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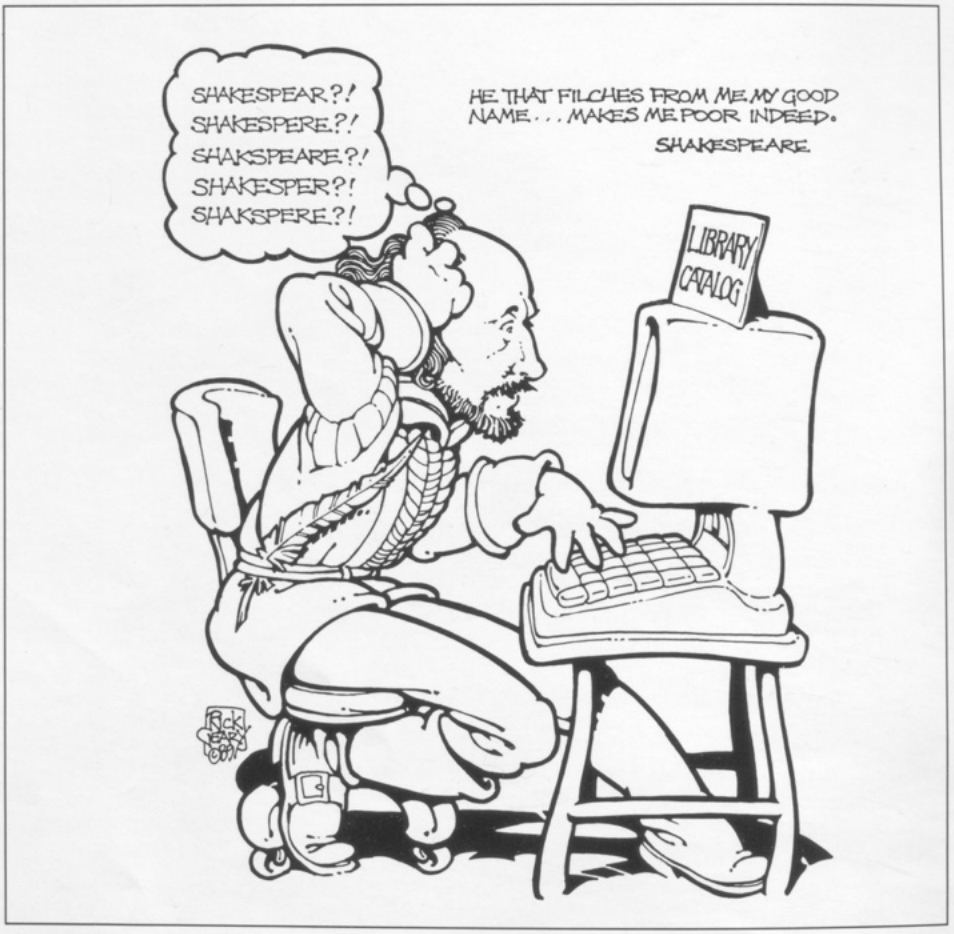

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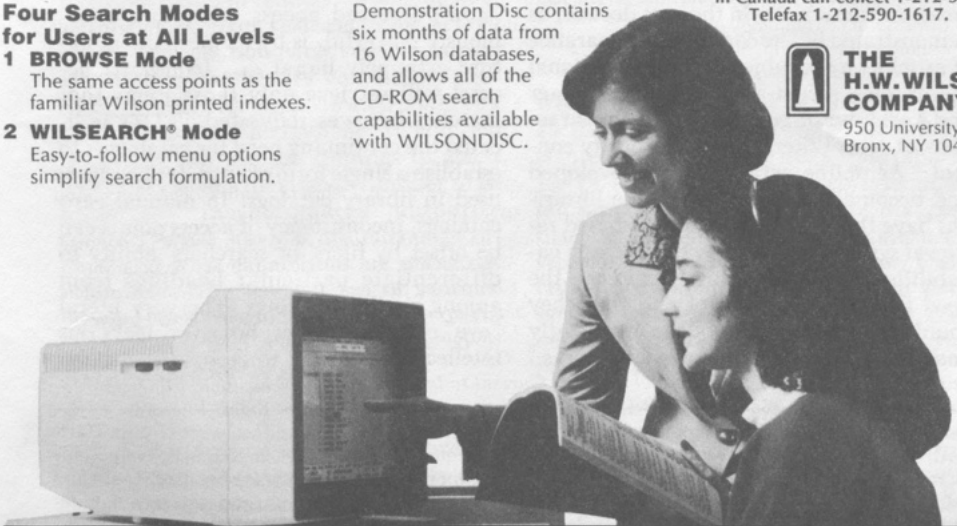

Current Offerings in Automated Authority Control: A Survey of Vendors

Sarah Hager Johnston

In order to investigate current trends in automated authority control systems and authority capabilities offered by vendors of library systems and software, sixty-six vendors were surveyed during August and September 1988. Vendors were asked to provide information on sources, management, and use of authority records in their systems or services and on the functions of an authority control module within an integrated system. From the results, librarians can determine how well vendors are responding to the library community's demand for increasingly sophisticated authority control in online systems. Further, librarians can assess what the vendors themselves consider important in authority control. A tabulation of vendors' offerings and capabilities should be useful in evaluating and selecting automated library systems for local use.

Authority control is defined by Burger as the creation of authority records for established headings, the linking of authority and bibliographic records, and the maintenance and evaluation of an authority system.[1] Interest in authority control has increased dramatically in the past decade, as demonstrated by the continued appearance of articles on the subject in the professional literature; a recent article by Nadine Baer and Karl Johnson contained an excellent review of recent literature on authority control.[2] As online catalogs have developed and become more common, some librarians have thought that use of text-based retrieval systems and the powerful search capabilities of online catalogs would end the need for authority control and that they could dispense with one of the most costly and time-consuming of professional tasks.[3] However, some far-sighted individuals predicted the need, not only for authority control, but for *automated* authority control and for substantially better authority systems than were currently being used; e.g., Malinconico, as early as 1979, wrote that "computerized access, although enormously powerful, is by its mechanical nature extremely literal . . . [computer access] will retrieve only those items that match what was requested."[4] This indicated the continuing need for catalogers to establish a single form of entry for headings used in library catalogs. In manual card catalogs, inconsistency of access points can be offset by filers' or searchers' ability to differentiate particular headings from among similar headings. The very literal "eye" of the computer, however, lacks this intellectual capacity to recognize associa-

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tions among items that are not explicitly linked.[5] (This is especially true for much of the retrieval software designed for online catalogs, although some systems are more flexible than others.) It is this fundamental difference between human-and machine-based retrieval methods that has initiated a reappraisal of the value of authority control in the online environment.

Having accepted the need for authority control in local online systems and having become better educated in the area of automated authority control, librarians now expect that vendors will include online authority control as part of the systems they market.[6] This has increased pressure on the vendors to develop sophisticated authority control software and services in order to remain competitive.

How well have vendors responded to librarians' demands for automated authority control? Recent surveys provide information about online maintenance of authority files[7] and database creation and maintenance for public access catalogs on compact disc.[8] In 1985 Taylor, Maxwell, and Frost described authority control methods available from networks and vendors.[9] The survey described below, which determines present availability of authority control modules and services as part of online library systems and software packages, updates that information and in addition identifies trends in vendors' development of authority control systems. The survey results indicate how well vendors are responding to the library community's increasing need for sophisticated authority control in local online systems. In addition librarians can use the findings to assess what the vendors themselves consider to be important in automated authority control—what services are currently offered and what capabilities are under development. This compilation of vendors' offerings and capabilities should be useful in evaluating and selecting automated library systems for local use.

METHODS

A questionnaire was developed covering seven aspects of automated authority control systems and services: (1) source, acquisition, and creation of authority records; (2) electronic format and storage of authority records; (3) authority database maintenance; (4) matching and linking authority and bibliographic records; (5) syndetic structure in the bibliographic and authority database(s); (6) authority database products; and (7) statistics generated by automated authority control systems. Definitions of specific terms were included in the survey to assist vendors in answering questions and to ensure uniform interpretation and responses.

Sixty-six vendors of library software and/or systems, identified through published surveys, advertisements in the professional literature, and other sources, were surveyed. Eighteen responses were tabulated and analyzed.

VENDORS

Respondents represent several different types of computer system or service, but for the purposes of this study, system type or size, company size, etc., were not considered. The questions were designed to assess—regardless of system type—trends in automated authority control, i.e., what specific capabilities are currently offered or under development. This premise should be kept in mind when evaluating the results. Recent market surveys[10-12] offer detailed profiles of many vendors of library systems and software; such information is not included here.

RESPONSES

Of the 66 vendors surveyed, the response was as follows: 27 (41.0%) did not respond; 19 (28.8%) returned completed surveys, eighteen of which were usable (see table 1); 13 (19.7%) reported that their systems did not support authority control or that their firm did not market library software or services or was no longer in business; and 7 (10.6%) responded with a general letter and information package (brochures, demonstration diskettes, etc.) but did not complete the survey.

RESULTS AND ANALYSIS

Response Weighting. Each questionnaire item was given a weight depending on its importance to the success on an online catalog as follows:

Table 1. Vendors Participating in the Survey

Vendor	System Name	Abbreviation
Autographics	Autographics	AUT
Blackwell North America (B/NA)	——	BNA
Centel Federal	DATALIB	DTB
CLSI, Inc.	LIBS 100	CLS
Comstow Info.	BiblioTech	CMW
Data Research	ATLAS	ATL
Dynix	DYNIX	DYX
Embar Information	COMPULOG	EMB
Geac	GLIC 8000 & 9000	GEC
Georgetown Univ.	Georgetown LIS	GTN
Inlex, Inc.	INLEX/3000	INX
Innovative Interfaces	INNOVACQ	INN
Library Automation Products	The Assistant	LAP
MSUS/PALS	PALS	MSU
multiLIS	multiLIS	MUL
OCLC Local Systems	LS/2000	OCL
Pueblo Library District	Pueblo LS	PUE
Software Marketing	DATATREK INC.	DTK

(Underlining indicates names used throughout this report.)

Weight	*Definition*
3	Essential—the system must have this feature in order to function adequately. Systems lacking these basic features should be suspect.
2	Desirable—these features would enhance effectiveness and sophistication; they are needed but not crucial; they could be compensated for procedurally.
1	Peripheral—these features are either (1) luxury items that could be added as cost permits, indicating software sophistication, or (2) low-priority items, features, or characteristics that may not affect the functioning of the catalog.

Response Scoring. Each response was given a numerical score based on these criteria:

Score	*Definition*
2	System, feature, or procedure in place; capability allowed and/or supported; high degree of automation and/or sophistication; good response.
1	System, feature, or procedure under development or partially implemented or partial/limited capabilities allowed; lesser degree of automation; incomplete response.
0	System, feature, or procedure not available or not planned; no answer or not applicable ("NA"); "don't know" or "not sure"; poor response; question was misunderstood or misinterpreted.

The scores and weights were combined to form a scoring matrix (see table 2).

Table 2. Scoring Matrix

	Score		
	Good	Fair	Poor
Weights	2	1	0
Essential (3)	6	3	0
Desirable (2)	4	2	0
Peripheral (1)	2	1	0

Overall Vendor Ratings. By multiplying the item scores by the respective weight of each item and summing the resulting weighted scores, composite scores and ratings for each vendor were calculated. The survey items were then divided into three groups according to the weighting of the questions ("essential," "desirable," and "peripheral") to provide vendor ratings in these areas (see table 3, figures 1–4). Where vendors received the same overall number of points, the vendor who had scored higher in the "essential" area was given the higher ranking.

Although Dynix emerged as the leader in composite scores (223 out of a possible 282 points, or 79%), the top six vendors (Dynix, Atlas, Autographics, MSUS/PALS, Geac, and Innovative Interfaces) were all ranked within ten percentage points of each other and were all within eight percentage points of the leader (see figure 1).

