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Library Processing Systems and the Man/Machine Interface

Anne L. Highsmith

The processing components of nine integrated systems were examined in terms of system support for bibliographic and item-record creation and maintenance. The study attempted to address these questions: how much support does the system offer for basic processing functions; how flexible is the system; and how comfortable is the system to use? Effect of system design on work flow for the above functions is suggested. Results suggest that present system support for basic processing functions represents an interim stage in system design while integrated systems move toward direct machine access to other systems.

In a recent article entitled "Cataloging for the Local Online System,"[1] Judith Hudson examined the cataloging work flow at six institutions with online catalogs, noted how automation has changed work flows, and suggested points for libraries to consider when implementing online systems. Among the activities usually associated with processing, Hudson concluded that the major changes have come in the areas of authority control, catalog maintenance, and quality control.[2] Starting from the viewpoint of system design, this article will consider the related question of how the man/machine interface of nine automated systems influences work flow for bibliographic and item record creation and maintenance.

The processing components of nine integrated systems were examined in view of the following questions: How much support does the system offer for basic processing functions? How comfortable is the system to use? How much flexibility does the user have in implementing the system? The data for making these comparisons were gathered in July and August 1985 during one- and two-day site visits to nine academic and research libraries for observation of library staff who carry out these functions on different systems. Both processing and systems staff were interviewed where appropriate; after a final checklist was compiled, it was reviewed by system vendors for completeness and correctness.[3] The systems and respective institutions were ATLAS, Cleveland Public Library; BLIS, University of Cincinnati; Geac, Rutgers University; LIAS, Penn State University; LS/2000, University of Kentucky; MSUS/PALS, Mankato State University; NOTIS, Northwestern University; and VTLS, Virginia Polytechnic Institute. The ALIS-II system, available at the author's institution, Texas A&M University, was also included in the comparison.

BIBLIOGRAPHIC RECORD CREATION

One of the advantages of automating cataloging processes is that it improves the currency of information in the database, but the method of creating new records to update the database can greatly affect the degree to which currency is improved. If an institution is loading archive tapes from a utility, for instance, there can be a long time lag, depending on the frequency of the tape, between processing an item and getting the bibliographic record into the cata-

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log. This time lag creates the same kinds of catalog maintenance problems that result from the gap between record production and card filing: bibliographers order duplicate copies; catalogers create duplicate records or process multivolume sets on different records. Loading a weekly archive tape is better than waiting for cards to be filed, of course, but there are faster ways of updating an online catalog to eliminate the problems created by delays.

Figure 1 illustrates the different ways in which a bibliographic record can be created on the various systems, beginning with tape loading. All systems use tapes for initial database load; some institutions also choose to use tape load for ongoing database creation, or are required to use it until the system in question develops an interface with a particular utility. Despite the fact that a Geac/RLIN interface exists, for example, Rutgers University updates its catalog by loading RLIN archive tapes. MSUS/PALS is unique in that it is designed around the concept of loading archive tapes for ongoing database update. Faced with the need to balance the constraints imposed by a small systems staff, the desire to have the online catalog functioning as soon as possible, and the complexities of writing an input and editing program that handles MARC records, system designers decided to rely strictly on archive tape update. All record creation and editing are accomplished through OCLC; as yet, the system does not have the capability to handle tapes from any other utility.

A more popular method of database update, which has been made possible with local systems, is online data transfer. Using this technique, it is possible to transfer a bibliographic record from a utility or other source of records directly into the local system, but this still does not mean that the record is immediately available in the local catalog. Many systems hold such records in a local edit file, requiring the library to batch-load them into the catalog or providing for a scheduled, periodic update as part of ongoing operations. Thus the problems

	ALIS II	ATLAS	BLIS	Geac	LIAS	LS/2000	MSUS/PALS	NOTIS	VTLS
Tape loading	X	X	X	X	X	X	X	X	X
MARC database match		X	X		X			X	X
Adaptation	X			X	X	X		X	X
Keyboarding									
a. Prompted input	X			X	X	X			X
b. Blank screen fill-in								X	
c. Form fill-in fill-in	X 1	X	X					X 1	
d. Customized prompt list or workform	X	X		X		X			
Online data transfer	OCLC Mini-Marc	OCLC RLIN		OCLC RLIN WLN UTLAS Mini-MARC	RLIN	OCLC		OCLC	OCLC RLIN

1. Fixed fields only

Fig. 1. Bibliographic Record Creation Techniques

involved in a time lag between processing and update are reduced but not completely eliminated.

Another advantage of using online data transfer is that it fits in easily with current work flow. After editing the record on the utility, the editor simply takes the steps necessary for transferring the record to the local system rather than producing cards. But if the record is edited on the utility and then transferred, this online transfer incorporates one of the disadvantages of card production: the editor is producing the record blindly, without any opportunity to fit it into the local online catalog. For instance, it is *necessary*, not merely *possible*, to do authority work in batch mode after the record has been added to the local catalog.

Seven of the systems offer the transfer technique from one or more utilities; OCLC is the best supported, and ALIS, ATLAS, Geac, LS/2000, NOTIS, and VTLS offer some kind of online data transfer from OCLC. As an example, the OCLC transfer works as a screen-to-screen print on ALIS, ATLAS, and NOTIS, while on Geac, LS/2000, and VTLS, the record is printed into an edit file on the local system. Those systems that work as a screen print would offer the option of editing the record on either system, i.e., on either screen; on those that dump the record into an edit file, it would be most efficient to edit the record on the utility and then do the transfer.

Once a record is in the system, the adaptation function permits it to be copied and edited to add another new record to the database. This is a useful feature for processing materials in which several data elements are common to a group of records, such as later editions, different printings, or titles in a microform set.

The MARC match technique offers the most timely update method available through any of these systems. The match permits an institution to access the MARC database directly through the local system rather than using MARC on a utility. With BLIS, LIAS, and NOTIS an institution would maintain its own subscription to the MARC database, while ATLAS customers access MARC through a vendor-maintained network called DRANET. The VTLS system can access MARC through the LSSI Laserfile system, an option presently used by the West Virginia Library Commission.

The advantage of the MARC match function is that it permits immediate catalog update, eliminating the maintenance problems mentioned earlier. It also allows catalogers to do their work directly in the context of the local catalog, physically as well as intellectually. This capability fosters the type of collection development wherein titles are cataloged sensibly and fitted properly into the existing collection. It gives more assurance that analyzed series will be correctly classified, or that similar editions will be classified together, because related records can be examined in context. With the MARC match function, technical services can begin to move toward the genuine currency of information that is one of the goals of automated cataloging.

All of the record creation techniques considered so far have assumed that the technical services processor is using some outside source of bibliographic records. The final point in the checklist outlines input styles for records that must be created locally. The majority of these systems uses a prompt mode for record input, but the type of prompting varies considerably. Most prompt with a list of field tags based on the appropriate MARC format: books, serials, etc. The system supplies a tag and the inputter responds by supplying the text of the field. VTLS merely prompts the user with a series of textual labels, TAG and TEXT, to show that it is ready to receive the next field tag and then the contents of that field. BLIS and NOTIS use a screen-oriented mode of record input that complements their screen editors. MSUS/PALS does not support local record input or editing.

Those systems that permit customers to define their own prompt lists or work forms for local record input were identified. Customized lists or formats are a considerable advantage, facilitating processing and helping to insure data integrity. Since most locally inputted records are temporary records or some type of minimal-level cataloging, the customized list can be designed, first, to remind the inputter of all the necessary fields and, second, to speed input by eliminating unnecessary fields. If an institution wanted to define a special format called "Rush," for instance, for any rush item, it could effectively set up a prompt list or work form containing only selected fields, so that the processor would input only the necessary information for controlling the item while it is being circulated as a "Rush." Although several systems offer the capability for customizing prompt lists and formats, this feature is a particular strength of the LS/2000 system.

ITEM RECORD CREATION

In this context, the term *item record* refers to the short record that most systems maintain for identifying individual items for circulation and inventory. Its minimum data elements would probably be call number, location, barcode or OCR number, and circulation category. Although the circulation department may have been responsible for creating item records in the early days of automated circulation, item record creation has been included here because of its analogies with the traditional cataloging function of shelflisting holdings (see figure 2).

While the majority of institutions are still working with largely unconverted collections, an important key to item record creation techniques is flexibility—the ability to create records differently in different situations. The most efficient item record creation technique for ongoing processing, for instance, would be to add barcode or OCR information to the bibliographic record before it is produced. But obviously that technique will not work if no bibliographic record exists for the item, so a separate record creation technique is also necessary. Another important element of support for item records is default values, the ability to derive certain data elements from the bibliographic record so that the processor does not have to enter absolutely every element. Figure 2 shows which systems support call

	ALIS II	ATLAS	BLIS	Geac	LIAS	LS/2000	MSUS/PALS	NOTIS	VTLS
Batch loading	X	X	X	X		X		X	X
a. Call no. default	X	X	X	X		X		X	X
b. Location default	X	X	X	X		X		X	X
Keyboarding	X	X	X	X	X	X	X	X	X
a. Call no. default	X	X 2	X			X	X 3	X	X
b. Location default	X	X 2	X 2			X	X 3	X	X
Lightwand	X		X	X		X	X	X	X
a. Call no. default	X	X 2	X			X	X 3	X	X
b. Location default	X	X 2	X 2			X	X 3	X	X
Multiple changes	X	X	X			X	X	X	
a. By collection	X		X	X		X	X	X	
b. Random titles	X	X		X			X		

2. For successive volumes or copies on the same record
3. Default values supported for retrospective conversion only

Fig. 2. Item Record Creation and Editing Techniques

number and location default values in each of the three record creation techniques. *Batch mode* refers to either tape loading or batching records from online data transfer; *keyboarding* and *lightwand* refer to ways of entering the barcode or OCR number in the system.

Several of these systems have the capacity for creating item records through batch load, either on tape or through an edit file of transferred records from a utility. For institutions using these systems, then, bibliographic and item record creation can be a simultaneous process. A processor sitting at the terminal can put an OCR or barcode label into a book and input the label information into the bibliographic record: the item record will be created automatically when the bibliographic record is batched into the local system. This reduces the number of times the book has to be handled. There are also advantages, however, to creating item records on the local system using the lightwand or the keyboard after bibliographic processing, such as the opportunity for using a less expensive level of staff to do item record creation.

From the checklist, one could conclude that item record creation is well supported on many systems, which may be due to the fact that many of them began as circulation systems. The most comfortable method of item record creation was seen at Northwestern, on NOTIS, which employs a laser scanner. The inputter sat at a terminal, called up the bibliographic record, and simply ran the work form containing the barcode under the scanner. It wasn't even necessary to remove the right hand from the keyboard. On the other hand, flexibility and support are obviously not present strengths of the LIAS system, which requires that item records be input completely and offers no support for adding barcode information via an optical scanning device. This lack represents the current state of system design and should be remedied when the bibliographic and item databases are integrated as planned.

Many systems support easy changes to groups of item records much as they support global changes for all occurrences of a heading. Those that have been listed as offering multiple changes by collection make possible global changes to a collection through maintenance of an internal table or parameter list. Some even support a multiple change capability for random records. This allows the processor to tell the system what the change is going to be and then store the change by wanding the item number, rather than calling up each individual item record and entering the text for the same new data element each time.

RECORD EDITOR TYPE

Once the records are in the catalog, of course, it is frequently necessary to maintain them, a task greatly influenced by the system editor. The editor types have been divided into screen-oriented and line-oriented, categories that were surprisingly difficult to assign. On one end of the range, there are screen editors like BLIS and NOTIS, which rely primarily on cursor control and some use of function keys. On the other end, there are pure line editors like ALIS, LIAS, LS/2000, and VTLS, which use some variation of a REPLACE text *with* text sequence. Somewhere between the two extremes fall the ATLAS and Geac editors, which heavily employ the function keys for invoking commands and positioning the cursor but use a screen-oriented approach for actual changes in text (see figure 3).

	ALIS II	ATLAS	BLIS	Geac	LIAS	LS/ 2000	MSUS/ PALS	NOTIS	VTLS
Screen-oriented		X	X	X				X	
Line-oriented	X				X	X			X

Fig. 3. Bibliographic Record Editor Types

The screen editors possess the advantage of familiarity, since the bibliographic utilities use full-screen editing styles. But line editors can also be efficient, particularly when they use the basic units of the MARC record structure as initial address points for editing commands. The LIAS and LS/2000 editors, for instance, permit many of the basic editing tasks—inserting, deleting, changing, and copying—to be carried out directly on entire fields and subfields as well as strings. The ALIS-II and VTLS line editors, however, require that subfields be treated as strings when deleting, inserting, or changing and do not support copying at all. Fields and subfields that need to be copied must be separately input a second time. The ATLAS editor is designed in an innovative way that permits both placement and editing to be done directly to fields and subfields but also permits full-screen editing for string changes.

The MSUS/PALS system was the only one that supported neither local record creation nor editing. Existing records are edited through OCLC using a partial record update system. In order to edit a record, the processor adds a transaction code (add, delete, or exchange) to field 035 subfield *a* and the tag of the field to be changed in 035 subfield *b*. Since the field identification cannot be refined beyond the tag level, however, the processor must reconstruct all the fields with that same tag. If one 650 field had to be corrected, for instance, then all the 650 fields would have to be checked for correctness and possibly edited, because there is no way to tell the system which 650 field to exchange in the local record.

CATALOGING SUPPORT AND ERROR CHECKING

Record creation and editing comprise the physical aspects of processing that may be influenced by system design. They also represent the present accomplishments for the processing systems currently available. The area of intellectual support for cataloging activities is still greatly undeveloped and much more problematic.[4] The next area of potential for system support of intellectual work lies with authority work, a topic that was not considered because many of the examined systems did not have functioning authority control systems at the time. There are other kinds of cataloging support that systems can offer, however, and these have to do with error checking and customizing a record to fit into the local catalog (see figure 4).

The three types of bibliographic data that can be error-checked in some way are MARC formats, ISBN and ISSN numbers, and check-digited barcode or OCR numbers. As is apparent from the checklist, most of the systems provide little error checking for records loaded in batch, probably on the theory that the records are coming from utilities that do that type of error checking and therefore do not need to be checked twice. What is more surprising is that only five of the systems check MARC format errors for local input. This is a great deficiency, because the system cannot process a mistagged field. If, for instance, an inputter mistags a title that is the only access point, the item is effectively lost. This lack of local MARC format checking is probably a reflection of the fact that many of these systems were not designed to provide primary processing support but simply the capacity to edit a record, if necessary, after it had been created on a utility (see figure 5).

Bibliographic record profiling is another example of customizing the record to fit into the local catalog. *Profiling* is defined as the ability to set up a profile that determines which data elements will be stored and which will be deleted from the source record. Unlike catalog cards, the responsibility for profiling a bibliographic record to the local online catalog lies with the local system, not the utility. When utilities print catalog cards, they create final products designed to customer specifications. But archive tapes or online transfers simply provide an intermediate product that must be customized on the local system. Thus, if an institution wants to save storage space, or to exclude certain fields from the record so that the local system doesn't process them, it can set up a storage profile to exclude those data elements. Otherwise the processor must remember to delete those fields, an

	ALIS II	ATLAS	BLIS	Geac	LIAS	LS/ 2000	MSUS/ PALS	NOTIS	VTLS
Batch mode									
a. MARC format	X 4		X	X	X	X			
b. ISSN/ISBN					X			X	X 5
c. Barcode or OCR numbers	X	X	X	X	X	X	X		
Keyboarded									
a. MARC format	X 6		X	X	X	X		X	
b. ISSN/ISBN					X			X	
c. Barcode or OCR numbers	X	X	X	X	X	X	X	X	
Lightwanded									
Barcode or OCR numbers	X	X	X	X	X	X	X	X	

4. Tags and fixed fields only; not indicators or subfields
5. Checks for the correct number of digits, but does not check-digit
6. Fixed fields only

Fig. 4. Cataloging Support and Error Checking

	ALIS II	ATLAS	BLIS	Geac	LIAS	LS/ 2000	MSUS/ PALS	NOTIS	VTLS
MARC field	X	X 7	X	X	X	X		X 8	X
MARC indicator		X 7	X	X	X	X		X 8	X
MARC subfield		X 7	X	X	X	X		X 8	X
Format specific	X	X 7	X	X	X	X		X 8	
Site specific	X	X 7	X	X	X	X		X 8	X

7. Only for records added through online transfer
8. During tape load, fields can be excluded at the tag level, but exclusion is not format-specific. Full site specific and format profiling is available for records added through online data transfer, MARC match or local input, but this must be done through parameter and is dependent on customer programming staff

Fig. 5. Bibliographic Record Profiling

unnecessary task and one that is highly prone to error.

The checklist shows the extent to which record storage can be profiled on the various systems. Parts of a MARC field can be excluded on the basis of the field or indicator, or the subfield value on some systems; most systems that offer profiling also permit different profiles to be set up for different bibliographic formats. ALIS, on the other hand, allows one to set up a list only at the tag or field level (see figure 6).

PREPARING A BOOK FOR THE SHELF

After the bibliographic record has been created, two tasks normally remain when preparing a book for the shelf—shelflisting and labeling. Shelflisting is one activity that most of these systems do not support well, because they are designed to do batch processing rather than to fit new records into the catalog one at a time. If the database is updated in batch mode, either through adding an archive tape or batching in records transferred from a utility, an institution has three choices for shelflist maintenance: (1) continue a card shelflist, shelflist everything in advance of production, and file a temporary shelflist record; (2) check the online shelflist against a postproduction call-number list if the system provides one; or (3) stop shelflisting completely and handle call-number conflicts as they are discovered. The latter course inevitably means that duplicate call numbers will be created for different items and that the institution will lose the double check on call-number accuracy and appropriateness that shelflisting usually offers.

All of the systems offer a shelflist search and browse capability that would make it possible to check the shelflist online before producing a record. But if it is possible to browse forward only, and only through the search (right hand truncation), several searches may be needed before the processor finds the appropriate spot in the shelflist for the call number being checked. Thus, checking can be greatly enhanced simply by the ability to browse infinitely forward and backward through the shelflist. One of LIAS' innovative features is that it specifically supports shelflisting as part of processing: it has a shelflist command that allows the processor to move back and forth automatically between the shelflist and the bibliographic record.

If the database is being updated in batch mode, the postproduction call-number list

	ALIS II	ATLAS	BLIS	Geac	LIAS	LS/2000	MSUS/PALS	NOTIS	VTLS
Shelflisting									
a. Online search	X	X	X	X	X	X	X	X	X
b. Browse capability	X		X						
(I). Infinite			F	F, B	F, B	F	F, B		
(II). Through search	F	F				B		F	F
c. Post-production call number list				X	X				X
Labeling									
Spine labels		X		X	X			X	X

F = Forward, B = Backward

Fig. 6. Preparing a Book for the Shelf

would permit shelflist checking after the record has been added to the database. The list identifies possible conflicts between call numbers that are already in the index and those being added as part of the most recent batch. Thus, if a duplicate call-number problem is discovered, one of the items can be recalled and remarked in order to eliminate the conflict. This is a less elegant solution, of course, because it means that the book has to be marked twice and all the relevant records changed. Geac, LIAS, and VTLS provide a postproduction call-number list.

The final step in the finishing process, of course, is applying the spine label to the book. Utilities may offer the capacity to produce labels, but it may be physically more convenient to get the labels from the local system for two reasons. First, label production is often done in batch: if an institution is an OCLC member, this may mean that all its records must be stored in a "Save" file and later recalled for printing labels, and that may mean that the labeling must be finished that day because the "Save" file will fill up and records will be lost. No such constraints apply to the local system. Also, the spine labels may be more accurate if produced on the local system because they can include item-specific information such as volume numbers without being rekeyed. Spine labels are available with ATLAS, Geac, LIAS, NOTIS, and VTLS.

CONCLUSION

The most important design decision affecting processing support in the examined systems is contained in this question: Is this system designed to be a library's primary means of creating and editing bibliographic records, or is it intended simply as a tool for "cleaning up" records that have already been created on a bibliographic utility? If a local system is designed to be the primary processing system, it should then support all the activities that are traditionally part of processing and do so in a way that makes the system comfortable to use. All systems that offer a MARC match function, making it possible to do all cataloging for MARC records on the local system, move in this direction. If a system is designed to be an adjunct to a bibliographic utility, however, and the utility is used to do the bulk of the processing, the system may then make some compromises with processing support. The most extreme example of this approach is the MSUS/PALS design, which permits neither local bibliographic record creation nor editing.

Such compromises make the system more difficult for the technical services processor to use and adversely affect cataloging work flow. Using MSUS/PALS as an example, system design around archive tape update means that item record creation is more cumbersome. There are no default values to reduce keying, and spine labels must be hand-typed—surely one of the advantages of automation is reducing this kind of time-consuming, repetitive labor? The alternative is to hold the items until the tape has been loaded, thus defeating the speedier processing that is so frequently identified as one of the advantages of automation.

None of these points is a make-or-break consideration for system selection, although they do indicate how comfortable a system may be for technical services staff to use and what kind of additional support the library will need for accomplishing its processing. But it should also be recognized that the design concepts inherent in these nine systems represent an interim stage in the evolving technology of integrated systems. All libraries look forward to the time when linked systems and direct utility access through the local system become possible. What we will want then is the ability to share cataloging in a standardized form through a fully customized local environment. We will no longer be satisfied with local systems that provide only secondary processing support.

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APPENDIX A. SYSTEM PROCESSING FEATURES—COMPOSITE CHECKLIST

	ALIS II	ATLAS	BLIS	Geac	LIAS	LS/2000	MSUS/PALS	NOTIS	VTLS
I. Record input									
A. Bibliographic records									
1. Tape loading	X	X	X	X	X	X	X	X	X
2. MARC database match		X	X		X			X	X
3. Adaptation	X			X	X	X		X	X
4. Keyboarding									
a. Prompted input	X			X	X	X			
b. Blank screen fill-in								X	X
c. Form fill-in fill-in	X 1	X	X					X 1	
d. Customized prompt list or workform	X	X		X		X			
5. Online data transfer	OCLC Mini-Marc	OCLC RLIN		OCLC RLIN WLN UTLAS Mini-MARC	RLIN	OCLC		OCLC	OCLC RLIN
B. Item records									
1. Batch loading	X	X	X	X		X		X	X
a. Call no. default	X	X	X	X		X		X	X
b. Location default	X	X	X	X		X		X	X
2. Keyboarding	X	X	X	X	X	X	X	X	X
a. Call no. default	X	X 2	X			X	X 3	X	X
b. Location default	X	X 2	X 2			X	X 3	X	X
3. Lightwand	X	X	X	X		X	X	X	X
a. Call no. default	X	X 2	X			X	X 3	X	X
b. Location default	X	X 2	X 2			X	X 3	X	X
4. Multiple changes	X	X	X			X	X	X	
a. By collection	X		X	X		X	X	X	
b. Random titles	X	X		X			X		
II. Record editing									
A. Editor type									
1. Screen-oriented		X	X	X				X	
2. Line-oriented	X				X	X			X

1. Fixed fields only
2. For successive volumes or copies on the same record
3. Default values supported for retrospective conversion only

	ALIS II	ATLAS	BLIS	Geac	LIAS	LS/ 2000	MSUS/ PALS	NOTIS	VTLS
III. Cataloging support									
A. Error checking									
1. Batch mode									
a. MARC format	X 4		X	X	X	X			
b. ISSN/ISBN					X			X	X 5
c. Barcode or OCR numbers	X	X	X	X	X	X	X		
2. Keyboarded									
a. MARC format	X 6		X	X	X	X		X	
b. ISSN/ISBN					X			X	
c. Barcode or OCR numbers	X	X	X	X	X	X	X	X	
3. Lightwanded									
Barcode or OCR numbers	X	X	X	X	X	X	X	X	
B. Bibliographic record profiling									
1. MARC field	X	X 7	X	X	X	X		X 8	X
2. MARC indicator		X 7	X	X	X	X		X 8	X
3. MARC subfield		X 7	X	X	X	X		X 8	X
4. Format specific	X	X 7	X	X	X	X		X 8	
5. Site specific	X	X 7	X	X	X	X		X 8	X
C. Preparing a book for the shelf									
1. Shelflisting									
a. Online search	X	X	X	X	X	X	X	X	X
b. Browse capability	X		X						
(I). Infinite			F	F, B	F, B	F	F, B		
(II). Through search	F	F				B		F	F
c. Post-production call number list				X	X				X
2. Labeling									
Spine labels		X		X	X			X	X

APPENDIX B. SYSTEM PROCESSING FEATURES—CHECKLIST DEFINITIONS

I. Record input

A. Bibliographic records

1. Tape loading		Initial and ongoing database creation possible through archive tape load
2. MARC database match		System can directly access locally-stored copy of MARC database, rather rather than accessing it through a utility
3. Adaptation		System can adapt from existing record in database to add another record. Useful for similar editions, etc.

4. Keyboarding		
a. Prompted input		System prompts inputter with list of MARC tags or other signal to input data field-by-field
b. User-defined prompt list		User can set up own prompt list for a given format or type of material
c. Blank screen fill-in		New records are input by typing information onto a blank screen, without any workform or template
d. Form fill-in		New records are input by typing information into pre-designed workform
5. Online data transmission [List utilities supported]		Ability to pass records from a bibliographic utility or other source into local system

B. Item records

1. Batch loading		Item records can be created from information in the bibliographic record, which is batch loaded through online transmission or archive tape
a. Call no. default		Records loaded this way derive call number from call number field in in bibliographic record, e.g. 050, 090
b. Location default		Records loaded this way can assign default location information for primary stack location
2. Keyboarding		Item records can be created by inputting information at keyboard, including barcode or OCR number
a. Call no. default		Records loaded this way derive call number from call number field in in bibliographic record, e.g. 050, 090
b. Location default		Records loaded this way can assign default location information for primary stack location
3. Lightwand		Item record can be created by scanning OCR or barcode with optical scanning device
a. Call no. default		Records loaded this way derive call number from call number field in in bibliographic record, e.g. 050, 090
b. Location default		Records loaded this way can assign default location information for primary stack location
4. Multiple changes		
a. By collection		A value for a group of item records, e.g. loan period, can be changed through parameter maintenance of a table value
b. Random titles		A value for a group of item records, e.g. location, can be changed by setting the value to be changed once, then storing the change in each item record by scanning OCR label or barcode

II. Record editing

A. Editor type

1. Screen-oriented		System has a screen-oriented editor for bibliographic records
2. Line-oriented		System has a line-oriented editor for bibliographic records

III. Cataloging support

A. Error checking

1. Batch mode

a. MARC format		System does full validity checking for each MARC format, validating tags, indicators, and subfield codes for records added in batch mode
b. ISSN/ISBN		System check-digits ISBN and ISSN numbers for records added in batch mode
c. Barcode or OCR numbers		System check-digits barcode or OCR numbers for records added in batch mode

2. Keyboarded

a. MARC format		System does full validity checking for each MARC format, validating tags, indicators, and subfield codes for records input on the local system
b. ISSN/ISBN		System check-digits ISBN and ISSN numbers for records input on the local system
c. Barcode or OCR numbers		System check-digits barcode or OCR numbers for records input on the local system

3. Lightwanded

Barcode or OCR numbers		System check-digits barcode or OCR numbers added to the system through optical scanning device

B. Bibliographic record profiling		Record profiling is defined as the ability to set up a profile which determines which data elements will be stored and which will be deleted from the source record
1. MARC field	______	Profile permits exclusion of a field at the tag level, e.g. database will not store any 043 field
2. MARC indicator	______	Profile permits exclusion of a field at the indicator level, e.g. database will store 650 indicator 0, but not 650 indicator 2-7
3. MARC subfield	______	Profile permits exclusion of a given subfield within a field, e.g. database will store field 130, but not subfield f within field 130
4. Format specific	______	Separate profiles can be established for each MARC format
5. Site specific	______	Each customer may establish an individual profile
C. Preparing a book for the shelf		
1. Shelflisting		
a. Online search	______	Shelflist can be searched online
b. Browse capability	______	Defined as the ability to move forward and backward through the index F=Forward, B=Backward
(I). Infinite	______	Browse is infinite, regardless of original search. Example:QA76.73.C15 is searched, browse can go forward to QA76.73.C25 and beyond
(II). Through search	______	Browse is limited to call number searched. Example: QA76.73.C15 is searched, browse cannot go beyond QA76.73.C15 to C25
c. Post-production call number list	______	After record is added to database, system produces list which identifies possible duplicate call numbers for different works

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From Cards to Online: The Asian Connection

Gloria H. Rogers

Converting catalog cards to online archival tape poses perplexing problems for library collections in Chinese, Japanese, and Korean. One problem is the need for specialized, expensive equipment and complex encoding procedures for inputting and retrieving records with vernacular scripts in those languages. Another is caused by the nature of the languages, whose romanized form is fraught with ambiguity and uncertainty. In this essay the San Diego State University Library's decision to convert its Asian collection online through OCLC, in romanized form only, is closely examined, and the procedures that were adopted are explained. A supplementary benefit of this conversion process is that the bibliographical information and the Asian-language resources are shared nationally, if not internationally.

At San Diego State University (SDSU) Library, we began the process of retrospective conversion in fall 1984 with the expectation that it would be completed sometime in 1986. Because OCLC, the library's cataloging system since 1977, offered a competitive price range for carrying out retrospective conversion, it was contracted for the entire conversion project. For the bulk of the library's materials in English and other alphabetic languages, conversion from catalog card to archival tape through OCLC posed no unusual problems. But in the case of a small but significant collection of materials in Asian languages—mostly Chinese and Japanese, with a few titles in Korean—it was apparent that the conversion would involve special difficulties.

CJK ONLINE TECHNOLOGY

At the time when the decision to convert this collection was being made, Asian cataloging was done without going through OCLC; cataloging procedures, including the typing and printing of the catalog cards, followed the manual route. Unlike RLIN, which inaugurated its first CJK bibliographical record on September 12, 1982, OCLC in 1984 did not—nor does it yet—have the capability for inputting and retrieving materials online in Chinese, Japanese, and Korean vernacular scripts. As a consequence, how to convert the library's Asian collection was a dilemma: would it be better to take advantage of the contract with OCLC and convert the collection in romanized form, or would it be better to wait for the day in the future when OCLC develops the CJK capability, announced for sometime in 1986? To wait until later, we realized, would necessitate an in-house conversion of the Asian collection that would be more expensive and time-consuming than an immediate romanized one.

We also had to consider whether or not a small Asian collection of six to seven thousand titles warranted the expense of creating an online database with CJK vernacular characters, especially in view of the fact that the current technology of inputting and retrieving is still at a rather primitive stage and that special, costly equipment and software are required and additional

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users' fees involved. The RLIN CJK system, which is made up of a terminal, a cluster control, and a printer, costs in the range of $35,000–$40,000. This CJK terminal keyboard contains two times more keys than a regular one—133 character keys, 36 function keys, and 10 control keys. "Each of the 133 character keys contains from two to five symbols: 123 keys contain 245 components for Chinese characters; 51 keys contain the Japanese script called kana; 33 keys contain basic components of the Korean script known as hangul; and 49 keys contain Roman letters or Arabic numerals."[1] All these keys must be mastered according to special procedures in order to encode bibliographical records with CJK vernacular scripts. In contrast, OCLC, which benefits from later, therefore more advanced technology, has announced that a CJK workstation is basically a modified M300 workstation with the same number of keys. Although it has fewer keys than RLIN's CJK terminal, the creation of vernacular scripts still calls for procedures that go beyond simply typing. Furthermore, the cost of the entire system would still be prohibitively high for a small collection of Asian-language books when the price of the workstation is combined with additional hardware, software, and related fees—around $20,000 for the first year and $9,000 for each succeeding year. And since the system is not yet on the market, the ease and flexibility of its CJK capability are still to be determined. Judging from the currently available technology of encoding Chinese, Japanese, and Korean characters on a regular keyboard—phonetic, word root, numeric coding, or the combination of phonetic and word root—the process of producing vernacular characters is rather complicated and time-consuming.[2] Another question that we had to keep in mind is whether or not the system eventually chosen for the online catalog should have a feature allowing it to handle CJK vernacular characters.

One thing that was not forgotten in these considerations is that an online catalog, even with CJK capability, is not solely for the use of librarians and staff. Since its main purpose is to serve and provide information for library patrons, it has to be fairly user-friendly so that the general public can retrieve a record with reasonable ease and speed. Given the fairly small size of the Asian collection at San Diego State, the relatively small number of library patrons who have the language ability to use the collection, and the expense of the CJK systems, we finally decided that it would be better to convert the Asian collection in romanized form only. A crucial influence on this decision was the fact that all the access points, except for untraced series, on the Asian collection catalog cards are already either transliterated or in English. Personal and corporate names and titles are in romanized form, and topical subject headings are in English. We felt that a person who knows how to find Chinese, Japanese, or Korean materials through the card catalog could easily learn to find the same record in romanized form in an online catalog.

