

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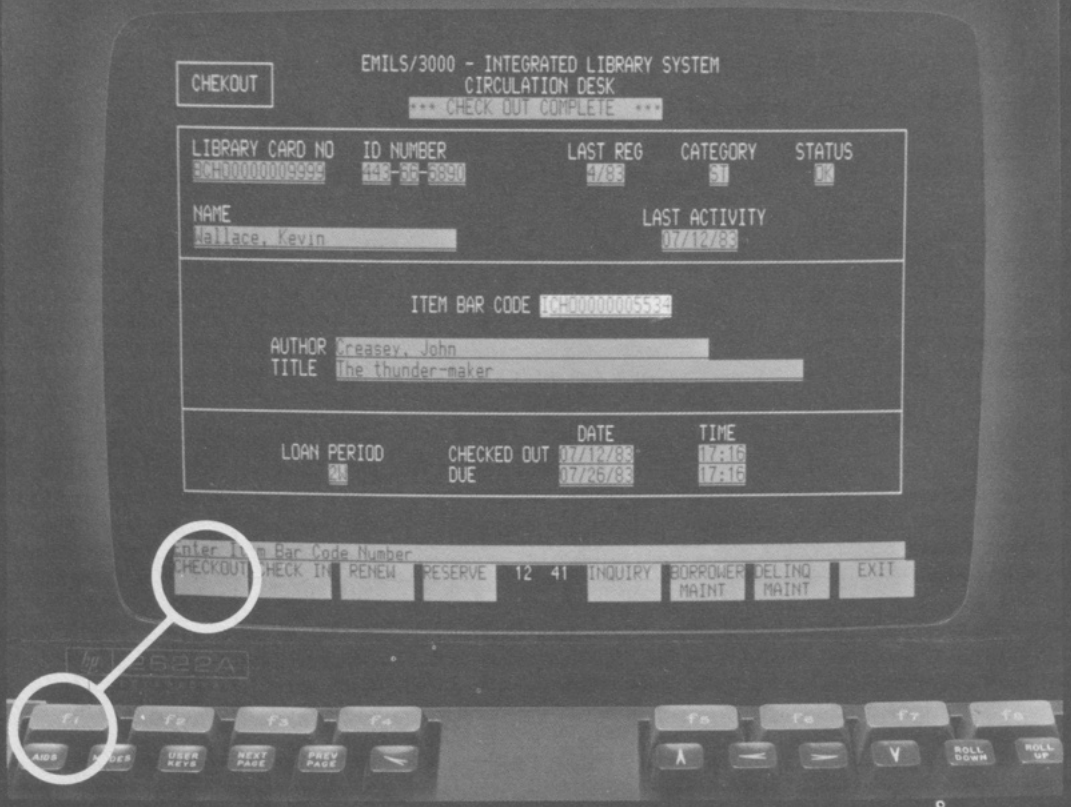

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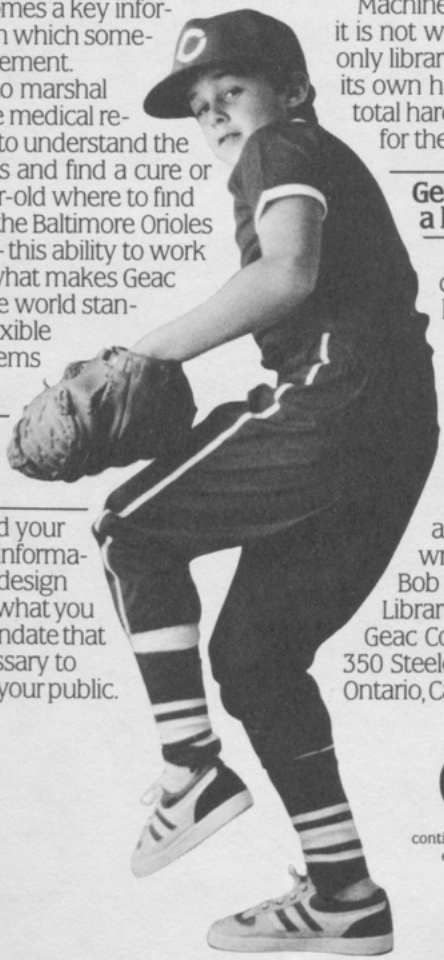

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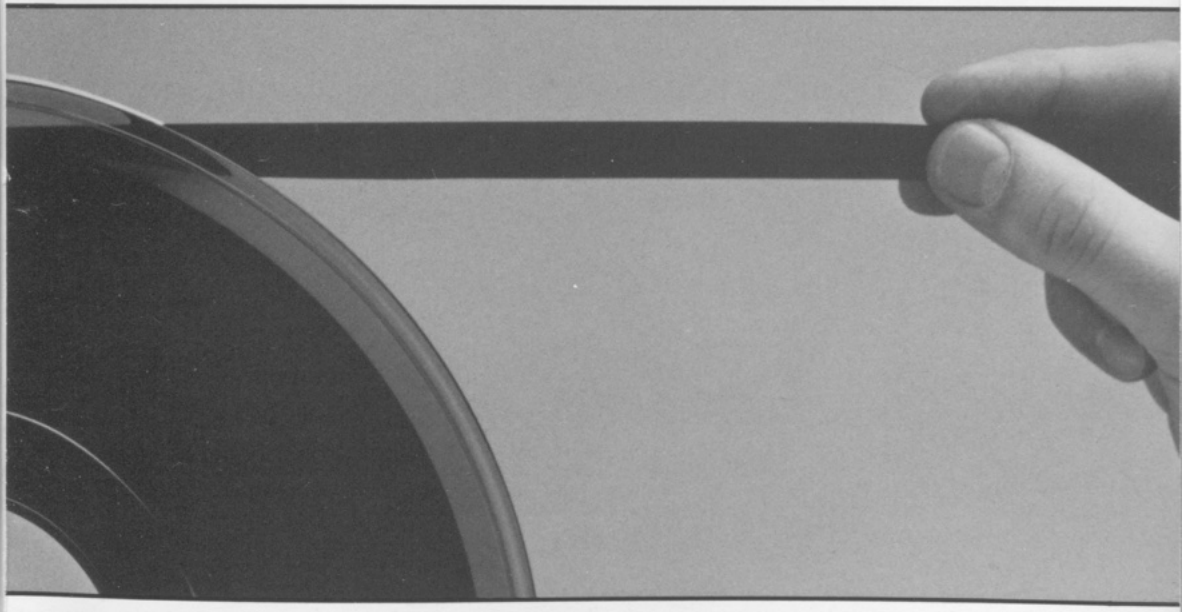

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