The breakdown of items into the three weighted groups provides information about vendors' relative strengths and weaknesses. For example, while Dynix was ranked first overall, its rankings ranged from first in the "essential" and "peripheral" categories to eleventh in the "desirable" section, demonstrating a wide range of development and sophistication in its authority control software. A similar analysis shows that, while Comstow provided good responses in the "desirable" and "peripheral" sets, ranking second and sixth respectively, its eleventh-place showing in the "essential" capabilities section brought its overall rank down to thirteenth. This shows that Comstrow, while clearly able to furnish some sophisticated authority control capabilities, is not providing the basic authority control functions necessary for a successful online catalog. Although Atlas and Autographics each received second-place overall scores of 217 points (77%), Autographics' higher rankings on the "essential" questions (123 points to Atlas' 120) indicates a higher placement. The information presented in tables 3 and 4 may be used in the same manner to compare vendors' relative strengths and weaknesses in different areas.

Vendors who ranked highest overall generally scored highest on the items rated "essential." These authority control systems (Dynix, Autographics, Atlas, Innovative, Geac, MSUS/PALS, Inlex, and CLSI) provide the features most desired by librarians and should meet the authority control needs of most libraries.

Questions about "desirable" authority control functions, such as global changes to subfields, verification of subheadings, and "transparent" cross-referencing, yielded a different group profile. MSUS/PALS, Comstow, and Pueblo (which had overall ranks of fourth, thirteenth, and eleventh), ranked first, second, and fifth in the "desirable" category, demonstrating that while their systems may not be the best in general authority control functions, they may have other characteristics or capabilities that

Table 3. Overall Rankings of Vendor Authority Control Systems

	ATL	AUT	BNA	CLS	CMW	DTB	DTK	DYX	EMB	GEC	GTN	INX	INN	LAP	MSU	MUL	OCL	PUE
Essential																		
Raw Score	120	123	81	99	60	78	57	135	81	117	54	114	120	69	114	96	84	84
Percentage*	83	85	56	69	42	54	40	94	56	81	38	79	83	48	79	67	58	58
Rank	3	2	12	8	16	14	17	1	12	5	18	6	3	15	6	9	10	10
Average Raw Score: 94 (65%) (Potential Raw Score = 144)																		
Desirable																		
Raw Score	74	70	74	66	76	62	50	64	44	68	32	66	62	42	82	68	60	70
Percentage*	71	67	61	63	73	60	48	62	42	65	31	63	60	40	79	65	58	67
Rank	3	5	3	9	2	12	15	11	16	7	18	9	12	17	1	7	14	5
Average Raw Score: 63 (61%) (Potential Raw Score = 104)																		
Peripheral																		
Raw Score	23	24	24	16	19	9	14	24	13	16	12	13	18	10	18	19	21	15
Percentage*	68	71	71	47	56	26	41	71	38	47	35	38	53	29	53	56	62	44
Rank	4	1	1	10	6	18	13	1	14	10	16	14	8	17	8	6	5	12
Average Raw Score: 17 (50%) (Potential Raw Score = 34)																		
Overall Ranks																		
Raw Score	217	217	179	181	155	149	121	223	138	201	98	193	200	121	214	183	165	169
Percentage*	77	77	63	64	55	53	43	79	49	71	35	68	71	43	76	65	59	60
Rank	2	2	10	9	13	14	16	1	15	5	18	7	6	16	4	8	12	11
Average Raw Score: 174 (62%) (Potential Raw Score = 282)																		

*Percentages rounded to nearest whole number.

would make them acceptable in particular library settings. These scores may also indicate this group's move toward development of better authority control functions.

The availability of "peripheral" functions, such as handling superseded, split, or canceled subject headings, indicates sophistication in authority control software. Vendors who performed well in this section of the survey generally performed well in the overall rankings as well. Exceptions are OCLC, which ranked twelfth overall but fifth in the "peripheral" section, and Comstow, which ranked thirteenth overall but sixth on the "peripheral" items. Again, these vendors may have more sophisticated software under development and so may warrant further investigation.

A few vendors who ranked well in the overall scores did not perform as well in the "peripheral" section; examples here are Geac and CLSI, ranked fifth and eighth overall, respectively, but tied for tenth on the "peripheral" items. This may indicate that software development programs have been restricted or slowed.

In general, systems that scored highest in the overall survey performed well in all areas, demonstrating sophistication. Dynix, the highest-scoring vendor, ranked first, eleventh, and first, respectively, in the three areas. Autographics, second overall, achieved ranks of second, fifth, and first. Atlas, in a tie for second place, was very consistent, ranking third, third, and fourth in the three weighted sections.

Librarians implementing standard authority control practices and procedures in an online catalog should carefully evaluate the systems offered by Pueblo, OCLC, Comstow, Datalib, Embar, Library Automation Products, Datatrek, and Georgetown to ensure that all local requirements will be met. However, for libraries not following national standards for cataloging (including national standards for authority control) and not planning to interface electronically with other libraries, these systems may be adequate. It should be noted that some respondents indicated authority control systems "under development"; these systems should be reexamined in the near future to assess software developments and enhancements.

(Note: Blackwell North America's rather low rank of tenth place overall may be misleading, since many of the survey items questioned library staff's control of authority records and database products and the function of an authority control module in a local online catalog. B/NA provides authority control services for libraries but does not develop or market automated library systems for in-house use.)

Vendor Ratings by the Seven Content Areas of the Survey. The weighted questionnaire items were regrouped into the original seven subject groups outlined in the survey. An analysis of vendors' responses compares their capabilities in specific areas or for particular functions (see table 4 and figures 5–11).

The first group of questions was designed to identify vendors' sources for authority records, frequency of updating authority databases, and capabilities for electronic transfer of authority records from outside sources. Three vendors (Atlas, CLSI, and Innovative Interfaces) achieved perfect scores of 14 points each, and five (B/NA, Datatrek, Dynix, Inlex, and MSUS/PALS) scored 13 points. Fifteen vendors (83.3%) received scores of 10 points (55.6%) or higher, indicating that most are able to supply authority records from the most desirable sources. The scores of the three remaining vendors (Georgetown, OCLC, and Library Automation Products) were significantly lower, ranging from 3 to 6 points (see table 4 and figure 5).

On questions seeking information about vendors' methods of electronic format and storage of authority records, the scores were more widely distributed, with most vendors scoring near the average (see figure 6). Atlas was the leader here, with 52 out of a possible 60 points; Geac was very close with 50 points; and Datalib and MSUS/PALS were closely tied for third place, scoring 48 points each. Ten vendors (55.6%) scored at or above the average of 36 points.

Vendors' scores on questions about library staff's ability to manipulate the authority control system covered a wide range, from 10 to 71 of a possible 76 points (see figure 7). Autographics ranked first with 71 points, with Atlas and Innovative Interfaces tying for second place with 67

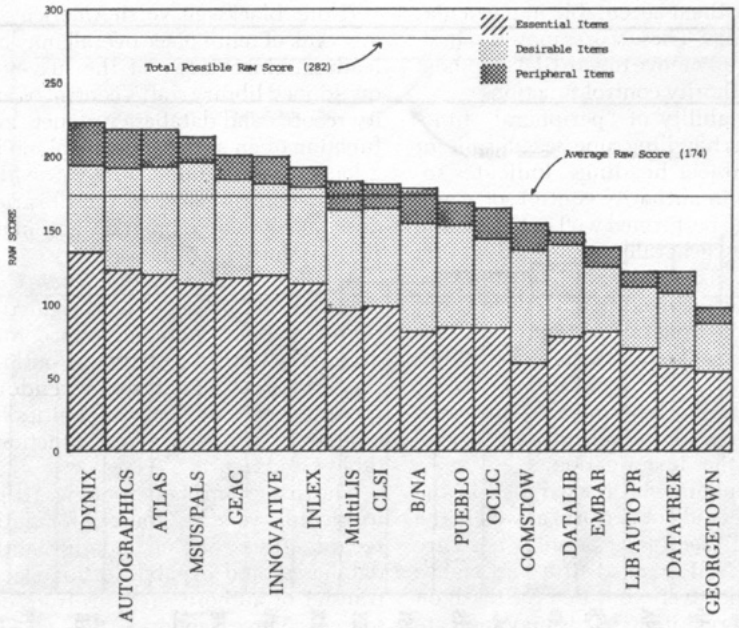

Fig. 1. Overall Compiled Results.

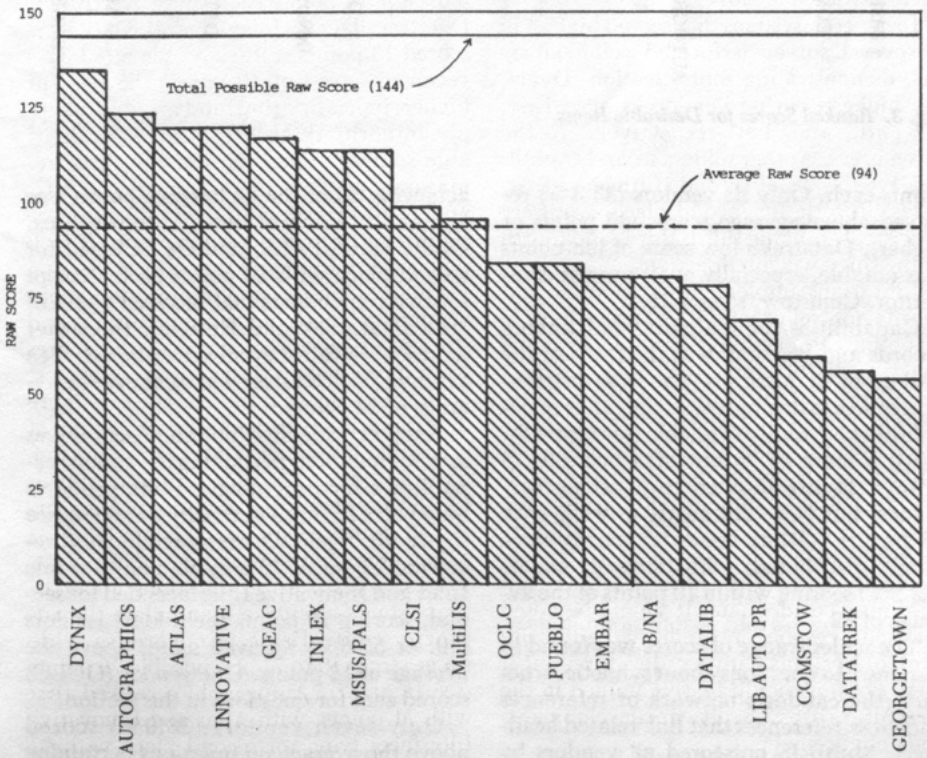

Fig. 2. Ranked Scores for Essential Items.