THE PROBLEM OF ROMANIZATION

Nevertheless, one major problem inherent in the nature of the Japanese and Chinese languages affects any system of romanization. Anyone who has tried to identify Chinese or Japanese words through romanizations only, without ready access to the corresponding original characters, often faces great uncertainty about which words the romanizations correspond to in the original language. For example, the Japanese words for both *ethnology* and *folklore* are romanized as *minzokugaku*. Different personal names could become the same in romanization, although they are signified by different characters in their original scripts. The quite different authors of *Bungo No Magaibutsu Sanpo* (Ōita: Sōrinsha, 1979) and of *Masaoka Shiki No Kenkyū* (Matsuyama: Aoba Tosho, 1980) are designated in romanization by the same name, Watanabe Katsumi. The crucial difficulty here lies in the large number of homophones and homonyms in Chinese and, to a somewhat lesser extent, in Japanese. For Chinese the problem is further compounded by the absence of tones in the romanization scheme used for cataloging and by the fact that every Chinese speaker cannot correctly pronounce the written words in the Mandarin dialect on which the library's Wade-Giles romanization system is based. The romanized Chinese word *chi*, for instance, may refer to any of the four tones accruing to a syllable in Mandarin; each of the tones represents at least one character. A quick glance in *Mathews' Chinese-English Dictionary* reveals 122 specific Chinese characters that are romanized as *chi*. The problem of referential ambiguity is further compounded by the fact that each specific *chi* generally possesses multiple meanings, depending on where and how it is used. Therefore a romanized *chi*—as opposed to a specific character *chi*—can represent hundreds if not thousands of meanings.

However, the library automation process need not be hindered and the future online catalog made incomplete by failing to convert an Asian collection because of the ambiguities inherent in romanized Chinese and Japanese. Asian-language materials should be included in the online catalog—just as they are now in the card catalog, despite the problems of identification in romanized form—so that library patrons who are searching in the online catalog can retrieve all relevant titles at the same time and place, just as they would in the card catalog. Patrons should be able to rest assured that what appears on the screen has been retrieved from a search of the entire library collection and that there are no separate files and records that require further checking.

Usually when romanized names and titles and English-language subject headings are put together with other types of information on the cataloging records, such as imprint, collation, and series, they can provide a fairly accurate indication of whether or not the record on the screen is the one the patron is looking for.

To ensure the absolute identification of a title in Chinese, Japanese, or Korean, San Diego State University Library also decided that even during the online era, a catalog card for each title in the Asian collection, with information in the original script, would be kept in a file in shelflist or other appropriate order. In cases when library personnel or patrons find the romanized information on the online catalog confusing or misleading, they then can easily refer to this card file containing information in the original vernacular scripts. Until the day when technology has advanced to the point that bibliographical records with Chinese, Japanese, or Korean characters can be inputted and retrieved as easily as one can type "abc" on the terminal keyboard without requiring special or expensive equipment, cards with Chinese, Japanese, or Korean script will still be quite essential to accurate bibliographical identification.

PROCEDURES FOR CONVERSION

Once the decision was made to convert the Asian collection online in romanized form only, as well as to maintain an Asian card file even after disposal of the rest of the card catalog, an online conversion policy specific to the Asian collection was needed.

Since romanized form does not provide an easy way to identify a bibliographical record for Chinese and Japanese titles, excessive romanization is to be avoided. The minimum input standard of Level K, as spelled out in *Bibliographical Input Standards*, was therefore adopted as the baseline. Also, since the whole point of converting the SDSU Library's Asian collection is to prepare the way for a comprehensive, future online catalog, the conversion should result in providing not only enough information for bibliographical identification but also as many access points as possible. In addition to inputting fields that are either mandatory or required for Level K, and updating headings to AACR2 or AACR2-compatible forms, we decided to input as many optional fields as possible if the information was available on catalog cards and if it would enhance the usefulness of the online catalog. This decision is certainly in line with the conversion recommendations of the Association of Research Libraries[3] and with OCLC's policy on Level K input:

> The Level k standard does not, however, prohibit the addition of other data which institutions may feel is necessary for their own use. In addition to identifying a base line below which OCLC Cataloging Subsystem users should not create records, code "K" in "Enc lvl" is also used to describe fuller records up to the point at which all applicable I-level standards have been met (*Bibliographic Input Standards*, p.21).

The following is a rundown of the optional fields that we have decided to input for the conversion of our Asian collection. Since the collection consists entirely of books and serials, only the fields relevant to these two formats will be dealt with here.

Fixed fields: Generally considered as unnecessary evils by those who use OCLC bibliographical records solely for card production, these index fields are very useful in an online catalog. In addition to those that are mandated by the input standard, we also code fields "Indx," "Cont," and "M/F/B" if the information is readily available on the catalog cards.

090: Call numbers will continue to be essential for locating materials and for subject identification in an online catalog.

260 #a: Place of publication can provide a quick determination of the text language. Additionally, in the case of Chinese publication—because of China's political division into communist and nationalist jurisdictions—a publisher who had moved from Shanghai to Taipei in 1949 could have issued a book in the same or in different editions at two different locations, often with dates of publication absent from the imprint. To know the place of publication is helpful in estimating the publication date and ascertaining which edition is earlier. Therefore, if the place name is displayed on the online bibliographical record, one is not compelled to check the catalog card or book for this information.

300 #b and #c; 310; 321: We input for bibliographical identification, since the information is readily available on the catalog cards.

4xx and 6xx: Although series and subject headings are optional under the Level K input standard, they provide essential information in a bibliographical record. Furthermore, since they are access points in retrieval, they are essential for an online catalog. We input all subject headings and series in romanized forms.

5xx: Notes in English, such as those for indexes and bibliographies, are input automatically for us by OCLC. Other notes, such as contents, although not required by the Level K input standard, are romanized and input into OCLC if they contain the individual titles of novels or plays in a collection. Even though notes are not access points at this moment, notes that contain relevant information can improve access if an online catalog has the feature providing for free-text search.

If the above input standards for converting the Asian collection are to be met, additional romanized information is needed besides what is available on our catalog cards, which do not romanize subtitles, statements of responsibilities, imprints, and some notes. Since OCLC has been contracted to execute the retrospective conversion of the entire SDSU Library collection, including the Asian collection, and since its conversion crew is not trained to do the extra romanization, such a specification would go beyond the limit of the contract and would entail substantial additional charges. We decided to have OCLC convert what they could from the information available on the catalog cards and return the cards to us flagged, so that the conversion could be finished in-house. This process may seem cumbersome, but in reality it has worked well. The final step of the conversion process must involve the work of a librarian with the requisite language and cultural expertise in Chinese, Japanese, and Korean. Such a librarian is charged with the task of reviewing all converted records and thereby ensuring the accuracy and quality of the online database. In this way the additional romanization can be inputted at the same time that typos and tagging mistakes are corrected and entries for names and subjects updated.[4]

CONCLUSION

At the inception of the SDSU Library's retrospective conversion project of the Asian collection in fall 1984—in addition to manually produced cards for our card catalog—we also started to input, into OCLC, all the newly cataloged Chinese, Japanese, and Korean materials in romanized forms, according to the augmented Level K input standard that we have established. We think this is a good if not a perfect way to transfer online the cataloging records of a small Asian collection such as ours without having to invest tens of thousands of dollars.

Since over 90 percent of the records we

have converted are original inputs, we have also made a significant contribution to OCLC's bibliographical database. It has been gratifying to discover that some of those records have already been used by other libraries. Not only is our cataloging information actually being shared nationally, if not internationally, but also our Asian-language resources could be shared by way of the OCLC interlibrary loan system. If "support of scholarship and research is the fundamental objective of any retrospective conversion program," as advocated by the Council on Library Resources and reiterated by C. Lee Jones in his article "Issues in Retrospective Conversion,"[5] we feel we have fulfilled this goal for a collection that otherwise would have remained inaccessible to those beyond the immediate area of San Diego State University.

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Using CCF: The Common Communication Format

Peter Simmons

Although MARC formats are well established around the world, the Common Communication Format (CCF) is also employed as a standard on which bibliographic systems are based. CCF differs from MARC by specifying no rules for description, permitting minimal records, and introducing the concept of groups of fields called record "segments." Through the use of segments, CCF records permit specific kinds of relationships to exist between fields, groups of fields, and records. CCF forms the basis for several new formats used in Europe and North and South America.

North American librarians commonly use a four-letter word when they speak of standardized bibliographic records in machine form: MARC. The use of MARC records has encouraged the growth of large and sophisticated online bibliographic systems, permitting libraries large and small to exchange records and thus to acquire bibliographic descriptions conveniently and inexpensively. In recent years, MARC formats have spread to so many countries that it becomes difficult to count them, for while some formats are specific to individual countries, others are used by groups of countries in a region. MARCAL, used in Latin American countries, is an example of the latter.

However, in many countries, bibliographic practice is only now becoming standardized, often in conjunction with the adoption of computer-assisted bibliographic systems. And although such countries need to adopt a standard format for machine-readable bibliographic records, it is not always clear that either an existing MARC format or a new MARC format designed for that country is the only solution, or even the ideal.

In many developing countries there is no established network or infrastructure to support libraries. The national library, if it exists, often plays a minor role as a legislative or a central reference library. While the most important bibliographic agency in such a country may be a university library or, if one exists, the national bibliography, major information agencies within the country may not be associated at all with other libraries and may not themselves be libraries. They may have started their existence as indexing and abstracting agencies—perhaps associated with such international information systems as INIS or AGRIS, which are sponsored by the International Atomic Energy Agency and the Food and Agriculture Organization of the United Nations respectively—or as bibliographic control projects associated with a foreign aid project.

Having begun as single-purpose bibliographic agencies, these organizations often become focal points of expertise, gradually enlarging their operations to encompass a range of bibliographic functions and products. As they mature, they frequently take on two additional roles: facilitating the ex-

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change of records among bibliographic agencies within the country, thus acquiring responsibility for coordinating the standardization of these other agencies, and exchanging records with (or at least obtaining records from) similar agencies in other countries. To accomplish both of these tasks the coordinating agency must choose a format that acts as a central standard for facilitating communication.

It would seem natural to a North American librarian that this standard would be MARC, but this is not always true, chiefly for two reasons. The first is that MARC formats are most closely associated with libraries: they typically mirror the structure and data elements of a cataloging code for libraries that has been adopted as the national standard. Other kinds of information centers see national acceptance of MARC as a precursor to the imposition of national bibliographic descriptive practices. Moreover, the MARC formats often make it difficult for abstracting and indexing agencies to record the kinds of data elements, and especially relationships among data elements, that are required to produce their products. This subject will be discussed in greater detail later.

The second reason for not adopting a MARC format is that—especially to those new to automated systems—the records appear to be too complex for small bibliographic agencies in developing countries. Where local descriptive practices result in very brief records, there tends to be an assumption that a MARC format will not serve the needs of the bibliographic agency well.

UNESCO, PGI, AND THE CCF

Requests for assistance in the establishment of bibliographic standards are often directed by developing countries to UNESCO's General Information Programme (PGI). Already well described in the literature,[1] this program addresses itself to the special problems faced by developing countries. Along with requests for expertise in establishing information systems, UNESCO is often asked for assistance in developing a standard format for bibliographic exchange within a country. In making their recommendations, consultants acting for PGI have tended to consider two major record formats: for libraries, they usually recommend a MARC format; for other kinds of bibliographic projects, the Unisist *Reference Manual*,[2] a format increasingly used in abstracting and indexing agencies, is usually recommended.

But because it is common for developing countries to support only a single bibliographic agency, while a developed country might have the financial resources and trained personnel to support many, some countries have indicated that they find neither of these two formats entirely satisfactory.

The direct result of this dissatisfaction has been the development of CCF, the Common Communication Format.[3] Published by UNESCO in 1984, it provides a standard for bibliographic records in machine form that will be useful for both library and nonlibrary agencies. Since it follows the rules for bibliographic formats laid down in ISO 2709,[4] CCF appears at least superficially familiar to MARC users: it has a twenty-four-character label, followed by a directory, followed in turn by a variable number of variable-length fields. The fields, identified with three-digit numeric tags, have two-digit indicators; the subfields have two-digit subfield codes; the coded fields (e.g., language, country of publication) use the same familiar codes found in most MARC formats; and so on.

The familiarity is the result of the fact that the US/MARC records used by American librarians are based on the standard Z39.2–1979,[5] which in turn is an implementation of ISO 2709, the international standard that enumerates the rules for national bibliographic standards. As examples of their relationship, ISO 2709 requires that tags consist of three characters; Z39.2 more narrowly stipulates that tags consist of three *numeric* characters. Also, ISO 2709 requires that the number of characters used as field indicators be stated in a single numeric digit, so that indicators may be between zero and nine characters in length; Z39.2 more specifically requires indicators to be two characters in length. Therefore, all US/MARC records follow ISO 2709, but not all ISO 2709 records are MARC records.

Thus it is possible for two formats to follow ISO 2709 and yet be quite different. CCF uses a structure very similar to MARC, as enumerated above—yet it is certainly different—and since, as this article illustrates, it is increasingly used as a standard for the communication of machine-readable bibliographic data, those differences are worth examining. They fall into three categories: the number and kinds of bibliographic data elements that comprise the standard format; the data elements that must be used to meet the standard; and the techniques used to show relationships between elements within a record and between bibliographic records in a file.

RULES FOR DATA ELEMENTS

Usually a standard data format is closely associated with a set of rules for bibliographic description. Thus MARC formats commonly have a subfield to contain the uniform title, should there be one, of an item. It is not necessary to define the content of the subfield, since that is defined in AACR2, the cataloging code associated with the MARC formats. The same is true of the MARC fields and subfields for edition statement, series statement, dissertation note, personal name added entry, and so on.

The Unisist *Reference Manual* handles these matters differently: the rules for description form part of the format. Thus the format not only indicates the code for designating such *Manual* elements as Title of Monograph and Corporate Body Associated with Analytic but also defines these terms and prescribes methods for creating them. For example, in the case of Title of Monograph, the *Manual* indicates that this "may be entered exactly as given on the document or it may be translated, transliterated or otherwise modified."[6]

Because of differences between AACR2 and the rules for description used by the *Reference Manual*, the automatic conversion of a Title of Monograph in a *Manual* record to Title Proper in an AACR2/MARC record would serve no useful purpose. Despite the possibility of table-driven tag conversion, computer translation from a *Manual* record would create a field that would be invalid in any agency using AACR as its standard for description.

CCF, in contrast, contains no rules for description. Although its fields and subfields encompass the broad range of description elements used by other formats, the rules for defining their contents fall into three categories. One of these is prescriptive: the user is instructed exactly how to describe the element, usually with language found in the International Standard Bibliographic Descriptions on which AACR2 is based. For example, CCF states that the Edition Statement "is normally given in the terms used in the item. Standard abbreviations for such terms may be used; numbered editions may be converted from script to numeric form," and so on. The second is permissive/indicative: the creating agency may utilize more than one method of description, then indicate which has been used. In CCF, for example, the user is asked to indicate whether the Title and Associated Statement(s) of Responsibility are as on the item, modified, or translated. The third possibility is purely permissive: for example, the form of representation for the Name of Corporate Body field is simply "in accordance with the practice of the agency preparing the record."

These three methods, used together, allow a tremendous amount of flexibility. A bibliographic record could easily be translated into CCF either from a MARC record with its content defined by AACR2, from the *Reference Manual*, or from a number of other formats. But this hospitality to various systems of rules for description carries a price: there will be cases in which it is impossible to convert a CCF record into, for example, a MARC record. To use the example of Title and Associated Statement(s) of Responsibility mentioned above, a CCF record indicating that these elements have been modified or translated from what is shown on the item will be difficult to convert to a MARC record if no other title or statement of responsibility is provided.

MINIMUM-LEVEL RECORDS

Those with smaller information systems may tend to see the richness and potential complexity of a standard format as a barrier to use. Often these systems produce what others might consider a minimum-level record; many systems, including libraries, discriminate among the materials they process, using different levels of description for various types of materials.

Standard formats often fail to meet the needs of such organizations either because of the format itself, which incorporates rules regarding its use, or because of policies associated with a format's use. The *Reference Manual*, for example, clearly indicates which data elements are mandatory and optional for various types of materials. Similarly, most national bibliographic agencies that create MARC records have a policy stating which data elements must appear in order to meet the national standard. Alternatively, the use of a cataloging code might require a minimum level of description, such as the first level of AACR2.

CCF, on the other hand, has designated only eight data elements as mandatory. Five are required chiefly for computer processing of the record, and most of these can be computer-generated. They include such elements as the unique record identifier, the name of the agency preparing the record, the date when the record was entered into a file, and so on. Another two or (in the case of serials) three elements are mandatory because they are considered necessary to identify the item uniquely. These include the language and script of the item and the title, and in the case of a serial, the ISSN and key title.

All other data elements are optional. An organization may use any CCF data elements it finds useful and omit those it does not. In addition, an agency is free to add private data elements if it so wishes, though it is recognized that this practice may tend to lower the value of such a record for purposes of interchange with other organizations.

In these ways CCF retains maximum compatibility with other standard formats while permitting local organizations not only to follow their own descriptive practices, but also to determine how complex a bibliographic description should be.

DATA ELEMENT RELATIONSHIPS

Computer bibliographic records typically consist of subfields and fields. CCF introduces the concept of record segments, which provide a solution for three kinds of problems.

One is the need to show relationships between fields in a record. Perhaps there are four listed authors who are affiliated with two institutions, or perhaps there are two publishers located in three cities. An organization wishing to list these separate elements needs to show which authors are associated with which affiliation, or which publisher with which city.

A second problem is the need to show relationships between groups of fields in a record. The creating agency may wish to describe both a host item, such as a conference proceedings, and one or more component parts, such as a number of contributions to the proceedings, in the same record. Often this is done to produce a printed product that shows tables of contents as well as indexes to them. Traditionally, unformatted lists of component parts have been "buried" in contents notes, where access for the purpose of creating indexes can be very difficult. What is needed is a way of showing which data elements in the record belong to the host, which to each of the component parts, and what relationships exist among these.

Or perhaps an agency wishes to record the various successive titles of a journal in a single record, with sufficient descriptive elements for a user to determine the bibliographic history of that item. Again, what is needed is a mechanism to show the relationships among the various data elements in the record, some of which will belong to each of the titles.

The third problem is the need to show relationships between records in a file. An agency may prefer to keep the host item and its component parts, or the successive titles of a serial, in separate records. This is commonly done in library catalogs, which include various syndetic features to point out relationships among individual entries. In the past most files of machine-readable bibliographic records lacked these features: CCF's record segments make them possible.

RECORD SEGMENTS

In a typical machine file, a number of bibliographic records will be hierarchical; that is, many records describe items at more than one bibliographic level. Figure 1 shows part of a record for a monograph as it would be coded in most files. The tags may or may not be familiar, but even without knowing their meaning, it is apparent that this record is concerned with three bibliographic levels: the majority of the elements describe a monograph; the name of the series, which is higher in the bibliographic hierarchy, and a group of component parts, lower in the hierarchy, also appear in the record. Note that only a single subfield exists for all of the various component parts that may be included.

The record shown in Figures 2 and 3 has normalized these elements into a "flat" record, placing each bibliographic item (the host monograph, each of its two component parts, and the parent series) in its own segment. In CCF, special fields and codes link these segments and show their relationship to one another. The mechanisms for accomplishing this are three: the segment indicator, which identifies the segment to which a field belongs; the fields, which denote intersegment links; and the codes, which specify the relationships.

Segment indicators are made possible by a change in the governing standard, ISO 2709. A new edition released in 1981 introduced the concept of an "implementation-defined part" of the record directory, which means that international standard exchange formats could expand beyond a "traditional" limit set when the first MARC format was designed at the Library of Congress in 1968.

Specifically, ISO 2709 now permits a record directory to show not only a field's tag, length, and starting character position but also up to nine characters of other information. CCF has added two more characters to the directory for each field: one is a repetition counter, so that it is possible to explicitly identify a given field even though its tag is used more than once in the record; such a counter is often added by online bibliographic systems. The second is an indicator showing to which segment the field belongs.

A comparison of the same record in two different formats, shown in figures 1, 2, and 3, points out the differences between the approach commonly used today and that of CCF.

In the CCF record shown in figures 2 and 3, the first digit after the tag is the repetition counter; a field appearing in a segment for the first time receives the counter 0 (zero), for the second time, 1, and so on. The second digit shown is the segment indicator. The segment containing the fields describing the "target" item—that is, the item whose bibliographic level appears in the record label—is said to be the "primary segment." It receives the indicator 0; any

Tag	Subfields of Data
245	$aEnergy conservation in heating, cooling, and ventilating buildings $cEditors C. J. Hoogendoorn and N. H. Afgan.
260	$aWashington :$bHemisphere Publishing,$c1978.
440	$aSeries in thermal and fluids engineering
505	$aGertis, K. Economically optimal heat protection in buildings—Motulevich, V. P. Heat transfer calculation in well-insulated houses—etc.
700	$aAfgan, N. H.
700	$aHoogendoorn, C. J.

In a typical bibliographic record each field is independent of the others. The tags for the two named editors are identical; distinguishing between them is left to the local system. The series title and the authors and titles of component parts appear in their own fields, which are subordinate to the description of the item shown in fields 245 and 260. For clarity, all field indicators and a number of fields have been omitted.

Fig. 1.

Tag	Repetition Counter	Segment Indicator	Subfields of Data
100	0	0	$aHoogendoorn, C. J.
100	1	0	$aAfgan, N. H.
100	0	1	$aGertis, K.
100	0	2	$aMotulevich, N. H.
245	0	0	$aEnergy conservation in heating, cooling, and ventiliating buildings $cEditors C. J. Hoogendoorn and N. H. Afgan.
245	0	1	$aEconomically optimal heat protection in buildings
245	0	2	$aHeat transfer calculation in well-insulated houses
245	0	3	$aSeries in thermal and fluids engineering
260	0	0	$aWashington :$bHemisphere Publishing,$c 1978.

In the CCF, tags are assigned according to the type of field. All personal names receive tag 100; all titles are 245. The segment indicator denotes to which segment of the record each field belongs. The monograph is segment 0; the component parts, which in a library catalog would appear in a contents note, appear in segments 1 and 2; the series is described in segment 3. For clarity, all field indicators and a number of fields have been omitted.

Fig. 2.

	Tag	Repetition Counter	Segment Indicator	Subfields of Data
Segment 0				
	100	0	0	$aHoogendoorn, C. J.
	100	1	0	$aAfgan, N. H.
	245	0	0	$aEnergy conservation in heating, cooling, and ventilating buildings $cEditors C. J. Hoogendoorn and N. H. Afgan.
	260	0	0	$aWashington :$bHemisphere Publishing,$c 1978.
Segment 1				
	100	0	1	$aGertis, K.
	245	0	1	$aEconomically optimal heat protection in buildings
Segment 2				
	100	0	2	$aMotulevich, N. H.
	245	0	2	$aHeat transfer calculation in well-insulated houses
Segment 3				
	245	0	3	$aSeries in thermal and fluids engineering

The information shown here is exactly the same as in figure 2, but the fields have been reorganized to show the segments more clearly. In a complete CCF record, every segment except the primary one (segment 0) would contain a linking field indicating its bibliographic level and its relationship to the primary segment.

Fig. 3.

other segments that may exist in the record are assigned higher numbers. Thus, in the example, the title of item (tag 245) appears in the primary segment (segment indicator 0), while the title of the series (also tag 245) appears in a separate segment (segment indicator 3).

Using this technique, a single field tag may be used to designate the same type of data regardless of which segment contains it. For example, all persons connected with the item(s) described in the record are assigned tag 100, even though some are associated with the primary item and some with component parts of the item. The series shown in the figures has two editors. According to current library cataloging rules, these names are not included as part of the bibliographic description of a monograph in the series. However, in a CCF record, the agency creating the record may, if its rules for description permit it, include these personal names as 100 fields in segment 3.

LINKING FIELDS

The second and third of the three mechanisms required to employ segments are special fields and codes that indicate a relationship between segments. CCF has several such fields; two will be used here as examples. Field 080 is named Segment Linking Field: General Vertical Relationship. This field occurs within a segment other than the primary one; this will be referred to here as the "current segment." Within this field there are three subfields: the first is the relationship code; the second is the indicator of the segment *to* which the current segment has a relationship (in most cases this will be the primary segment); and the third is the bibliographic level of the current segment.

Here is a typical example of a Field 080;

080 0 1 $a01$b0$ca

This example shows that the current segment describes a component part (code a in subfield $c), which is subordinate to the item described in the primary segment (code 0 in subfield $b). The nature of the relationship is denoted by the code found in subfield $a, in this case 01. For field 080 there are only two possible relationships: code 01 means that the current segment is lower in the hierarchy than the segment to which subfield $b points; code 02 means that it is higher.

Another major linking field is 085, Segment Linking Field: Horizontal or Chronological Relationship. This field is formatted exactly like field 080, but different codes exist. These are used to link earlier, later, and variant editions; former and subsequent serial titles; supplements and the items they supplement; translations and their originals; items issued with and the items with which they were issued; and so on. The following example indicates that the current segment (segment 3 according to its indicator) describes a monograph (code m in subfield $c), which is a translation (code 31 in subfield $a) of the item described in the primary segment (code 0 in subfield $b):

085 0 3 $a31$b0$cm

These same linking fields can be used to show relationships between records rather than within a record. In all standard formats, field 001 is used for the unique record identifier. In CCF, field 010 is used for record identifiers shown in secondary (i.e., other than the primary) segment. Thus it is possible to build a complete segment that looks like this:

085 0 1 $a12$b0$cm
010 0 1 $a2284259-86

These two fields constitute a segment that points to another record in the file whose number is 2284259-86. That record describes a monograph (code m in subfield $c of field 085) that is a later edition (code 12 in subfield $a) of the item described in the primary segment of the current record.

The final special linking field to be described here is field 086, Field to Field Linking, whose purpose is evident from its title. Its three subfields show the field linked from, the field linked to, and the relationship between these two fields. Two examples of this field follow:

086 0 0 $a21000$bTR$c20000
086 1 0 $a21010$bTR$c20000

In the first field 086 shown, subfield $a denotes that this is a link *from* field 210 (Parallel Title), repetition indicator 0 (the first field 210 in the segment), segment indicator 0 (the primary segment). Subfield $c shows that the field linked *to* is field 200 (Title), repetition indicator 0 (the first field 200 in the segment), segment 0 (the primary segment). The existing relationship (code TR in subfield $b) shows that the parallel title in 210 0 0 is a transliteration of the title in 200 0 0. The second repetition of field 086 shows that there is another parallel title (200 1 0 in subfield $a), which is also a transliteration of the title (200 0 0 in subfield $a).

Other relationship codes for this field are used to denote links between author(s) and affiliation(s), publisher(s) and place(s), ISBN(s) and publisher(s), a field and a version of it in another script, and so on.

These several techniques for recording relationships within and between bibliographic records in a file, together with the minimal-level records permitted by the format, make CCF quite different from other standard formats.

APPLICATIONS

The CCF was published in 1984 and virtually immediately began to have a discernable impact on newly emerging automated bibliographic systems. Most of these are currently under development, but a few are sufficiently stable to be worth reporting briefly here. Three applications have been chosen because each use of CCF differs markedly from the others'.

FORMEX is a system that adopted CCF soon after it was issued.[7] Used by the Office for Official Publications of the European Communities to record both the description and full text of publications in machine form, FORMEX uniquely combines two different formats. These are CCF and the standard generalised mark-up language (SGML), which is based on ISO 8879 (Text Preparation and Interchange—Processing and Mark-up Languages). The latter embeds, within the text, codes designed to be read by a parser that interprets the mark-up and introduces into the text the logical layout for typesetting and publication.

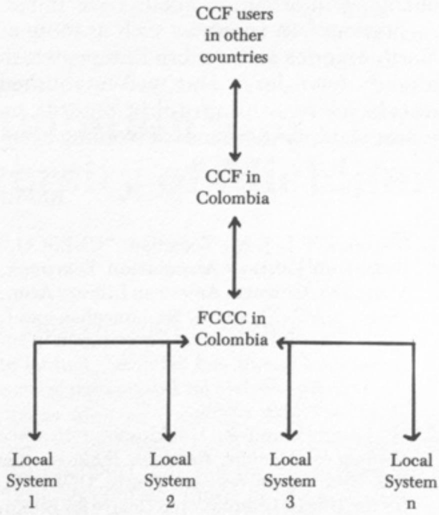
FORMEX makes use of CCF with only minimal changes. A few data elements have been omitted; a few have been combined (e.g., the several kinds of notes); and very few added. Also, limits have been placed on the kinds of relationships that may exist within records: all segment links must connect one secondary segment with the primary segment (no links may exist between secondary segments), and in every case the data elements appearing in a secondary segment are restricted to "pointer" information—that is, reference to another record that contains the description of the related item. FORMEX also introduces some new codes for use in data elements, and has proposed these for inclusion in the next edition of CCF. With these few exceptions, FORMEX incorporates CCF exactly as it was published.

A second use of the CCF is evident in the UNIBS format,[8] which serves as a manual for the United Nations Bibliographic Information System at the Dag Hammarskjold Library of the United Nations in New York. Prior to 1983 the library operated two separate bibliographic systems: one for United Nations documents and publications, the other for publications acquired from external sources. Now UNBIS, whose rules for description are based on AACR2, has replaced both of the former systems. Also, through the use of in-house computer programs, the files of bibliographic records in the two preexisting formats have been converted to the new CCF-based UNBIS, permitting integration of the two separate files for the first time.

UNBIS differs from CCF chiefly in one regard: the software used to process records is unable to handle either indicators or subfields. Since subfields cannot exist, each data element in UNBIS is a field, and other ways have been found to accommodate the information found in indicators. For example, where CCF has a field for the title, with an indicator showing whether it is as found on the item or modified, UNBIS has two separate fields, for title as on the item and modified title. Thus UNBIS does not copy CCF but retains compatibility with it; in this case, compatibility suggests the ability to convert from one to another without any human editing or interpretation.

A third CCF-related development is currently under way in Colombia, a country without a central bibliographic agency whose bibliographic resources are distributed widely among a large number of organizations in various urban centers. There COLCIENCIAS, a semiautonomous government agency, has taken on the task of creating and coordinating a cooperative national information system that will include the resources of the various existing documentation centers, libraries, archives, databases, and special information centers covering a broad spectrum of disciplines. These bibliographic organizations, being separately funded and responsible to various government agencies, choose their own computer hardware, typically (though not always) a microcomputer, and software, usually a commercially available product.

To facilitate the exchange—not only of information but also of machine-readable bibliographic records—among these agencies, COLCIENCIAS has designed a "switching format," based on CCF, to be called the Formato Común de Comunicación Bibliográfica para Colombia (FCCC). The plan currently under development proposes that two facilities will exist for the exchange of bibliographic records among heterogeneous systems: a mechanism, probably in the form of a commercial service bureau, which will convert physical records from one storage medium to another, and a pair of computer programs to convert records from each organization's in-house format to the FCCC and vice versa. These programs, which will be given to the local bibliographic agencies by COLCIENCIAS, will run on the individual agency's own hardware. Programs will also be written to convert records in both directions between FCCC and CCF, in order to provide an exchange link between the Colombian national information system and CCF users in other countries. A diagram of the system is shown in figure 4.



The proposed system for Colombia permits heterogeneous computer systems to interchange bibliographic records using FCCC as a switching format. FCCC is compatible with CCF, which will be used for international exchange.

Fig. 4.

Of the several CCF-based formats mentioned here, FCCC is least like CCF. In common with most national formats, it lacks the label-directory-fields structure dictated by ISO 2709 but retains sufficient information to be able to convert between its own structure and the standard. FCCC also lacks field indicators and all aspects of record segments, including the segment indicators and linking fields. It retains compatibility with CCF in two ways: first, by limiting the types of relationships that may exist in a single record, using a policy somewhat more liberal than the one imposed by the UNBIS format and second, by ensuring that all data required to create a full CCF record in ISO 2709 structure can either be generated automatically from the FCCC record or saved with an FCCC field or subfield.

The FCCC format marks the farthest that any format has thus far traveled away from CCF while still retaining compatibility with it. But the ambitious undertaking of permitting bibliographic interchange among a wide variety of heterogeneous computing systems demands a bold approach. The careful planning that has taken place at COLCIENCIAS—involving personnel from a number of organizations and including systems analysts, computer programming teams, information specialists, and experienced information system administrators—bodes well for the future of a microcomputer-based, distributed national information system that retains compatibility with bibliographic systems in many countries.

It would be rash indeed to conclude from the three examples of CCF use described above either that the concept of a single format employed as a switching mechanism between libraries and other bibliographic agencies is proved successful or that record segments are the best method of normalizing hierarchical bibliographic records. But these three projects do provide several different working environments in which CCF is now proving itself. It is apparent that a number of other countries are closely watching the Colombian developments, and UNESCO has acknowledged the necessity for establishing a mechanism for exchanging information about CCF implementations.[9] In countries such as those of North America and western Europe, which already have large and well-established databases of bibliographic records on whose stability thousands of working agencies rely, it is extremely difficult to introduce changes to record formats. The Common Communication Format, still in its youth, provides useful opportunities for observing the extent to which it is possible to carry out its goals successfully.

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Microcomputer Installation and Support at the University of Michigan Library

William C. Manspeaker, Rebecca M. Dunkle, and Selden S. Deemer

Everything is changing—the technologies, the players, the users, the concepts, and the applications.[1]

Implementing microcomputers is a task facing virtually all libraries, one that they share with other public and private organizations. Most libraries have already acquired at least one microcomputer: 81 percent of those responding to a 1984 ARL survey reported microcomputer applications in their libraries.[2] Hand in hand with the rapidly paced growth of hardware and software in general, library vendors are taking advantage of the numbers of these machines and their capabilities for developing new services (DATALYNX, BRS Colleague, Dialoglink) and products (INFOTRAC, Bibliofile). The promises of enhanced service, increased productivity, and reduced staff effort combine to make the acquisition of microcomputers a topic likely to arise whenever costs are discussed.