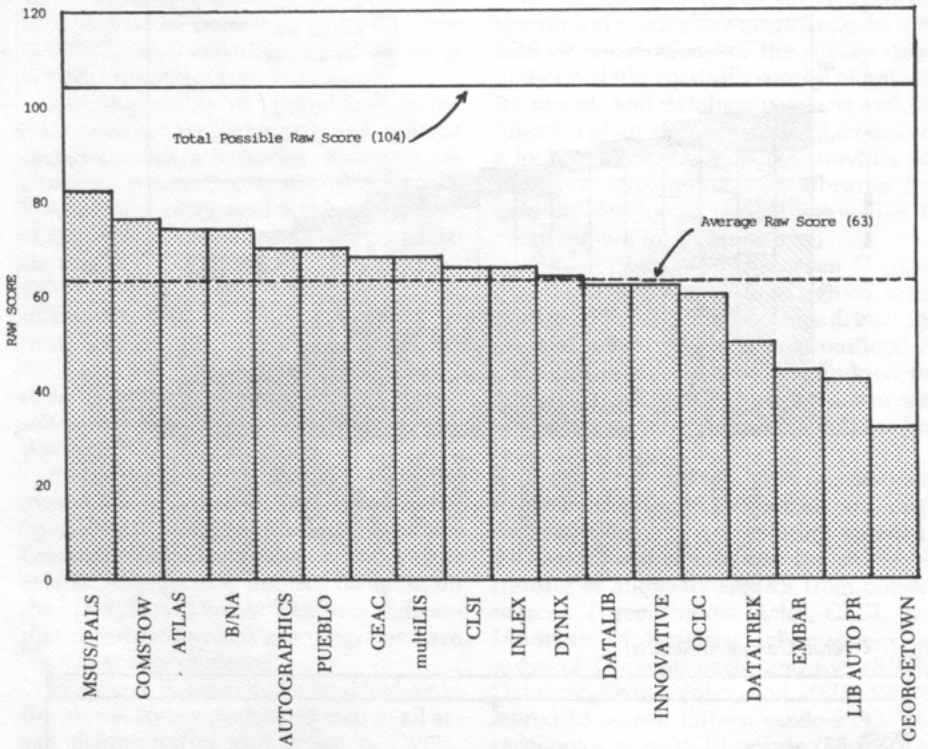

Fig. 3. Ranked Scores for Desirable Items.

points each. Only six vendors (33.3%) received above-average scores (45 points or higher). Datatrek's low score of ten points was notable, especially as its nearest competitor, Comstow, scored 31.

Capabilities for matching and linking records and headings was the focus of the next group of questions. The wide distribution of scores demonstrates the range of capabilities currently available (see figure 8). With a score of 70 out of a possible 78 points, Dynix showed the best performance, but Geac did nearly as well, with 68 points. Other vendors' scores were evenly distributed, with thirteen vendors (72.2%) scoring within 10 points of the average of 52.

The widest range of scores was found in responses to questions about syndetic structure (the catalog's network of references and cross-references that link related headings). MultiLIS outscored all vendors by achieving 22 of the 24 possible points (see figure 9). Four others (Autographics, CLSI, MSUS/PALS, and OCLC) tied for second place with 20 points each. Except for two respondents that received scores of zero (Datatrek and Embar), the other scores were fairly evenly distributed. Ten vendors (55.6%) scored at or above the average of 24 points.

Another wide distribution of scores was seen for questions pertaining to vendors' capabilities for providing off-line products based on a library's authority database (see figure 10). Again, Dynix scored highest, receiving 22 out of 22 possible points, while Inlex and Innovative Interfaces tied for second, scoring 19 points each. Most vendors (10, or 55.6%) received scores above the average of 12 points. One vendor (OCLC) scored zero for questions in this section.

Only seven vendors (38.9%) scored above the average on questions pertaining

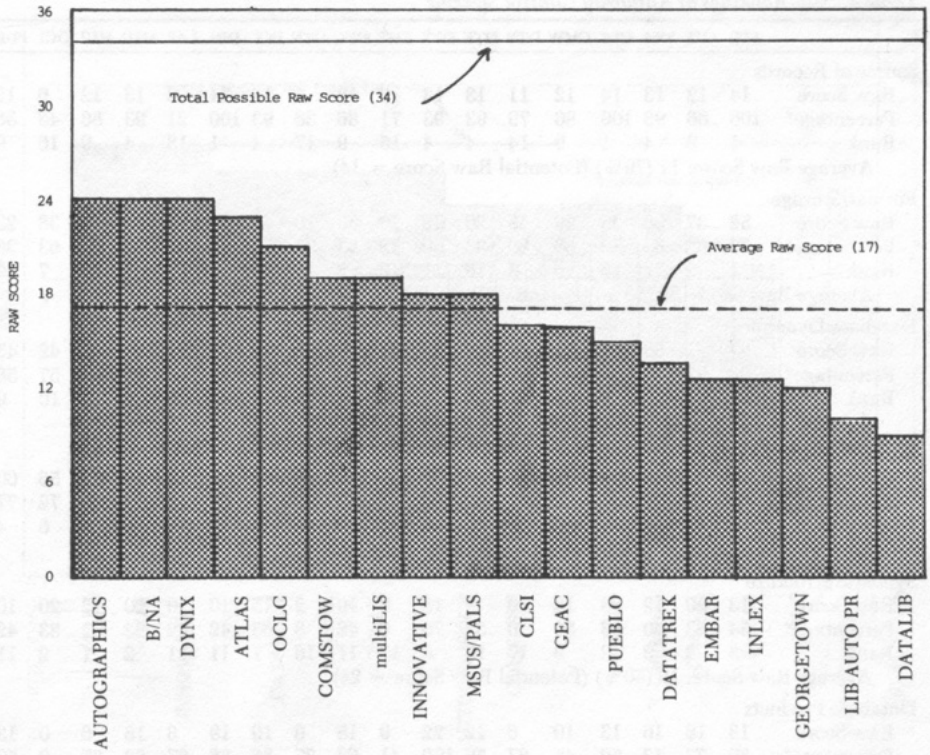

Fig. 4. Ranked Scores for Peripheral Items.

to the evaluation and statistics-gathering capabilities of authority control systems (see figure 11). Autographics, MSUS/PALS, and Pueblo each received perfect scores of 8 points, followed by Innovative Interfaces with 7. Most others were evenly distributed in the 3- to 5-point range, but one (Library Automation Products) scored zero.

DESCRIPTION OF RESPONSES

Vendors' responses to questionnaire items are described below, in order to demonstrate general trends in automated authority control systems. Totals for some responses are more than eighteen (the number of respondents), since vendors were sometimes given several choices and often responded with more than one answer.

Source and Acquisition of Authority Records. In all authority control systems, *authority records* form the basis of the authority file. The source of these authority records varies; some systems can accommodate a variety of sources, while other systems are more limited.[13] The sources of authority records in a bibliographic database can be important when libraries want to merge their databases for union lists or other purposes.[14] Eight vendors reported that authority records are created locally at the time that bibliographic records are loaded into the system. Five said that libraries must obtain authority records through a third-party vendor. Three vendors said that any source may be used, while two reported that Library of Congress name authority files are used directly. One respondent, a medical library that developed an online library system, uses the National Library of Medicine's *Medical Subject Headings* (MeSH), and one vendor reports that Sears subject headings may be

Table 4. Sub-Rankings of Authority Control Systems

	ATL	AUT	BNA	CLS	CMW	DTB	DTK	DYX	EMB	GEC	GTN	INX	INN	LAP	MSU	MUL	OCL	PUE
Source of Records																		
Raw Score	14	12	13	14	12	11	13	13	10	12	5	13	14	3	13	12	6	12
Percentage*	100	86	93	100	86	79	93	93	71	86	36	93	100	21	93	86	43	86
Rank	1	9	4	1	9	14	4	4	15	9	17	4	1	18	4	9	16	9
Average Raw Score: 11 (79%) (Potential Raw Score = 14)																		
Format/Storage																		
Raw Score	52	37	38	35	39	48	20	36	20	50	19	43	34	28	48	37	38	23
Percentage*	87	62	63	58	65	80	33	60	33	83	32	72	57	47	80	62	63	38
Rank	1	9	7	12	6	3	16	11	16	2	18	5	13	14	3	9	7	15
Average Raw Score: 36 (60%) (Potential Raw Score = 60)																		
Database Dynamics																		
Raw Score	67	71	53	44	31	41	10	59	42	40	35	45	67	39	49	40	42	43
Percentage*	88	93	72	59	42	55	14	80	57	54	47	61	88	53	66	54	57	58
Rank	2	1	5	8	17	12	18	4	10	13	16	7	2	15	6	13	10	9
Average Raw Score: 45 (59%) (Potential Raw Score = 76)																		
Matching and Linking																		
Raw Score	53	53	42	51	47	40	54	70	55	68	28	55	49	35	58	62	56	60
Percentage*	68	68	54	65	60	51	69	90	71	87	36	71	63	45	74	79	72	77
Rank	10	10	15	12	14	16	9	1	7	2	18	7	13	17	5	3	6	4
Average Raw Score: 52 (67%) (Potential Raw Score = 78)																		
Syndetic Structure																		
Raw Score	13	20	12	20	12	0	8	18	0	10	2	15	10	10	20	22	20	10
Percentage*	54	83	50	83	50	0	33	75	0	42	8	63	42	42	83	92	83	42
Rank	8	2	9	2	9	17	15	6	17	11	16	7	11	11	2	1	2	11
Average Raw Score: 12 (50%) (Potential Raw Score = 24)																		
Database Products																		
Raw Score	13	16	16	13	10	6	12	22	9	15	6	19	19	6	18	6	0	13
Percentage*	59	73	73	59	45	27	55	100	41	68	27	86	86	27	82	27	0	59
Rank	8	5	5	8	12	14	11	1	13	7	14	2	2	14	4	14	18	8
Average Raw Score: 12 (55%) (Potential Raw Score = 22)																		
Evaluation and Administration																		
Raw Score	5	8	5	4	4	3	4	5	2	6	3	3	7	0	8	4	3	8
Percentage*	63	100	63	50	50	38	50	63	25	75	38	38	88	0	100	50	38	100
Rank	6	1	6	9	9	13	9	6	17	5	13	13	4	18	1	9	13	1
Average Raw Score: 5 (63%) (Potential Raw Score = 8)																		
Overall Ranks																		
Raw Score	217	217	179	181	155	149	121	223	138	201	98	193	200	121	214	183	165	169
Percentage*	77	77	63	64	55	53	43	79	49	71	35	68	71	43	76	65	59	60
Rank	2	2	10	9	13	14	16	1	15	5	18	7	6	16	4	8	12	11
Average Raw Score: 174 (62%) (Potential Raw Score = 282)																		

*Rounded to the nearest whole number.

used as well as headings from LC and the National Library of Canada.

Authority records from sources other than the primary source could be accommodated in fifteen of the systems. Four of these added locally created records, three permitted direct downloading from bibliographic utilities, three could accommodate "any [authority records] in MARC format," while one vendor could take "any in ASCII format." Other sources named were Bibliofile, LC, Vedettes de l'Universitaire Laval, and "any source."

Frequency of updates to authority files is a matter of concern for many librarians.[15] When asked how often new records can be added to their systems' authority files, vendors' responses ranged from continuously, at the user's discretion (eight vendors), to daily, monthly, or quarterly updates.

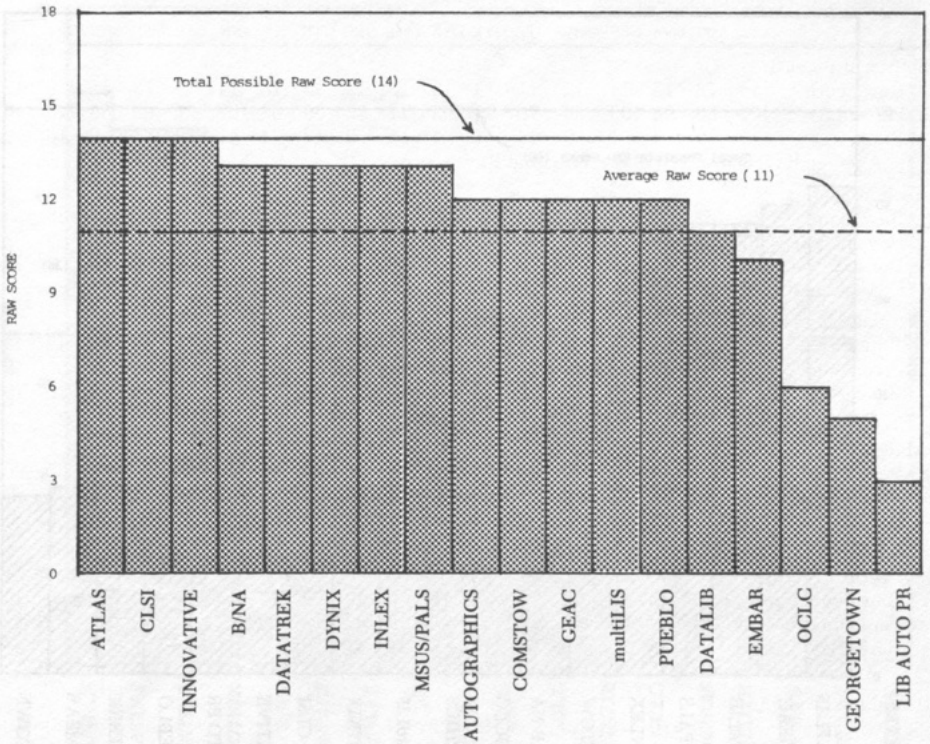

Fig. 5. Ranked Scores for Source of Authority Records.

Eight vendors reported that updates were performed at any or all of these intervals, while four reported that authority records would be added as often as bibliographic records were loaded.

When asked about transferring individual authority records electronically[16] (i.e., from the bibliographic utilities), fifteen vendors reported that this could be done; three said it could not. Of the fifteen, eleven can use magnetic tape, eight can use an online process, five can use floppy diskettes, three can accommodate CD-ROM, and one system claims to be "hardware dependent."

Many larger libraries subscribe to LC authorities, considering them the best option for local authority control.[17,18] Fifteen vendors reported that their systems accommodate batch loading from LC tapes, two said they cannot, and one did not respond.

Format and Storage of Authority Records. The ability to transfer authority information to and from other systems or institutions is often controlled by the internal format of the authority records and is also affected by the system's ability to convert the format when necessary.[19] The format usually preferred by librarians is the MARC format for authorities.[20-22] Twelve vendors reported using the MARC format for transmission of authority records; six use another, unspecified format.

Eleven vendors said that the MARC format is used for storage of authority records; seven use some other, unspecified format. Twelve vendors reported that their systems are able to accommodate authority records that are not in MARC format; six vendors cannot accommodate such records. Thirteen vendors can convert non-MARC authority records to MARC format, four cannot, and one was "not sure." Only five vendors said that they could fully translate

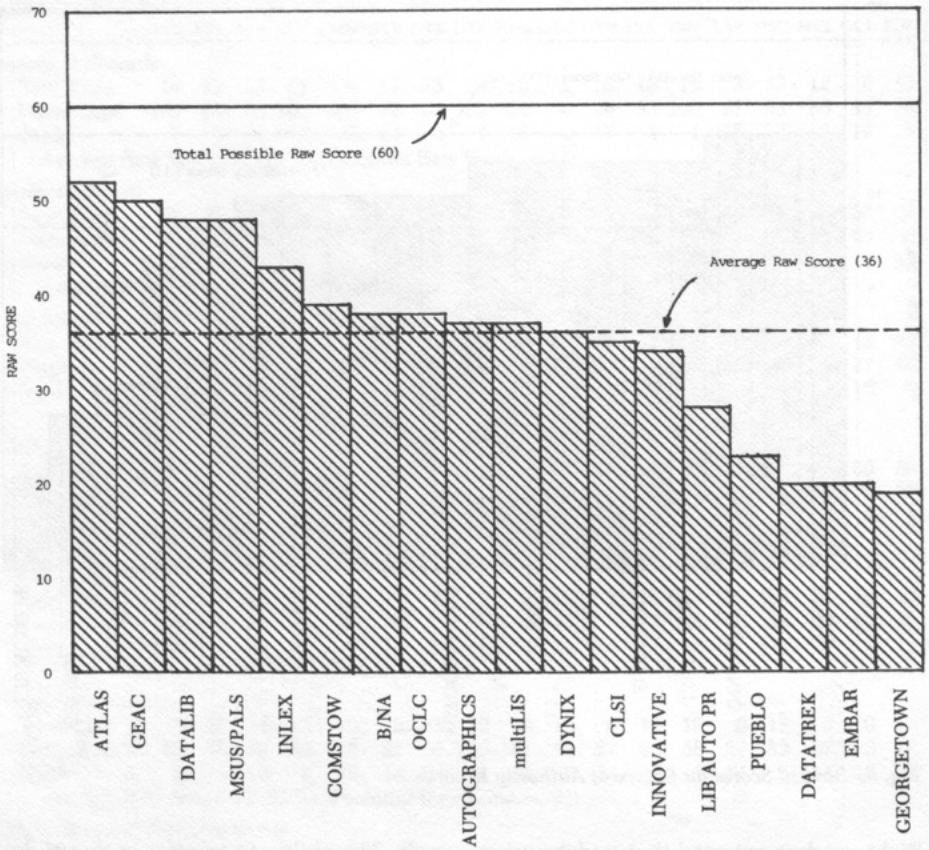

Fig. 6. Ranked Scores for Format and Storage of Authority Records.

non-MARC records so that all fields are usable and retrievable. Ten could not do so, but two have this process under development. One vendor gave no response.

Regardless of the format used for authority records, automatic validation can verify that the machine tags and codes in each record are correct for the format in question and that all required tags are present.[23] Format and content designators are checked automatically against an already established list, such as the MARC authorities format.[24] Only five vendors are able to do this, ten cannot, and two report this capability is under development. One vendor did not respond.

In the same way that use of various machine-readable formats for authority records can affect the success of merged databases from multiple institutions, so can the presence of authority records from different sources affect the creation of union catalogs or other shared bibliographic databases.[25,26] Sixteen vendors reported that their systems allow coexistence of authority records from multiple sources; fifteen of these can store authority records from different sources in the same file. Two vendors reported that their systems could not accommodate records from multiple sources.

In addition to established headings and cross-references, authority records can contain other information useful to the librarian, e.g., the heading source[27] and scope notes. Ten vendors reported that authority records can indicate who established the form of the heading, six said they cannot, and two did not reply. Half of the vendors

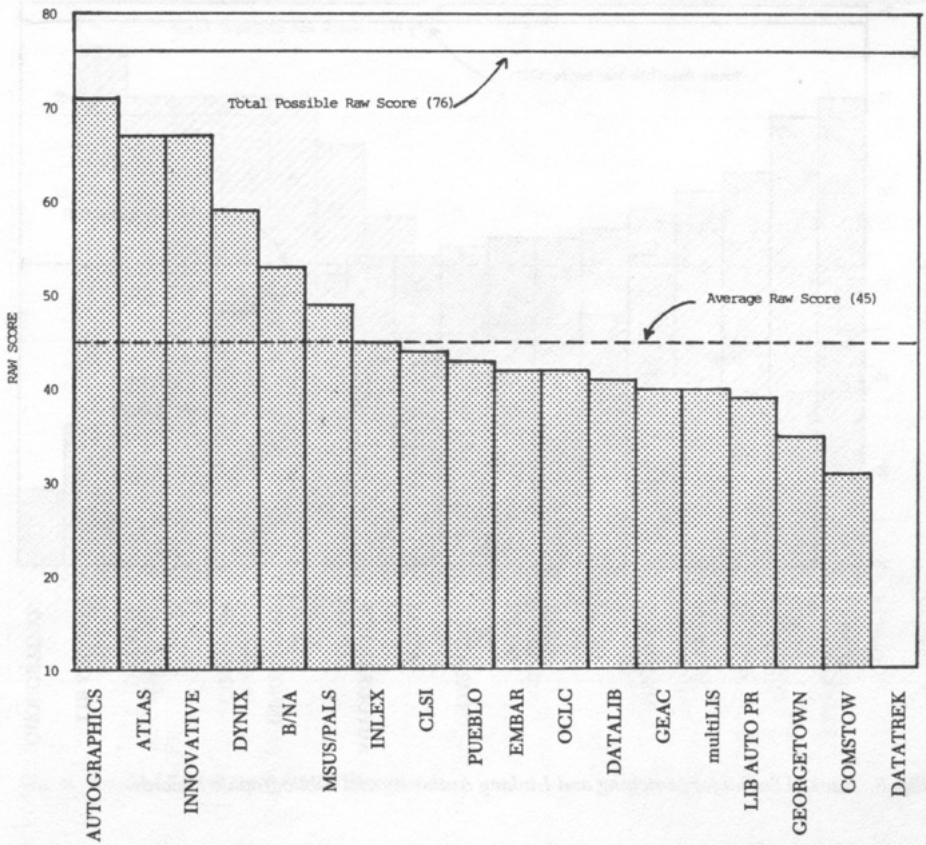

Fig. 7. Ranked Scores for Database Dynamics.

indicated that scope notes could be included. Four others said that such notes could not be included; two indicated that they could be included only for subjects. Three vendors did not reply.

In some systems, "dictionaries" or "indexes" are used instead of separate authority files. Indexes do not have associated references and notes, as do authority records, and do not generate and de-blind references automatically. However, indexes may be preferred over full authority files because they require less magnetic storage space in the system.[28] Twelve vendors store bibliographic headings in an authority file. Only two reported use of an index file for heading storage; two vendors responded that both index and authority files were used. Two did not answer the question.

The text of a bibliographic heading may be stored in the bibliographic record, the authority record (or index file) or both, or it may be stored in a separate authority file that is electronically linked to the bibliographic records.[29] (A single storage location reduces the amount of disk storage space required but increases response time due to the need to retrieve a heading from an authority file before the requested bibliographic record can be displayed.) When asked which method was used in their system, fifteen vendors reported that the headings are stored in both the bibliographic and authority records, while three said that headings are stored in authority records only.

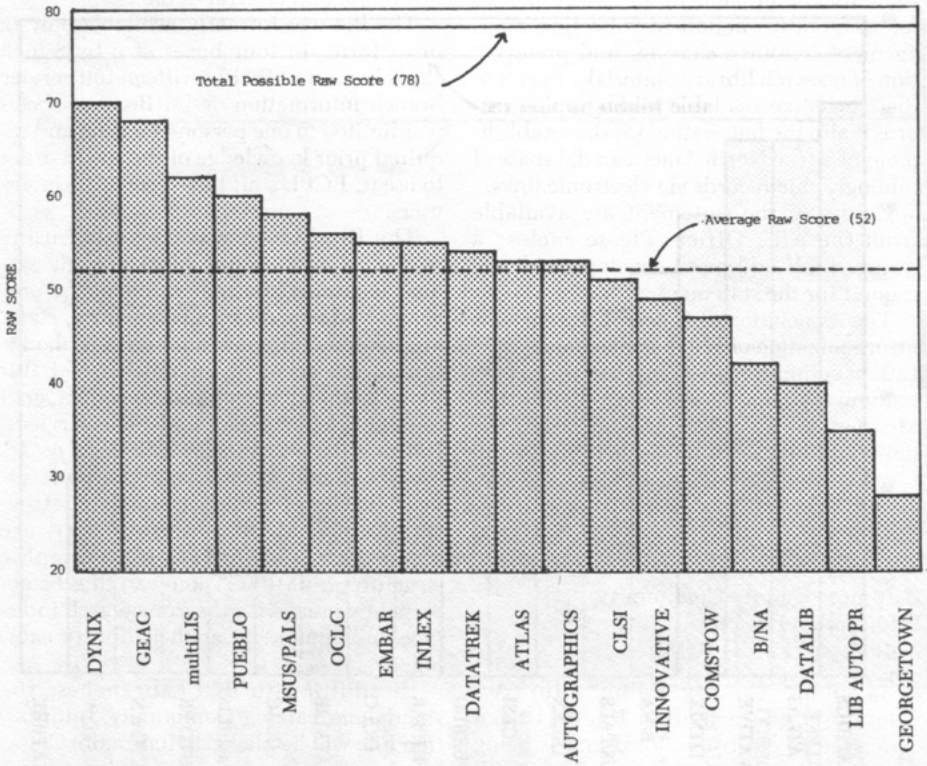

Fig. 8. Ranked Scores for Matching and Linking Authority and Bibliographic Records.