With these attractions, libraries that have acquired one microcomputer are now facing demands for more machines. This expansion can raise many issues—issues that could be resolved on an ad hoc basis for one or two machines become magnified, and there are new issues. Though often presented as stand-alone solutions to problems, microcomputers require money for purchase and operation, and staff time for learning. They have an overall effect on how a library conducts its business: costs in areas such as training, supplies, maintenance and repair, software upgrading, and staff support may not be anticipated. In a broader context, many of the issues facing libraries are also being faced in the corporate environment, and there is already a body of literature dealing with the introduction and management of microcomputers in the journals of both the data processing profession (*Datamation*, *Infosystems*, *Journal of Systems Management*) and those of businesses where microcomputers have become well established (insurance, banking, accounting, etc.) That libraries are also dealing with these issues is shown in a recently published ARL SPEC Kit;[3] librarians who are aware of some of the issues in "end-user computing" will be better prepared to manage this resource.[4]

This paper will discuss the planning and implementation efforts required to support installation of approximately eighty microcomputers distributed for staff use in the University of Michigan Library System as well as some of the initial and ongoing issues that continue to be a part of that process. The integration into library operations and, in particular, the benefits of electronic messaging and conferencing are among the results reported.

PLANNING

In general, there is very little planning for the purchase or implementation of microcomputers in [these] libraries.[5]

William C. Manspeaker is computer systems consultant, and Rebecca M. Dunkle is systems librarian/analyst at the University of Michigan, Ann Arbor; Selden S. Deemer, library systems manager, Emory University, Atlanta, was formerly systems librarian, University of Michigan, Ann Arbor.

The University of Michigan Library, like many others, already had a few microcomputers for staff use when it began seriously investigating possibilities for more widespread use in late 1983. Two key issues arose early, according to an analysis prepared by one of the authors:

1. whether personal computers will be acquired on an individual, site-by-site basis or as part of a planned process with some central guidance and
2. what the relationship between these microcomputers and the bibliographic records of the library would be.[6]

Allowing site-by-site acquisition could result in the purchase of many different kinds of machines, potentially using different operating systems and incompatible applications software—each requiring its own supplies and training—and, very importantly, complicating transfer of data among the various systems and the units that used them.

With respect to bibliographic data processing applications, Michigan already used an automated cataloging system (RLIN); circulation system (Geac); and acquisitions system (Innovacq). How would microcomputers interact with these systems? Would bibliographic records potentially be changed locally rather than through the automated system, or would there be attempts to automate functions already available on the larger systems? As these questions were discussed, the issue that emerged was whether the library would acquire microcomputers as "personal productivity" tools or as support for specific library functions. This distinction had important implications in a number of areas, including selection, distribution, training, and policy.

The library decided to purchase microcomputers as personal productivity aids for its staff and to support a single hardware and software configuration. This "standard" configuration (including a printer, modem, and access to a phone line plus software to support word processing, spreadsheets, and telecommunications) would be distributed to each unit. Standardization offered the library a number of advantages, which are among those reported in the corporate literature:

- Machines would be able to share files easily, allowing data and applications to be used throughout the system
- Provision of supplies, maintenance, and repair would be simplified
- A unified training approach could be used.[7]

The microcomputer systems were purposely delivered without a programming language: librarians would not be expected to acquire programming skills in order to perform useful work with their machines. Decisions about hardware and software to be used in all libraries were based on recommendations made by staff in the library's Systems Office.

With these guidelines established, the process of identifying a microcomputer that would meet the libraries' needs began. As a personal productivity tool, it should have the potential for running a variety of software products and working with a variety of hardware products. Additionally, the system should be well established in the marketplace and/or support the de facto marketplace standards, as hardware and software vendors will not develop products for an unlimited variety of microcomputers. Technical superiority, while important, would be a secondary consideration to current and predicted support for a particular system within the library and business marketplace.

The library also examined its campus computing environment for the kinds of supported machines, the arrangements for educational purchase, and the criteria for using the campus mainframe computer system. Together these factors identified the IBM personal computer's architecture as the one that would be supported—it has become the de facto standard in both the business and library communities. The specific machine chosen was the Z-150 personal computer from Zenith Data systems, which is extremely compatible with the IBM PC and came "standard" with 320K memory and the ability to display both text and graphics. It was both officially supported and widely used on campus.

Following the basic microcomputer selection, the search began for software. A fundamental issue here was whether to buy and support word processing, spreadsheet and telecommunications packages from different vendors or to purchase an integrated software package that would combine these functions in one consistent working environment.[8] Separate packages run the gamut from very low-cost, basic, and easily learned, to sophisticated, expensive, and difficult to master. The primary advantages of an integrated package are the ability to transfer data among different modules (e.g., spreadsheet figures to a word processing document) while using a similar command structure across different applications. As with hardware, software products that are standards or support the standards are likely to have a longer life, as seen in the aftermarket of experienced users (consultants), enhancement programs, and training and application materials for products such as dBASE II and III, WordStar, and Lotus 1-2-3.

In this area the library took a risk by becoming one of the first organizations to buy sizable quantities of a new integrated package, Enable, developed and marketed by the Software Group. Providing word processing, spreadsheet, database management, graphics, and telecommunications in one package, it would also work with 192K of memory, well within the 320K standard memory that was available in the Zeniths. In addition, Enable could work with files created under many of the older, more established programs—including WordStar, Lotus 1-2-3, and dBASE II. The University of Michigan Library's Systems Office was included in prerelease testing of Enable. The promise of the software, a low introductory price, and expectations of a good working relationship with the company were other factors that contributed to the selection. This initial promise was confirmed in the ratings later given the product in national software reviews,[9] as well as in favorable staff acceptance.

The selection process for modems and printers was similar to that described above, with the additional constraints of compatibility with equipment already selected. The basic type of printer to be supported would use dot matrix and not formed character technology. There were several reasons for this decision:

- The technology is relatively cheap, fast, and reliable.
- Dot matrix printing offers greater flexibility of typography; with appropriate software control, the printed results can approach those of a formed character printer.
- Under software control, a dot matrix printer can generate graphics that are impossible to produce on a formed character printer.

The C.Itoh 8510BPI printer was selected for purchase. By including an IBM Graphics Printer emulation, the C.Itoh printer could be used successfully with a wide variety of programs.

Hayes Smartmodems were purchased for each machine, since many programs are designed to work with the Hayes standard. Each machine was equipped with an internal modem rather than an external model for the following reasons:

- A price differential of approximately $100 per modem
- Bundled communications software (Smartcom II) at no extra cost
- Simplified installation, maintenance, and operation
- Greater physical security.

INSTALLATION STRATEGIES

Considering the large number of machines to be installed throughout the library (eighty machines in more than fifty different library units), a systematic installation plan was important. This plan had several components:

1. Site preparation before installation

A site audit was made in each unit prior to installation to assist staff in determining the exact placement of the hardware, assure that there would be sufficient electrical outlets, a phone line within reach, etc. A cardboard mock-up of the computer and printer was useful, as staff could visualize the amount of space required for the equipment and plan adequate and comfortable working space. The mock-up made it easy to present some of the ergonomic issues, such as the height of the monitor relative to the operator, and allowed for several possible solutions to be tested. The site audit also began to raise questions from staff and stimulate interest in the machines that would soon be arriving.

2. Equipment diagnostics

As the equipment was received, Systems Office staff ran diagnostics on each microcomputer to be sure it was in full working order. Since it is normal with an order of this size that a percentage of the equipment would be nonfunctional as received, this step assured that nonworking equipment was not delivered to individual library units, and that major hardware problems were identified within the ninety-day warranty period. A lengthy running of diagnostic tests, generally twenty-four hours straight, gave a very high probability that machines passing would provide reliable service. The printers were also tested, and the internal modems installed and tested in each machine. Defective equipment was returned, and all fully tested systems were re-packed for delivery to library units.

3. Delivery and installation

Following the site audit, units received an order of basic microcomputer supplies—two boxes of diskettes, one of paper, and one of printer ribbons—so that they could be prepared to use the machine when it was installed. Machines were delivered to individual units by the library's mail service according to a published schedule, just prior to the microsupport specialist's appointment with that unit. At this second meeting, the machine was physically installed and tested again, and designated staff in the unit were provided with a brief orientation to the hardware and software. The orientation included verbal and written information describing the equipment and software delivered, and basic instructions for booting the system and loading the software. The orientation also introduced basic DOS commands in a sequence that produced back-up copies of the software that units would use in their daily work. Staff were encouraged to use the disk-based Enable tutorials if they wished, with an understanding that more complete instructions would be available through the staff training program.

STAFF TRAINING PROGRAM

One of the most important components in the introduction of broad-scale automated systems or equipment into libraries is an effective training plan. This point can not be overlooked as libraries acquire microcomputers for use by staff, who often have little or no previous exposure to these machines. Whether they are introduced systemwide with a large initial investment, or creep into the organization incrementally, the value of microcomputers to the library depends on how well staff are trained to use them. The need for an effective training plan becomes all the more apparent when one realizes that one of the largest and often overlooked costs is training. "While user experiences differ, it is clear that the largest and most universal hidden cost associated with owning and operating personal computers is training."[10]

An organization can approach training in a variety of ways, including:

- providing each staff member with the software and hardware manuals, i.e., encouraging a do-it-yourself approach;
- purchasing materials from the growing market of computer-based, audiovisual, or other specially written instructional material;
- sending staff to formal training sessions provided by vendors or other outside firms;
- hiring professional consultants/trainers to conduct on-site workshops;
- conducting in-house training sessions, using existing staff and local resources.

The library decided that in-house training sessions for staff would be the most effective approach, considering the number of systems and people who would be using them. A training program was developed under the direction of the library's Systems Office, with staff from a variety of library units serving as primary trainers. During the initial training phase from January through April 1985, twenty-eight in-house training sessions were conducted, providing an opportunity for several hundred staff members to participate.

TRAINING OBJECTIVES

The training workshops were designed to provide staff with a general introduction to the use of microcomputers in the workplace, with emphasis on the basic skills needed to use the Zeniths and the Enable and Smartcom software that were included with each system. These workshops focused on the (initial) expected uses for the machines, with no references to programming languages; the goal of the training program was not to turn library staff into programmers or hardware experts, but rather to pass on enough basic knowledge and skills for people to use their new tools effectively. Anticipating some staff members' fears (voiced or unvoiced) about using computers, the greatest possible emphasis was placed on making the learning experience positive.

The program included four separate units:

Session 1—Introduction: To provide a general familiarity with microcomputers and basic operations of the MS-DOS operating system.

Session 2—Word Processing: To introduce users to the Enable software Word Processing component, including creating, editing, and printing simple documents.

Session 3—Spreadsheets: To provide an overview of electronic spreadsheets in general and their potential uses, with particular emphasis on the use of Enable's spreadsheet component in a library context.

Session 4—Telecommunications: To introduce electronic communication with microcomputers and modems, use of Smartcom software, and the electronic mail and conferencing possibilities available through the university's large computer system.

TRAINING SESSIONS: TRAINERS AND STRUCTURE

Trainers

Eight library staff members (from the Systems Office and several other library units) served as primary trainers. Trainers were selected in some cases because of previous experience with microcomputers—either on or off the job—or because of training expertise in other areas, not necessarily related to computers. None of the trainers had extensive previous experience with either the Zenith hardware or Enable software. The library also invited an instructor from the university's Microcomputer Education Center to serve as a primary trainer in the Introduction session.

In addition to cost advantages in using library staff as trainers, with the flexibility to mount a large training effort using existing resources, there were other advantages perceived by the library: (1) Trainers were more likely to be familiar with the participants and their jobs in the library than outside consultants, and sessions could be tailored accordingly. (2) The fact that trainers were known to them and from a variety of library units (not all microcomputer "experts") provided a degree of confidence to the trainees, particularly if they had no previous microcomputer experience. (3) A network of trainers within the library could provide continued staff support in the future.

In order to prepare for the sessions, each trainer was given the opportunity for personal use of a microcomputer at home or at work for several weeks. During the initial planning stages for the workshops, and continuing throughout the training, trainers met once or twice a week to design the documentation, prepare the lectures and related exercises, and critique previous sessions for both content and organization.

Structure

Each session followed the same basic structure: a two-hour lecture and demonstration, followed by a choice of two one-hour hands-on sessions. Each lecture was prepared and presented by a team of two trainers: one provided the verbal descriptions and explanations, while the other ran a microcomputer connected to a projection monitor, so that all participants could view the examples as they were presented and discussed. The team approach allowed the lecturer to maintain close contact with the audience, and not be distracted by operation of the equipment. Students at each session were provided with instructional handouts related to the topic for that workshop, providing an outline of the points covered in the lecture, and detailed instructions for exercises in the hands-on session. These exercises could be used later by students for practice on a micro in their own library unit. For some sessions, a glossary of terms was also included.

Immediately following the lecture demonstration, the hands-on sessions provided a one-to-two ratio between instructors and students at each machine. Pedagogically, this arrangement allowed students to convert the learning by listening and watching in the lecture demonstration into learning by doing. All trainers attended at least one of the lecture portions of each unit and participated in most of the hands-on sessions.

Initial sessions took place in a training laboratory set up in the library, using Zenith computers that were scheduled to be installed at a later date.[11] Midway through the training program, the Microcomputer Center in the Undergraduate Library became available, and all subsequent sessions were held there. (The center provides seventy-five Zenith and Macintosh microcomputers for student and faculty use, either connected to the university's computing network or as stand-alone units.)

Each of the four workshop units (Intro, WP, SS, and Telecom) was scheduled seven times, a total of twenty-eight sessions, with up to 20 staff attending each session. Overall 560 staff trainee slots were provided, with the opportunity for staff to attend any or all of the four units; approximately 200 individual staff members attended one or more workshops.

Overall Evaluation of the Training Program

The effectiveness of any training program can be measured by a combination of factors including participant reaction, trainee learning and transfer of skills to the job, increased productivity and improved job performance.[12] While the effort to mount such a training program was considerable, the overall results seem to indicate that it was time well spent. Staff members attending the workshops were asked to complete an evaluation form after each session. The results of the evaluation, based on 386 questionnaires completed, are as follows:

To what degree were you satisfied with this session?

(very satisfied)			(dissatisfied)	
1	2	3	4	5
60%	30%	8%	2%	0

Participants were also asked to rate each session (see table 1).

The positive reaction of the trainees is one indication of the program's success. This first round of training was broadly based, not designed for any particular library department, job family, or specific application, with overall microcomputer literacy and the ability to use microcomputers as personal productivity tools in the workplace as the primary objectives. Informal interviews and observation indicate that these objectives were fully met, as staff at all levels have begun using the machines effectively for a wide variety of job tasks.

A second round of training has begun, which offers more advanced skills in the software components and which begins to address specific applications directly related to job tasks and improved methods for performing them. In these latter sessions the issue of improved productivity will be an important measure of training evaluation.

CURRENT USE OF THE MICROS—ELECTRONIC COMMUNICATION OF SPECIAL BENEFIT

Alan Mazursky notes that "microcomputers have become ubiquitous in the business world, enabling many people to improve the methods they use to perform their jobs."[13] The University of Michigan Library's staff, at almost all levels and in every unit of the system, have been able to utilize microcomputers for enhancing productivity and reducing repetitive tasks. Communication with other units, and in some cases with primary clientele, has improved. Most units now use word processing software for all routine correspondence; subject bibliographies for patron use, job training materials, and library committee reports are among the many other documents that are now more easily produced with the microcomputer software.

Units that produce regular statistical reports or budgets for staff or material resources have found that spreadsheets can simplify their work. Taking advantage of the spreadsheet and graphics capabilities of the software has allowed them to produce reports in a more timely and efficient manner, using information that was previously difficult or prohibitively time-consuming

Table 1.

	Excellent/ Strongly Agree 1	2	3	4	Poor/Strongly Disagree 5
Organization and presentation of content	57%	33%	8%	2%	0
Clarity and thoroughness of material	54%	36%	8%	2%	0
Instructor(s) explained clearly and was easy to understand	72%	21%	5%	2%	0
Instructor(s) appeared to know the subject matter well	76%	19%	4%	1%	0
Instructor(s) made me feel comfortable to participate and ask questions	80%	16%	4%	0	0

to obtain. Some units have been exploring the DBMS function to create mailing lists and specialized databases, such as unit equipment inventories and staff development program data.

TELECOMMUNICATIONS

When the microcomputers were first acquired, Richard Dougherty, library director, stated that "Communication capabilities with the micros should help tie together a geographically distributed staff." In addition, Dougherty felt that "opportunities for School of Library Science faculty participation in electronic Library conferences should help the Library and Library School to bridge gradually the gap between theory and practice."

With the telecommunications capability now in place, the director's expectations have begun to be met. Use of the communications software and modems to access the university campus network and main computer system has improved communication, improved service, and enhanced job tasks in several ways. Staff use two primary methods for electronic communication:

- a personal message system, which allows messages and memoranda to be passed privately from one person to individuals and groups and
- online "conferences," which provide an open forum for discussion of issues by members of both the library and campus communities.

The Messagesystem

By dialing in through the campus network UMnet, staff are able to sign on to the host computer and send private messages to any member of the library staff. This is particularly useful for eliminating "telephone tag," since the message is sent immediately, to be retrieved by the recipient the next time he or she accesses the system. Since estimates have shown that only about one-third of all business calls are successfully completed with the first call,[14] considerable staff time is saved using electronic messaging in this way. With nineteen separate libraries spread over a geographic area of several miles, and individual departments widely separated even within the same building, the Messagesystem also provides a means to get information quickly to a variety of units, without experiencing the delays of campus mail delivery.

Committee work is enhanced by using the Messagesystem; only one message, sent simultaneously to all members of a committee, need be generated to set up meetings, announce agendas, or provide preliminary information for meeting discussion.

Messages can be sent to individuals by personal name; to departments such as "graduate library circulation services," or to "groups" that the user has personally established. Library staff also communicate with faculty and other campus departments, and by accessing several national communications networks, with colleagues in other areas of the country.

The Library Conference

The University of Michigan computer system utilizes CONFER software, which was privately developed on the university system by Robert Parnes.[15] CONFER supports on-line, interactive "conferences," which provide many of the features inherent in personal message systems, and permits interactive group communication. (A more extensive description of computer conferencing may be found in the December 1985 issue of *Byte, the Small Systems Journal.*)

Participants in a conference can enter items (brief announcements, "articles" describing a topic of interest to the members, or requests for information) and can respond to any item by providing requested information, asking for clarification, or sharing related information. The original item and its responses remain intact on the conference, and with many participants able to respond almost simultaneously, or over an extended period of time, effective and prolonged discussion can take place.

Library staff contribute to many of the public conferences on campus, e.g., the CRLT:MICROS conference, which focuses on topics relating to microcomputers and their uses. The library has also established a private conference for staff and faculty of the University Library System, the several independent libraries on campus, and the Graduate School of Library Science. The library conference allows dissemination of information to a large staff quickly, and encourages discussion and shared information among a somewhat diverse (and geographically separate) group of people. Discussion items range from the practical (a request for surplus shelving or for an ALA group travel rate) to the theoretical (a discussion of the possible demise of libraries). Sample conference items are listed in the appendix.

A primary advantage of the conference is the potential to reach a previously unidentified audience. With a library staff of approximately four hundred FTE, it is not always possible to know who might have the answer to a query, or who may have an interest in or a "need to know" about a particular issue. For example, the library's coordinator for online search services routinely uses the conference to announce training workshops and new databases available; the operations manager for the library's automated circulation system announces changes to online availability during holidays; an item on collaborative reference provides an opportunity for librarians throughout the system to share ideas and advice about various reference issues. In this manner information can reach all library staff and is not limited only to those known to the sender.

The use of electronic messaging or computer conferencing is not, as pointed out by Michael Waggoner, director of professional development at the University of Michigan School of Education, "intended to replace constructive use of the telephone or face-to-face meetings. Rather it is intended to supplement these other media as a means of increasing individual and group productivity."[16]

Increased Access to Remote Sources and Improved User Services

The university library had a number of in-house terminals to provide access to a variety of computer systems, including dumb terminals at reference desks for online database services and dedicated terminals to access RLIN or the library's in-house circulation and acquisition systems. After the installation of the microcomputers, individuals or smaller units that previously had limited or no access can now provide enhanced services to their patrons quickly by dialing-in to RLIN and the library's circulation and acquisitions systems; reference units' database search services are enhanced with the use of the microcomputer and software instead of dumb terminals, since searches can be downloaded, edited, and transmitted electronically to clients.

ONGOING ISSUES OF MICROCOMPUTER SUPPORT

Every user must make a significant investment in the computing process after the initial purchase. . . . It isn't simply a matter of buying a boxful of computer.[17]

Acquisition, installation, and training are not the only issues that must be considered when implementing microcomputers. Questions about the hardware and software will come up every day, repairs will be needed, new staff will be hired, and users will want to know more. New products will be introduced and current products will be discontinued and upgraded by the vendors. Answers to these questions may differ among libraries, but the questions themselves are bound to arise.

A model that has been widely implemented in corporations dealing with the advent of microcomputers is the information center. A concept developed by IBM in the late 1970s "to help nontechnical staff use computer technology to better perform their jobs," an information center is a place that "offers some combination of hardware, software and services that deliver information and information processes to [its] users."[18] While the services differ among corporations, most information centers have supported hardware and software for users to try, provide maintenance and repair, and offer training. The corporate literature covers a number of support issues under the headings "end-user computing" and "information centers"; while libraries' decisions on support will reflect their local environment, the model of the information center and the discussion of issues it is intended to solve can be helpful.

At Michigan, decisions made during the planning stages shaped the library's commitment to continuing resources. A major decision during this time was that the Systems Office should be responsible for continuing microcomputer support. For this purpose, an additional staff member was added, responsible for the initial site audits, machine diagnostics and delivery, and involved with the training effort. In a continuing capacity, this position would handle continuing hardware and software questions, provide a preliminary diagnostic and basic repair service, and provide administrative support in the area of equipment inventory, location, and service. With the emphasis on providing personal productivity tools and not demanding hardware and software expertise, the advantages of centralized support included:

- Hardware and software questions beyond the expertise of local staff can be answered.
- A preliminary diagnostic and basic repair capability can reduce the number of machines sent for service and, by eliminating some diagnoses, reduce maintenance vendors' time and charges.
- A resource is available for investigating and responding to questions regarding acquisition of new hardware and software.
- Planning, delivery, and support of additional training can be continued.

Just as with installation and delivery, the number of machines and people involved mean a systematic plan for providing support needs to be developed. How much and what kind of support should be provided through this means and how much should be the responsibility of the users? With the library's emphasis on personal productivity, much of the responsibility for day-to-day use falls on the users. This covers tasks such as ensuring that food and drinks are kept away from the machine, that diskettes are handled carefully, and that back-up copies are made of those diskettes containing their files. Users are also responsible for ordering the unit's microcomputer supplies when those originally delivered are exhausted.

To handle questions, announced call-in hours are available for providing immediate answers; questions can also be submitted by writing or phone, and many are submitted by electronic mail, providing a written description of the problem. Site visits for repair are also scheduled regularly; a well-made, basic tool kit covers most situations. Items requiring further work can either be sent directly for repair or returned through the library's mail service for continuing work in-house. Requests for new hardware and software packages, before their final approval at the administrative level, are routed to the microcomputer specialist for advice on how these products fit into the current hardware and software environment and to make sure there is sufficient detail about products to be specifically described to the vendor.

Another effect of the decision to provide microcomputers as personal productivity machines is that the decision for new local applications can be made at a local level, requiring only the unit manager's willingness to commit resources. The microcomputer support specialist in the Systems Office is available for consultation regarding the capabilities of the product and suggestions concerning design but does not get involved in applications work; the ratio of support staff (one) to microcomputers (eighty) does not allow for the time-consuming work of developing and supporting new applications. There is also consultation available for suggesting new hardware that might be needed to support the application. Broader applications determined by administration can be developed, but there is a limit on the number of these that can be maintained along with normal support tasks. Promising new products, such as CD-ROMS, are also being investigated as the library community is finding more and more microcomputer technology with application in the library.

THE FUTURE

As quoted at the beginning of this paper, everything keeps changing. In the microcomputer marketplace, enhancements to existing products are announced weekly, such as features that provide more storage, memory, or computing power. While IBM and Apple are still the most influential microcomputer designs, instead of a manufacturer shakeout, more companies, many from Asia, are producing machines and producing them cheaply. In software, the emergence of the phrase "artificial intelligence" suggests an emphasis on making packages easier to learn or more flexible to use. It may always be easier to wait for the next product rather than buy now, but this marketplace won't settle down for a number of years, and there are benefits to be gained now. For libraries, the products mentioned in the opening paragraph, INFOTRAC and DATALYNX, are being joined by digital disks containing millions of records and software that permits Boolean searching on large sets of reference material stored on disk. On a larger scope, national bibliographic utilities are providing more kinds of services, including links with local automated systems. The "scholar's workstation" with local software tied into local and national databanks is the goal seen by many involved in designing and implementing integrated library systems.

This emphasis on technology brings up additional issues for the future. As the library, long the information center, expands into technology, it begins to meet the traditional technology centers headed the other way. With the increasing sophistication of new library users, access to information through tools and techniques more familiar to computing personnel challenges the profession to find its role in this new environment. The University of Michigan Library's experience in implementing microcomputers shows that the challenge can be met.

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1. Alan D. Mazursky, "On Managing Change," *Journal of Information Systems Management* 2, no.1:67 (Winter 1985).
2. Diane R. Tebbetts and Ching-chih Chen, "Microcomputers and Integrated Library Systems in New England ARL Libraries," in *Microcomputers for Information Management* 2, no.3:137 (Sept. 1985).
3. Association of Research Libraries, Office of Management Studies, "Microcomputer Software Policies in ARL Libraries," SPEC Kit 123, 1986.
4. In the context of this discussion, a microcomputer is a self-contained system that serves only one user at a time. Specifically, such a computer system includes a processing unit with a microprocessor, electronic memory (RAM), and one or more mass storage devices (usually a disk drive), a keyboard, and a display. Such a system is capable of both processing and storing data without being connected to any other computer. Links with other systems may be established, if necessary, through telephone lines or direct connection, to form a local area network (LAN). The IBM PC and Apple personal computers are representative of this type of system.
5. Tebbetts and Chen, p.138.
6. Selden S. Deemer, "Personal Computers in the University of Michigan Libraries," University of Michigan Library internal discussion paper, Nov. 1983.
7. Laurie Flynn, "Dealing with Software Standards," *InfoWorld* 8, no.31:31–32 (Aug. 4, 1986).
8. The integrating packages currently on the market (e.g., Topview), which allow users to work comfortably with several different software programs simultaneously, were not widely available and/or required more memory than the library microcomputer configuration.
9. "Integrated Productivity Programs," *Software Digest Ratings Newsletter* 1:10 (Dec. 1984); Diane Burns and S. Venit, "Enable

Does It Right," *PC Magazine* 4:4 (Feb. 19, 1985); Keith Thompson, "Enable Could Give the Big Boys Some Competition," *InfoWorld* 7:3 (Jan. 21, 1985).

10. "Cutting through the Hidden Costs of Computing," *Personal Computing* 8:98–99 (Oct. 1984).
11. The staff training program and unit-by-unit microcomputer installations in the library were carried on simultaneously. Individual sessions of the various training units (Intro, WP, SS, and Telecom) were scheduled in varying weeks (e.g., an Intro session was scheduled each week and a WP, Telecom, or SS section the same week). This enabled staff to attend a sequence of training programs beginning around the same time that their micro was actually installed.
12. Additional information about computer training programs and their evaluation may be found in the following articles: Ralph F. Catalanello and David L. Kirkpatrick, "Evaluating Training Programs: The State of the Art," *Training and Development Journal* 22:2–9 (May 1968); Marybeth Hanley, "Technical Know-how vs. Teaching Skills—Training's Sticky Issue," *Data Management* 24:14 (May 1986); Richard W. Hollman and Belva J. Cooley, "Overcoming Managerial Fears of Computers through Planned Training," *Personnel Administrator* 29:25–32 (Oct. 1984); Naomi Karten, "End User Demand Requires New Approach to Training," *Data Management* 24:10 (May 1986); Dan McElwreath, "Computer Literacy Training," *Personnel Administrator* 29:37–39 (Oct. 1984).
13. Mazursky, p.67.
14. Thomas B. Cross, "Electronic Mail vs. Phone and Post," *Today's Office* 20:40 (Jan. 1986).
15. CONFER and Confer II: copyright and trademark by Advertel Communications Systems, Inc., Ann Arbor, Mich.
16. Michael Waggoner, "CONFER, an Electronic Conferencing System," *Media Spectrum* 00:21 (Mar. 1985).
17. "Cutting through the Hidden Costs of Computing," p.98.
18. Alice LaPlant, "The Rise and Development of the Information Center," *InfoWorld* 8, no.35:27–28 (Sept. 1, 1986). ■■

APPENDIX A. EXAMPLES OF ITEMS FROM THE CONFERENCE LIBRARY

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Item 178  13:21 Feb05/86
Rebecca Dunkle
CRLT WORKSHOP ON COMPUTER-BASED TRAINING

I received a memorandum from Center for Research on Learning and
Teaching about a "more advanced workshop for those interested in
actually developing their own computer-based tutorials or
simulations." (on IBM/compatibles and Apple IIe.) The information
isn't directly useful to me, but if anyone who does training, BI,
whatever, is interested, I'll pass it on to you.

4 responses

Feb06/86 11:03
178:1) Jane Smith: I'd like to see this; please send a copy to me
care of the School of Library Science.
- - - - -
Feb06/86 16:32
178:2) Roger Leslie:  Rebecca, is the workshop scheduled for the
near future? We're planning some computer-based tutorials for
student assistants in our dept., but are still in the discussion
stage and aren't quite ready for a training session.
- - - - -
Feb07/86 08:15
178:3) Rebecca Dunkle: Roger, there's also a questionnaire included
asking about interest in the workshop in future semesters. I've
sent you and Jane each a copy of the info. Anyone else interested
can contact the CRLT Workshop Coordinator, at 5-2174.
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Mar02/86 09:31
178:4) Ruth Little: Thanks for the information about this workshop. Two people from our Reference Dept. attended the sessions last week; the program was very useful, and we are now developing a tutorial (which we'll use as part of our BI program) which introduces new users to our Special Collections. We plan to demo this for interested library staff on Mar. 15; we'll run it continuously, on the hour, beginning at 10:00 AM -- stop by the Reference Desk if you're interested.

Item 192 11:31 Feb10/86
Linda Schmidt
PATRON USE STUDIES -- BACKGROUND INFORMATION REQUESTED

I am an intern in the Political Science Library. One of my assignments is to evaluate several user services offered by the library, so decisions can be made regarding their expansion (or, in some cases, possible elimination.) I expect to use a variety of methods for the evaluation (e.g. available statistics, patron questionnaires.) Does anyone have copies of similar studies done in the past they would be willing to share, to help give me some ideas and background information?

Feb10/86 14:03
192:1) Janet Long: The Undergraduate Library recently did a survey on the use of public terminals in our library, based on user questionnaires made available at the terminals, and staff interviews of patrons. I have sent you a copy of the survey results and sample questionnaire.

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Feb11/86 08:15
192:2) Ruth Little: Last year several libraries were involved in a study of collection use, which included exit interviews as part of the methodology. Our Reference department has a copy of that study; you may also want to contact Tom Simmons, who coordinated the study, for additional details.

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Feb11/86 17:20
192:3) James Carter: The Library Science Library has archival copies of most library studies and major reports.

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Feb13/86 10:42
192:4) Linda Schmidt: Thanks to everyone for the suggestions; I did stop by Library Science to look at the reports, and was also directed to some good articles in the literature which will give me additional help.

Special Section: Technology at the Library of Congress

Editor's note: The LC/LITA Institute, held in Washington May 5–7, 1986, provided those in attendance an overview of how the Library of Congress is applying new technology in its programs and services. Following are a summary and four papers based upon presentations delivered there. The editor would like to thank Michael Gorman, convener and moderator of this important institute.

Technology at the Library of Congress: A Summary of the Proceedings of the LC/LITA Institute

Karen A. Schmidt

In the first overview in ten years of automation activities in progress at the Library of Congress, the LITA/LC Institute gave attendees a detailed and informative look at LC's efforts to automate its many processes and products. Held May 5–7, 1986, in Pentagon City and at the library, "Technology at the Library of Congress" provided an array of presentations and was a unique opportunity to view the burgeoning programs that will affect so much of the future of libraries in the United States. What follows are synopses of the presentations. Papers based upon four of these presentations are published elsewhere in this issue of *ITAL*.

TECHNOLOGY OVERVIEW

Giving both an overview of LC technology programs and a historical perspective to the institute was Henriette Avram, assistant librarian of Congress for Processing Services. The first review of LC's efforts—held in 1976 and sponsored by LITA's precursor, ISAD—looked only at the processing section's work. Avram pointed out that many automation and technology strides have been made in other areas of the library; these include the diethyl zinc project and the optical and videodisk programs for preservation. MARC format development continues to command attention at LC, as it did in the past, and has become much more highly integrated with other functions in the library. MARC formats have been developed for serials, maps, films, manuscripts, music and sound recordings, visual materials, and computer files, thus ensuring that bibliographic integrity exists for both internal and external data exchange and control. The manual catalog was closed in 1980, and the online version is now comprehensive enough to serve as the official catalog. Offshoots of LC's cataloging work, through its products and services, have grown more extensive and, through automation, more accessible. Cooperative cataloging, Avram pointed out, continues to be a major focus of activity that includes such sophisticated technological work as the Linked Systems Project (LSP), which connects OCLC, RLG, WLN, and other network databases, and the Name Authority Project (NACO), which forms the authority basis for LSP's operation.