A constant problem for librarians maintaining automated systems is keeping the local authorities current—by adding new headings as needed and by deleting or modifying superseded headings.[30] Vendors offer several methods for handling superseded authority headings. Eleven require that library staff perform a local review and edit procedure. Six have a local global search and replace function, whereby new headings can automatically replace old headings in all affected bibliographic records. One vendor requires that the bibliographic database be run through authority control to add new or modified LC headings. One vendor did not answer the question.

Authority Database Cleanup. A first step in implementing authority control in an already existing online system is to match the headings in a library's bibliographic database against an established authority source. Before this match can be attempted, the headings must be "normalized," i.e., converted to upper case, stripped of punctuation and diacritics, spaced in standard fashion, etc., in order to maximize the number of likely matches with the outside authority file.[31,32] Vendors may use standard conversion tables or special tables developed by the vendor or the library. Thirteen vendors normalize headings before matching them against an authority file; four do not. One reported a normalization process under development. Of those who do normalize headings, six use a locally developed table, and four use a standard table. One vendor reported that no table is used, and two vendors did not reply.

Even after normalization and matching against an authority source are completed, problems can remain in the records. Errors in spelling, punctuation, series volume numbering, and MARC tagging may persist, as may the presence of unwanted ini-

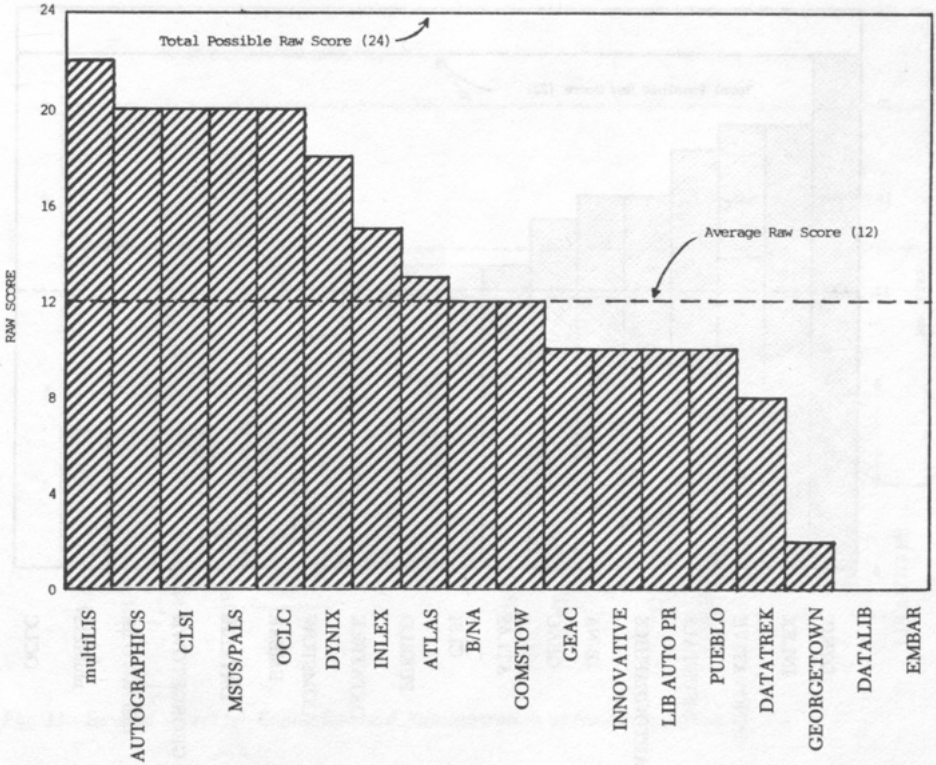

Fig. 9. Ranked Scores for Syndetic Structure.

tial articles. The ability to access and edit authority records is essential to establish and maintain the integrity of the database. Thirteen vendors reported that local staff may correct spelling, capitalization, punctuation, and similar problems in local authority records. Seven reported that such changes would be made by the vendor; in four cases, either may make changes. Two vendors did not respond.

Eleven vendors' systems allow library staff to remove initial articles; eight reported that the vendor can make those changes; and four systems allow changes by both library and vendor staff. Three vendors did not give answers.

Form of entry for series titles and numbering of volumes within a series can affect the consistency of an online catalog display.[33] This might not become evident until after a library's bibliographic database has been loaded into an online catalog and searches are attempted, after which corrections may be desired. When asked about making changes to the form and numbering in series headings, eleven vendors reported that library staff could make such changes locally, while six reported that vendor staff could do this for the library. In three cases, library or vendor staff may make corrections to series headings. One vendor reported that this is not done at all, and three did not respond.

Regardless of the accuracy of the textual information within authority headings and references, effective retrieval is possible only if fields are tagged and coded correctly according to the format in use. Since it is possible that tagging errors may slip through the initial processing of a library's database, the ability to correct MARC encoding is important.[34] Ten systems allow library staff to make changes to MARC tags, indicators, and subfield codes. Seven ven-

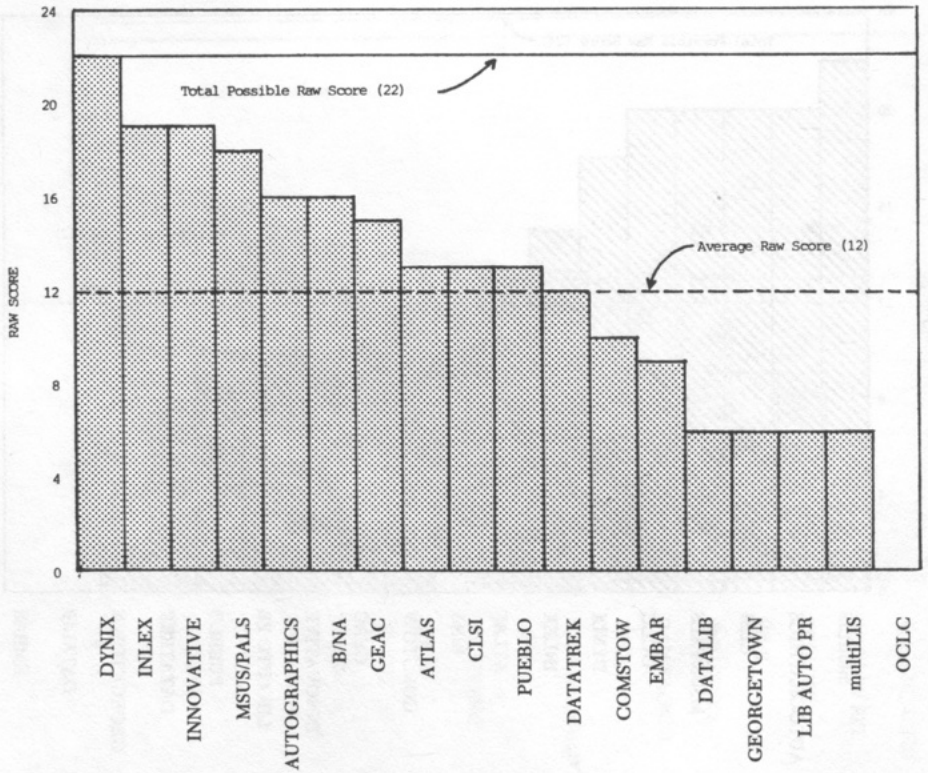

Fig. 10. Ranked Scores for Database Products.

dors report that vendor staff can make these changes; four allow both library and vendor staff to make these corrections. Three vendors said this is not done at all, and two vendors did not answer.

The MARC formats undergo frequent revisions, and obsolete tags or subfield codes may be present in older cataloging records in a library's database. This is especially true if a retrospective conversion project has been done. Conversion of outdated MARC tags and codes to current values can contribute to the consistency and usefulness of the catalog.[35] Nine vendors report that library staff may correct MARC tags, and eight report that vendor staff can carry out the conversion. Four said that this can be done by library or vendor staff. Three do not perform this service at all; two gave no reply.

Cleanup of Subject Headings. Bibliographic records may contain subject headings from multiple sources. Records taken from the databases of bibliographic utilities (like OCLC) may include descriptors from the *Library of Congress Subject Headings* (LCSH), the National Library of Medicine's *Medical Subject Headings* (MeSH), and others. In the MARC format, the sources are distinguished by the value of the second indicator in the 6xx subject field. Most libraries use headings from only one source for their local catalogs, so it is important that vendors be able to select subject headings based on that indicator value.[36] When asked about their ability to do so, half of those surveyed indicated this could be done, six responded that they could not, and one reported the capability under development. Two vendors did not answer the question.

Verification of subject subdivisions is important, too, since they may be used as search keys in some online catalogs. Since

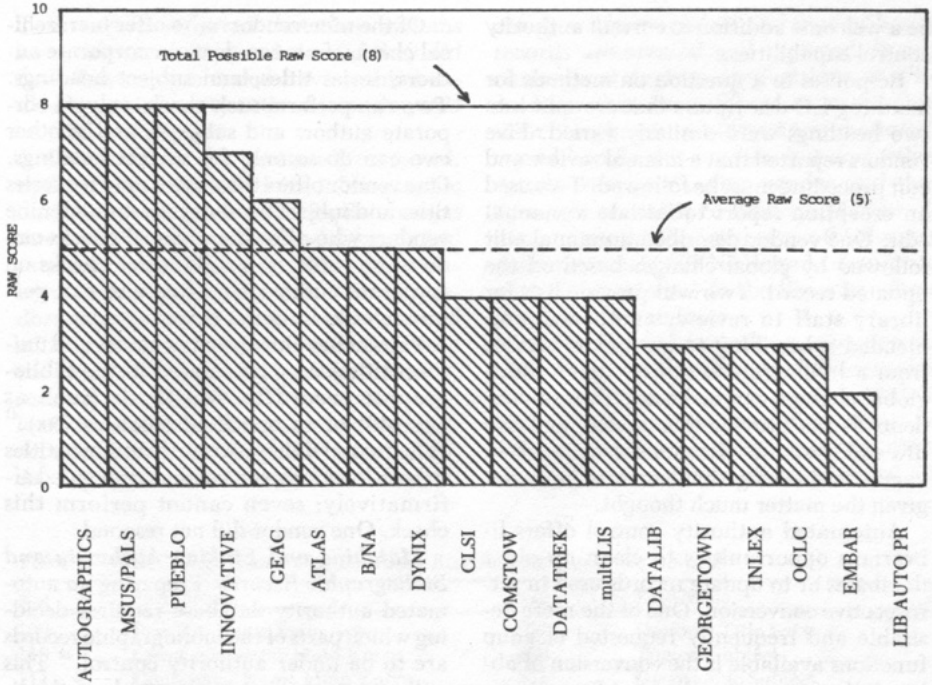

Fig. 11. Ranked Scores for Evaluation and Administration of Authority Systems.

LCSH does not include all subdivisions, verification of form and content during database cleanup activities may be incomplete.[37] Vendors in the survey were asked if they could verify subdivisions separately. Ten replied that they could, seven said that they could not, and one reported this function under development. Of the ten who will verify subdivisions, half did not specify a method. The other five vendors reported these conditions for verification: one vendor requires that the library have a separate authority record for each subheading to be verified; one requires a manual review and edit of subject subdivisions; and another has the system verify subheadings against those already in the bibliographic database (this would assume that all subheadings in the database are completely correct). Only one vendor matches subheadings against an authority file.

As LC continually revises and updates its subject heading list, old headings may be replaced by new headings, or they may be split into two related headings. Vendors differed on how these two problems are resolved. When queried about canceled and unreplaced headings, eight vendors responded that a manual review and edit process was required for updating. Two respondents reported use of an exception report in conjunction with a global search and replace process, and two update users' authority files through the use of current LC tapes. One recommended use of bibliographic utilities' updating services for LCSH changes. Another responded, "As bibliographic records are deleted, so will the affiliated authority records, if no other bibliographic record has them," obviously misunderstanding the question. Five vendors did not answer the question at all. Answers to the question regarding method included phrases such as "people making intelligent judgments," "catalogers have to keep track of canceled LC headings," and "local library decision." Of course, it is the library staff which ultimately decides which headings are appropriate in a given catalog, but automation of this task would

be a welcome addition to current authority control capabilities.

Responses to a question on methods for handling LC descriptors that are split into two headings were similarly varied. Five vendors reported that a manual review and edit procedure must be followed. Two used an exception report to initiate a manual edit. One vendor described a manual edit followed by global changes based on the updated record. Two will provide lists for library staff to review; another recommended subscribing to an update service from a bibliographic utility, upon which global changes can be based. Two respondents do not provide this service, and five did not respond. Responses were often vague, indicating that vendors have not given the matter much thought.

Automated authority control offers librarians opportunities to clean up older databases or to update records used in retrospective conversion. One of the more desirable and frequently requested cleanup functions available is the conversion of abbreviations to their spelled-out forms (e.g., "U.S." to "United States").[38] Half the vendors surveyed have this capability; seven do not, and two gave no reply.

System Checks. Another process used to ensure quality in the authority database is dependent field validation, the "capability to cross-check between fields, usually between fixed and variable fields,"[39] according to pre-established sets of codes (such as MARC tags, indicators, subfield codes, and fixed field values). For example, a vendor may check to be sure that all tags in an authority record are valid MARC tags or check that subfield codes present in variable fields are valid for use with the field tags. When asked if dependent field validation is offered, ten said yes; five said no. Two vendors reported this process to be under development, and one did not answer the item.

Some validation of authority heading content may be done through a hierarchical check, which "determines if the parent bodies of an entry established subordinately are represented in the authority file."[40] Nine vendors reported that their systems can accommodate hierarchical checks; eight cannot. One vendor claimed to be "undecided."

Of the nine vendors who offer hierarchical checks, four can do so on corporate authors, series titles, and subject headings. Two can perform such checks only on corporate authors and subjects, and another two can do so only for subject headings. One vendor offers the service only for series titles and subject headings. In sum, all nine vendors who offer hierarchical checks can do so on subjects, six also offer checks on corporate authors, and five also can perform checks for series titles.

Pairs of headings (such as names and uniform titles) may be entered in the bibliographic record in two fields (such as 1xx/240) or in one field (such as 7xx).[41] When asked if they can verify uniform titles in both locations, ten vendors responded affirmatively; seven cannot perform this check. One vendor did not respond.

Matching and Linking Authority and Bibliographic Records. Preparing an automated authority database requires deciding which parts of the bibliographic records are to be under authority control.[42] This will vary according to the needs of the library and the capabilities of the chosen system. Headings representing authors, titles, subjects, and series may be under authority control. When presented with a table of twenty-four MARC field tag numbers (see table 5) and asked to indicate which of them can be under authority control in their systems, vendors gave widely varying responses. Five indicated that "all of the above" tags could be under authority control, and four said the choice of tags was "user-defined," implying that all could be included. One vendor said, "undecided—under development," and one vendor failed to specify which tags could be under authority control.

The seven vendors who did not report that "all tags" could be included listed various exceptions (see table 6). The presence of MARC tags 111, 240, 243, 710, 711, and 730 on this list are especially disappointing, as the use of established forms for names of authors—whether personal, corporate, or conference—and uniform titles are crucial to the catalog's effectiveness.

Some authority control systems allow bibliographic and/or authority records for certain types of materials—audiovisuals, for example—to be bypassed entirely.[43]

Ten vendors reported that their systems have this capability, and six said they did not. One recommended having this handled by a third-party authority vendor, and one did not respond.

After a library has processed, corrected, updated, and installed its bibliographic database, it must maintain the database as internal (materials added and deleted) and external factors (changes to chosen authority sources) render it obsolete.[44] Seven vendors reported that a manual review and edit by library staff was required to keep the local database and outside authority sources synchronized. Three systems can load updated authority tapes, produce exception reports, and then use a global update procedure to make the desired changes. Three vendors said that authority records are created and reported during current cataloging, so decisions can be made at that time. Three reported that their "authority maintenance modules" would handle this process, but no further details were given. One vendor said that "changes are made to bibliographic headings automatically," and one, a third-party authority vendor (B/NA), made changes in authorities external to the libraries whose databases it maintains.

A vendor may be asked to produce an extract or subset of a library's bibliographic database for use in various products such as branch catalogs, lists, or catalogs of special formats, etc.[45] When asked about capabilities for coordinating authority control for

Table 5. MARC Tags Which Can Be Under Respondents' Authority Control

Tag	Field Name	Tag	Field Name
100	Personal Name Main Entry	630	Uniform Title Subject
110	Corporate Name Main Entry	650	Topical Subject
111	Conference Name Main Entry	651	Geographic Subject
240	Uniform Title	700	Personal Name Added Entry
243	Collective Uniform Title	710	Corporate Name A.E.
400	Personal Name Series	711	Conference Name A.E.
410	Conference Name Series	730	Uniform Title A.E.
440	Series Title Heading	800	Series A.E., Personal Name
490	Series Title Traced Differently	810	Series A.E., Corporate Name
600	Personal Name Subject	811	Series A.E., Conference Name
610	Corporate Name Subject	830	Series Title Added Entry
611	Conference Name Subject	87X	Variant Forms of Entry

Table 6. MARC Tags Not Under Respondents' Authority Control

MARC Tag	Field Name	Vendors Not Using
111	Conference Name Main Entry	1
2xx (all)	All 2xx Fields	1
240	Uniform Title	4
243	Collective Uniform Title	5
4xx	All 4xx (Series) Fields	1
400	Personal Name Series	1
410	Corporate Author Series	1
490	Series Title Traced Differently	1
610	Corporate Author Subject	1
611	Conference Author Subject	1
630	Uniform Title Subject	1
651	Geographic Subject Heading	1
710	Corporate Author Added Entry	1
711	Conference Author Added Entry	1
730	Uniform Title Added Entry	1
87x	Variant Forms of Entry	1
8xx	All 8xx Fields	2

such products, five vendors described a process whereby the extract is produced, and then the new database is matched against the authority file to obtain the desired authority headings. Four others either do not have this capability, have not planned for it, or have not been asked to perform this service. One vendor reported that they had never been requested to create "abstracts" of a library database—even though the word "extract" was clearly printed in the question. Six vendors gave confusing answers to this question: two said that this capability would be a function of the OPAC search process; one said that it would "write a special program"; and one said that this would be done through a third-party authority vendor. One reported that "headings should already be verified"; however, this would not necessarily be true for a system where bibliographic headings are stored not in the bibliographic records, but in the authority records, thus necessitating a coordination of authority control should an extract of bibliographic records be produced.

Another advantage of an automated authority control system is its ability to check new headings against a resident authority file automatically, doing away with the need for a cataloger to check authority files manually during the cataloging process. In such a system, the cataloger can be alerted when a heading is entered that does not match any already in the local authority file.[46] Some systems provide this information in an exception report, while others give immediate notification. Eleven respondents reported that the cataloger is notified immediately when a term not in the authority file is entered into the bibliographic database. Six do not have this function, and one did not respond.

Seventeen vendors named a variety of methods by which library staff may perform nonautomated checking of new/unmatched headings. Four use a printout, four use an online report, and three offer either printed or online reports. Other methods mentioned were global update and browsing in the authority file. Some bibliographic headings may be made up of more than one component requiring authority control, e.g., subject headings and subdivisions both may be controlled.[47] When asked about the provision of multiple authority records for such headings, fourteen vendors reported that multiple authority records could be supported, two said they could not, one reported this capability under development, and one did not answer.

Along with record matching, a system's ability to make corrections and revisions automatically holds great appeal for librarians charged with database maintenance. Vendors were asked if their systems can correct headings in bibliographic records by matching them separately against authority records.[48] Ten said yes, five said no, two reported this function under development, and one did not respond.

When asked if their systems can notify the library staff of "near" matches of new headings to established authority forms (where slight discrepancies such as dates, spelling errors, etc., affect matching),[49] eight said that this was possible; ten said it could not be done.

For headings containing both author and title components, fifteen vendors reported that the system could check the authority file for the name portion of the heading; three could not.

Linking Bibliographic and Authority Records. In an online catalog, the authority records and the bibliographic records may be in separate files, or they may be in the same database. If separate, the two can be connected electronically so that headings in the authority file are linked to all occurrences of that heading in the bibliographic file; such a connection facilitates global changes.[50] Thirteen vendors reported that, in their products, authority systems are separate from bibliographic databases. Four vendors reported that these systems are integrated; one vendor did not answer the question. Fifteen vendors reported bibliographic and authority files are linked in such a way that each heading in the authority file is linked to each occurrence of that heading in the bibliographic file. One vendor does not offer this capability; two did not respond.

If changes are made to headings in authority records, or if multiple authority records are merged, the bibliographic records in which those headings are used must be

updated. The electronic link between authority and bibliographic files described above allows global changes to be made easily. The final step in this procedure is the automatic relinking of bibliographic records to authority records after the authority records are merged or changed.[51] Fourteen vendors report that their systems have this capability, two said it cannot be done (one specified that "records have to be edited after changes to authority files"), and two did not respond.

Some systems have the capability of checking all incoming headings automatically against the authority file and then providing some sort of notification to library staff if the heading does not match any in the authority file.[52] If no match is found, a "skeleton" authority record may be created temporarily. Sixteen vendors report this capability, one said it cannot be done, and one did not answer.

Five systems require that headings be entered into the authority file (and, presumably, verified) before they can be entered into bibliographic records. Thirteen systems do not have this extra quality control procedure.

When asked if their systems allow bibliographic records to be linked to unauthorized headings, ten vendors said yes; eight said no. A few of the vendors who responded yes added comments such as "then [use the] report change function . . . to correct [the heading]" or "[then use] global update [for] correction," showing that in using such systems, extensive manual review and edit procedures would still be required to maintain database currency in the database, since automatic relinking is not available.

Syndetic Structure. Validated authority headings are made more useful if the syndetic structure of the catalog—the network of references linking related headings—facilitates their retrieval. Half the vendors reported that "see" and "see also" references cannot be generated automatically from nonmatching records. Seven systems do have this capability, and one vender reported it under development. One vendor did not answer.

One aspect of this reference structure is "earlier/former name" and "later name" references which "indicate relationships between two authorized corporate or meeting conference and series headings."[53] Systems from eight vendors have this capability, and eight do not. One vendor reported this was available in their serials control product only and not in cataloging or authority control modules, in an obvious misreading of the question. Two vendors did not answer the question.

As important as it is to add references when needed to link existing headings, it also is essential to remove those references when they are no longer needed, i.e., when the heading(s) to which they were linked is no longer used. If they remain in the catalog, these so-called blind references may direct the user to nonexistent headings. Some systems can remove the obsolete references automatically, in a process called "automatic de-blinding."[54] Ten vendors reported that their systems can perform automatic de-blinding, seven cannot, and one did not give an answer.

Eleven vendors reported that their systems can automatically change headings that match a "see" reference to the preferred (authorized) form. Only five cannot do this; one vendor reported this capability under development, and one did not answer.

Some systems are able to perform "reciprocity checks," where for each 5xx ("see also" reference) input, the machine checks for the presence of an authority record with the corresponding 1xx field.[55] Half the systems have this capability, four do not, and one is under development. Three vendors did not answer, and one gave a response of "don't know."