The fiscal worries at LC have meant serious scrutiny of all these projects, with resultant cutbacks in positions as well as diminished contractual support for development.

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The development of state-of-the-art technology has been seriously impeded by financial cuts, to the point where strategic planning is also curtailed. Strategic planning continues, however, as a management device for answering such fundamental questions as what products and services can and should be provided and to whom; what are the needs of the units involved, and how might these needs change in the future; and what new developments, products, and services should be offered? Strategic planning has given the Processing Services section a mission statement that acknowledges the importance of acquiring, organizing, and facilitating access to library materials and service for Congress, the library, and the information community at large. All major components of the section have been involved in a five-year coordinated plan for identifying specifications for databases and determining how each will be implemented. This process signifies that automated activities within LC will be coordinated with one another and with the systems, manual or automated, which each replaces. Despite fiscal restraints, Avram said, the library continues to approach its basic commitments to local, national, and international constituencies as a priority and will continue to work on the technological developments that make this mission possible.

Herbert Becker, associate librarian for Management Services, gave an overview of the Automated Systems Office (ASO), the duties of which are responsibility for all of LC's computer hardware and software, telecommunications, and technical standards. In addition, ASO supports payroll and administrative functions for other government bodies. With some one hundred permanent positions, its staff is divided into six divisions: computer center, systems programming, user and production scheduling, engineering and planning, systems assurance, and systems development.

Becker outlined some of the major projects that ASO has in hand (details of most of these are given later in this summary). It has been involved in the name authority system for LSP, now completed, and in the task of adding an OCLC search to LSP. It is also currently engaged in introducing an LC acquisition system, planning for a serials control system, reviewing the copyright registration system (COINS) for improvement and development, and working on the Congressional Research Service's Inquiry Status and Information System (ISIS), which tracks the state of congressional inquiries—currently running at about four hundred thousand a year. ASO has developed the technology for the Optical Disk Project and for the now operational book-paging system and is working on a circulation system, the first phase of which is scheduled to be in operation later this year. It is also working on improved telecommunications for LC's two major systems, SCORPIO and MUMS, specifying improved hardware for the LC buildings.

Becker said that the constraints on ASO's work were (1) the huge size of computer files of all kinds and their great rate of increase, (2) the eager appetite for new systems and features, (3) the hitherto fragmented approach to automation at LC, and (4) the funding cuts and other pressures on resources. He concluded that the answers lie in the use of intelligent planning, outlining instances of plans for strategic information systems. Overall, ASO must plan in the larger context because it is influenced by, and is an influence on, all aspects of LC's work.

LINKED SYSTEMS PROJECT

Developments in LSP were presented in three parts by Sally McCallum, head of the Network Development and MARC Standards Office; Ray Denenberg, senior network specialist in Network Development and MARC Standards; and Judith Fenly, assistant coordinator of Cooperative Cataloging Projects.

McCallum provided the overview of the project and described the growth of technology from mainframe batch processing in the 1960s, through the telecommunication efforts and growth of networks in the 1970s, to the present, when the cost of owning a terminal has decreased while the cost of telecommunications has increased. This pattern of change has created the environment necessary for the development of LSP. The motivation to share on a national level exists, but the three largest networks

(OCLC, RLIN, and WLN) have been developed along separate lines. LSP provides the potential for linking not only these three networks but also others. The basic agreement for LSP was settled in 1980, but not until 1986 has there been data transmission between LC and both RLIN and OCLC. Because the library world has no standard computer configuration, the protocols were difficult to define, as the roles of each network have been. Once the telecommunication linkage was established, record transfer and information retrieval, as two separate functions, could take place. McCallum noted the potential for local systems, permitting a hybrid development that maintains commitment to the network of choice while meeting local needs. She mentioned two important demonstrations of the potential for LSP: the RLG-GEAC-NYU project and OCLC's work with the Triangle Library Network consisting of Duke, University of North Carolina, and North Carolina State University Libraries. Both projects are in the development stage.

The telecommunication linkage necessary for these two functions was described by Ray Denenberg. The protocol for the link, called the Standard Network Implementation (SNI), is both intricate and essential. Each layer of the hierarchy sets the parameters for the other layers, and the total hierarchy permits the full functioning of LSP. He pointed out the problem of "harmonization" among the software vendors and predicted that the marketplace will settle on compatible systems within four to five years.

LSP depends upon a consistent database, for which NACO was developed. Judith Fenly described the efforts between LC and thirty-nine U.S. libraries. NACO represents a proposal for a nationwide authority file using LC standards; as a secondary use, it will exist as a bibliographic network file. Currently, approximately 10 percent of available authority records have been contributed by NACO libraries, which account for inputting some 20 percent of authority records. The record transfer component of LSP holds the master files at LC, with copies at the networks; no record distribution is made without LC's approval. The information retrieval sector is still in a pilot stage. RLIN is beginning work with Yale's contributions to the authority file, OCLC chose Indiana University for its pilot during the summer of 1986, and WLN participation is expected in 1989. The project should eliminate duplication of efforts in authority work among similar types of libraries, Fenly said, and it should have a positive impact upon the integration of cataloging functions.

INTERNAL CONTROL

Ruta Pempe, automation planning specialist in the Automation Planning and Liaison Office (APLO), discussed efforts to automate the acquisitions process; development of the first automated acquisitions system, LOIS; and integration of the new system, ACQUIRE, with the other automated databases within LC.

Kim Dobbs, chief of the Serials Records Division, and Linda Miller, automation planning specialist in APLO, presented information concerning LC's efforts in serials management. A lengthy review of available commercial systems led to the decision to develop an in-house system. The library expects that the completed system Serials Management System (SMS) will take some twenty years to meet all current requirements fully.

The conversion of the *Library of Congress Subject Headings* to machine-readable form was described by John James, automated planning specialist in APLO. The retrospective conversion covers some 150,000 entries, including the weekly distribution updates. No alphabetic browsing capabilities are available yet for *LCSH*, but given the importance of this tool to the cataloging process, it will be developed. James discussed the principles and problems of using automated systems to change MARC authority records. Currently, many records, loaded by different libraries, and changes in the subject authorities are handled one at a time in a centralized place, ensuring optimum quality control. The issues of the cost and viability of manual versus automated conversion need to be reviewed carefully for their impact upon the Cataloging Distribution Service and catalog integrity in general. Subject headings could be treated in the same manner as name authorities in the NACO project, but other issues will temper any decision to handle subject authority records in this way. Distribution of the printed *LCSH* on fiche will continue on an annual basis.

Michael Pew and Michael Burke of the Copyright Office described its work and automation capabilities. Because this Office is responsible for registering all U.S. copyrights, the need for sophisticated automated systems is essential. Some 600,000 copyright claims are received each year; approximately 90,000 are handled as correspondence and loaded into one of the three basic automated systems: COINS (Copyright Office In-Process System); COPICS2 (Copyright Office Publications Interactive Cataloging System); and the Jukebox Licensing System. COINS serves as an in-process file of about 1 million records. Data is constantly being transferred in and out of this file, keeping its size at a steady level. A new generation of COINS is planned, for which automated numbering of correspondence and claims and title access to the system will be made available. COPICS2, the cataloging system, primarily holds registry information dissimilar to the bibliographic records fed into SCORPIO. Only about 60,000 copyright claims are actually cataloged each year, and these records are retrievable on SCORPIO as well as on COPICS2. The Copyright Office controls the licensing of jukeboxes, and a separate system to handle these registrations has been developed. About 4 million registrations are on file since 1978; outside access to this file is not available at present. Because of the specialized nature of this office's work, many of the terminals are dedicated and noninteractive.

BIBLIOGRAPHIC CONTROL

On the second day of the institute, Lucia Rather, director of Cataloging, introduced the topic of bibliographic control. The development of the MARC format began in 1966, when the idea was begun as a pilot project among sixteen libraries. Later, in 1969, the concept was enlarged to MARC II, the ultimate development of the format. MARC tagging was originally implemented at LC as part of the cataloging process and later moved to the editing portion of the work flow. The MARC formats serve as the descriptive basis for the resulting automated projects that have been implemented and that permit the development of the many systems now available. Three such systems are MUMS, SCORPIO, and APIF (Automated Process Information File), which form the integral systems around which most other automated systems at LC are designed. APIF, which allows for efficient entry of cataloging data without having to enter MARC tags, has served basic needs, although problems with content designation and interaction with records from networks have caused some problems. A second generation of APIF (APIF 2) permits more informative and accurate interaction with other databases and enables accessing libraries to predict which books will be cataloged soon by LC. APIF can handle approximately 150,000 titles each year, including not only monographs but also maps, music, films, and other types of materials. Serials, which are CONSER-contributed, are not included in this database.

New capabilities will be added to the online catalog in the next few years; they will simulate the browsing that users often employ when using the manual catalog. Access to subject headings, currently limited by one command, will offer users an overview of available headings before a specific search is entered. This enhancement is especially useful for finding corporate names with commonly used words. Questions concerning bibliographic control issues, which will be examined in the near future, include the role of acquisitions records in creating preliminary cataloging records, the need for terminals for every cataloger and the potential impact on productivity, the quality control among potentially scattered record inputting, the effect of online shelflisting (not yet a capability), and the concomitant labor concerns for all of these questions.

Rather also commented on LC's interest in using expert systems to handle the bibliographic elements of an electronically produced manuscript by taking the data directly from the publisher and reviewed the history of REMARC, the database originally built by Carrollton Press and now handled by UTLAS. Carrollton began by filming LC's shelflist and producing a title index to this list, adding author, title, and dates for all records not already converted to the MARC format. In all, 4.5 million records were converted at a cost of $.37 per record, compared to an estimated $10 per record for conversion by the LC staff. It is LC's intention in the next twenty years to edit REMARC gradually. REMARC tapes, Rather noted, are available to libraries from UTLAS, and the database can, in the future, be searched via LSP.

Alice Kniskern, program coordinator for Cataloging Activities in Foreign Field Offices, described the work of automating LC cataloging in foreign countries and transmitting records to the LC database. At present, the office in New Delhi is engaged in a highly productive catalog-entry operation. Based on the success of this program, other foreign field offices will begin similar operations in the future. Overseas data entry was first proposed in 1980, and work began in the summer of 1981. Sixty percent of the overseas entry is for nonroman alphabets.

Hugo Christiansen, chief of the Shared Cataloging Division, discussed the development of the CJK (Chinese, Japanese, Korean) terminal available through RLIN. While transliteratable scripts have been relatively easy to automate, materials in nonalphabetic languages have been hindered by the lack of standardized romanization tables. The need both for standardization and for an automated method for catalog entries of these materials became more urgent to research libraries. In 1979 a $1.1 million cooperative grant to RLG from the Ford and Mellon Foundations and the National Endowment for the Humanities for the development of a standardized vernacular keyboard system laid the groundwork for the automation of nonroman entries. Over fourteen thousand characters are needed to represent Chinese, Japanese, and Korean. The keyboard that was developed contains 179 keys, with sixteen to thirty thousand character-component parts allowing for language-specific characters to be built on the screen. The RLG CJK system links four terminals on a dedicated line to one controller that holds the local dictionary of characters and the resulting database. A high-resolution dot printer produces printed records of the catalog entry. Earlier efforts to produce nonroman alphabet catalog cards relied upon a typesetting or photocomposition machine, frequently handled in various cities of the Orient.

In 1983, a pilot project using the RLG CJK terminals was begun with eight terminals and volunteer catalogers. It was anticipated that productivity would fall to 25 percent of the normal amount produced by the manual method. In fact, after a two- to three-month training period, productivity rose to the level for the established method. By 1984 LC had adopted the CJK terminal for all Chinese, Japanese, and Korean cataloging. The project is organized by the type of work, not the language, so that preliminary as well as descriptive cataloging makes use of the CJK terminals. With a staff of forty-two librarians and twenty paraprofessionals and with twenty-four terminals, LC has now input about forty-two thousand records, of which forty thousand are original cataloging. In addition, the RLIN database contains approximately one hundred thousand romanized records from various inputting libraries. LC loads the romanized portion of all CJK records into its MUMS and SCORPIO databases. In addition, there are plans to print 3-by-5 inch cards for manual access. The development of similar CJK capabilities by OCLC will undoubtedly increase the number of records and the access to them, particularly in light of LSP.

Developments in the MARC formats for bibliographic control were discussed by Sally McCallum, Phyllis Bruns, and Mary Lou Miller (MARC standards specialists). Currently the U.S. has seven formats including the holdings format published in final draft form in 1984. The Machine-Readable Data Files format (MRDF), the latest to be developed, is intended primarily for use with the computer files of mainframe computers. Mass-produced software requires more attention to physical format than the data files of large computers do, however, and specific notes have been added to handle this type of material. Revisions of AACR2 chapter 9, "Machine-

Readable Data files," are expected to have little impact on this format. Other formats went through the revision process throughout the late 1970s and early 1980s. For example, the manuscripts format, originally published in 1973, was revised because it was never widely accepted in the archives community. The films format was revised mainly for public library use in describing paintings, and because the Library of Congress Prints and Photographs Division expressed a need to put cataloging information into machine-readable form. Additional specifications for the visual materials format are being discussed currently and are under review by MARBI.

The holdings format addresses an issue somewhat different from that of the formats for physical representation. In general, MARC formats provide content designation for all copies of material and do not describe unique or altered works. While notes fields have been established to handle local copy variation information, there is a need to communicate this kind of information in a standardized manner, particularly for interlibrary loan operations, preservation projects, and union list activities. In 1982 work was completed on this format, which is designed to accommodate holdings and location data for all kinds of material. Other standards affecting the holdings format include those of the National Information Standards Organization (NISO) Z39 Committee, and the NISO Subcommittee W's standards for nonserial holdings information. Future work on these formats will concentrate on the clarity of presentation and the details to be included in holdings and location statements. Problems such as multiple versions of material (e.g., microfilm and paper copies) and lack of standardized handling of the seriality of some forms of materials will be solved by future scrutiny.

It was pointed out that there are only three actual formats (bibliographic, authority, and holdings), although seven designations are used for different types of material. In dealing with new technology, format integration is needed to define all kinds of materials but poses a controversy about reducing the number of formats. Another area of concern regarding integration involves the various foreign MARC formats such as InterMARC, ICEMARC, CHINAMARC, and UNIMARC. Currently, the Netherlands is the only foreign country using USMARC. IFLA has promoted the use of UNIMARC, and conversion of UKMARC and CANMARC for USMARC compatibility has been completed in this country. In addition, LC can handle the UNIMARC format on a regular basis. Even when the subject headings are in different languages, the intention of the MARC Standards Office is to use as much of another MARC-format record as possible in order to reduce the need for duplicative work. It was suggested that minimal content designation in MARC records, regardless of the country of origin, will hasten consistency.

DOCUMENT DELIVERY AND PRESERVATION

LC's diethyl zinc (DEZ) project was described by Peter Sparks, director of the Preservation Office. This 20-year initial project marks a concerted effort toward preservation using mass deacidification of paper. The material earmarked for this process has a healthy life of only 30 years. After 100 years, the paper is weak, and after 150 years, becomes brittle and crumbling. The mass deacidification process, using a carbonate and acid, has been proven to increase the life expectancy of vulnerable books fivefold. The benefit of deacidification lies in the quickness with which it is applied: the later a book is treated, the less benefit is derived.

All deacidification projects work with the same principles. The paper is brought into contact with chemicals that neutralize the acid, creating an alkaline. Once this is achieved, the paper is brought back to a static, nonacid condition before it is returned for use. Both single-page and mass deacidification are possible, although the single-page process generally is saved for rare items. Sparks estimates that, by 1989, a large-scale treatment plant costing about $11.5 million will be operational, with two tanks holding up to 9,000 volumes and a stand-alone laboratory. In the first year of operation, the plant will treat some 350,000 volumes. By 1992, approximately 1 million volumes a year could be handled. Start-up costs are predicted to be $3.50 per volume in the first year, falling to $2 per volume within three years. Both new (nonalkaline) and old books will receive treatment, with treated books designated as DEZ books. There has been some discussion with the manufacturer of the plant concerning the development of small turnkey facilities for other libraries, which could be managed by consortia.

Robert Zich, head of the Planning and Development Office, described the optical and videodisk project for preservation and image enhancement. A 12-inch digital optical disk has the capacity for holding up to 10,000 pages on one side of the disk and reduced amounts for halftone (300 per disk) and color pages (110). The experimental optical disk will hold some 1 million pages. Periodical articles from 1983 to the present and the online catalog file are now contained on optical disks. The second phase captures the *Congressional Record* from the Ninety-ninth Congress to the present, with full indexing. Related manuscripts and holographs are being added. Optical disk storage has the advantage of image enhancement, displaying foxed and water-damaged material as it was before the damage occurred. Copying from these storage disks can be done with a Xerox 2700 copier.

Access to the collection via optical and videodisks is on three levels: level one consists of the capability to scan images for retrieval; level two is a menu-driven system listing the major collections for browsing and leading the user to further information; level three access consists of MARC-like records with complete bibliographic information, including BRS software for Boolean subject access. The initial project will be reviewed by patrons, who will help determine the ease of use, and will be judged for its usefulness in preservation, including investigation of how long disks will last. An overall program analysis will determine the future of this project. Other programs that are being developed include the analog video disk, which will store 108,000 images on a single disk, and compact disks for recording concerts at the library.

The Congressional Research Service (CRS) serves the reference and research needs of Congress and so has a mission somewhat different from sections described above. James Price, coordinator of Automated Reference Services for CRS, discussed the growth of the service into a fully selective dissemination of information (SDI) program with twelve bibliographers reviewing some six thousand journals for abstracting and for notification of subscribers. Subscribers wishing information on one of the abstracts can return it and receive a full text. The average article is reproduced eight times, printed from microfiche holdings using a Xerox microfiche copier.

Experiments with a scanning device for processing articles were tried in 1980, but the cost was prohibitive. CRS hopes to place the entire SDI operation on an optical disk, although some problems exist with copyright. Currently the analysis of every bill and resolution since the Ninety-third Congress is online, and there is a demand for older online services. An "issue brief" system containing topics of interest to Congress is also available online or in printed format—online usage is less than print.

Office automation has made a significant impact on CRS' ability to handle queries. Since its introduction in 1974, there has been no backlog in reference queries. About 240 microcomputers have been installed since that time to handle sophisticated analysis. The consensus is that the introduction of these microcomputers has assisted staff development on all levels and has created an appetite for machine service that is more efficient and makes better use of staff skills. Experiments with the integration of data processing and the telephone are being considered for the workstation of the future. The first electronic mail system, which will handle data that is not created digitally but from voice imaging, is envisioned. The current costs, at $10,000 to $12,000 per station, are prohibitive. Its utility will be in the verification of the contents of an article to assure that the abstract is a true representation.

The final presentation, by Gerald Lowell, chief of the Cataloging Distribution Service (CDS), concerned CDS' products and services and the impact of automation on this office's future. Its mission statement is simple: to produce and distribute products and services. The demand for these has reached the point at which CDS serves as a miniature company within LC. It operates as a batch shop that uses the products from other areas as its merchandise. Most data come from ASO and from publication files. Examples of the latter include data from the Government Printing Office, British National Bibliography, and National Library of Canada. Records are taken from ASO daily as they enter the LC MARC work flow.

A variety of tape services are available from CDS, including MARC tapes (in both USMARC and UNIMARC formats); *New Serials Titles* software; and CDS Alert Services (a continuing SDI service). On-demand services include SelectMARC, an inexpensive way to get noncustomized bibliographic records for retrospective conversion; MARCretriever, a customized bibliographic retrieval program with powerful search capabilities; and MARC catalog cards. As might be expected, catalog card sales are declining at the rate of about 16 percent a year. The distribution of an optical disk format for cataloging and bibliographic records is in the experimental stages. Four categories—name and subject authorities, Americana, and music—have been chosen for test marketing, but the program has been delayed due to budgetary constraints. In planning for the future, CDS is looking at a number of issues including: identification of the market for its products; economics of bibliographic consumption; changes brought by realignment of the utilities, their member institutions, and LC; and new services such as indexing. Lowell noted that keeping the "romance of new technology" in proper perspective is a major challenge.

In the immediate and long-term future, the technology of the Library of Congress is the technology of all American libraries. An understanding of LC's goals is essential to planning in each of our libraries. Many of the systems viewed during this institute will become integral parts of our working lives in the next years, for which these proceedings stand as a preview.

ACKNOWLEDGEMENT

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Standard Network Interconnection

Ray Denenberg

The mechanism that supports intersystem communication for the applications of the Linked Systems Project (LSP) is called the Standard Network Interconnection (SNI). Each LSP participant implements SNI on its own system.

The use of the term *Standard* relates to the three particular attributes or features of SNI, which are listed at the bottom of figure 1.

The first is *application independence*, which means that the same basic facility is used regardless of the application using it. New LSP applications can be added with minimal changes to the SNI facility. Of course, any new application might impose a new communication requirement, necessitating an enhancement to SNI, but any such enhancement would be made within the existing framework.

The second is *system independence*. Different types of computer systems have vastly different architectures, operating systems, and procedures: SNI system independence refers to the fact that the type of one LSP computer system is completely transparent to another. The specifications that define SNI are totally independent of system type. LC's SNI facility currently communicates with both the RLIN and OCLC SNI facilities, but there is no indication within the facility that RLIN and OCLC have two different types of systems or even that they are different from the LC system.

A major theme of any SNI discussion is its third feature: *use of applicable international standards* for computer protocols.

The set of rules that governs information exchange between computers is referred to as protocol. The first two features, independence from both application and sys-

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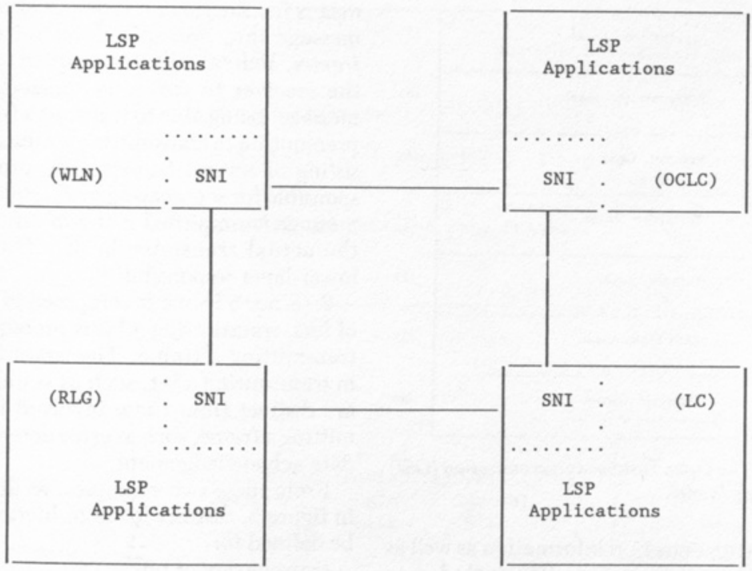


Features of SNI:
1. Application Independence
2. Independence from System Type
3. Use of Applicable International Standards

Fig. 1. Standard Network Interconnection SNI.

tem type, can be achieved by a network of computer systems communicating with one another, if they adhere to a common protocol. But a different network could also achieve these objectives and could use a different protocol; of course, the two networks could not communicate with one another—interworking is possible only if they use the same protocol. But who decides which of the many existing protocols to use? The only realistic answer to this clearly rhetorical question is that universal interoperability is achievable only through the use of applicable standards.

SNI is based on internationally accepted standards for computer-to-computer communication and is totally committed to maintaining conformance to international standards as they continue to evolve.

OPEN SYSTEMS INTERCONNECTION

International standards for computer protocols are being developed by a variety of different standards groups, and these standards activities are being coordinated by a set of guidelines called the Open Systems Interconnection (OSI) Reference Model, shown in figure 2. The OSI model is itself an international standard developed by the International Organization for Standardization (ISO) and also formally recognized by CCITT (International Consultative Committee for Telephony and Telegraphy, which develops standards for telecommunications); ISO and CCITT are the two major international standards bodies.

COMMUNICATION FUNCTIONS

Computer-to-computer communication poses a variety of technical issues. Two computers must agree on how to distinguish a "zero" bit from a "one," how to distinguish between successive bits, what size messages are transmitted, and how to recognize the start and the end of a message. Messages tend to pick up errors during transmission and sometimes are lost; there-

Application Layer	(7)
Presentation Layer	(6)
Session Layer	(5)
Transport Layer	(4)
Network Layer	(3)
Data Link Layer	(2)
Physical Layer	(1)

Fig. 2. The Open Systems Interconnection (OSI) Reference Model.

fore, error-detection information as well as sequence numbers are often included in messages so that the receiving computer can recognize error conditions, acknowledge messages correctly received, and request retransmission of lost messages or those in error. Sometimes one computer will transmit data faster than the receiving computer can process it, so that a mechanism is required for the receiving computer to throttle the flow of data, for example, by interrupting transmission with a message—"don't send more data until further notice"—and subsequently—"ready for more data." These are just a few examples of the many different problems involved in computer communication.

The OSI model divides the many communication functions into discrete sets called *layers*, illustrated in figure 2. Seven layers are defined in a hierarchy; that is, if one communication function is a prerequisite for a second, the first is in a lower layer.

The following two examples illustrate a hierarchy of three levels:

1. For several reasons, only a limited amount of data (e.g., 1024 bits) is transmitted in a single physical transmission. (One reason is the physical limitations of the transmission facilities: the longer the physical block, the greater the chance of error; another reason is to prevent one user from dominating the line when several users are sharing it.) Protocol must provide the means for the sender to segment a longer message into multiple data units called *frames*, individually transmitted, and for the receiver to correctly reassemble the message. Being able to transmit a frame is a prerequisite to transmitting a message consisting of several frames. The process responsible for segmenting or reassembling a message is simplified if it can assume that the actual transmission of a frame is a lower-layer responsibility.

2. Since a frame is composed of a string of *bits*, transmitting a bit is prerequisite to transmitting a frame. The issues involved in transmitting a bit, such as voltage level, are distinct from those involved in transmitting a frame, such as error detection and data acknowledgement.

From these two examples, as illustrated in figure 3, distinct levels of hierarchy can be defined for:

transmission of bits,
transmission of frames, and
segmentation of messages into multiple frames and subsequent reassembly.

These three levels correspond closely but not completely to the first three OSI layers. To complete the description of layers 1 through 3, some historical background is useful.

CCITT RECOMMENDATION X.25

In a technology called *packet switching*, which evolved in the early 1970s, data messages are broken into smaller units (typically 1024 bits) that are individually transmitted, and the message is reassembled at the destination system. Each unit is called a *packet*. Usually, in a packet-switched network, the communication path, or logical connection between two users, consists of several physical circuits or channels. The important feature of packet switching is that each physical channel is dedicated to a logical connection only during transmission of a packet, after which the channel is available for use by packets being transmitted over other logical connections. Thus any given channel along the transmission path between two users may at the same time be part of a path between other users, although the illusion is created that the two users have a dedicated connection such as a telephone line.

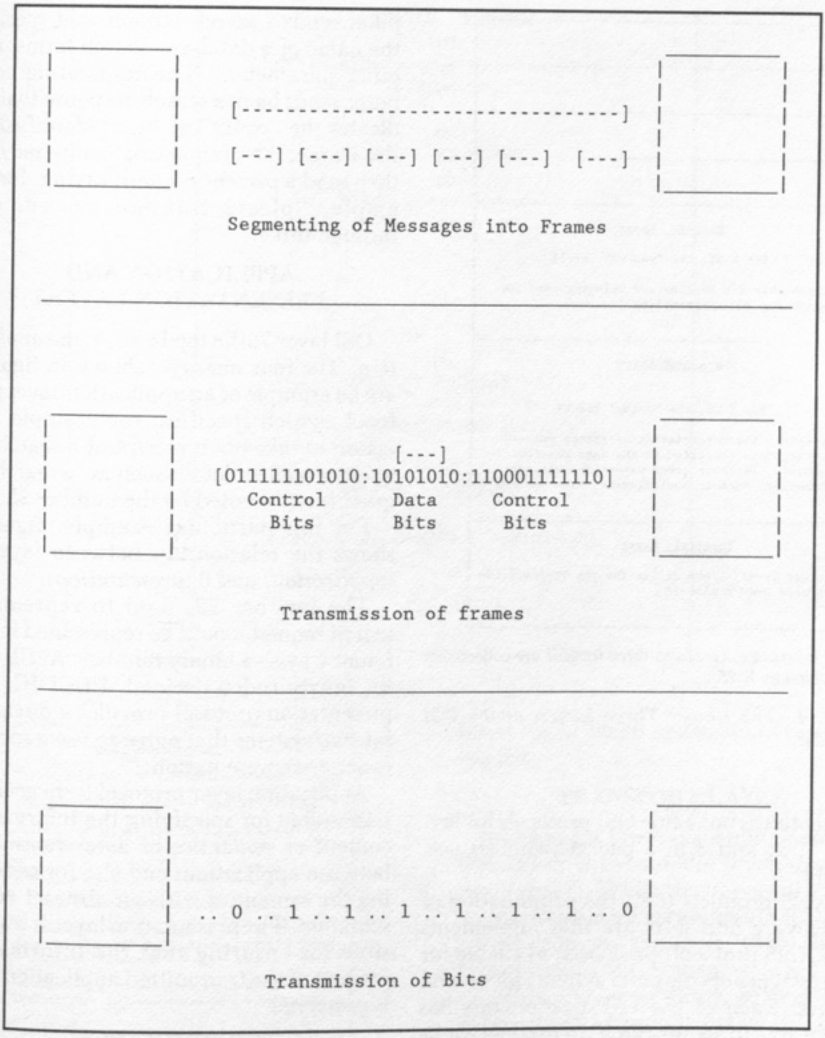
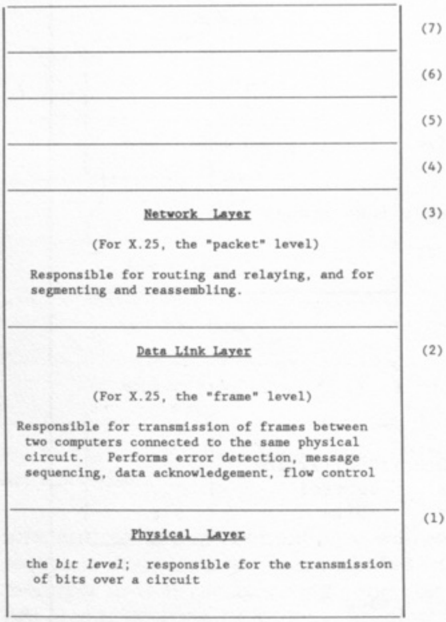


Fig. 3. Hierarchy of Communication Functions.

In 1976, with packet switching's coming-of-age, CCITT proposed a standard called Recommendation X.25 in order to prevent the proliferation of incompatible protocols. It defined three levels of protocol for communication between a computer and the local network-node on a packet-switched network (illustrated in figure 4). Level 1 defines the protocol for maintaining a physical connection and transmitting bits over that connection. Level 2 defines the protocol for error-free transmission of frames over the connection. Level 3 defines the formats of packets and the procedures for establishing and maintaining a logical connection.

Today, the use of X.25 is widespread: it is used by Telenet, Tymnet, and virtually all of the packet-switched, public data networks. The LSP participants currently use the Telenet X.25 network to provide the lower three layers of communication.

X.25 preceded OSI, but the three protocols of X.25 have subsequently been fully



OSI layers one, two, and three for SNI are collectively provided by X.25

Fig. 4. The Lower Three Layers of the OSI Model.

accepted as bona fide OSI protocols for layers 1, 2, and 3 in a packet-switched network.

X.25 products (i.e., the combination of hardware and software that implements the X.25 protocol) have been available for many types of computer systems for several years. Each of the LSP participants has been able to acquire an X.25 product for its system.

THE UPPER OSI LAYERS

As illustrated in figure 4, X.25 addresses only the first three layers and not the full range of communication functions. Therefore, each LSP participant has developed, in-house, the software for the upper four OSI layers, which are now briefly described.

One of the LSP applications, *information retrieval* (illustrated in figure 5), allows one computer to search the database of a remote computer. The requesting computer sends a search request that specifies the name of a database, search terms, and other parameters. The responding computer sends back a search-response that indicates the "count" of items identified by the search. The requesting computer may then send a *present request*, saying, for example, "please transmit records one through three."

APPLICATION AND PRESENTATION LAYERS

OSI layer 7, the top layer, is the *application*. The four messages shown in figure 5 are an example of an application-layer protocol, which specifies, for example, the action to take upon receipt of a search request as well as details such as "a search request is represented by the number 22."

For this particular example, figure 6 shows the relationship between layers 7 (*application*) and 6 (*presentation*).

The number 22, used to represent a search request, could be represented in different ways—a binary number, ASCII digits, binary coded decimal, EBCDIC. The presentation protocol provides a discipline for two systems that agree to use a specific concrete representation.

Application layer protocol is, in general, responsible for specifying the information content or semantics of data transmitted between applications and also for associating the semantics with an abstract representation. The presentation layer is responsible for ensuring that the information content of the transmitted application data is preserved.

SESSION LAYER

Layer 5, the *session* layer, allows two communicating applications to synchronize their dialogue. None of the potential session-layer functions is applicable to existing LSP applications.