In MARC bibliographic records, an 87x field contains a cross-reference form for a name used in a record; some systems are able to make cross-references for that name using the information present in the 87x field.[56] Only one vendor surveyed can use the 87x for generating cross-references; fifteen cannot. Two did not respond.

In the only question which pertained directly to authority control in the public portion of an online catalog, vendors were asked if their systems perform "transparent" cross-referencing, i.e., automatically transferring a user from a cross-reference

term to an authorized heading. Eleven vendors reported this capability in their systems; five systems would require a user to rekey the search if the original query had used an unauthorized form. Two vendors did not respond.

Authority System Dynamics. Keeping the authority database current requires adding new records periodically;[57] this can be accomplished using several methods. Ten vendors reported that library staff can key authority records directly into their local systems, and seven systems can accommodate tape loading of authority records from various sources. Six responded that authority records are added via tape loading of bibliographic records into the system, while five reported that authority records are added during current cataloging activities. Downloaded authority records from bibliographic utilities can be accommodated by four vendors. Also mentioned were printed work forms, online work forms, and machine transfers.

Another way to keep authorities current is to make changes to local records as problems and discrepancies arise.[58] When queried about capabilities for manipulation of local system authority records by library staff, seventeen vendors reported that library staff may display, replace, and print authority records; sixteen vendors' systems allow staff to add and delete authority records; and fifteen allow full editing of authority records by library staff. Most vendors (fifteen) allow all these procedures.

Various methods can be used to manipulate the authority records in a library's local system. Sixteen offer an online, interactive mode for manipulating authority records, including online work forms. One vendor described a global update and delete function but did not specify if it was interactive. When asked if library staff could access and edit all fields in authority records, fifteen vendors responded that full editing was allowed, while three do not allow editing of all authority fields.

Global Updates. One of the most costly components of card catalog maintenance is the time required to make the many changes required to keep the catalog current as terminology and usage evolve. Making global changes in an automated system is attractive to librarians because of the ease with which all occurrences of headings can be replaced or modified, often with a single command.[59,60] Fifteen of the vendors surveyed report that global changes may be made within the authority file, two said this capability is under development, and one did not answer.

Of the fifteen vendors that currently offer global change, twelve use an interactive, online process; one uses a floppy disk system; one a batch overnight process; and one third-party vendor (B/NA) controls the entire process.

In addition to the using global commands to replace or update headings which take up entire fields (with or without subfields), some systems offer similar updates for subfields alone.[61] For example, one command could change all occurrences of "Ceylon" to "Sri Lanka." Only ten vendors offer global change capabilities for subfields alone, five do not, but three reported it to be under development. Of the ten systems that can accommodate global changes to subfields, six use an online process, one uses an overnight batch process, one uses a written request form from the library, and one (B/NA) controls the entire process. One did not specify a method.

Five vendors' systems allow libraries to make global changes to all fields in the authority records, regardless of indexing; one vendor reports this is under development. Eight allow global changes in the authority records to be made only on indexed fields. One respondent has this under development, and three vendors did not respond to this item.

Authority Database Products. A printed list of the library's authority file may be useful in detecting errors and facilitating corrections and updates. The ability of library staff to produce a list at any time is an attractive option to those selecting an automated system.[62] Thirteen vendors reported that library staff may produce a printed list; four indicated that it cannot be done. One vendor did not respond.

Twelve vendors are able to provide copies of the library's authority database in other formats: ten on magnetic tape (reels);

seven in printed form; five on floppy diskettes; and one on magnetic tape cassettes. Taken together, four of the twelve provide copies on paper, magnetic tape, or floppies; four provide magnetic tape only; one can produce copies on magnetic tape or on paper; one can give copies on paper or on floppies; one provides print copies only; and one can produce copies on magnetic tape reels or cassettes only. Of the vendors that produce copies of the authority database in machine-readable format (magnetic tape reels or cassettes or floppy diskettes), only half provide the authority records in MARC format. Seven vendors use formats other than MARC; two did not respond to the question.

Evaluation and Administration of the Authority System. Statistics on the creation, modification, maintenance, size, and other aspects of authority records and the local authority system are useful in evaluation and management of the system.[63] Of the eighteen vendors surveyed, sixteen reported on a variety of statistics that are compiled and/or reported by their systems. Two vendors did not respond to any of the questions on this subject.

Of those who responded, twelve noted that their systems can report the number of authority records added, deleted, or modified; ten can report the number and average size of authority records present in the system at a given time. Eleven vendors can report the number of bibliographic headings in the authority file, while seven can report the number of bibliographic headings changed. Six systems can report the number of cross-references generated, and six can report the number of nonmatches that occur. Custom statistics can be programmed by three vendors, and seven vendors noted that they could provide additional statistics not covered by this survey.

When asked which authority control services they offer, seven vendors reported they could provide all required authority control services. Four vendors direct some authority control processing to a third vendor, while one recommends that all authority work be done by a third vendor.

SUMMARY

Creation and maintenance of a library's bibliographic database is not complete without effective authority control. Although complete, correct bibliographic and item records may be present for each item held by the library, complete access to that information cannot be guaranteed unless access points are consistent and accurate throughout the database and unless a true syndetic structure is present.

In this light, authority control capabilities should be considered as important an aspect of choosing an online catalog as speed and sophistication of searching, indexing capabilities, keyboard design, and screen display.

The level and sophistication of authority control required by a particular library will depend on many factors. Size of collection, sophistication and demands of users, past cataloging practices, and anticipated uses of the bibliographic database must be considered. For example, if effective authority control procedures are included in the library's cataloging policy, a less sophisticated authority control system may be required, since less cleanup will be needed. If no authority control has been exercised over years of cataloging activity, more authority capabilities may be desirable in a new online system, in order to carry out the necessary corrections and heavier maintenance work load.

Vendors of automated library systems offer a wide range of capabilities and services for authority control in bibliographic databases. The results of this survey, though limited by the small number of respondents, indicate that the library automation marketplace is beginning to respond to the increasing need for automated authority control in library systems. However, the very wide range of responses, and the wide variance in the overall ratings, demonstrate that some vendors are far behind the mainstream in authority control. The ratings described above should help librarians to choose the automated system best suited to their needs and to the needs of their patrons.

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APPENDIX A. AUTOMATED AUTHORITY CONTROL SURVEY OF SERVICES OFFERED BY VENDORS OF AUTOMATED SYSTEMS

Vendor Name _____ System Name _____

Your Name and Title _____

Telephone _____ Date _____

This survey is intended to determine the types of automated authority control systems and processes available to purchasers of automated library systems. Your time and thought in helping us to gather this information are appreciated.

Instructions—Please circle **YES** or **NO** as indicated or give as detailed an answer as possible for other questions.

Authority file: A file containing authorized headings for names (personal and corporate), subjects, series titles, related references ("see" and "see also" references), and information regarding the decision upon which the heading was based.

1. *Source and Acquisition of Authority Records*

1.1 What is the source(s) for authority records used in your system?

_____

_____

_____

1.2 Can records from other sources be accommodated? **Yes** **No**

1.3 If yes, from what source(s)?_____

_____

1.4 How often are new records added to the authority file?

_____daily _____quarterly

_____weekly _____annually

_____monthly _____other:_____

1.5 Can your system accommodate the electronic transfer of individual authority records?

Yes **No** If so, in what mode?

_____magnetic tape _____floppy disks _____CD-ROM

_____online transfer _____other:_____

1.6 Can your system accommodate the batch loading of authority records from the Library of Congress? **Yes** **No**

2. *Format and Storage of Authority Records*

2.1 *Format*—The system's ability to transfer authority information to and from other systems or institutions is often controlled by the internal format of the authority records and is also affected by the system's ability to change the format when necessary.

2.1.1 In your system, are authority records transmitted in the MARC authority format? Yes No

2.1.2 In your system, are authority records stored in the MARC authority format? Yes No

2.1.3 Can your system accommodate non-MARC authority records? Yes No

2.1.4 Can your system automatically convert non-MARC authority records to MARC format? Yes No

2.1.5 If your system uses a non-MARC authority format, can the format accommodate all fields from the MARC authority format? Yes No

2.1.6 If not, what fields are eliminated?_____

_____

2.1.7 If your system uses a non-MARC authority format, are all the fields that are translated from MARC authority records fully usable and retrievable? Yes No

2.1.8 If no, what are the problems? (name specific fields and associated problems)_____

_____

_____

_____

2.1.9 Can your system validate format and content designators in the authority records against a predetermined set of codes (e.g., USMARC or other authority format)? Yes No

2.1.10 Does the authority record indicate who established the form of the name or other heading? Yes No

2.1.11 Are scope notes included in the authority records? Yes No

2.2 *Storage*

2.2.1 Does your system allow coexistence of authority records from multiple sources? Yes No

2.2.2 If yes, may they be stored in the same file? Yes No

2.2.3 If no, how are they stored?_____

_____

_____

In some systems, "dictionaries" or "indexes" are used instead of separate authority files. Reference and/or note fields are not linked to index entries as they are to authority records but are maintained separately. The presence of full authority files allows for automatic generation of references.

2.2.4 In your system, are bibliographic headings stored in an index/dictionary file or in an authority file?

_____index or dictionary file

_____authority file

_____other:_____

2.2.5 Is the text of a bibliographic heading stored in both the bibliographic record and the authority record or index file, or is it stored in a separate authority file which is electronically linked to the bibliographic record?

_____text stored in both bibliographic and authority records

_____text stored in authority record only

2.2.6 How does your system handle superseded authority records?

3. *Authority Database Maintenance*

3.1 *Authority System Dynamics*

3.1.1 In your system, how can a library add authority records to its authority file?

3.1.2 Can library staff:

display authority records:	Yes	No
edit authority records	Yes	No
add authority records	Yes	No
replace authority records	Yes	No
delete authority records	Yes	No
print authority records	Yes	No

other:

3.1.3 If library staff can manipulate authority records, what is the method used?

3.1.4 Can library staff access and edit all fields in authority records? Yes No

3.1.5 If no, which fields cannot be accessed?

3.2 *Global Update*—A global update is the use of a single command to create a change in all representations of a bibliographic heading.

3.2.1 Can your system accommodate global changes within the authority file? Yes No

3.2.2 If so, what is the method (online process, micro system from vendor, written change request, etc.)?

3.2.3 Can global changes be made to subfields? Yes No

3.2.4 If so, what is the method (online process, micro system from vendor, written change request, etc.)?

3.2.5 Are global changes allowed on any fields in the authority records or only on those indexed fields?

_____any fields _____indexed fields only

_____other:

3.3 *Database Cleanup*

Normalization—Normalization is the process of removing all but the essential characters of a heading in order to match it against another heading. Diacritics and punctuation are removed, and all letters are converted to all upper-case to increase matches.