However, as an example of a session-layer function, consider an application with a protocol somewhat less structured than information retrieval. Suppose each system can randomly send a request to the other, as long as both do not send requests at the same time. The session-layer protocol can provide a discipline to designate, at a

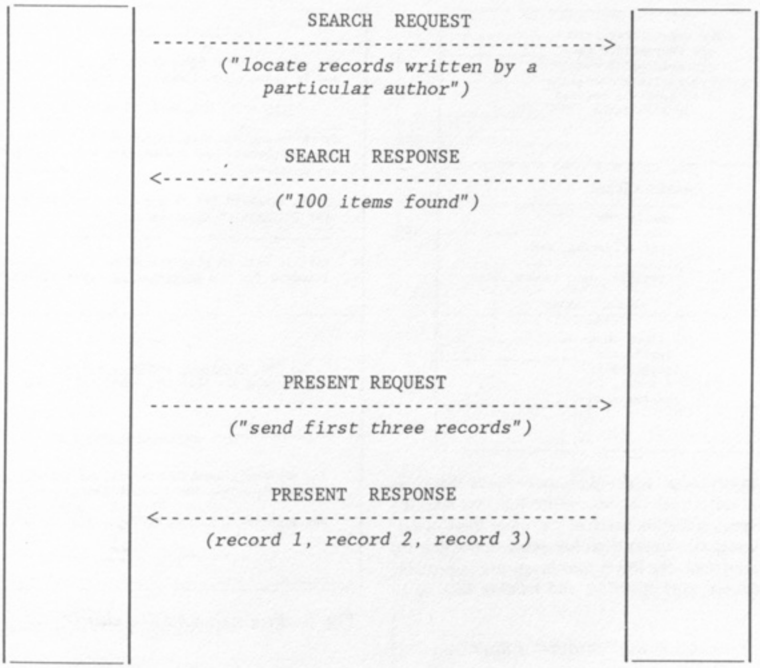


Fig. 5. Information Retrieval Protocol.

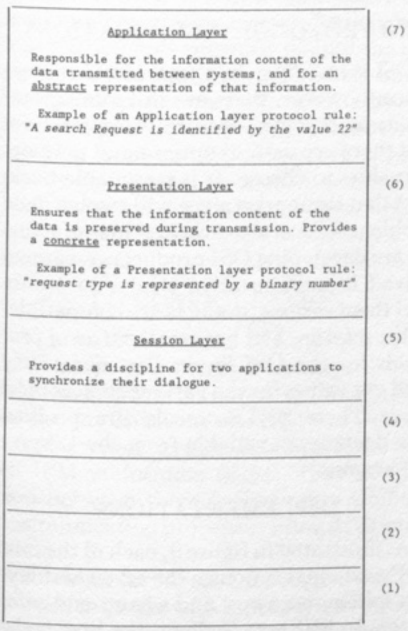


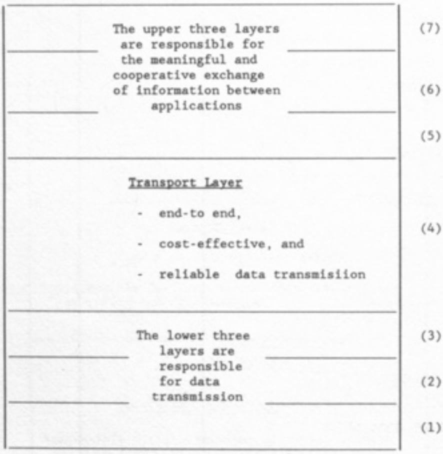
Fig. 6. The Upper Three OSI Layers.

given time, which system may transmit a request.

TRANSPORT LAYER

Between the lower three and upper three OSI layers is the middle layer, *transport* (see figure 7). While the upper three layers are responsible for meaningful exchange of information and the lower three for data transmission, the transport layer "adds value" to the lower three, so that collectively, layers 1 through 4 meet the specific communication needs of the upper three. Expressed somewhat differently, the lower three layers are responsible for data transmission, and the lower four layers are responsible for end-to-end, cost-effective, and reliable data transmission.

There are a variety of telecommunication functions that might or might not be provided by the transport layer depending on two factors: (1) whether they are already provided by a given telecommunications network and (2) whether they are required by a given application. These functions include error detection, data ac-



The Transport layer "adds value" to the lower three layers, so that collectively, layers one through four meet the specific communication needs of the upper three layers. In other words, the lower three layers are responsible for *data transmission*, the lower *four* layers are responsible for *end-to-end, cost effective, and reliable* data transmission.

Fig. 7. Transport: the "Middle" Layer.

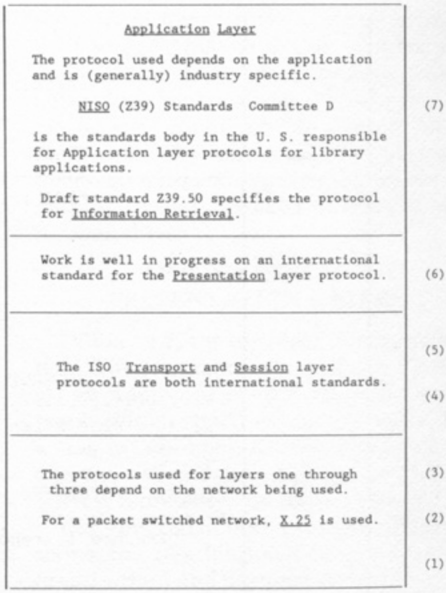


Fig. 8. Protocols and Standards.

knowledgement, message sequencing, multiplexing, and flow control.

LAYERS AND PROTOCOLS

Figure 8 summarizes the protocols used for the OSI layers; those used for layers 1 through 3 depend on the type of telecommunications network being used—for a packet-switched network, X.25 is used.

ISO has developed protocols for layers 4 and 5, which are international standards, and protocol development and standardization for layer 6 are in progress.

SNI uses ISO layers 4 and 5 protocols with minor variations, because it adopted the specifications before they were completely standardized. It uses a draft version of the layer 6 protocol.

At layer 7, various protocols are being developed for different applications. The standards group responsible for application-layer protocols for library applications is Standards Committee D of the National Information Standards Organization (NISO Z39). NISO Committee D is currently standardizing the information retrieval protocol, which was described earlier, and which was originally developed by LSP participants.

SNI PROTOCOL SPECIFICATIONS

OSI is rapidly gaining worldwide acceptance; however, there are still some protocol areas that are open to interpretation, and there are various options and parameter values to choose. It is reasonable to expect that the marketplace will resolve these problems. Several computer manufacturers are developing OSI products and are involved in collaborative efforts to ensure that these various products are compatible. In the interim, SNI has created a set of protocols for the OSI layers that concretely spell out values for the various choices to be made. These "SNI Protocols" are specified in a document available from the Library of Congress.

IMPLEMENTATIONS

As illustrated in figure 9, each of the four LSP participants houses the seven SNI layers, split across a host and a front-end computer. In SNI terminology, the host is the computer on which the application resides and the front-end is a computer on which

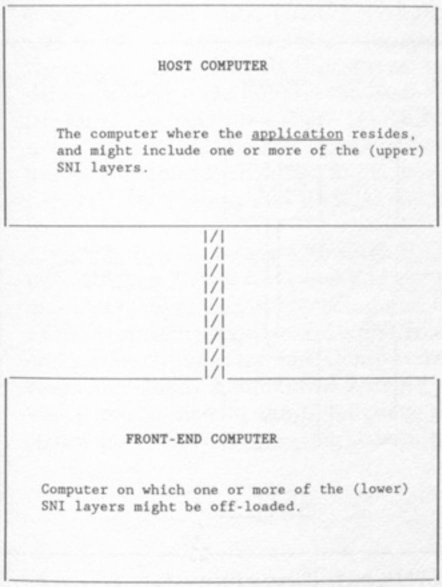


Fig. 9. General SNI Configuration.

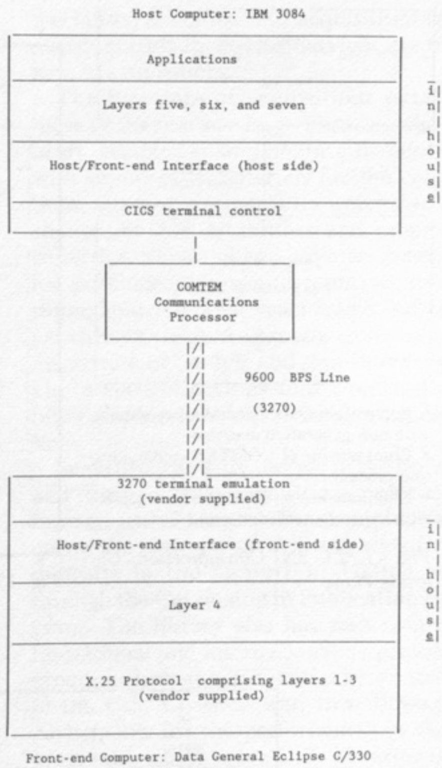


Fig. 10. LC SNI Configuration.

one or more of the layers have been off-loaded. The use of a front-end is strictly a local implementation matter. Although all four participants currently do split the layers across two machines, there may be future participants who will house all seven layers on a single machine. The use or non-use of a front-end at one system is completely transparent to another system: the host, together with the front-end, is considered a single system when viewed by a remote system.

LC CONFIGURATION

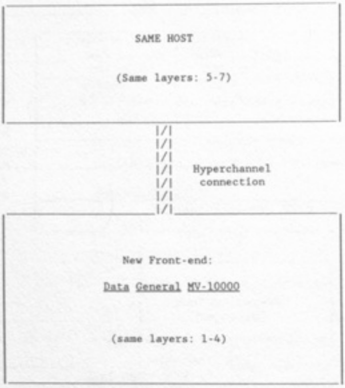
Figure 10 shows the LC configuration: LC houses SNI layers 1 through 4 on a front-end and layers 5, 6, and 7 on the host computer. The front-end is a Data General minicomputer (Eclipse C/330) and the host an IBM mainframe (3084). Communication between them is through a Comten communication processor, using 3270 emulation.

Software for layers 4 through 7 was developed in-house with support from the Automated Systems Office—the custom software, required to interface layers 4 and 5 on the two different computers, was also an in-house development. Programming on the host was in the PL1 language and on the front-end, PASCAL. The 3270 emulation and X.25 were supplied by Data General.

The Data General Eclipse C/330 is an older model. As shown in figure 11, LC plans to replace it with a newer Data General, the MV-10000, and also to replace the existing interface with a hyperchannel connection, thus eliminating 3270 emulation and the use of the Comten communication processor. In the long run, as shown in figure 12, LC hopes to move the lower four layers up to the host and eliminate altogether the need for a front-end.

COMPARATIVE CONFIGURATIONS

Figure 13 is a comparative overview of the SNI configurations of the LSP participants. RLG and WLN also house SNI layers 1 through 4 on a front-end and layers 5,



- Replace old Data General minicomputer with new generation machine
- Eliminate use of COMTEN communication processor
- Eliminate use of 3270 interface, replace with hyperchannel connection

Fig. 11. LC SNI Configuration: Upgrade Plans

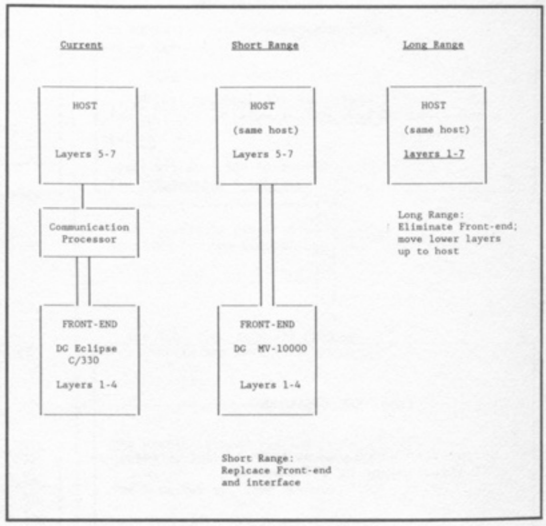


Fig. 12. SNI Upgrade Plans in Perspective

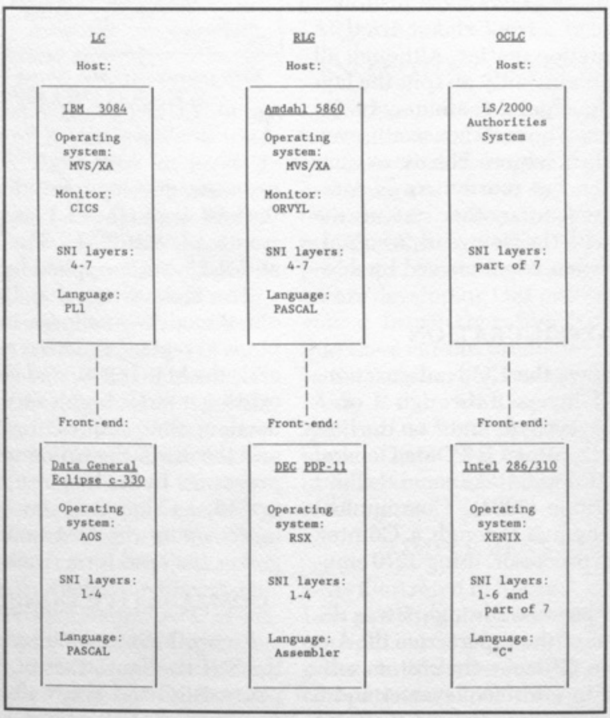


Fig. 13. Comparative SNI Configurations

6, and 7 on their hosts. The WLN configuration (not shown) is in nearly all respects the same as LC's. The RLG host is an Amdahl mainframe (5860), and the front-end is a DEC minicomputer (PDP-11). Its host language is PASCAL and its front-end language Assembler (in contrast to LC, which uses PL1 on the host and PASCAL on the front-end).

OCLC houses layers 1 through 6 and part of layer 7 on a front-end and the remainder of layer 7 on its host computer, the LS/2000 Authorities system. Its SNI front-end is referred to as the LSP Gateway Processor, an Intel, Xenix-based system that was programmed in the *C* language designed for the UNIX operating system. ■■

Acquisitions Automation at the Library of Congress, 1986

Ruta Pempe

ACQUISITIONS PROGRAMS AND INFORMATION PROCESSING

The responsibility for technical processing of acquisitions at the Library of Congress rests with the Directorate for Acquisitions and Overseas Operations. Four divisions are within the directorate: Order, Exchange and Gift, Overseas Operations, and Cataloging in Publication. Several hundred staff in these divisions maintain contact with an international network of publishers, dealers, exchange partners, and donors and process correspondence and the shipment of materials. It is estimated that within the Library of Congress as many as 750 staff members, incorporating recommending officers, collections development specialists, selectors, and acquisitions specialists outside Processing Services, participate in acquisitions.[1]

The functions of acquisitions parallel those in many other large libraries: the library establishes and maintains contact with suppliers of materials for the collections; sets up agreements for purchase, exchange, or gift; establishes and monitors collection development policies; budgets for purchased items and monitors funds throughout the fiscal year; tracks individual titles through the process from recommendation to receipt; and supplies materials to the collections and preliminary bibliographic controls to cataloging divisions.

Some programs are unique to the library and distinguish its acquisitions processing from all other libraries'. For example, it acquires the majority of U.S. imprints from deposits to the Copyright Office and through the Cataloging in Publication Program. The library also has responsibility for national and international acquisitions programs such as NPAC and is accountable to the U.S. Congress and to nationwide participants for the performance of these programs, which serve U.S. libraries and an international constituency, directly and indirectly. The extent of legal and legislative obligation in the library's acquisitions programs is another unique aspect.

The Library of Congress is also unique in the volume of its operations. In fiscal year 1985 it acquired 132,260 monographic pieces by purchase and 93,189 monographic pieces by gift or exchange.[2] About 44,000 purchase recommendations were processed, over 35,000 monographic titles are acquired each fiscal year through the CIP Program, and there are about 35,000 active purchase subscriptions. Not all new titles require new cataloging at the fullest level—some represent additional copies; some receive minimal-level cataloging. Each piece received in the library through any avenue must be screened by selections officers and accessioned by stamping. Gift and exchange receipts require extensive international correspondence and the maintenance of correspondence files by supplier and bibliographic title. Many purchased titles go through a process of recommenda-

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tion, order, claim, invoice, voucher, payment, and receipt. Through the CIP Program, publishers may request cataloging information in advance of publication, then send copies of the work to the library after publication—a unique process that puts cataloging work before the receipt of an item.

Acquisitions divisions maintain names and addresses for over forty thousand suppliers including booksellers, publishers, government agencies, blanket order dealers, and agents. There is little overlap between programs in such dealings; thus various sections tend to deal exclusively with a particular network of suppliers.

Purchase acquisitions require the oversight of over two hundred funds with a total annual outlay over $7.5 million in 1985. Funds must be obligated and liquidated with conversions to a wide range of foreign currencies. Accounting functions must be coordinated and reconciled with the library's central Financial Management Office accounts. In fiscal year 1985, about twenty-five thousand invoices were processed.

Bibliographic records and correspondence involve the use of many major languages of the world. Specialized staff maintain contacts using native languages, and many records may be kept in original languages.

Acquisitions orders and requests inevitably require much follow-up contact with suppliers and the attendant need for a record of claiming history, cancellations, and redirection of orders to out-of-print dealers or to other sections for a different acquisitions avenue. Up to one hundred thousand follow-up requests are made each year, and more will be made once it is feasible to do so. Claiming is a significant factor in obtaining materials within the time frame they are available—still in print, in stock, and offered for delivery.

The performance of acquisitions processing can affect the work flow of other major library organizations. Collections development, selection, cataloging, binding, preservation, collections control, serials control, financial management, and reference and research services are affected by the volume, breadth, timeliness, and reliability of acquisitions processing.

CURRENT SYSTEM

The Library Order Information System (LOIS) was one of the first automation projects initiated in the library: it was started in 1968, and the final release was in operation by 1977.[3]

Five tasks, or releases, were accomplished:

1. An input system and production of printed purchase orders, dealer slips, file slips, reports to recommending officers, encumbrance reports, in-process lists, archive listings, order claims and cancellations, and vendor directory listings in batch mode.
2. Creation and maintenance of files to support the products in task one and printing of continuation or subscription orders
3. Fiscal processing added: obligations and liquidations, invoice tracking, voucher printing
4. Creation and maintenance of files for continuations and blanket orders
5. A copy of bibliographic records for active book orders, made to a file that may be searched online using the library's new retrieval software systems (MUMS)

The technology selected in 1969 was one of the most appropriate and accessible at the time: the Administrative Terminal System (ATS) installed on the library's IBM 360/40 mainframe computer. The ATS input system was accessed through IBM 2741 Selectric typewriter terminals. In addition, IBM 1030 data collection terminals were used for keyboard input, either online to the computer or for computer card punching and reading.

LOIS software was written in IBM Assembler language and PL/1. At the time (late 1960s and early 1970s), there were far fewer software utilities and facilities available. The LOIS system relies on file access methods that are now outdated. The system was developed before the era of structured methodologies, rigorous documentation standards, and sophisticated systems testing and assurance practices.

In spite of its "early origins," LOIS has worked for about fifteen years. The library has upgraded its IBM or IBM-compatible mainframes, operating systems, file access methods, terminals, and software development methods many times. Still, the Automated Systems Office, the central automation service organization, maintains LOIS—running batch jobs, monitoring files and storage of data on the system, repairing terminals and punch-card equipment, delivering paper outputs, and keeping an eye on the impact of system upgrades on LOIS performance. Most of the software is maintained with great difficulty due to the lack of extensive documentation, the use of Assembler language, and the weak early controls on storage and organization of source code.

When LOIS was planned in 1968, the Order Division was a different operation.[4] Due to varied reporting methods over fifteen years, it is not easy to make neat comparisons. Two generalizations are valid, however: the number of titles acquired by the library was greater fifteen years ago, due to the Title II program; and, although the number of certain types of activities shows little change, the amount of funds involved is greatly increased. A pivotal impetus to plans for LOIS was the Title II program—between 1967 and 1968, payments associated with that program grew 340 percent (see table 1 for other changes).

USE OF THE PRELIMINARY CONTROL SYSTEM (APIF)

The completion of the LOIS system left many known and substantial requirements unmet. During the ten years that the LOIS project team worked to deliver a system, operations grew and changed in terms of paper management. It was not possible to add requirements to the project and still accomplish the original plan.

Among the unmet requirements was support for processing blanket orders, which are annual agreements for continuous service whereby titles are selected by dealers according to guidelines. Blanket orders encompass significant new titles that the library can expect to receive "automatically" from blanket order dealers and for which it does not need to initiate individual orders. (Blanket order agreements were invented to save libraries some of this effort.) The funds for such purchases are obligated as a lump sum, specific to the blanket order account. They are liquidated (and paid) on the basis of invoices from blanket order dealers for several titles at once. The financial management of blanket orders, then, is not highly dependent on bibliographic control at the title level.

There was a need for bibliographic control of blanket orders, however, in order to monitor the selection of titles and coordinate the various active acquisitions avenues in the library. Blanket order dealers notify the library of their selections by marking titles cited in issues of national bibliographies and sending the marked issues. Also, library staff recommend and make selections of additional titles to be sought on blanket order. It is important for the blanket order processing section to communicate to recommending staff and collection developers that titles have been selected and are on their way to the library, as well as to provide feedback to blanket order dealers on

Table 1.

	1968/69	1985	% Change
General book funds available	$1,106,650	$4,576,000	+314%
Cost of purchase subscriptions	$ 370,331	$3,288,194	+788%
Title II/Bibliographic services	$ 912,344	$ 189,700	−79%
Purchase subscription titles	22,488	35,144	+56%
Titles searched	26,328	32,090	+22%
Regular order titles recommended	16,050	17,334	+ 8%
Titles ordered	93,380	31,662	−66%
Blanket order titles recommended	42,023	19,160	−54%
Invoices processed	21,038	23,297	+11%
Vouchers for payment	37,985	22,019	−71%

their selection judgments.

Each citation marked in the national bibliographies was manually typed in order to create slips to send within the library and to blanket order dealers and to keep on file.

Several years ago, the library's management realized there were many benefits to using an existing online input system to capture the citation needed for acquisitions. While LOIS was being developed, an online, MARC-based, input-update system was developed for preliminary cataloging. The system, called APIF (Automated Process Information File), is separate from the official online cataloging system. (The preliminary and official online cataloging systems were ultimately to be integrated.)[5]

By having blanket order citations keyed online into the preliminary control system, the existing software could be used to print multiple copies of cards for processing; the entire library could know if a title had already been selected (through search access to the record, using the bibliographic retrieval system); and, once the title was received in the Library, the record would not require rekeying for cataloging purposes.

The example of blanket orders illustrates an ad hoc solution to automation that, although not optimal, provides benefits. Currently, over 25 percent of the input of records into the preliminary cataloging system represents initial input for acquisitions purposes. About 175 records are processed each day. The main languages of blanket orders currently are English (primarily Irish), Chinese, French, German, Italian, and Russian. About 73% of the records are blanket order purchases, and 26 percent represent exchange requests. The acquisitions bibliographic record tends to be a simpler and shorter one than the typical preliminary cataloging record. This means the bibliographic capabilities of APIF exceed the needs of acquisitions. Alternatively, some special needs of acquisitions are not met, but accommodated by "fooling the system"—by using certain data fields creatively and by having a few batch jobs do custom work.

The solution is typical of ad hoc automation. The "guest" user (for whom the system was not expressly designed) tends to get frustrated with the lack of custom features and of the full and consistent support that is normally promised to the "official" system user. The official user tends to overlook special needs and differences and to emphasize and perceive primarily the benefits to the high-volume, official operation. The system's maintainer and planners must remember both the reasons for the ad hoc solution and what the optional (but not realized) solution was, so that plans for further development can accommodate all areas of requirement. There is a tendency to invest more in a current practice—ad hoc, but known—and to expand or work with it rather than go back to original requirements and invest in a better solution.

AREAS OF NEED

The most critical need is replacement of an obsolete system on which a significant operation is dependent. The management of millions of dollars and hundreds of thousands of individual order, invoice, and voucher records depends on the daily operation of LOIS. If a punch-card reader or printer fails, if a file fills and locks up, if a program encounters inherent data limits (such as dollar amounts not anticipated in 1969)—the system stops. Payments from \$30,000–\$50,000 may be delayed for each day of outage. LOIS reports are vital for preparation of budget requests and justifications; replacement equipment and parts are becoming scarce; and there are neither easy manual procedures nor adequate staff for assuming a manual mode of information management. (Such a conversion alone is a major project.)

Current staff are increasingly spending time compensating for limitations in the system, for example, by rekeying records in order to trigger a correction to storage problems. Use of the system is relatively labor-intensive, due to the use of punched cards and the need for thoroughly reviewing all the input to avoid encountering data sensitivities in the software. There is a dependence on a few individuals who have learned the complexities and can manipulate transactions into correct patterns. The Automated Systems Office must devote scarce staff resources to the task of struggling without good documentation and with an increasing incidence of problems due to incompatibilities with the current mainframe environment. As a small, old, and fragile system, LOIS competes poorly for expert attention.

Systems support staff are addressing two problems related to storage techniques and file access method in hopes of extending the stable and useful life of LOIS for at least four to five years.

LOIS currently supports only part of the operations in the Order Division. There is a critical need for expanding the functionality of the library's acquisitions system to support a number of operations that currently have either no automated support or highly inadequate automation. A few microcomputers, or a word processor with file management functions, cannot handle thirty-five thousand subscription payment records, forty thousand vendor names and addresses, automatic claiming against nearly two hundred thousand outstanding orders, thousands of exchange or gift requests, or tracking correspondence related to nearly one hundred thousand monographic exchange receipts. It is counterproductive to automate any of these functions in a stand-alone mode, even if a number of small computers were available. The work flow of hundreds of staff handling hundreds of thousands of records is integrated in manual procedures and can be integrated in an automated system.

The need for expanded functionality for acquisitions, and for integration within acquisitions, is compounded by the need to integrate acquisitions with other library systems. Interfaces with the cataloging systems, accounting, circulation control, serials check-in, and bibliographic resource files would reduce the work load of transferring information between organizations on paper and needing to rekey it, reconcile accounts, synchronize time-critical summaries, and understand the status of an information item. Certainly we try to automate, as well as we can, operations that improve the productivity of a core group of people, but in a large organization such as the library, the interfaces between operations can become complex, time-consuming, and costly.

In our new acquisitions system, we need to build the basis for incremental future expansion. The LOIS system was written with software tools that were the state of the art in the early 1970s. Typically, there were fewer options for writing transportable, maintainable, and expandable software. Now we can require and achieve more modularity in design, higher-level programming languages, better documentation, and greater reliance on software tools that are powerful, generalized, robust, and commercially well-supported. Every new addition to the system should not cost us extensive software rewrites, retesting, and redocumenting. There are better conceptual techniques (and staff trained to use them), as well as management approaches—many of them developed in answer to the need for systems that last and that are flexible.

A new system with better operator interfaces, external and internal procedures, and foundations will improve stability and maintainability. The puzzle of how to operate the system, what it does, and how to fix it should be reduced and minimized in a new system—one which *many* staff members can learn, understand, and operate. With significant input to requirements and procedures design from numbers of users and with the library's current systems assurance techniques, we might hope for standard approaches and designs that avoid esoteric features and assure maintainability by future operators and programmers. After fifteen years, the library and the data processing profession have more experience, and many more specialists, to contribute to the design of a system that will operate after its originators are gone and others need to adopt its use or maintain it.

Having fifteen years of experience with LOIS does give us a better sense for improvements we need in the performance of any acquisitions system in the library. We have a more precise knowledge of critical data errors and how to avoid them; we have more staff members who are familiar with automation and can pinpoint both better features and system operations we might avoid in the next round. No system is perfect, but the advantage of having any system at all is learning from it.

The library needs a new system long before LOIS obsolescence forces conversion to some alternative. Rough estimates are that the clock will run out in four to five years on punched-card equipment, storage and file access techniques, and inherent data capacities.

FUNCTIONAL GOALS

The library recognized the limitations of LOIS, and, as resources permitted, proceeded with steps to plan and implement a replacement system. In 1984, it contracted for a description of the current state of acquisitions processing throughout the library.[6] The resulting study comprises three volumes of documentation that includes descriptions, by organizational unit, of all activities, with procedures described in narrative text and in data-flow diagrams (following the deMarco structured method) as well as sample forms and letters. Individuals in all the acquisitions divisions participated in gathering data and summarizing their activities.

The current system description provided the basis for looking to future automation. The consultant completed a draft of functional requirements, which were then expanded as a discussion document. Processing Services invited representatives from every department in the library to participate in discussions of the scope of a future system. The committee, chaired by the Automation Planning and Liaison Office, had fourteen members and met weekly for five months.

By April 1985, the report of the Acquisitions Requirements Committee was issued.[7] It recommended priorities among fifteen distinct functional areas and the scope of phase 1 development.

The fifteen major features needed by the library are

Phase 1

- On-Order File
- Fund Accounting/Payment Requests
- Supplier Directory
- Print Forms and Standard Form Letters
- Follow-up (Claiming, Cancellations, Correspondence)
- Material Receipts Processing

Phase 2

- Full Retrieval
- Preorder System (Recommend/Select)
- Acknowledgments/Letters Production
- Management Reports and Statistics

Phase 3

- Link to Serials Management System
- Link to Internal Cataloging Files
- Link to General Ledger, Accounts Payable
- Link to Collections/Circulation Control
- Link to External Resources

The On-Order File will handle all types of acquisitions orders and requests: regular, subscription, and blanket-order purchases and exchange and gift requests. A record for an order or request must have a bibliographic component; a history of the order or request (which section initiated it, to which supplier it was directed, special instructions and terms, etc.); and unique information pertaining to each type of order-request—for example, blanket-order agreement numbers, payment data, full description of a subscription or standing order that was carried across fiscal years, and detailed information such as claim, cancellation, invoice, voucher, and receipt status.

The Fund Accounting component will manage appropriated amounts for over two hundred accounts. It will track obligations for individual items and for a category of items such as blanket orders and continuations. The system will track invoices and credit memos from initial receipt through final recording of payment, linking them to specific orders and materials received. In addition to U.S. dollar payments, the system will handle transfers of funds and foreign currency payments and allow for prepaid orders, partial payments, and credit memos. The system will provide data and documentation to the Financial Management Office, which is responsible for the library's centralized accounting, and actually issues payments to suppliers based on approved vouchers. The Fund Accounting component will have to meet the standards of the Internal Audit Office. It will typically produce daily, weekly, monthly, and annual detailed and summary reports that make it possible to track every accounting event related to acquisitions.

The Supplier Directory will comprise a comprehensive name-and-address directory for any exchange, gift, or purchase source used in acquisitions. A supplier in the directory may have alternate addresses for correspondence, remittance, and claiming. The directory will be referenced electronically via supplier code, for printing purchase or request forms and letters and summary reports that track activity by supplier. Vouchers forwarded to the Financial Management Office will give the latest full name and address for payment, for example. Ultimately, activity by supplier and performance (in terms of number of orders or requests, claims, cancellations, and receipts) will be analyzed electronically.

In the future, all libraries may employ electronic mail systems to communicate with suppliers; currently, however, nearly all communication depends on paper forms and letters. Tens of thousands of communications will be printed by the acquisitions system, onto forms or on letterhead. Initial orders and requests, claim notices, cancellation notices, acknowledgements of receipt, and notifications of status may be derived from bibliographic and other data once it is keyed into the system. The fact that a form was printed (and presumably sent) will be tracked by the system, minimizing the need to keep manual correspondence files.

Claim and cancellation notices will be printed automatically, based on a default time period set when an order or request is initiated. Operators will be able to modify or override a predefined follow-up pattern and timetable but may allow the predefined pattern to do the work of checking how long an order or request has been inactive. The system will summarize claiming activity and cancellations for management evaluation, showing patterns by supplier, type of acquisition, or other attribute that may be significant.

Operators will be able to log receipts of items on order, automatically updating the status of the order or request. For purchased items, the receipt status will be presented to an operator who must clear invoices for payment. Not all the items received by the library will be tracked individually by the acquisitions system, but only certain categories of acquisitions that warrant input of a bibliographic record and status updates by operators. For those items logged in it, the system will be able to produce summary reports of numbers of items, by type, and provide useful management reports.

Features in phase 2 represent an expansion of basic capabilities for including some features not now available and not as critical as those included in phase 1. A Preorder System, for example, will support the recommendation function, including verification, selection decision, and approval, before an item enters the process of making a request or order to a supplier. About two hundred staff members now produce over forty-four thousand purchase recommendations annually. Their recommendations complement the acquisitions that are received "automatically" through blanket-order dealer selections, existing standing orders and subscriptions, and official deposit programs. Another significant component will be extensive management reports that help acquisitions divisions monitor the universe of publications and the library's activities. With an international scope, multiple acquisitions programs, and impacts on cataloging and collection development programs, using mechanized analyses is increasingly essential to understanding a complex operation.

Features in phase 3 emphasize linkages to internal library systems and external automated systems. Because the systems environment within the library is complex, large, and dependent on annual budgetary approval from Congress for development resources, it is not easy to predict what systems will be implemented once the acquisitions system reaches phase 3 development. Ideally, the acquisitions system will share redundant data files with other major systems and transfer transactions electronically. There are key bibliographic interfaces with cataloging systems and claiming and with the serials management system; voucher and payment transfers interface with the centralized financial management systems, and bibliographic and inventory data transfer to the collections management system. Outside databases might provide preorder bibliographic data (recently published and retrospective titles) and might electronically exchange correspondence with the library's acquisitions system. The economics of such transfers, and their technological and administrative manifestations, are still open questions. By phase 3 of the library's acquisitions system, we hope the commercial and library communities offer clear, low-risk, and cost-effective systems options.

PLANNING FOR A REPLACEMENT SYSTEM

The development of any large system requires the participation of different groups with different interests. Although about 750 staff members are potential users of a comprehensive acquisitions system in the library, a committee of 15 representatives provides the broad, user perspective. The divisions actually responsible for the core processes to be automated are within the Processing Services Department. They are represented on the librarywide committee. In addition, small working groups of individuals designated by management make recommendations on how work activities might be automated and how procedures will be affected (and improved) using the new system. About 25 core staff members are providing technical input to requirements, through the coordination of the Automation Planning and Liaison Office.

Planning resources for development and for setting a project priority is the responsibility of top management in Processing Services, in the Automated Systems Office, and in the library. Strategic planning at the department and librarywide levels is a mechanism for approving development resources primarily located in the Automated Systems Office. Participation in strategic planning extends to all managers; thus the acquisitions system as a development project is only one of a whole constellation of projects and programs defined through management discussions and a formal planning process.

The department depends on the Automated Systems Office for development and maintenance of systems. Thus requirements are translated into a request for development, with a departmental priority and supplementary staff resource allotments if necessary. The Automated Systems Office is an equal partner in the planning process and feasibility studies and invests development resources according to priorities.

Each year the library presents budget requests to Congress for the next fiscal year. A development project such as an acquisitions system might be funded through additionally requested staff positions, a procurement budget, or reassignments of existing resources. This depends on the components of the overall budget request and priorities across all programs, whether concerned with automation or not.

The process of identifying requirements, arriving at a management decision to commit to the project, and finding financial resources is slow and complex. Severe budget cuts at the federal level become another variable in the critical path of the project.

PROJECT ESTIMATES AND ENVIRONMENT

The library has the option to buy a commercial acquisitions system or to develop a new system. Custom development may be accomplished using contractors or the services of specialists within appropriate organizations. A combination of all these options is theoretically possible.

Alongside the critical planning variables—staff resources or contract money currently available, management commitment, and budget cycles—are more "purely technical" decisions.

Processing Services let a small contract for a survey of available commercial acquisitions systems. The purpose of the survey was to compare the phase 1 requirements document (not the equivalent of an RFP) against broad capabilities demonstrated or claimed by vendors in the marketplace. The study was meant as a preliminary look at the feasibility of procurement as an alternative to custom development—with feasibility very narrowly focused on functional capabilities described in narrative.[8]

The consultant reviewed literature and contacted some vendors, identifying eighty "acquisitions systems" now in the marketplace, and concluded, from a more detailed look at six systems, that there is a good chance a commercial system could perform 70–80 percent of the functional capabilities needed for phase 1. This conclusion, surprising in light of the library's high volume and complexity of acquisitions activities, means a system might be procured instead of built.

A system or software procurement poses a wholly different set of considerations than does a custom development project. Some key issues are

1. What will a procurement cost compared with custom development?

2. Which functions will a commercial system offer compared with those of a custom system?

3. Will a commercial system meet the library's requirements for hardware and systems environment compatibility and its systems assurance standards?

4. Will the library be able to control customizations and enhancements, or will there be total dependence on a vendor for changes to proprietary software?

5. Will the procurement cycle accomplish a timetable and quality level that will deliver a replacement system as fast as needed?

6. Can the library expect funds to be available in budgets for two and three fiscal years in the future, when needed to complete a procurement process and to pay ongoing license fees and service contracts?

Custom development is more predictable, in the library's experience, than procurements of application systems. Resource fluctuations and changed priorities occur, original estimates are proven inaccurate, and the result is slippage in development, usually due to known internal factors. Even with minimal staff resources, the library can start a project and see some progress.

The advantages of custom development are clear: management flexibility and control over quality and timetables at every point, design that meets specific user and system-compatibility requirements, and the ability to generalize and integrate software development investments. Integration is particularly a key issue, due to the high volume of information exchange between operations.

For example, the library has selected and invested in the license for a database management software package. Applications expertise, systems programming support, quality assurance, and implementation are all more efficient if the core software is a constant between applications. The infrastructure of trained staff, familiar procedures, past and parallel experience all better serve quality development and maintenance.

Maintenance of a system on which scores of operators depend is less risky if support is a responsibility of in-house staff, and some developers are available to help. With a vendor system, contracted agreements rule, and sometimes preclude, areas of dependence, standards, and degrees of assistance.

There are initial estimates of the total development effort for a phase 1 system: they are not translated to dollar amounts as a standard practice. Existing staff are often reassigned to work on a project, and this may make the project more or less expensive than it might be with an optimally composed team. Some reassignment is assumed with in-house resources; thus costs cannot be easily contrasted with those associated with a procurement. Similarly, training costs are absorbed as part of ongoing staff development, and the benefits of the training carry over to more than one project. An internal project has development tools—software, hardware, standards, practical approaches—that reduce the overhead. A contractor might have to incur costs for special tools, skills, and quality standards in order to meet the requirements of the library. Furthermore, a custom project the size of the acquisitions system will probably depend on the mainframe computer already available and maintained for other applications. The significant costs of a hardware environment are not separately quantifiable for a library project. In the case of a commercial system, a special hardware environment will add significant additional costs.

SUMMARY

Because of the impact of the Gramm-Rudman-Hollings legislation on federal agency budgets, it is not feasible to pursue a procurement of a commercial system for acquisitions. Steps toward custom development are under way, by virtue of assigning several systems specialists to the project. The current budgetary picture makes it difficult to predict any future timetable: limited staff resources are committed for the foreseeable future. With the current level of staffing, progress will be slow, and the scope of phase 1 may be further abbreviated. A minimal replacement of the LOIS system may take four to six years, unless its failures cause the diversion of development people to the solution of maintenance crises. The most pessimistic picture is not the one we dwell on—the LOIS system developed one year at a time, and so will the new system.

Processing Services sponsored a contest to name the new system, which will be called ACQUIRE. We have commitment, enthusiasm, and the community of other acquisitions system developers and operators, alongside whom we also will juggle budgets, priorities, technical designs, desperate operational needs, and new technologies.

REFERENCES AND NOTES

1. Readers interested in a fuller description of acquisitions at the Library of Congress might request a copy of the following brochures: "The Order Division of the Library of Congress" (August 1980); "The Exchange and Gift Division of the Library of Congress" (June 1985); "Documents Expediting Project" (April 1981); or the *CIP Publishers Manual* (Washington, D.C.: Library of Congress, Cataloging in Publication Division, 1984), 38p. Also, libraries may have the *Annual Report of the Librarian of Congress, 1984* (Washington, D.C.: Library of Congress, 1985), 126p. with appendixes and index.
2. See "Library of Congress Book Receipts for 1983 and 1984," *Library of Congress Information Bulletin*, Oct. 14, 1985, p.285–91.
3. *Order Division Automated System* (Washington, D.C.: Library of Congress, MARC Development Office, 1972), 74 leaves with diagrams (LCCN 72-12530 Z689 .U59 1972).
4. See *Annual Report of the Librarian of Congress, 1968* (Washington, D.C.: Library of Congress, 1969), 149p.
5. Josephine S. Pulsifer and Justin M. Kniemeyer, "Overview of Automated Bibliographic Processing for the Library of Congress," Processing Department Automation Planning Document, no. 1 (MARC Development Office, 1978), 79 leaves. Also relevant is John R. James and JoFrances M. Calk, "An Integrated Technical Processing System in Support of Processing Services' Bibliographic Control Responsibilities: A Proposal," APLO Document, no. 150 (Automation Planning and Liaison Office, 1983), 56 leaves.
6. Gerald R. Lowell, "Library of Congress Acquisitions Processing," Contract A84-147 (Washington, D.C.: Library of Congress, Processing Services Department, 1984), 3v., 953 leaves (available from the Cataloging Distribution Service.)
7. "Report of the Acquisitions Requirements Committee," APLO Document, no. 164 (Library of Congress: Automation Planning and Liaison Office, April 1985), 21 leaves.
8. "Future Acquisitions System: Phase 1 Prioritized, Detailed Functional Requirements," comp. by Ruta Pempe with the Acquisitions Requirements Committee, APLO Document, no. 167 (Library of Congress: Automation Planning and Liaison Office, August 1985, rev. Nov. 1985), 54 leaves.

APPENDIX A. CHRONOLOGY OF LIBRARY OF CONGRESS ACQUISITIONS SYSTEMS

1968	Library Order Information System (LOIS) project initiated
1971	Cataloging in Publication (CIP) program started; records are controlled via the online cataloging system
1977	Final release of LOIS completed; the system handles only regular purchase and subscription purchase orders, and not exchange and gift requests or blanket orders
1978	Monograph purchase order records from LOIS are made available for online searching via the librarywide retrieval system (MUMS)
1981	Blanket order records are input to preliminary control system (APIF) as an interim solution
1984	Plans for new system start with a contract for a current systems description
1984–	Staff resources are committed to planning and development of a new acquisitions system; a small contract to survey commercial systems is let; the Acquisitions Requirements Committee is formed

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Automating Serial Management at the Library of Congress: A Status Report

Kim Dobbs and Linda Miller

1.0 INTRODUCTION

The objectives of this article are to sketch the Library of Congress' (LC) present serials management environment, to detail the preparatory steps leading to serials automation, and to describe the current plans for the development of a librarywide automated serials management system. For purposes of this paper, bibliographic control, though integral to a total system, is not included as part of the Serials Management System, but rather is considered a related system.

2.0 BACKGROUND

2.1 Manual Serials Control

The central inventory of the library's serial holdings is the Serial Record File (the Serial Record Division was formed in 1941 and has grown, basically unchanged, until now). It reflects the bound and unbound holdings of most of the library's serials published in the Roman, Cyrillic, Greek and Hebraic alphabets. The file contains entries for all serials received, regardless of whether they are permanently retained.

These are some basic Serial Record File characteristics:

- Approximately 850,000 entries
- 55% English, 9% Spanish, 7.5% German, 7% French, 3% Russian and 2.5% Italian.
- Single access with limited cross-references and no authority structure
- 1941–1980: organized by catalog main entry; 1981: form of entry changed to title.

A staff of fifty-five technicians is directly responsible for processing receipts in the Serial Record Division and for maintaining the file. The following annual summary of basic work-load statistics provides a notion of activities on the file:

- 20,000 entries added
- 1,500,000 pieces accessioned
- 80,000 reference questions answered
- 26,500 updates to binding records
- 5,000 claims forwarded to acquisitions divisions
- 22,000 entries edited
- 500,000 pieces routed (intermediate routings before issues are sent to their permanent custodial locations).

2.2 Serial Management in Other Areas of LC

The statistics cited above represent about one-third or less of the library's total serials management activity. In addition to the Serial Record File there are over fifty other serials inventory files, plus twenty-five binding files and numerous acquisitions, claiming, routing, circulation, and preservation files maintained in the library. In truth, the magnitude of serials control is just beginning to be understood.

3.0 DECISION TO AUTOMATE AND PRELIMINARY STEPS

3.1 Problems and Constraints

The decision to automate serials control, or perhaps more accurately, the realization that automation was needed within the next five to ten years, was reached in 1981 with the introduction of AACR2. The new cataloging rules had a significant impact on the organization of the Serial Record File and serials processing.

One might reasonably ask why it took so long to make the decision to automate serials processing at LC. There are a number of factors:

1. Up until the late seventies, the manual files seemed to be working reasonably well. This is no longer the case: access is becoming difficult, and space is running out.
2. There were already too many pressing automation priorities.
3. The enormity and complexity of the task.

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4. The large number and variety of user interests, spanning almost the entire library, had increased. To date, most automation development has involved a relatively small number of user organizations.

5. A very large amount of data conversion was required.

6. The state of automation technology in the late seventies did not provide the kind of flexibility and performance guarantees that are available today.

3.2 Evaluation of Existing Systems

Before the library began to develop an in-house system, it was considered prudent to look at the already existing systems. The library worked with a consultant to identify candidate systems and develop a methodology for evaluating them in terms of its needs.

A four-phase evaluation process was established.

Phase 1 was identification of candidate systems. This phase was accomplished primarily through a literature search. At the time the work was done four years ago, there were over one hundred systems available for consideration. The number has increased considerably today.

Phase 2 involved examination of system-descriptive literature. While a very large number of automated systems existed, many were eliminated following a careful review of this literature—systems that obviously lacked major features were weeded out. This review was followed by direct contact with the source organizations that had potentially acceptable systems. An attempt was made to obtain system documentation for closer study.

Phase 3 involved development of an evaluation scheme and comparison of the various systems against that scheme, which consisted of twenty-five functional areas and over three hundred features related to serials control. A numerical weight was assigned to each feature, and those functions considered absolutely essential were identified.

In this phase, the evaluation scheme was used to compare systems on the basis of information contained in available documentation. The purpose was to further reduce the number of candidate systems.

Phase 4 was on-site evaluation. On the basis of the determinations made in the earlier phases, four systems were selected for evaluations. Following discussions of the respective systems with the source institutions and demonstrations under actual operating conditions, the next step in the process was to work through the evaluation scheme, feature by feature, with the source organization and assign weights.

3.3 User Tests of the Faxon and UCLA Systems

Based on the results of these evaluations, two systems were selected—Faxon's LINX SC-10 and UCLA's TPS—for further study. Both organizations were contacted, and arrangements were made to conduct six-month use tests at LC. A test database of twelve hundred titles was loaded into each host, one located in Westwood, Massachusetts, and the other in Westwood, California. Two teams of library technicians were trained to check in current receipts on the systems. Progress of the test was carefully monitored.

The evaluation demonstrated to the library's complete satisfaction that automation could be effectively applied to its serial processing activities with multiple benefits to all divisions involved in the acquisition, processing, service, and maintenance of serials.

Either of the systems studied, with modifications, could meet the basic needs of Serial Record and other divisions. However, it was determined that even starting with one of the systems as a base, several years of additional development effort would be required to achieve all serials automation objectives. Some closer post-test study proved that installation of one of the systems on the library's computer, a basic requirement, would prove to be very expensive. In the end it was determined that the library would need to develop a system in-house.

Even though this pilot check-in effort did not lead to the installation of a system, the experience is considered to have been most worthwhile. There were many benefits derived from the evaluation study and user tests:

Much more was learned about automated serials control than ever could have been from just studying the literature and talking to vendors and other experts.

It was demonstrated that automated serials control could be applied to meet the library's needs.

A much clearer understanding was developed of basic functions and features such as issue prediction, retrieval, display, routing, claims alert, and multiple issue check-in.

Through involvement, staff interest and support were gained. The benefits of automated serials control to potential users throughout the library was demonstrated, and wide interest in the project was obtained.

The user test was one of the most helpful and positive steps taken.

3.4 Functional Requirements, "Wish List"

Simultaneously with conducting the user tests, a project was begun to develop a comprehensive functional requirements document or "Wish List." To help those of us faced with this task, the library employed the services of a consultant with particular expertise in the area of automated serials control.

Using primarily the interview process, he drafted an extensive document that reflects the requirements of thirteen major acquisitions, processing, and reference divisions. In total, over fifty people were interviewed.

The document organized eleven serials control functions into a ranked implementation priority scheme:

Check-in by Serial Record Division
Librarywide display of check-in records
Routing
Check-in by areas other than Serial Record Division
Acquisitions, payment control
Claims alert system
Link to bibliographic record
Binding alert
*Vendor source file
*Automated claims production
Binding control module

Over five hundred requirements were listed under the appropriate functions and further categorized as "mandatory or desirable." The mandatory and desirable labels were applied conservatively. Only those requirements deemed absolutely essential for the successful realization of a specific function were classified as mandatory.

It is believed that this "Wish List" document will serve as a solid basis for rationally carrying out development of the Serials Management Systems.

3.5 Data Conversion

It was recognized from the beginning that data conversion will be the most time-consuming and expensive aspect of the entire project. To help ease this aspect, two initiatives were undertaken.

First was preparation of a major study of file conversion issues, "The LC Manual File: Blueprint for Conversion to an Automated Environment." The report discussed fourteen general conversion issues and also outlined criteria for evaluating conversion options, describing seventeen options and presenting recommendations. The study ended with an operational scenario of how the conversion effort might coexist in the Serial Record Division with "business as usual" needs over an extended period.

Today, the conversion effort is focused on building a new MUMS (Multiple Use MARC System) database—SERLOC or SERials LOCation File. Basic serials control information is converted from the Serial Record File into SERLOC, whose primary purpose is to make available a core, machine-readable file to be loaded into the Serials Management System as soon as it is available, so that check-in records for at least the actively received titles can be created as quickly as possible.

Even though SERLOC does not include holdings information and should not be considered a serials control file, it does provide remote access to a great deal of serials information that a year ago was only available through a direct search in the manual file.

To date fifty-five thousand records have been converted, and fifty to seventy thousand records will be converted in 1986. Most of the conversion is being done by contract employees working in the Serial Rec-

*These functions are now part of the automated acquisitions system under development.

ord Division during evening and weekend hours.

4.0 UNIQUE ASPECTS

Before discussing current development plans, certain, possibly unique, characteristics of system development at LC should be factored into any analysis and design of software applications. These are factors that make it difficult to consider "off the shelf" software packages from commercial vendors, even though many fine ones are available. Perhaps the most important is the sheer volume of material that must be dealt with at the library. Current estimates call for a serial system that could accommodate as many as two million check-in records. This sort of volume immediately eliminates from consideration a whole group of systems whose inherent capabilities are not sufficient for efficiently dealing with file sizes of this magnitude.

Another peculiarity relates to the sources of acquisition. While most libraries do acquire material through a variety of mechanisms such as purchase, exchange, or gift, LC's reliance on various types of acquisition sources may be more unusual than most. If material processed by the Serial Record Division is analyzed, only 20 percent of received serials are acquired through purchase. Another 30 percent come in through copyright deposit or registration and the remaining 50 percent through exchange and gift. This becomes important in designing the serials management system because consideration must be given to more than one type of acquisition system for linkage when generating serial claims. For example, the system in the Copyright Office, with data pertinent to placing claims, is very different from the library's present purchase acquisition system (LOIS) and will remain separate from the replacement acquisitions system under development. Design considerations for the Serials Management System (SMS) must take into consideration possible interfaces with both these acquisitions systems and the copyright system, since they all contain data pertinent to the production of serial claims. Interface with the new circulation control facility, as well as the bibliographic system itself, will be required for the SMS. Experience has shown that it is often easier and more efficient to create such interfaces between software products tailored to work in concert with one another than to pick up an outside system that might require storage of redundant data elements.

Commitments at LC make it necessary, when providing any automation support, to secure systems somewhat compatible with LC's own software environment, systems designed to work well with very large files, and systems that are well documented. In most cases, the library would strive to find vendors who could make their source code available with the understanding that LC would need to take over maintenance and change responsibility for the system at some time after implementation. A number of factors contribute to requiring this level of control. Like other libraries, LC makes available to other members of the library community a variety of products from its machine-readable databases. A commitment to following established standards puts LC in the position of needing to make frequent changes and alterations to tape and paper products in order to stay current and in step with various standards. Since these changes are continual, the ability to readily change and adapt to new requirements is critical. Another major consideration—large files—is due to the sheer number of records involved. Existing systems frequently do not possess the indexing strength to handle efficiently file sizes of the magnitude inherent in this collection. This set of requirements greatly narrows the options that are available for the library's consideration.

The last consideration was the cost of adapting any purchased system to LC's specific needs. It would probably end up being more expensive to work through all the interface problems and to retrofit any existing system to LC's requirements than it would be to build a customized system "from scratch" internally. This does not mean that acquisition of computer-aided instruction software or electronic mail to support the system could not be considered. There may well be a place for many commercial packages within the system's overall design. The library does not intend to "reinvent the wheel" when software commercially available can be useful to the project.

5.0 COST OF "NOT AUTOMATING" SERIALS

As mentioned earlier, the large size of the file in Serial Record alone has made it increasingly difficult from a sheer physical dimension to continue expanding the visible file. Coupled with this kind of logistics problem, a further penalty is paid with anticipated duplication of entries. Since manual check-in files generally limit users to a single form of entry, it is likely that titles have been set up multiple times within the same file, causing further confusion. When considering that as many as four different sets of cataloging rules have been in effect during the life of some of the visible files, it is a mystery how the staff manages to locate so successfully the appropriate record for accessioning a given piece. By providing keyword access to the files, the tools available for accessioning tasks are greatly expanded. Since such valuable entry points as issuing body, LCCN, LC call number, ISSN, and various forms of title will be built into the SMS, it will not only be easier for trained accessioners to do their work but also will greatly increase access to serials information for the whole range of potential users of the LC serials collection.

In serials, the lack of automation has seriously hampered the ability to make decisions at a time when deselection becomes increasingly necessary. Cataloging records only contain serials data about which a final retention decision has been made. They do not contain records for all the titles that LC has retained in the collection for review before making a final retention decision, titles that are kept on a "current issues only" basis or those retained as sample copies. This kind of information remains in over fifty visible files. It is very difficult to get a comprehensive picture of the entire collection, its growth rate, its physical expansion requirements, etc. It is even difficult to tell how many copies of a given title are retained when these titles are checked into so many different files across the library. An SMS with decentralized capabilities, transferring all serial records into a centralized serials database, would provide statistics on the entire serials collection.

6.0 AN OPPORTUNE TIME

Now is a propitious time to move toward automation of the serials management system. The publication of the *U.S. MARC Format for Holdings and Locations*, coupled with the completion of the ANSI Z39.44 Serial Holdings Statements standard, has made it possible to address design of a serials check-in system that accommodates a standardized notation for communicating its holdings information.

Another opportunity involves the current development of new acquisition and circulation systems at LC. Since the SMS Project is under way at the same time as these two projects, it is possible to fashion those parts of SMS that make use of facilities within the acquisitions and circulations systems in such a way as to optimize the connections built between them. By this means, provision of the needed data elements in a form required by each of these systems can be ensured. Redundant storage of data elements can be minimized (if not eliminated). This issue of redundant storage becomes even more important when considering the size of these files and the amount of extra storage involved for even a small amount of redundant elements.

Still another opportunity comes from the introduction of a variety of fourth-generation tools into the library's "software environment." The library has recently obtained various Applied Data Research products that include a relational database, Datacom DB, and an online application generator, IDEAL. These tools have built-in opportunities for prototyping and greatly enhance the capability for providing flexible indexing approaches to databases. The report-writing tools incorporated into this package will also increase the ability to respond to user needs for a wide variety of reports much more easily than before. Best of all, these tools should greatly reduce the amount of time required to provide a new software application.

In the last year, considerable effort has been made to improve documentation of the serials bibliographic system. A serials data dictionary tracks data elements through a life cycle that begins in the OCLC database and moves through various communications formats and internal storage locations, until a serials cataloging product is output to customers at the other end of the data processing stream. Work is now being done to streamline this process greatly and to speed the ability to integrate serials cataloging data with other resident databases inside LC. These procedures will make the link between the serials cataloging system and the emerging SMS much easier to accomplish.

Perhaps the greatest opportunity related to serials occurred when SERLOC was introduced one year ago. It provided an opportunity to begin the enormous task of putting data from visible serial files into machine-readable form and to get a head start on conversion of the database. In the process of doing this, important decisions and discoveries were made that would not have been possible without a machine-readable file of this information. The presence of every data element has been questioned, while noting that some currently retained information might be eliminated in an automated system. Analysis of the collection has been conducted statistically, to make projections not only about the eventual size of the completed file but also about its frequency distribution and the number of check-in records that will be required. From this type of data, figures can be extrapolated to help predict the system's future hardware needs. Predictions can be made about the load of transactions to be generated by the new system as well as about the data storage requirements that will be necessary. As the SERLOC conversion proceeds, the ability to use statistics generated from this file will make estimates about the future attain an even greater degree of accuracy.

7.0 SYSTEM CAPABILITIES

In its first phase, SMS will span an estimated three- to four-year development period. The system will provide an automated mechanism for recording serials holdings at an issue-specific, or piece level. A side benefit of this process will be the ability to detect irregularities in the receipt of expected issues and to claim them automatically. The claiming will be accomplished by linking the serials management system to the acquisitions systems. Tied into this functionality, a subsystem will be provided to enhance selective dissemination of information. Referred to as the routing subsystem, it provides for the automated generation of a routing slip as a by-product of recording issue receipt. The routing slip contains the names of individuals or divisions that have a continuing interest in receiving a given journal and serves as a forwarding device, ensuring that all persons or groups interested in reviewing certain material will have it "automatically come across their desks."

Among the many benefits expected from the first phase of this project is the realization of a central and authoritative serials holdings/location database that will permit all areas of the library to obtain accurate data about the status and locations of issues that are immediately needed.

In its second phase the serials management system will provide public-access screens and a communication link with the acquisitions system for automatic generation of claims, renewals, and other functions; a link to the bibliographic file will also be provided. The public-access system will furnish answers to queries regarding serial titles held for all copies of a title, regardless of format or check-in location. Location points for material will be available, in addition to summary holdings statements pertaining to retained copies of all serials. Displays will be geared to promote ease of use for nontechnical personnel and casual users. The link to the bibliographic file will permit a user to locate a bibliographic item from the many retrieval points available on LC's MUMS cataloging system and quickly page to either the public access screen for holdings or, when necessary, to the actual check-in record for a specific issue of a title.

The third phase includes a binding alert function, a bindery processing and tracking system, and a circulation system link.

The binding alert provides the ability to advise LC's divisions of the proper interval for collecting loose issues into complete sets for binding by utilizing data stored in the check-in system. It is well known in binding circles that the longer an institution waits, the less likely it is to find a complete set to bind. This subsystem will generate pick-up lists to aid personnel in assembling binding units for shipment in a timely manner.

The bindery processing and tracking system will assist by generating specific details concerning issues collected for bindery shipment. It will track individual shipments into and out of the bindery until they reach their final destination in their respective custodial locations.

In this phase links to the circulation control facility will be created. Both the routing and binding subsystem will contain data about the temporary location of serial issues that can be fed into the circulation system's collection status monitor. This status information will then reflect the location of any item in the collection at any time after initial receipt at LC.

Since none of the data identified in the systems above will be in machine-readable form, an extensive conversion confronts the library. Some have estimated the scope of the effort to be as long as twenty years, if completion of all the routing, binding and check-in detail required by this automation effort is to be accomplished.

The conversion of data for the serials management system will proceed by attempting first to record check-in detail for all files and then gradually moving into ancillary areas such as claiming and binding. Because of the scope of the overall project, SMS is sliced into a phased series of releases. Priorities are set according to a consensus of the various internal constituencies within the library. There is a strong feeling that the benefits to be provided by the Serials Management System will greatly improve control of and access to the LC serial collection. ■■

Overseas Data Entry

Alice L. Kniskern

The Overseas Data Entry system is designed to process bibliographic records for monographs acquired by the overseas offices. There are six field offices administered by the Overseas Operations Division, which is part of the Directorate for Acquisitions and Overseas Operations of the Processing Services Department. The offices, located in Cairo, Jakarta, Karachi, Nairobi, New Delhi, and Rio de Janeiro, are responsible for identifying and acquiring research materials published in the countries assigned to them, for preparing preliminary cataloging records for these materials, and for dispatching them to the U.S. The offices, except in Rio, also manage cooperative acquisitions programs serving a total of fifty-one research libraries in the U.S. and abroad. In addition, the New Delhi office has two microfilm cameras and two microfiche camera/processors that are used for preservation of both monographs and serials, primarily from the offices in Jakarta and New Delhi but also from Cairo and Karachi.

During the past four years the cataloging function of the field offices has assumed a major role in their relationship to LC. The quantities of material acquired by the overseas offices and the specialized nature of that material in terms of language and subject content have made the early bibliographic control established by the field staff extremely useful in Washington and, for some languages, is the only means of processing materials. For example, all preliminary cataloging of Persian monographs is now done in Karachi, and Mongolian monograph titles are given minimal-level cataloging in New Delhi with no additional processing done in Washington at all. Each of the field offices creates preliminary bibliographic records that accompany pieces to LC and to participants in the cooperative acquisition programs and are published in one of five Accessions Lists produced by the offices.

The Overseas Data Entry (ODE) system was developed to provide this cataloging information for monographs in machine-readable form. The project was first proposed in January 1980 by Joseph Howard, assistant librarian for Processing Services. William Nugent of the library's Automated Systems Office visited New Delhi two months later while on a tour sponsored by the National Science Foundation. He discussed the idea with the field director and made a number of inquiries to determine the feasibility of the project in the Indian environment. Both men emphasized the

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need for automation to reduce redundant keying of records, not only between India and the U.S. but within the India office itself. Nugent's proposal of July 1980 emphasized the need to display and print clearly and distinctly the many diacritics and special characters needed to romanize the languages of South Asia.

The team responsible for development, training, and testing was drawn from the Engineering Planning and Development Office in the Automated Systems Office (ASO) and the Automation Planning and Liaison Office and Overseas Operations Division in Processing Services.

The equipment chosen for the system by ASO was a Terak microcomputer with an 8600 color processor, state-of-the art technology in 1980. The unit provides a high-resolution color screen, 640 by 480 dots. The printer is the Qume Twintrack, model S3/TT75, regretfully no longer manufactured, which uses two print wheels that together provide the entire ALA character set.

The customized print wheel and the screen images for the diacritics and special characters were designed by ASO staff with assistance from the Network Development Office—the second print wheel is a standard Courier-10. The diacritics and special characters are keyed on a standard keyboard with a set-two function. Special characters and diacritics are identified by customized key caps.

ASO, working with a contractor in New Mexico, developed six software programs to support the ODE system.

ENTRY
: written by contractor; allows for entry/edit of bibliographic records; format exclusive to Terak; word processing features; supports variable length fields; superimposes diacritics on the screen

VALIDATE
: written at LC; checks for repetition of nonrepeatable fields and subfields, invalid tags, etc.

PRINT
: written at LC; prints catalog cards, APIF worksheets, screen images, mailing transmittal sheets in the field office

CONVERT
: written jointly by LC and contractor; runs at LC, converts ODE format in ASCII to APIF/MUMS format in EBCDIC; creates the segment control and record control areas, record directory, etc.

TRANSMIT
: written at LC; sends converted data to the mainframe

WEEKLY
: written at LC; loads records received from TRANSMIT into the APIF file

The records are keyed in the field on 8½-inch flexible, single-sided, double-density, soft-sectored disks, which are shipped to Washington via diplomatic pouch. Each disk is accompanied by a mailing transmittal listing the LC card number, main entry, and title (245) field. The CONVERT and TRANSMIT programs are run by OvOp staff on a Terak unit in the division.

The ODE system provides for all MARC data fields; the records are fully content-designated by field staff. The system allows MLC (minimal-level cataloging) records to be keyed and then transmitted to the LC mainframe with the approval bit set. Records so identified in the machine file are moved to BOOKS by a batch migration program run automatically by ASO every second and fourth Sunday.

MLC records are thus added to the library's database without review by staff in Washington. Before an office can be authorized to load MLC records in ODE, the staff must meet standards set by the Collections Development Office for both selection and assignment of priorities as well as cataloging standards established by the Office for Descriptive Cataloging Policy and the Descriptive Cataloging Division.

Machine-readable records for monographs assigned to priorities requiring full cataloging are left in APIF until the book itself has completed the cataloging process through Descriptive, Subject, and Shelflisting. Once preliminary approval is given in Shelflisting, MARC Editorial Division staff make any corrections noted on the work sheet and key additional data provided by Washington staff.

The New Delhi office is the first and, as yet, only office to be automated for cataloging. Responsible for Bangladesh, Bhutan, Burma, India, Laos, Nepal, Thailand, and

Sri Lanka, the New Delhi office currently provides preliminary cataloging for titles selected for full-level records and MLC for monographs (microfiched at the office) and selected hard-copy titles. Priorities for monographs are assigned by the staff there.

New Delhi was chosen as the initial automated office because it processes more titles (more than nine thousand monographs per year) in more languages (over forty) in more scripts (eighteen) than the other five overseas offices. Since the system went into production in March 1984, more than sixteen thousand records have been keyed in New Delhi and subsequently loaded into the LC database. Sixty percent of these are from languages printed in nonroman scripts, and these records are fully romanized for machine input.

As Terak does not provide maintenance support outside the U.S., it was necessary to identify and train one Indian staff member to oversee the system at post. Dina Nath Wadhwa came to Washington in February 1983 for three months of training: he learned to dismantle and rebuild the Terak and Qume equipment and learned content designation in order to create records for practice input and testing. Nine months elapsed before the equipment reached India, and although we were able to provide an LC trainer for only one month in India, Wadhwa has been remarkably successful at keeping the system going since then, despite hardware failures; he also trained the computer staff in New Delhi and helped the catalogers learn content designation. Wadhwa now works closely with an Indian firm that has a contract for maintenance of the equipment.

The equipment was shipped to India in December 1983 and installed by two ASO staff members in January and February 1984. The New Delhi office sent the first disk with ODE records in March. While LC did not finish final testing of the system until September 1984, New Delhi staff continued to key data, building a file of nearly three thousand records before the first records were transmitted to the mainframe during the last week of September.

In the Indian office there are three Terak microcomputer systems, each with one CRT, one 8600 processing unit, one keyboard, and three disk drives. They have two Qume Twintrack printers. The products, both machine-readable and printed versions, are excellent when the system is operating. However, problems do occur and, sadly, these are frequently serious problems.

Our biggest headaches have been caused by the Qume Twintrack printers. After a series of small failures with which we were able to cope, one of the two printers went down in September 1985. New Delhi staff were forced to cannibalize the disabled printer repeatedly in order to keep the other one in operation while we in Washington struggled to get replacement parts. In 1986 Overseas Operations shipped a third printer, intended for use in Washington, to the field office. New Delhi staff reported on May 1 that they are once again operating with two printers—the disabled one was returned to us for repair and use here.

The basic problem with the Qume printer is that it is not built for "industrial" use. New Delhi staff are running their equipment eight hours a day, six days a week, a work load that is clearly too heavy for this machine. Another problem is poor service from the parent company in California and unavailability of parts on the open market. Our parts orders generally take three months to fill, and that does not include shipping time to India. Qume admits it will eventually run out of those parts that are unique to the Twintrack. The search is on for a replacement, but so far we have not been successful. We must have a printer for which parts can be acquired abroad and that is strong enough to run almost continuously, provide the full, ALA extended-character set, and meet our budget limitations.

The Terak microcomputers have caused problems as well, but access to parts on the open market and responsive service from the manufacturer have eased the strain. We did have a major downtime on one machine in summer 1985, when its 8600 unit malfunctioned. It had to be returned for repair because the field staff and contract maintenance firm were unable to diagnose what was wrong. The time required to ship it to the U.S. and to send back another 8600 unit from the LC system seriously affected the work load in India. We have since acquired a spare 8600 color processor, now in New Delhi ready for immediate use. Other malfunctions have been in boards, which have proven less difficult to handle. New Delhi telexes the pertinent information on the needed part to OvOp, which prepares the necessary purchase requisition for Procurement and Supply, which in turn contacts the Terak supplier by phone. The last board was in New Delhi within two weeks of the initial telex, a new record but one that we doubt we will duplicate often, much less improve.

Another concern is the Terak's slow response time: while it was state-of-the-art in 1980, it has since been surpassed, especially in speed. We are grateful for its capabilities but look forward to more efficient equipment.

The future will most likely bring new equipment and software for overseas cataloging. We are reluctant to acquire Terak micros for other offices, since the company does not offer maintenance outside the U.S. We are restricted to board swapping for identification of trouble and must acquire and ship all replacement parts, as none are available overseas. Undiagnosed malfunctions require that the affected unit be returned to the manufacturer. But some microcomputers are supported in the Third World, and in 1985–86 we acquired IBM PC XTs and Wang PCs for use in five of the offices. IBM offers service in Cairo and Karachi, and Wang service is available to us in Jakarta, Nairobi, and New Delhi through the Department of State's worldwide contract.

Our printer situation is more restricted. We cannot acquire more Qume Twintrack printers and must resolve that problem before any expansion of the project can proceed.

We are looking for off-the-shelf software that will provide an integrated library program to handle ordering, cataloging, and accounting for LC and our cooperative acquisition program participants. Keying of serial cataloging data abroad must be coordinated with OCLC, as LC uses CONSER files to input serial data. Once we have met some of our other goals we hope to undertake this major task of programming for serials: this capability would be appreciated by many at LC as well as by the program participants.

Our goal is to spread machine data capture to every local office, giving first priority to those offices that handle nonroman scripts (Cairo, Karachi, and New Delhi). The Indian experience shows that employees with local language expertise are capable of high production and extraordinary accuracy when inputting romanized records. Microfiche items are another group of records for which input assistance from overseas is needed: work loads in Washington have made it almost impossible to enter these here. We would like to provide machine load capability in the Jakarta office, for example, which sends over 50 percent of its monographic receipts to New Delhi for microfiching.

The ODE system has been an exciting project. Watching the disks arrive, finding ODE records on APIF and in the BOOKS file, and receiving reports from LC monitoring staff that the New Delhi office continues to provide almost perfect work in content designation is most gratifying. We are also excited by the future. ODE offers a potential enhancement to bibliographic control, in the fifty countries covered by the overseas offices, that will benefit research libraries worldwide. Someday there may even be the possibility of satellite transmission for online searching and, perhaps, cataloging.

As enticing as the future seems, we are all well aware of the immensity of the task before us. There are many stumbling blocks to automation in the Third World, including power supply, parts, service, and the continuing problem of distance from LC. Most pressing are the very real funding restrictions that will be with us for the next several years. These will almost certainly delay expansion. ■■

In Memoriam: Hugh C. Atkinson, 1933–1986

Hugh C. Atkinson, university librarian at the University of Illinois–Urbana-Champaign, died this past October. He was an active leader in the Library and Information Technology Association and in its predecessor, the Information Science and Automation Division.

Those of us who were fortunate enough to work with Hugh will feel his absence, certainly, but we will also feel, and continue to live with, his profound influence.

Those of us who knew Hugh through professional associations will miss his wit and considerable political skills.

Those of us who heard Hugh speak or read his writings will realize the loss of one of our most sensible and progressive colleagues.

All of us were impressed by the unique combination of common sense and illuminating vision that Hugh possessed.

While we mourn his passing, we are grateful to have shared his wisdom, his guidance, and his love of libraries and know that all of these qualities will continue through those of us who knew him.

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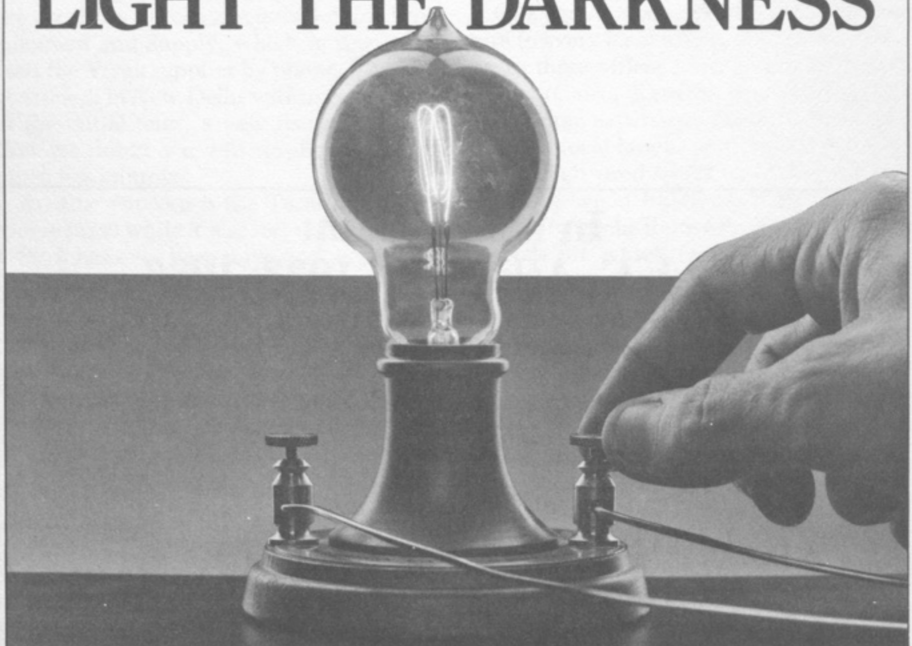

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Communications

SORT-AID with RANK: Search Postprocessing Tools for Automating the Determination of Citation Relevance

William Leigh and Noemi Paz

This article reports on the design and use of a computer system to aid online, bibliographic database searchers in the post-search, analysis phase of their work. The major task addressed is determining the relevance of downloaded abstracts. Aids for the individual review of abstracts, semiautomatic determination of relevance, and fully automatic use are described. The system runs on a personal computer and is in use at several NASA technology transfer organizations.

INTRODUCTION

Nowadays the personal computer and associated software components aid the searcher of online, bibliographic databases. Existing software packages, available commercially, assist the searcher in "front-end" activities such as connecting to the database computer system and formulating a query.[1] Word-processing software use is a commonplace in the preparation of search-related reports. However, it is not so well established that a computer can contribute to the actual analysis phase of search work in more than a specialized, word-processing capacity until the promise of natural language processing is realized by the researchers in artificial intelligence.

Analysis of downloaded citations and abstracts follows searching. The searcher intends to download only those citations and abstracts that are relevant, but chaff is inevitably present and can only be removed through manual review and "cut and paste." This review process can be computer-aided with specialized word- and data-processing routines. Programs can be written to display the citations and abstracts to the searcher rapidly, to allow tagging of the citations with classification information, and to support the reordering or culling of the downloaded set.

Our SORT-AID system is a set of computer programs that executes on an IBM PC personal computer. SORT-AID provides facilities for display, classification, reordering, culling, and printing of downloaded abstract sets. One component of SORT-AID, called RANK, is a notable and unusual addition to the functionality customarily supplied by such systems. RANK applies automatic indexing technology to the downloaded set to impose what is intended to be a relevance order on the abstract set.

Our work is sponsored by the NASA Technology Utilization Office, the agency that sponsors the Industrial Application Centers and the Technology Assistance Centers. These organizations are known as technology transfer agents, and their primary products are bibliographic database searches with value added in the forms of report preparation and related in-depth research. A necessary step in the preparation of their search-associated products is the determination of citation relevancy. Thus, the capabilities offered by SORT-AID with RANK for automating the relevance determination task can be especially valuable in the context of their work. In addition, it is reported that this type of citation relevance

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The software described in this article is in the public domain and available on an unsupported basis from the authors.

determination is a major activity among online search professionals in general.[2]

THE INDIVIDUAL ABSTRACT REVIEW TOOL SET

Figure 1 is a chart representation of the data flow and component relationships in SORT-AID; two programs comprise its basic abstract manipulation facility. One of these executes in a batch mode to format the sequential downloaded set file into a direct access organization that affords reference and access of individual abstracts in any order. This program must be applied to all downloaded set files, but multiple downloaded sets from diverse database systems may be combined into the same direct-access file. Format information for several database systems is available to this program in data tables.

The resulting abstract file, organized so that the abstracts may be accessed individually, is used as an input for a second program whose role is that of an interactive intermediary between the searcher and the abstract file. Abstracts may be displayed sequentially, forward or backward at the searcher's command, or individual abstracts may be called up by entry of their system-assigned identification number. Comments and classifications may be appended to the abstracts. "Help" texts are available online for all of the commands supported.

Full-text searches on the abstracts may be run on words and phrases. Alterna-

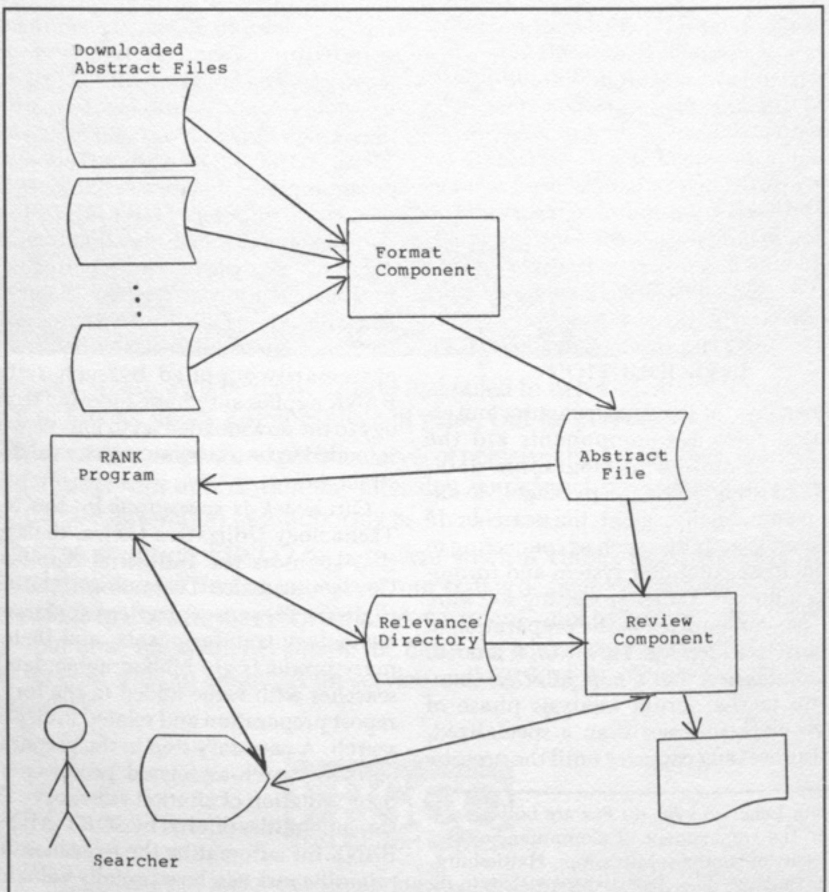

Fig. 1. Organization of SORT-AID System

tively, searches of the abstract file may be performed with searcher-assigned abstract classifications as the argument. Subsets of the abstract file, selected by either of the two search modes, may be printed to hard copy. The response of this program is rapid, owing to the preformatting and organization accomplished by the preceding program in the system and to the inherently superior screen-display capabilities of the personal computer (as opposed to remotely accessed systems).

This basic functionality of SORT-AID is not markedly different from that described elsewhere.[3,4] It is worth mentioning, though, that the capabilities of modern personal computers are more than adequate for supporting these types of database searching tasks in an economical and efficient fashion. This statement could not have been made only a few years ago, when an expensive mainframe computer was necessary for this type of text-processing application.

The unique aspect of SORT-AID is its interface to the relevance ordering component RANK. As described in the following section, RANK prepares a directory to the abstract file that can be used by the reviewing program in SORT-AID to govern the sequential browsing of abstracts. Thus, the searcher can view the downloaded file either in the order in which it was captured or in the order indicated by the RANK-supplied directory.

RANK's purpose is to derive an ordering of the abstracts from the most "relevant" in the set to the least relevant, with those of intermediate score in decreasing order in between. If searchers are confident of the RANK-supplied order, they may elect to review individually only a first or last portion of the file, which can save considerable time when a large number of abstracts are present.

SEMIAUTOMATIC RELEVANCE DETERMINATION

RANK is a program that reapplies the strategy that resulted in the retrieval of the downloaded set of abstracts in the first place. It indexes the downloaded set and allows the searcher to re-pose the original query, but this time using the newly generated keyword index. This stepwise iteration of the indexing and searching process can result in more powerful discrimination within the set of abstracts of interest than was originally possible when those abstracts were dispersed as a small proportion of the larger universe of the complete database.

The theory of automatic indexing is well described in the literature.[5] We employ the most fundamental lexical association methods, collection frequency and signal-noise. The searcher can select which of these methods will be used in a given application run of RANK. Theory suggests that collection frequency might be used when high recall is desired, and signal-noise used when the primary objective of search querying is high precision.

The collection frequency method selects words to use as index terms on the criteria of most occurrences in the complete corpus of abstracts to be indexed. Thus, the words selected to be keywords are those that appear most frequently in the downloaded abstract set. The signal-noise method selects keywords differently. The terms that are used frequently in a small number of the abstracts are selected over those terms used uniformly throughout the set. (Of course, a "stop list" prevents the common and "contentless" words, such as *a*, *an*, or *the*, or the code words used by the database services to format abstracts from dominating the index.)

After the index of keywords is generated, the searcher repeats the querying process. We call this a "semiautomatic" process because of the necessity for searcher intervention. In the querying phase, RANK displays all of the words in the index, from the one with the highest score (collection frequency or signal-noise) to the one with the lowest. The searcher can move the cursor to select a word and enter positive and negative integer weights to the word selected. If a weight is not applied to a word in this manner, a zero weight is assumed. This method of selecting keywords for querying would be impractical for the database as a whole, but is quite workable for the smaller downloaded set.

These searcher-supplied weights are used by RANK to compute "relevance" scores for each of the abstracts in the downloaded set. Abstracts containing a word with a nonzero weight have their scores modified by the amount of the weight. High positive weights cause abstracts containing the word to get a higher score. High negative weights cause abstracts containing the word to get a lower score. Zero weights do not affect the calculation. The abstract scores calculated in this manner are sorted into decreasing order and then used to build the directory, which is passed to SORT-AID's review function.

TOWARD FULL AUTOMATION?

The literature suggests that we are only now beginning to understand how complex the problem of search relevance determination really is.[6] Early work endeavored to order the output of the searcher's original query automatically.[7] More recent work recognizes the necessity for involving more specific information about the user than can be present in a single query.[8] Such methods that learn from the history of the searcher's work are of little use in the case of professional searcher-intermediaries who perform searches for a diverse clientele and who must achieve results in an economical number of search queries. However, this recent work does point the way toward methods that are less than fully automatic and involve the participation of the searcher in some way.

We have experimented with applying our reindex and re-search tactic in a fully automatic mode. The crux of this is an assumption that the searcher accomplished a "good" search in the first place. This assumption allows the downloaded set as an aggregate to be used as a synthetic norm against which to compare the individual constituent abstracts.

In a fully automatic mode, the querying phase in the operation of RANK, during which the searcher would supply weights, is carried out programmatically without consulting the searcher. RANK is modified to insert a weight of one for terms scored highest by collection frequency and a negative one weight for the terms scored highest by the signal-noise method. This follows from the assumption that the search was a "good" one, in that the collection frequency terms will indicate abstracts that are closest to the norm established by the collection as a whole, and the signal-noise selected terms will indicate abstracts that differ from this norm.

We concluded an experiment to evaluate the worth of RANK in this fully automatic mode. The abstracts in a small number of searches (eight) were coded by their searchers as "relevant" or not. An automatic application of RANK consistently gave 10 percent more "relevant" abstracts in the top twenty than would have resulted from a random ordering of the abstracts. This result is not significant, but does encourage us in further investigation of this technique.

CONCLUSION

The basic abstract manipulation and reviewing capability afforded by SORT-AID has been enthusiastically received by the searchers using it. Tools such as this are relatively inexpensive to implement and do increase the productivity and effectiveness of searchers.

A component such as RANK in semiautomatic mode is a logical extension of the basic abstract manipulation capability. Reindexing and re-searching appear to be a useful and powerful approach to this problem, since there is such a well-developed theory in lexical association indexing and querying. This reindex and re-search strategy is more computationally expensive than would have been practical for workaday searching before the advent and mass production of modern personal computers—but it is quite practical today.

We suspect, and have observed, that the utility of the technique described here for semiautomatic relevance determination is not greatly affected by the indexing method employed. The power derives from the stepwise refinement of the search process, regardless of the particular index generation algorithm. For this reason we do not intend to investigate modern refinements in indexing and querying for application in this context. Instead, we intend to pursue methods that more effectively engage the searcher's involvement in a semiautomatic process, such as combining the reindexing and re-searching tactic with navigation of a hypertext or semantic net. This implies that RANK build a directory that is a more complex data structure than the list produced now, so that dimensions of relevancy might be offered, optionally selected, and investigated in the individual abstract reviewing and classification phase.

The meagerness of the fully automatic RANK experimental result also reminds us of the value of the direct and interactive involvement of the searcher in the relevance determination process. Fully automatic methods are of theoretical interest, but, as in this case, their maximum potential may be of only modest practical use.

Effective and efficient semiautomatic and data-processing techniques have a great payoff in proportion to their cost. The true potential of automating intellectual tasks is as an aid to the human worker, not as a replacement.

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Tribute to Donald P. Hammer

Donald P. Hammer retires on December 31, 1986, after thirteen and a half years of devoted service as executive director of the Library and Information Technology Association of the ALA. I would hazard a guess that many members of LITA are unaware of the central role that this modest and unassuming man has played in the creation and progress of one of the largest and most innovative library organizations in this country. It is safe to say that even fewer will know of Don's long and varied career as an academic librarian and in professional organizations.

He worked in positions of steadily increasing responsibility in the libraries of Gettysburg College, Pennsylvania State, the University of Illinois–Urbana, Purdue University, and the University of Massachusetts from the late 1940s to the mid-1970s. In his later posts, he developed an interest and expertise in the problems and techniques of automated library systems. This working experience in research libraries was paralleled by an increasing involvement in professional organizations concerned with the matter of library technology. Don was, inter alia, a member of committees of the American National Standards Institute concerned with library technology, a committee of the American Society for Testing and Materials, and, most importantly to our association, the Board of the Information Science and Automation Division (ISAD) of the ALA—the precursor of LITA. In 1972–73, he was elected vice-president and president-elect of ISAD. He did not become president because he was, during his vice-presidential term, chosen to be the executive director of the association. Thus, Don's professional interests and his daily occupation converged. We should note that he served simultaneously, for the next six years, as executive director of the Library Administration and Management Association.

As executive director of LITA, Donald Hammer has been tireless in pursuing the interests of the members of that association by every means open to him. He has arranged numerous conferences, institutes, and other meetings (with the attendant and ever-present grief that only those familiar with the inner workings of such events can begin to comprehend); he has controlled the massive paper flow of the association (alas! LITA is living proof of the length of the road that lies ahead on the way to the "paperless society"); and he has dealt with patience and aplomb with all the multitudinous crises—great and small—that afflict the understaffed and overworked administrative personnel of professional associations. It is doubtful that any such organization has had a more devoted and effective director.

I would like to conclude on a personal note. After I decided to spend my sunset years in American librarianship, I also decided that LITA was the professional organization with which I most wished to be associated. Since then, I have participated in LITA institutes, been involved in its publications program, and had the honor of being elected to the LITA Board. In all of these activities, Don Hammer's benign presence has been of great assistance, and I have come to realize the very special contribution that he has made. Don is, in all the very best senses of the word, a gentleman. All the members of LITA will, I am certain, join me in thanking him for all that he has done and in wishing him all that he wishes for himself wherever the future takes him.—*Michael Gorman* ■■

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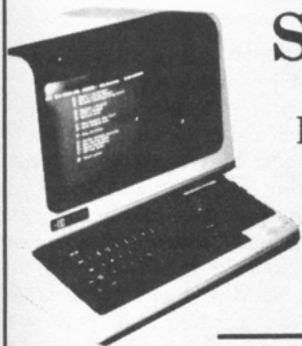

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News and Announcements

ARL Receives Grant from Mellon Foundation for NRMM Recon Project

The Andrew W. Mellon Foundation has awarded the Association of Research Libraries a three-year grant of $290,000 to support retrospective conversion of records in the *National Register of Microform Masters* master file. The master file contains over 550,000 reports for monographs and serials, including Library of Congress cards and other bibliographic records submitted to LC by libraries and other producers of microform masters. The grant from the Mellon Foundation supplements a grant of $828,755 from the National Endowment for the Humanities' Office of Preservation.

In partnership with the Library of Congress, ARL plans to begin the project in fall 1986. The project focuses on the monographic reports in the master file, which represent 90 percent of the file—conversion of the reports for serials might better be done under the auspices of CONSER (the CONversion of SERials project)—and will result in the creation of over 460,000 records for microform masters held by libraries, archives, publishers, and other producers. It is expected to take just under three years to complete.

ARL and LC will use the services of a cataloging contractor to produce machine-readable records in accordance with the technical guidelines of the ARL Recon Project. LC will perform quality control evaluation of the contractor's work and will distribute the resulting records in machine-readable form through the MARC Cataloging Distribution Service. ARL will take full responsibility for all aspects of administration, including contract enforcement and management of grant funds. Jeffrey Heynen, ARL program officer, is the project director.

Preservation microfilming is currently recognized as an extremely effective means for resolving the most difficult preservation problems. Although cost-effective, it is not an inexpensive process, and given the magnitude of the problem—the many millions of volumes that can best be preserved by this means—cost control is a major concern. Preventing costly and wasteful duplication of effort by improving the means to locate existing masters is an important step. The primary tool for locating microform masters, the NRMM, has several drawbacks. It is unautomated and, because it was developed to complement the *National Union Catalog*, has only brief entries with limited access points. In addition, it has been cumulated only once, to cover the period 1965–75, necessitating the time-consuming searches of annual volumes for subsequent years.

Conversion of monographic reports in the NRMM master file and distribution of the resulting machine-readable records to any bibliographic utility, library, or other organization that wishes to obtain them will be a major step toward ensuring that searches for existing microform masters are as efficient and inexpensive as possible. Achievement of this objective will greatly assist cooperative preservation projects and will eliminate extremely costly and wasteful duplication of effort. Its benefits will accrue to librarians in collection development, interlibrary loan, and cataloging departments as well as those specializing in preservation. In consequence it will benefit libraries, archives, and publishers—and the scholars and researchers served by them—throughout the United States and Canada and, potentially, throughout the world. ■■

University of Toronto and Stanford Medical Library Choose Utlas T/Series 50 for Local System

The University of Toronto Library has signed an agreement with Utlas International for the purchase of an Utlas T/Series 50 local system. The T/Series 50, which runs on Tandem Computers hardware, will provide the main library and its departments with circulation control and an online public access catalog. The T/Series 50 will be operational for the start of the university's 1987–88 academic year.

This will be one of the largest T/50 installations to date. The system will support one hundred terminals to access the library's 2 million–title, 4.8 million–item database. The initial configuration for the University of Toronto includes three Tandem NonStop TXP processors.

The Lane Medical Library at Stanford has also chosen Utlas T/Series 50 for its local system.

Lane, one of the foremost medical libraries in the United States, currently maintains a collection of over 300,000 volumes. It serves the Stanford University Medical School, which is noted for its excellence in medical education and research.

Lane Library's Utlas T/Series 50 is based on Tandem NonStop hardware with two processors and will reside in the Stanford University Medical Experimental Computer for Artificial Intelligence in Medicine (SUMEX-AIM) computing center. SUMEX-AIM is a federally sponsored facility that is researching computer-assisted medical decisions. Its personnel will be assisting the library in the integration of the T/Series 50 with other medical school systems.

Lane Medical Library and the University of Toronto join ten other United States libraries now served by T/50, including the Houston Area Library System and Arizona State University. ■■

CLSI Signs Phoenix Public Library

CLSI, Inc., West Newton, Massachusetts, has signed a contract with the Phoenix Public Library (Arizona) for an automated library system; purchase price was $1.18 million, which does not include data conversion.

The library is replacing its current automated system with the CLSI installation, which may be the largest system conversion in the library industry. The initial configuration includes 2 Digital Equipment 11/84s and 3 11/73s, with plans for migration to VAX technology, including 3 VAX, 2 terminal, and 10 front-end processors. The contract specifies the installation of 104 terminals, including 4 CLSI MARC Editing Terminals, and an X.25 communications network.

The library's new computer room was completed in mid-October 1986, and installation is scheduled for December and January.

Phoenix Public Library is the interlibrary loan clearinghouse for Arizona. It is anticipated that other libraries will gain access through five auto-answer devices connected to the CLSI system. The module for system linking may be used to access the online databases of other libraries and commercial information services.

Phoenix Public Library has a central library, nine branches, and a bookmobile. It serves a population of 880,000 and has an annual circulation of over 4.5 million. ■■

Microlinx Successfully Tested on WLN

The Western Library Network (WLN) has successfully tested Faxon's MicroLinx system for serials control in its member libraries. Following testing and evaluation by its staff members, WLN announced that Microlinx Check-in meets its specifications for network libraries using WLN-PCs with hard disk drives.

The WLN-PC is a modified IBM PC that has a special keyboard and will support 640K memory expansion and either 10 or 20 megabyte disk drives. It can act both as a bibliographic terminal accessing the WLN network and as a standalone microcomputer for a number of library activities. Two member libraries have already begun MicroLinx Check-in installation.

During testing it was determined that WLN's MARC serials records can be automatically downloaded into MicroLinx files using Faxon's bibliographic interface software.

In a related development Faxon and WLN have successfully tested dial-up access to Faxon's DataLinx database using a WLN-PC. Plans for future development include testing the capability of transmitting DataLinx information to MicroLinx files on WLN-PC. ■■

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Recent Publications

Book Reviews

Armstrong, Chris, and Stella Keenan. *Information Technology in the Library/Information School Curriculum: An International Conference.* Brookfield, Vt. and Aldershot, England: Gower, 1985. 266p. ISBN: 0-566-03526-X, hardcover, $53.95. "Proceedings of the International Conference on Information Technology in the Library/Information School Curriculum, London, 8–10 December, 1983."

This international conference was called to coincide with the 1983 International Online Information Meeting, sponsored by Learned Information, and is an outgrowth of work by the British Library Research and Development Department.

The organization of this book follows that of the conference: seven "sessions" beginning with Blaise Cronin's keynote address and ending with comments by W. F. Saunders. In addition to the papers presented, this book includes the panel discussion based on José-Marie Griffith's paper and two general discussions of all attendees. For more value, this title also provides copies of three papers not presented in person and a summary of a related seminar, "The Management of Change," held at Leeds Polytechnic, also in 1983. A useful feature, in addition to the list of registrants, is a section providing brief abstracts of all exhibits. Access points include two indexes, besides the table of contents. The personal-name index includes both paper authors and authors cited within these papers. There is also a subject/institution index.

Since the specific point of the conference was to present a state-of-the-art overview, no research per se is reported. While the papers, as a whole, are as diffuse as might be expected with such a conference, they do naturally group themselves under several basic themes. For purposes of review, it is much easier to group the papers under those themes.

The first set, beginning with the excellent presentation by Blaise Cronin, deals with the future needs of the information world and how these may affect those who educate the future workers. Cronin's paper, often cited by other presenters, includes a list of thirteen major issues affecting library/information science education. In essence, these can be summarized as major changes leading to almost total obsolescence both of the current library school curricula and of the present role of the library school. This theme is carried by the summary of competency requirements for the information worker by José-Marie Griffiths and ensuing panel discussion.

A second set of papers present recent and current changes in library and information science education nation by nation. These include summaries of the state of information technology education in the United Kingdom (L. A. Tedd), Australia (Marianne Broadbent), the Netherlands (B. J. J. Groeninger), and Hanover, Germany (C-R. Huthloff). In addition, two undelivered papers discuss the national curriculum set up in Poland (M. Muraskiewicz and Z. Nowicki) and plans for integrated accreditation in the United States (B. and J. Schlessinger).

Related to this set are papers on the European Institute for Information Management's courses (M. N. Rischette) and attempts by IFLA, FID, and the International Council of Archives to develop a consensus on curricula (R. Bowden). A very brief discussion of continuing education, based on U.S. experience (M. Lowe), adds little to this theme.

The fourth set of papers deals with specific examples of the reciprocal use of information technology in training for the use of information technology. With one exception (the discussion of a circulation simulator by G. Tseng and H. Bateman), these all deal with online bibliographic search systems. Further, they also deal with the use of systems other than "real" systems. Since the terminology is still fluid, the references to "simulators" and "emulators" are often confusing, but, on balance, the papers by F. E. Wood, B. Livesey, J. A. Large and C. J. Armstrong, and D. Fairhall all describe a locally controlled system that either provides a demonstration of typical searches (usually called here a "simulator") or permit access to a local database by use of software that imitate such systems as Dialog or BRS (usually called here a "emulators"). A third approach is the use of subsets of real databases, represented here by L. M. Koster.

The non-North American flavor of the conference is most apparent in this set of papers. The major reason for the emphasis on avoidance of use of "real" online search systems appears to be their cost—especially the telecommunications charges. Unfortunately, each system is described in a vacuum—only Koster provides any comparisons, and no one discusses value (beyond cost).

A fifth set of papers discusses the current state of affairs within libraries and information centers with rather limited comments on their relationship to education. These include the description of software for information systems now available in Poland (J. Dobosz, et al.); a discussion of the potential role of libraries and information centers in introducing students to information technology (J. K. Tsebe); a description of the National Museum for Science, Technology and Industry in Paris (F. Reiner), and a projection of the needs of office automation (R. Clough).

As a record of what appears to have been an interesting conference, this book has some use; it is most unfortunate that it came out almost two years after the conference, with little editing. A number of the papers, particularly the Schlessingers' on COA in the U.S., are wholly out of date. The good quality binding and decent margins are offset by the small typewriter-style typeface and minimal leading, which make the papers quite difficult to read. Given the rate of change in this field, the profession would have been better served by a less expensive production on a more timely basis.

Since the question of the relative importance of information technology versus theoretical information science versus traditional library science in the curriculum continues to be debated in the United States, the description of the more centralized curricula in other nations is extremely useful, as are the discussions among the participants. Blaise Cronin's highly provocative paper should be read by all information educators. Overall, however, it does not appear that this book is really worth its price of more than twenty cents per page.—*James H. Sweetland, School of Library and Information Science, University of Wisconsin–Milwaukee.* ■■

Auster, Ethel, ed. *Managing Online Reference Services.* New York and London: Neal-Schuman, 1986. 408p. ISBN: 0-918212-93-6, softcover, $35.

Managing Online Reference Services is a book of readings on the administrative aspects of online literature searching. Its genesis was a recent course on the topic that the editor taught at the University of Toronto. The book consists of twenty-six selections published between 1975 and 1984. In justifying the need for such a work, Auster points to the widely dispersed nature of the literature on online management, and indeed this volume reflects that scattering, drawing from fifteen sources, ranging from *RQ* and *Online Review* to *Drexel Library Quarterly* and *Bulletin of the Medical Library Association*. Selections reflect fairly the important literature from the past decade. Six items were published prior to 1980, the oldest two from 1975. Of the remaining twenty selections, six appeared in 1984. The end-of-chapter bibliographies are similarly balanced, noting significant older works but emphasizing more recent publications. Authorship of the selections also reflects the diversity of experience in this field: the twenty-six readings represent the work of twenty-nine authors, including well-known contributors such as Martha Williams, Carol Tenopir (two pieces), and F. W. Lancaster.

The volume is arranged into eight parts:

"Planning for Online Reference," "Choosing Services and Databases," "Staff Selection and Training," "Promotion and Marketing," "Financial Considerations," "Measurement and Evaluation," "Microcomputers and Online Reference," and "Impact of Online Services." For each part Auster has selected two to four readings that discuss the general trends and issues relevant to the topic. Highly localized, soon dated, or very specific treatments have been avoided, and material appearing in major refereed journals has been emphasized. Auster begins each section with written summaries of the principal management issues relevant to the topic under consideration, highlighting the significant elements in the readings chosen for inclusion. Each part concludes with a list of a dozen or so additional readings. The volume ends with brief biographical notes identifying authors of the readings, an index to all names appearing in the volume, and a well-done general subject index of ten pages.

Although Auster makes no claims for this volume as anything but a book of readings, it nevertheless stands up very well in the company of works such as Ryan Hoover's *Library and Information Manager's Guide to Online Services* and *Online Searching Technique and Management* edited by Jim Maloney. Auster's book, in fact, has the advantage of a somewhat narrower and clearer focus than either of these other works. Both Hoover and Maloney extend their scope to include what can best be called primers on online services and techniques. Providing such information is understandable, given the time Hoover's book came out (1980) and the circumstances that gave life to Maloney's volume (an ALA conference program to a general audience). Auster has chosen to dispense with the basics of online searching—arguing correctly that there are already guides and manuals aplenty for that purpose—and to concentrate on the issues that the planner and the decision maker must face regarding online services. Because of her narrower focus she has been freed to include selections that explore aspects of management questions from different perspectives and in rather greater depth than works trying to cover the entire field.

All in all this is a satisfying collection to read. It should prove useful both as a supplemental text for library school courses dealing with online services and as a resource for online managers.—*Charles L. Gilreath, University of Arizona Library, Tucson.* ■■

Cortez, Edwin E., and Edward John Kazlauskas. *Managing Information Systems & Technologies: A Basic Guide for Design, Selection, Evaluation, and Use.* Applications in information management series, no.4. New York and London: Neal-Schuman, 1986. 179p. ISBN: 0-918212-92-8, softcover, $35.

Written by two library school professors, this work is apparently intended for classroom use in spite of the preface's assertion that it is "designed for librarians, information managers, consultants records managers, management information specialists, and students." It is a very comprehensive if diffuse survey of all aspects of information system management, but deals with few topics to a depth sufficient for it to act as a handbook for practitioners. As an introductory text, its breadth is commendable, but it is very uneven, covering subjects such as microfilm quality control at some length and giving other subjects very short shrift.

It is a good example of book production. The typography and page layout are inviting. The perfect binding is sturdy enough to survive rough handling. Illustrations are well designed and cleanly reproduced.

The work is divided into ten chapters, each followed by references and additional readings. Many of the references seem more pedantic than useful, although the additional readings seem well chosen. An excellent glossary and adequate index complete the work.

Chapter 1 is a sort of preamble to the work as a whole, reading rather like an ASIS keynote address. Chapter 2 discusses selecting information systems and technologies and briefly introduces the concepts of goals and objectives, needs assessment, costing, evaluation, selection and contracting.

Chapter 3, "Planning & Designing Information Systems," contains an excellent basic introduction to database and index construction concepts with good explanatory illustrations. Chapter 4 does a good job of introducing principles of human factors and work-space design.

"Performance Monitoring: System Reliability & Quality Control," chapter 5, discusses various quality control issues. Chapter 6 provides a variety of operational concerns such as security provisions and procedural controls. Chapter 7 explains system evaluation.

Documentation is discussed in chapter 8. "The Human Side of Managing Information" is the subject of chapter 9, while the last chapter addresses future trends.

The work could have used tighter editing. Page 150 offers "The ability to maximize the user of a variety of information systems and technologies will be available to a greater number of individuals and organizations." Page 6 mentions *video discs*, page 112 and 173, *videodisc*, and page 151, *video-dics*. The text mentions Dialog and Orbit on page 64, and Lockheed and SDC on page 147, without any way for the naive reader to know that they are related. Page 93 uses the terms *comic* and *cine* for microfilm images, but they are not defined in the work. *CRT* is defined on page 149 after having been used numerous times throughout the work. The acronym CPU is used on pages 100 and 101 without definition, although the glossary entry "central processing unit (CPU)" is well written.

There is a curious unevenness in this coverage. Teletext and viewdata are mentioned, but the more common term *videotext* does not appear. Videodisc is mentioned, but not CD-ROM. Gant and PERT charts are briefly defined, but critical paths are not.

There are a number of questionable assertions in the text. Page 3 tells us that "As stand-alone units, micros will not perform several activities simultaneously." Page 5 states that "subsidiary [distributed] databases" are "stored on double-density, double-sided diskettes," while page 6 informs us that "subsidiary commercial databases stored on video discs are not yet a reality." Page 150 promises that "The issue of compatibility among disparate computerized information systems will be resolved in the next decade through the development of translator programs."

In spite of its flaws, the intelligence and understanding of its authors shines through. It is ambitious and brilliant in spots, but very uneven and, for the most part, too succinct. Its breadth is exemplary. The fundamental problem is that its vision is too large for its 179 pages. It would be nice to see the work expanded to about double its size so that the concepts it introduces could actually be explained. It shines when sufficient pages are allocated to go beyond merely introducing terminology and a skeletal outline of concepts, as in its discussion of database management.

As it stands, it will be useful for classes in library science, records management, or management information systems. It is an excellent outline for anyone teaching a beginning course in information systems management. It does cursorily introduce a wealth of important concepts and terms, but additional readings or classroom lectures will be necessary if students are to achieve any real understanding. Some portions may be useful as supplementary readings, especially chapters 3 and 4. Experienced practitioners may find it of value as a very thorough checklist of implementation considerations.—*Brian Aveney, San Francisco State University, California.* ■■

Essential Guide to the Library IBM PC. V.1, Nancy Jean Melin, *The Hardware: Set-Up and Expansion*. V.2, Suzana Lisanti, *The Operating System: PC-DOS*. Westport, Conn.: Meckler, 1985–86. ISBN: 0-88736-033-5, spiralbound, $19.95 (V.1); 0-88736-034-3, spiralbound, $19.95 (V.2).

The Essential Guide to the Library IBM PC series is designed for the novice with a minimum knowledge of computer technology and terminology. It is "a continuing series of practical volumes for librarians using an IBM PC for technical processing, public access, and administrative support." In keeping with its purpose of presenting a sequential program for setting up the personal computer in a library environment, the first volume of the series discusses setting up hardware, and the second volume discusses the IBM's operating system. Later volumes in the series will cover software and applications useful in libraries.

Volume 1, *The Hardware: Set-Up and Expansion*, assumes the library has already made its choice of equipment, either a PC or PC XT. PC ATs and IBM compatibles are not covered in this volume, nor is there advice on which system and peripherals to choose. This volume is not intended to be a selection guide, although it is well illustrated with photographs of specific brand-name components. It does give a good overview of the internal and external parts of the PC, explaining the function of each system component as it guides the reader step-by-step through a typical computer setup.

A chapter on expanding the PC discusses the rationale for additional memory and the options available for system expansion. The various types of storage devices are also covered in this chapter. Chapters on input and output devices discuss the advantages and disadvantages of keyboard options, monitors, printers, and modems on a very basic level. A chapter sure to interest everyone is "Your Micro: Care and Maintenance." Here are listed the pitfalls of ownership—static electricity, power surges, security breaches—and practical suggestions to follow to avoid equipment trouble.

Several appendixes round out the introductory nature of this first volume. An extensive glossary gives brief explanations of all computer terminology used throughout the text. Also appended is a list of sources for additional information, including a list of IBM user groups and a list of bulletin boards arranged by state, and a bibliography of periodicals and disks and video-based training packages. This bibliography is unfortunately not annotated, but does include title, publisher and address, frequency of issue, and price information.

A volume on hardware can not avoid discussing software, at least the basic operating system of the computer. And this volume does include a chapter on DOS that explains the basic commands necessary to format a disk and copy a program. There is also an appendix that lists the DOS commands with a simple one- or two-line explanation of each. But these explanations are very simple, and taken out of context, not very meaningful. Here is where volume 2: *The Operating System: PC-DOS* picks up the story.

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Volume 2 begins with a simple and clear explanation of what DOS is, what it does, and why you can't do without it. Following the introduction are four sections that present essential and useful commands for the PC and for the PC XT. This arrangement, although repetitious in some instances, allows the reader to pick the section most appropriate to his or her library situation. There is no index to volume 2 as there is to volume 1, but the table of contents is specific enough to substitute.

Each DOS command is explained in terms of its use, its form (how to type it), tips on its use, any cautions to observe, and options available. The tips are quite good, and worth reading even if one knows all about DOS already. A hands-on session for each command gives examples of typical screen displays following the execution of a command. The command structure is clearly written—no guessing at spacing and punctuation here! The use of different typesets for commands, computer responses, and text, and the clear outline format of the volume enhance its usefulness as a learning tool.

Also included in volume 2 are chapters on EDLIN and batch files. The chapter on EDLIN, the DOS line editor, covers only six basic commands to any extent and gives a brief mention to the line commands (function keys) used to edit lines. The hands-on session that creates and changes a batch file is quite useful, as is the chapter on batch files, which includes a section on setting up menu screens.

Neither volume in this series is intended to be a reference guide. One will need to refer to the PC manual for detailed information. But for a general overview of the hardware and operating system in clear, easy-to-understand language, this *Essential Guide to the Library IBM PC* is a good place to start.—*Ellen Calhoun, Library of Science and Medicine, Rutgers University, Piscataway, New Jersey.* ■■

MARC for Archives and Manuscripts. The AMC Format by Nancy Sahli. Chicago: Society of American Archivists, 1985. ISBN: 0-931828-65-1, three-ring binder, $20 to SAA members and $30 to others; *A Compendium of Practice* by Max J. Evans and Lisa B. Weber. Madison, Wisc.: State Historical Society of Wisconsin, 1985. ISBN: 0-87020-232-4, three-ring binder, $15 to SAA members and $20 to others. Distributed by the Society of American Archivists.

Nancy Sahli's volume in this two-part set delineates the history, structure, and use of the USMARC Archival and Manuscripts Control Format (AMC). The AMC Format, a truly revolutionary tool for archivists, curators, librarians, and those charged with responsibility for archival and manuscript holdings, is displayed in full detail. The publication is an essential reference tool for any professional attempting to comprehend the often mesmerizing jargon of this automated bibliographic and collection management format.

The first of three main sections in the volume consists of a lengthy introduction that provides both the novice and the expert with useful data in question-and-answer format on the historical and technical aspects of the AMC Format. Of equal importance is information that places the AMC Format in its local and national perspective, that is, information that provides the proper context for the reader to evaluate the local and national implications for implementation of the format. The inclusion of sample AMC records, a selected bibliography, and a glossary of terms succeeds in arming the reader with the necessary combination of confidence and curiosity.

The second section, "The AMC Format," provides a detailed inventory of the fields, subfields, tags, codes, and descriptive information that is the format. The attempt—largely successful—to portray the utility and flexibility of the format must be applauded. The inclusion of examples for many of the frequently used portions of the AMC Format provides touchstones of reality for those unfamiliar with the machinations of automated systems.

The volume concludes with the Society of American Archivists' "Data Element Dictionary." This document provides a common set of definitions for practices, procedures, and terminology widely used in archival and manuscript repositories. Such mutually agreed to "definitions" are essential to the effective understanding and exchange of information in an automated environment.

The volume thus fulfills an important professional need, translating as it does the dense alphanumeric language of an automated format to a useful bibliographic tool applicable to the basic operations of archival and manuscript repositories. The publication of "Update No. 1" (and future updates) to this first-rate reference tool ensures that the volume remain current to all those exploring the AMC Format.

Evans and Weber's volume is a most useful companion to Nancy Sahli's work. While the latter is prescriptive in nature, this document is descriptive in focus, containing as it does the interpretations of the USMARC AMC Format by the following institutions and repositories: Chicago Historical Society, Cornell University, Hoover Institution, Historical Department of the Church of Jesus Christ of Latter Day Saints (LDS), New York State Archives, Smithsonian Institution, Stanford University, State Historical Society of Wisconsin, and Yale University.

The volume is the result of a conference held at the State Historical Society of Wisconsin in 1984 and funded by the National Historical Publications Records Commission. The authors are former members of the host institution.

Omitting introductory text available in Sahli's publication, this work proceeds to offer numerous examples of AMC records created by the above-named institutions. The arrangement and discussion of these examples parallels the format of Sahli's companion volume, thus facilitating the concurrent use of both works. In addition to the field-by-field review of the AMC Format, with samples of "real" records from participating institutions, the volume provides OCLC and RLG policy statements regarding the standards and definitions of each field. This configuration aptly demonstrates the flexibility of the format and the diversity of institutional applications.

The volume also includes a full list of participants and complete samples of AMC records for each repository. Evans and Weber have made an important contribution to a rapidly growing aspect of archival and manuscript work. This volume demostrates that automation, archives and manuscripts, and national information systems can coexist and flourish. When taken in concert with Nancy Sahli's publication, the two works represent the future course of archival and manuscript information exchange.—*William E. Brown, Jr., Yale University Library, New Haven, Connecticut.* ■■

Matthews, Joseph R., ed. *The Impact of Online Catalogs.* New York and London: Neal-Schuman, 1986. 146p. ISBN: 0-918212-84-7, softcover, $29.95.

The papers published in this book (with one exception) were presented at a program sponsored by the Library Administration and Management Association (LAMA) at the ALA Annual Conference held in Los Angeles in 1983. The three-year time lapse before publication is indeed unfortunate. The papers are of good quality and reflect upon the issues and problems resulting from the CLR Online Catalog Project conducted in 1982. Most of the papers are followed by relevant questions and answers from the discussion held at the LAMA program.

Gary S. Lawrence's paper, "Online Catalogs and System Designers," examines telecommunications equipment, terminals, and printers. Lawrence also stresses the user interface to the online catalog with ideas on system needs for controlling searches, display format, command structure, online system user assistance, and system response time.

Joseph R. Matthews' paper, "The Online Catalog and Technical Services," discusses bibliographic record content and coverage, authority control, index creation, and online catalog maintenance concerns. Brief reference is also made to the potential reorganization of library technical and public services staff.

Douglas K. Ferguson looks at the impact of the online catalog for reference services. Ferguson considers bibliographic instruction, reference sources in the online catalog, the actual reference process, and staff issues.

The best paper in the book is "Users and the Online Catalog: Subject Access Problems" by Karen Markey. Markey covers three problem areas for online catalog searchers: finding the right subject heading, increasing search results, and decreasing search results. Online catalog subject result displays (both keyword-in-context and alphabetical), the need for cross-references, possibilities for the linking of free text terms to controlled vocabulary, and automatic truncation of search terms are examined.

Rosemary Anderson presents an overview of the issues a library manager needs to consider for online catalog implementation. Anderson describes the planning process, catalog content, equipment concerns, and staff and training considerations.

A discussion of the data needed for online catalog evaluation is presented by Lois Ann Colaianni. Hardware evaluation (terminal choice, keyboard labeling, etc.), catalog content data (materials requested, collection use data, etc.), user performance information (user and nonuser behavior at terminals, needs for help messages, etc.), and library resources data (staff workload, bibliographic instruction, etc.) are described.

The final paper is an extensive report on the evaluation of "Bobcat," the online catalog installed at New York University Libraries. The study conducted in 1984 consisted of three parts. The first part surveyed library patrons using the CLR user and nonuser catalog study questionnaires. The second part surveyed patrons using an NYU-designed user questionnaire, and the last part was conducting patron interviews. Ample statistical data are given in the text as well as in appendixes. (The final report of the NYU study, administered by the Association of Research Libraries, was published and is still available from ARL's Office of Management Studies, according to this book.)

In addition to the time lag before publication, some of the information in the book has already appeared in a different form in *Using Online Catalogs* published in 1983 by the same publisher and editor. *The Impact of Online Catalogs* should be considered a companion volume to the former book. Some more current ideas and studies have been reported at library conferences and published in the library literature since these papers were first presented. For those libraries in the process of planning to implement an online catalog or librarians unfamiliar with online catalogs, this book is well worth acquiring. For those libraries that already own *Using Online Catalogs* or have an online catalog (and presumably are current with the literature about online catalogs), the $29.95 price tag might be a bit steep. However, this book does provide a "historical" look at some of the problems and issues faced by some early versions of online catalogs and their designers.—*William A. Garrison, Northwestern University Library, Evanston, Illinois.* ■■

Tracy, Joan I. *Library Automation for Library Technicians: An Introduction.* Metuchen, N.J., and London: Scarecrow, 1986. 163p. ISBN: 0-8108-1865-5, hardcover, $16.

The initial and continuing training needed by library technicians in an automated library presents a challenge that must be met successfully for the library to function smoothly and efficiently. Therefore, all of us in automated libraries are looking for training materials to make this job easier. Joan Tracy's book is a step toward building a body of training materials for automated libraries and may be useful to those charged with training paraprofessionals.

However, it is not a book that can be used productively as a text for training technicians. The overall plan for the book is commendable: first a general discussion of various kinds of libraries, followed by a general discussion of computers and then a more detailed analysis of various types of automated functions in libraries. The attempt to cover too much in a few pages leads the author to use a style I can only term as "expanded outline," with many one- and two-sentence paragraphs and numerous lists. While this approach may be useful as lecture notes for the teacher, it is difficult and unsatisfactory reading for the student. Furthermore, it places the burden of synthesis on the readers who have neither the knowledge nor the experience to make the necessary connections. Since, according to the author, the book is "intended for the person who plans to seek a position as the technician in a library with automated systems" or for the "technician employed in a library that has automated systems or will be installing them," it is hardly fair to ask them to perform this synthesis.

The opening chapter attempts to provide a wide overview of the types of libraries, their customers, and their services. The expanded-outline format style is particularly unsatisfactory here, and the description of libraries is very traditional, with no suggestion that automation forces change in the traditional ways libraries are organized and managed. The author misses opportunities to imbue neophyte technicians with a sense of being part of a service organization where everyone's work is an important part of customer service. Statements like "the nuts within the library that carry out operational functions are called technical services because their activities are internal to the library and *rarely concern patrons directly*" encourage technicians to separate their work from customer service. In actual practice, at least in our library, customers are extremely concerned about how fast new materials are ordered, received, and processed for use, and they are also interested in being able to find them. Technicians need to be made and acknowledged as integral to that process. Instead the author seems content to regulate the work of technicians to routine mechanical procedures rather than seizing opportunities to relate what the technician does to the larger mission of the library as it serves its customers. Libraries are exciting, dynamic places but this book makes them a snooze.

The general discussion of computers seems more simplistic than necessary. The general public knows a lot more about computers than they did in the past. The information contains some of the glitches that gremlins love inserting into books, such as identifying the central processing unit as a software program (page 13). The chapter on microcomputers seems out of place and too brief to be useful. It probably should be a separate publication aimed at small libraries or the special use interests in large libraries.

The third large area covered are the functions in a library that lend themselves to automation: acquisitions, cataloging, serials control, circulation, user services, and support functions. Although the author claims to have made these discussions generalized enough to apply to all situations, it is still very specialized and would be best applied to libraries using the vendors listed in the introduction: Baker & Taylor systems, OCLC, WLN, Follet Book Trak, Faxon LINX and Microlinx, CHECKMATE, ULYSIS, and VTLS. Whatever functions a library automates, those functions will have to be taught to new technicians in great detail since even turnkey systems have many options available to the buyer so the system is tailored to the policies and operations of the library.

In-house training people may find this a helpful guide and checklist for areas to cover and will probably appreciate the lecture-note format. State libraries should buy this to loan to libraries developing training programs and to small libraries where librarians want to read about the functions automation can assume.—*Janet K. Schroeder, Duluth Public Library, Minnesota.* ■■

Nonprint Reviews

Searcher's Tool Kit. Produced by Personal Bibliographic Software, P.O. Box 4250, Ann Arbor, MI 48106.

Hardware requirements for the package under review are Pro-Search: IBM PC or IBM compatible with two double-sided disk drives or IBM XT or AT (or compatible) with one double-sided disk drive and fixed-disk drive or Texas Instruments Professional Computer. 256K RAM storage; DOS 2.0 or later version; Hayes Smartmodem (300, 1200, 1200B, or 2,400) or other modem types or any acoustic modem; IBM compatible modem cable. Pro-Cite & Biblio-Link: IBM PC (PC, XT, AT) or compatible; DOS 2.0 or later version; 256K RAM storage.

For some time now, librarians and scholars have eagerly awaited software that would automate the various steps of bibliography. In the last several years programs have been developed that provide easy dial access to bibliographic databases, online search assistance, management of bibliographic databases, and the creation of properly formatted bibliographies from citation files. Unfortunately, few of these programs integrate all of these functions in a single package.

Recently, however, two library-oriented software producers have updated their bibliographic software to include integrated search, bibliographic management, and formatting programs. One of these (not under review) is ISI's Sci-Mate Software System, which has added a bibliographic report generator—the Sci-Editor—to its search and file management programs. Another, Professional Bibliographic Software's Searcher's Tool Kit combines its own Biblio-Link (file transfer programs) and Pro-Cite (file management and bibliographic format programs) software with the former Menlo Corporation product—Pro-Search—to produce an expensive yet effective means of using PCs to create bibliographies.

In June 1986 Personal Bibliographic Software announced its takeover from the Menlo Corporation of all marketing, development, and support for Pro-Search, a gateway communications program for searching the online databases of Dialog and BRS. The review copy of Pro-Search is substantially the same program we reviewed in the December 1985 issue of this journal. In fact, the program is conceptually the same having only been updated to include new modem configurations and other minor revisions. For a detailed description and evaluation we suggest our review. Here we would simply like to reaffirm our opinion that Pro-Search's native mode functions—automatic dialing and logon, uploading and downloading of files, system type-ahead, cross-emulation of search languages between Dialog and BRS, and search accounting—provide one of the most well-designed programs of its kind. We still maintain our interest in a more varied program that would support these excellent functions for other systems outside the BRS/Dialog orbit. Finally we again emphasize that Pro-Search is not for the beginning searcher. Claims made by both Menlo and PBS that Pro-Search simplifies the search process or the learning of online searching are based upon largely questionable assumptions we challenged in our earlier review.

Biblio-Link is actually a series of separately sold programs that transfer ASCII files downloaded from BRS, Dialog, RLIN, and OCLC into file formats usable by Pro-Cite. Originally designed for Professional Bibliographic System software, the Biblio-Link programs create PBS formatted files, which, in turn, must be converted to Pro-Cite files using that program's Convert program. To transfer downloaded files, the appropriate software is loaded and a menu followed. In the case of Biblio-Link to BRS, transfer of downloaded BRS searches requires that you identify a database recognized by the program, name the destination file into which the programs will be transferred, and then indicate the number of records to be transferred. The BRS records are then transferred to a PBS database whose structure can be adapted for a number of different bibliographic formats, selective transfer of fields, and customized field assignments.

On the whole, the use of Biblio-Link to BRS is easy and unproblematic. Fields transfer accurately and many of the problems of bibliographic data transfer have been overcome by a well-designed program. This is not the case, however, with Biblio-Link to Dialog, a program for the transfer of downloaded Dialogl files. Contrary to BRS databsaes, which offer tagged fields and a highly standardized format, Dialog files are for the most part untagged and nonstandard. Apparently this has caused great problems for the PBS programmers. Unlike the Biblio-Link to BRS program, that allows selecting a number of document types, Dialog records are transferred into the documentary type "monograph—long" due to the number of fields available for use.

Author, title, and publisher information transfers accurately to the appropriate fields; as do descriptors and identifier fields that are placed in an index field. Customization, however, is limited to eight Dialog paragraph labels Biblio-Link to Dialog recognizes—availability, bibliography, document type, journal announcement, language, note, report number, and sponsor. Paragraphs with no labels or paragraphs with labels not known to Biblio-Link are automatically placed in the abstract field. Such limitations can and do create very dirty bibliographic records; for example, a great deal of unlabeled bibliographic information is crammed into the abstract field. To use the program as it is now designed would require a great deal of posttransfer editing before the formatting of bibliographies. We understand that a program for Dialog2 is being designed. We recommend that close attention be given to those Dialog files that provide tagged field formats—some 50 percent by last unofficial count. A program could be developed that would take advantage of these. We also suggest that link programs be developed for online systems like SDS, Wilsonline, and other systems librarians and scholars search.

Records are entered into Pro-Cite either from the keyboard or as downloaded records from BRS, Dialog, OCLC, or RLIN using the Biblio-Link programs for these databases. In either case the bibliographic information in these records is entered into preset citation work forms appropriate for each type of document. These work forms are made up of bibliographic fields that correspond to the standard citation elements used in ANSI (American National Standards Institute) bibliographic formats. There are forty-five fields listed in each work form but each work form defaults to just those fields appropriate for that document type as set by ANSI. The work forms also include fields that can be used for additional information. The user has the option of choosing among twenty preset work forms or using two that can be customized for other types of document formats. The most commonly used work forms are preset, "books-long," "journals-long," and so on.

Once the bibliographic information is stored in the work forms the records of the resultant database can be formatted into any bibliographic style desired. This is done by using punctuation files that take

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the bibliographic information and arrange and punctuate it in accordance with the style format chosen by the user. ANSI is the default bibliographic format, but any number of other formats can be defined by the user by setting up new punctuation files. Even though Pro-Cite is designed to automatically generate formatted bibliographies in many different styles it should be pointed out that it actually only provides this one preset format. To use other bibliographic formats a punctuation file that emulates that particular bibliographic style must be created using the Style program included in Pro-Cite. Pro-Cite's claim that "you can produce correctly formatted bibliographies with no knowledge of the rules or requirements of the format itself" is a little misleading. The Style program must first be used to create the punctuation files that, when combined with the bibliographic information in the work forms, produce properly formatted bibliographies. These punctuation files cannot be created without a fairly thorough knowledge of the particular bibliographic style in use.

How easy is it for the user to define his own bibliographic formats? It is true that Pro-Cite allows the user to follow any style sheet, but the user must set them up; how easy is this and how well do they work? There is a tutorial for Style and the manual contains guidelines for setting-up punctuation files, but no real guidelines are provided for setting-up punctuation files that mimic particular style sheets. There is a section in the manual that provides hints for making the best use of Pro-Cite with punctuation files that follow the style sheets for the Modern Language Association, American Psychological Association, and Science, but even here the advice is limited. This probably is not a big problem, but reading the hints for using the punctuation files for these three commonly used style sheets leads one to believe that their use can be troublesome. If special hints are needed for these three to make them work well, what about the rest? How easy will they be to use with no special information provided at all?

We think that Pro-Cite should provide a set of punctuation files that are already set to mimic particular bibliographic formats or styles. Most Pro-Cite users could be satisfied with a small selection of them, just picking the most commonly used would suffice. It is a very useful feature to have the flexibility to duplicate any particular style sheet, but this freedom could be daunting for many Pro-Cite users who do not feel comfortable defining their own punctuation files and troubleshooting their use in Pro-Cite to format bibliographic information.

In addition to its use for generating formatted bibliographies Pro-Cite's word-processing and database-management features are also very useful. Once a database is established the records can be edited, new records can be inserted and deleted, specified fields in all or selected records can be searched, sets of records can be selected, browsed, sorted, and indexed, different databases can be merged, and in-text references can be used to generate a list of cited sources. Of special note is Pro-Cite's ability to perform very sophisticated searches of database records. Boolean logic and truncation operators are used and databases can be searched by keywords or character strings in all or selected records. Within these records all fields can be searched or certain fields can be specified by using the field name or code. This makes it possible to search by date, record number, author name, title, and so on. Searching a database in turn creates a new database of records that can also be indexed, browsed, added to or deleted, as well as formatted into a bibliography.

Searcher's Tool Kit, we conclude, offers the librarian and scholar essential tools to automate bibliography. Inasmuch as bibliography is research, a good portion of the bibliographic task will always remain hard, intellectual work. Moreover, short of universal citation standards, cleaning up after a messy download will always be a common chore for the bibliographer. Fortunately, programs like Searcher's Tool Kit will offer some respite from the more onerous aspects of research while at the same time offering features that extend bibliography well beyond the 3-by-5 card.—*Dennis R. Brunning and Doug Stewart, Arizona State University, Tempe.* ■■

Other Recent Receipts

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

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

Berman, Sanford, ed. *Cataloging Special Materials: Critiques and Innovations.* Phoenix, Ariz.: Oryx, 1986. 198p. ISBN: 0-89774-246-X, softcover, $32.50.

Clark, Alice S., and Kay F. Jones, eds. *Teaching Librarians to Teach: On-the-Job Training for Bibliographic Instruction Librarians.* Metuchen, N.J., and London: Scarecrow, 1986. 232p. ISBN: 0-8108-1897-3, hardcover, $18.50.

Dyer, Hilary, and Alison Brookes, comps. *A Directory of Library and Information Retrieval Software for Microcomputers.* 2d ed. Aldershot, England, and Brookfield, Vt.: Gower, 1986. 145p. ISBN: 0-566-03561-8, softcover, $26.95.

Foulkes, John, ed. *Downloading Bibliographic Records.* Aldershot, England, and Brookfield, Vt.: Gower, 1986. 72p. ISBN: 0-566-05014-5, softcover, $21. "Proceedings of a one-day seminar sponsored by the MARC Users' Group" in the United Kingdom."

Hernon, Peter, and Charles R. McClure, eds. *Microcomputers for Library Decision Making: Issues, Trends, and Applications.* Norwood, N.J.: Ablex, 1986. 311p. ISBN: 0-89391-376-6, hardcover, $45 to institutions and $29.50 to individuals.

McQueen, Judy, and Richard W. Boss. *Videodisc and Optical Digital Disk Technologies and Their Applications in Libraries, 1986 Update.* A *Library Technology Reports* monograph. Chicago: American Library Assn., 1986. 155p. ISBN: 0-8389-7041-9, softcover, $25. "Update to the 1985 report, with the same title, by Information Systems Consultants, Inc. to the Council on Library Resources."

Essential Guide to Apple Computers in Libraries. Volume 1, Public Technology: The Library Public Access Computer, by Jean Armour Polly. Westport, Conn., and London: Meckler, 1986. 169p. ISBN: 0-88736-049-1, spiralbound, $19.95.

Strickland-Hodge, Barry. *How to Use Index Medicus and Excerpta Medica.* Information Sources in the Medical Sciences, 1. Aldershot, England, and Brookfield, Vt.: Gower, 1986. 60p. ISBN: 0-566-03532-4, spiralbound, $31.50. ■■

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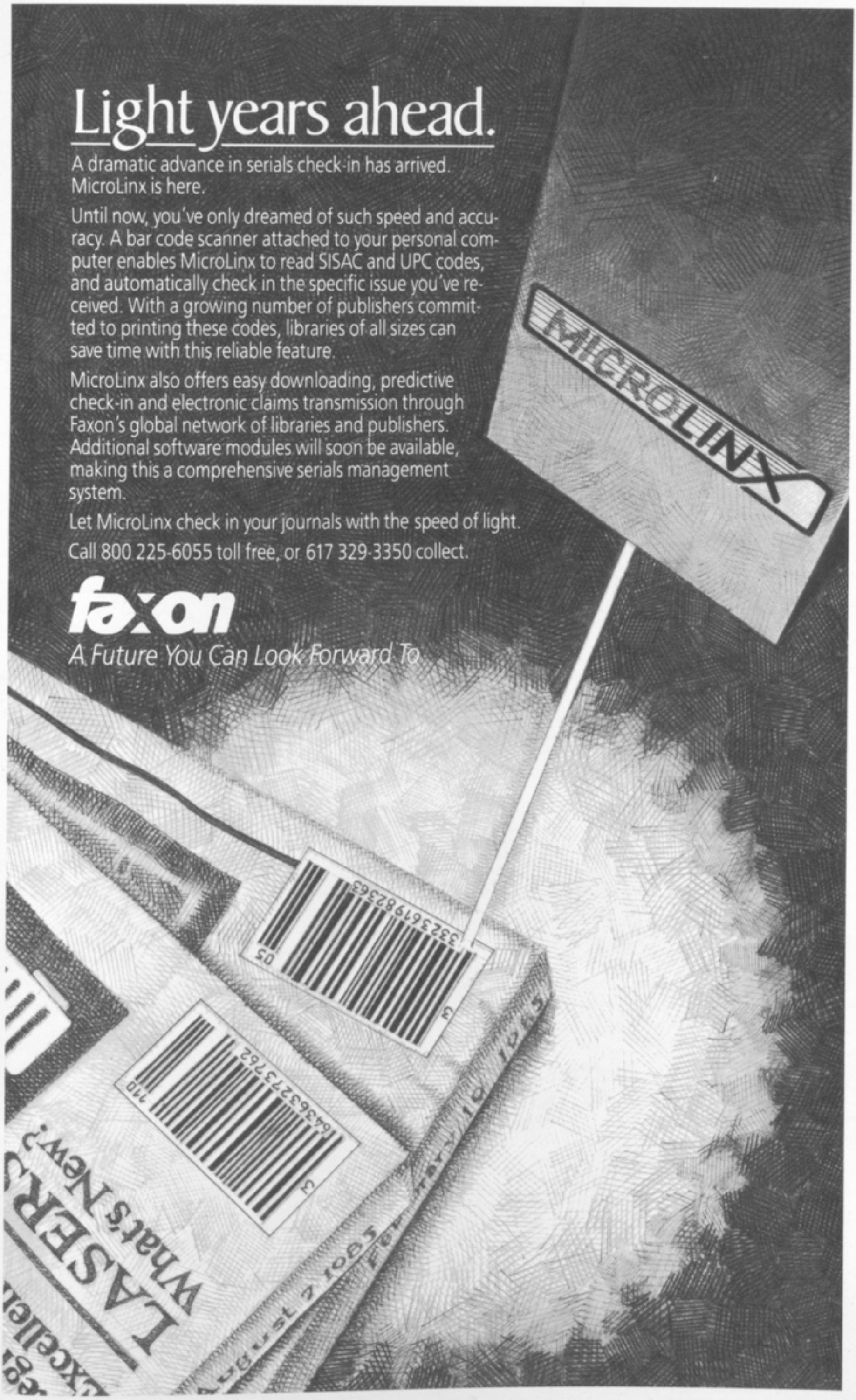
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