3.3.1 In your system, are headings normalized before they are run against the authority file?
Yes No

3.3.2 If yes, does the vendor use a standard table or a locally developed table?
_____standard table (please describe:)_____
_____locally developed table

3.3.3 Errors in content or formatting may not be resolved by the automatic matching process. Please indicate if corrections can be made by vendor and/or by library staff or not at all:

3.3.3.1 correction of obvious errors in spelling, capitalization, punctuation, etc.
_____vendor _____library _____not done

3.3.3.2 removal of initial articles where appropriate
_____vendor _____library _____not done

3.3.3.3 normalization of form and number on series titles
_____vendor _____library _____not done

3.3.3.4 checking of MARC tags, indicators, and subfield codes
_____vendor _____library _____not done

3.3.3.5 conversion of obsolete MARC tags/codes to current MARC
_____vendor _____library _____not done

3.4 *Cleanup of Subject Fields*

3.4.1 Some bibliographic records contain subject headings from more than one source (e.g., LC and NLM headings in the same record). Can your system select subject headings for processing based in the 2nd indicator in the MARC 6XX field? Yes No

3.4.2 The Library of Congress subject list contains only main headings; subheadings are not included. Can your system verify subheadings separately? Yes No

3.4.3 If so, by what method?_____

_____

_____

3.4.4 How does your system handle canceled and unreplaced LC subject headings?_____

_____

3.4.5 How does your system handle LC subject headings that are split into two headings?_____

_____

3.4.6 Can your system convert abbreviations to their spelled-out form (e.g., "Gt. Brit." to "Great Britain")? Yes No

4. *Matching and Linking Authority and Bibliographic Records*

4.1 *General*

4.1.1 In your system, which headings in bibliographic records can be under authority control? Please circle all that apply or add as needed:

100	110	111		240	243				
400	410	440	490	600	610	611	630	650	651
700	710	711	730	800	810	811	830	87X	

others:_____

4.1.2 Are there any limitations on which headings can be reviewed? Yes No

4.1.3 Can your authority system be bypassed for certain types of materials (e.g., serials)?
Yes No

4.1.4 How are the library's authority file and bibliographic database kept synchronized as the database changes and as the authority source (such as LC) modifies its headings?_____

4.1.5 If the library requests an extract of its bibliographic database, how is the authority database coordinated so that the authority records appropriate for the extracted records are also extracted?_____

4.1.6. Does the system immediately alert the operator when a term not in the authority file is entered? **Yes** **No**

4.1.7 Does the system provide a means of manual checking of new (unmatched) headings, either online or through a printout?
Yes (specify method: _____) **No**

4.1.8 Some bibliographic headings involve more than one authority heading. Does your system provide all authority headings associated with the heading? **Yes** **No**

4.1.9 Does your system correct headings in the bibliographic record by matching them separately against authority records? **Yes** **No**

4.1.10 Does your system notify the library of "near matches"? **Yes** **No**

4.1.11 When matching name/title headings, does the system check for the presence of an authority record for the name portion? **Yes** **No**

4.2 *Links Between Bibliographic and Authority Records*

4.2.1 Is the authority system separate from the bibliographic database? **Yes** **No**

4.2.2 If the two are linked, is each heading in the authority file linked to each occurrence of that heading in the bibliographic file, so that all occurrences of a heading can be modified with a single transaction (global change)? **Yes** **No**

4.2.3 Does the system relink bibliographic records automatically to authority records when authority records are merged or changed? **Yes** **No**

4.2.4 Does the system automatically create "skeleton" authority records from new headings entering the bibliographic database? **Yes** **No**

4.2.5 Does the system require that a heading be entered into the authority file before it can be entered into a bibliographic record? **Yes** **No**

4.2.6 Does the system allow bibliographic records to be attached to invalid headings? **Yes** **No**

4.3 *System Checks*

Dependent Field Validation—Dependent field validation is the process of cross-checking between content designators in a record, according to preestablished sets of codes (i.e., the MARC formats).
Content Designators—MARC tags, indicators, subfield codes, control field values.

4.3.1 Does your system have dependent field validation? **Yes** **No**

Hierarchical Checks—Such checks determine if the "upper" parts of a subordinately established heading are represented in the authority file.

4.3.2 Does your system perform hierarchical checks?
No **Yes:** on _____corporate headings _____subject headings
_____series headings

4.3.3 Name/uniform title pairs sometimes appear in two fields (1xx/240) and sometimes in one field (7xx). Does your system verify uniform titles in both locations? **Yes** **No**

5. *Syndetic Structure*

5.1 Are "see" and "see also" references generated from nonmatching records? **Yes** **No**

5.2 Does the system include "earlier/former name" and "later name" references for corporate or conference names? Yes No

5.3 Does your system automatically remove cross-references to unused headings ("de-blinding")? Yes No

5.4 Does your system automatically change headings that match a "see" reference to an authorized form? Yes No

5.5 Does your system perform reciprocity checks for the presence of an authority record with a 1XX heading which would match each 5XX ("see also" reference) input? Yes No

5.6 Are MARC 87X fields (or their equivalent in non-MARC formats), which are sometimes used in bibliographic records for cross-references, used to make cross-references in the authority record? Yes No

5.7 Does the system use "transparent" cross-referencing, i.e., automatically transferring a user from an unused heading to a used one? Yes No

6. *Authority Database Products*

6.1 Can the operator of a library cataloging terminal produce a printed list of library authority files? Yes No

6.2 Can the vendor provide a copy of the library's authority file as a separate product?
No Yes: _____printed list
_____magnetic tape
_____floppy diskettes
_____other:_____

6.3 If in machine-readable format, is the list in MARC format? Yes No

6.4 Can the vendor provide the authority records in machine-readable format to be loaded into the library's local system? Yes No

7. *Evaluation and Administration*

7.1 What sorts of statistics can be compiled and/or reported by the system?
_____ number of authority records added, deleted, modified
_____ number of cross-references generated
_____ number and average size of authority records
_____ number of bibliographic headings in the authority file
_____ number of bibliographic headings changed
_____ number of matches by match type (full, cross-reference match, etc.)
_____ number of nonmatches
_____ number of automatic updates to bibliographic headings
_____ other custom statistics specified by library (examples: _____
_____
_____ other:_____
_____ no statistics generated

7.2 If some authority control services are not performed by the vendor, which ones are contracted to an outside agency?
_____ all authority services performed by vendor
_____ all authority services contracted to outside agency
_____ some authority services contracted to outside agency:
_____
_____
_____

■■

Information Malpractice: Some Thoughts on the Potential Liability of Information Professionals

Martha J. Dragich

For several years librarians and other information professionals have speculated about malpractice liability. Although many of us find it hard to believe that we will be faced with lawsuits filed by dissatisfied clients, the trend toward greatly increased malpractice litigation involving other professionals[1] gives us pause, especially as the commodity in which we deal—information—has taken on enormous value in our times.[2] To date we have only speculated about, and not actually faced, malpractice suits. This article examines the hypothetical cases of library malpractice posited in the literature. It then suggests other hypothetical situations in which information providers might face ethical dilemmas or charges of negligence. Finally, it discusses a few cases arising in other contexts that shed some light on how courts would react to malpractice suits against information professionals.

The classic hypothetical library malpractice case was put forth by Alan Angoff more than ten years ago. In Angoff's hypothetical, a public library patron sued the library for $250,000 for "injuries to his home and personal injuries to himself and his family as a result of . . . inaccurate information contained in a book recommended to him" by the reference librarian.[3] The patron had wanted to build a deck on his house and went to the library to find a how-to book. Although he followed the instructions in the book, the deck collapsed, injuring him and his two sons and damaging part of the house. The book recommended by the librarian was about ten years old, and the publisher was no longer in business. The patron claimed that the library was "grossly negligent" in circulating an antiquated book.

Law librarians have also speculated about malpractice liability.[4] Even law librarians who very carefully avoid giving legal advice wonder whether they could be charged with malpractice for recommending an outdated or inadequate law book. Typical examples include the patron who needs to find out the length of the statute of limitations that would apply to his legal problem, and the patron who wants to write his own will or do her own divorce.

Angoff's hypothetical was based on the traditional library setting where a brief, often anonymous transaction takes place and where the librarian's involvement in actually solving the client's problem is quite limited. The charge against the librarian rests on faulty information contained in the book itself. In order for the librarian to be found liable in such a case, the librarian's duty to the client would have to include verification of all the information in every book before recommending any book to the patron. Although it is a librarian's duty to build a good collection of sound materials, and to know the collection well, it is clearly

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impossible to undertake independent verification of the informational content of the collection.

Therefore, we should forego further speculation about malpractice liability in cases such as those posited thus far. No actual case on similar facts has been reported to date, and they are unlikely to arise in the future. We should turn our attention instead to the rather different situations in which we as "information providers" find ourselves and explore the possibilities for malpractice liability there.

MALPRACTICE

One writer on the malpractice liability of librarians defines malpractice as "any professional misconduct or unreasonable lack of skill in the performance of professional duties through intentional carelessness or simple ignorance."[5] The legal requirements for a charge of professional negligence are that there be a duty owed by the professional to the client which was breached, causing actual damage to the client.[6] The scope of a professional's duty to her client does not extend so far as to guarantee a satisfactory result in the provision of every service.[7] Thus, each situation must be examined to see whether the professional had a duty to perform a particular action in a specified manner or, to put it another way, to determine whether the professional's actions constituted breach of her duty. The balance of this article focuses on the elements of duty and breach of duty as they might apply to information professionals, particularly in light of the challenges we face in dealing with an ever-expanding universe of print and online resources. We will assume that the element of damage is satisfied.

PROFESSIONAL-CLIENT RELATIONSHIP

First, we must consider the concept of duty by examining the relationship between the information professional and the client. The duty of a professional to the client arises out of the relationship between the two parties.[8] The client entrusts his/her needs to the professional because the professional has knowledge or expertise the client lacks. This places the client in a vulnerable position and the professional in a corresponding position of power and responsibility. Although our transactions with library patrons were often anonymous, we are moving closer to the consultative model of other professionals.[9] Librarians traditionally provided access to sources of information in which patrons could find for themselves the information they needed. While in the past the librarian may have been the "organizer and dispenser of books and documents," the role of information providers today is more often to advise the client on information needs.[10]

Today, information professionals often provide either raw data or synthesized information to clients.[11] Anne Mintz, who writes on information malpractice, states that while in our earlier role it was improper for a librarian to interpret information for a patron, information professionals now are required to evaluate requests for information, determine the best databases for searching, translate the request into the appropriate search language, evaluate the results during and after the search, and decide whether the results are appropriate.[12] It is clear that a professional-client relationship does exist in the circumstances under which many independent information professionals currently practice.[13] This relationship results from the provision of more extensive services to clients and from the imposition of fees for services.

The "information profession" includes independent information brokers who specialize in conducting online research for clients in certain technical areas, operators of legal research services providing manual and online legal research for attorneys and law firms, and many other nontraditional roles. Clients retain information professionals to conduct research for them—not merely to direct them to sources of information in which they could do research themselves. The information provider is expected to find the information the client needs, not merely to recommend an item from a preexisting collection of materials. The information provider in these instances has taken on a more active role in solving the client's problem. The client likely has sought professional help precisely because the client's own skills do not enable her to undertake the kind of sophisticated research needed.

Other information professionals work as information consultants, whom law firms or businesses might hire to recommend and set up a litigation support system or business records management system to meet certain objectives. Here again, the professional possesses knowledge and expertise the client lacks and is expected to study the client's needs and come up with an appropriate solution for them. In all of these situations, the client pays for the services rendered. While this factor alone is not determinative, it goes a long way toward suggesting that a different relationship exists here than in the traditional library setting.

The client's increased reliance on our knowledge and judgment increases our duty to assume responsibility for the accuracy of the information we provide and for the manner in which it was obtained.[14] Even though we gather and use data originating with an author, database producer, publisher, or agency, we are called upon specifically to employ our knowledge and judgment to retrieve accurate and up-to-date information relevant to the client's information needs. We are not only the finders but also the evaluators and interpreters of the information—roles formerly performed by the client. Thus, it will be much easier for courts to find a duty sufficient to sustain liability in cases filed against us by disgruntled clients.

Having established that the relationship that exists between an information professional and the client is likely to give rise to a duty to act responsibly, we must define the scope of that duty in order to determine what would constitute its breach. One component of a professional's duty to the client is the need to act in an ethical manner. The second component of the professional's duty is the need to exercise reasonable care in the performance of professional services. Many professional codes of ethics include both provisions related to ethical behavior and provisions related to care, knowledge, and skill.[15] Library-based codes have focused almost exclusively on the former.

ETHICAL ISSUES

Several library associations have formulated codes of ethics by which to judge professional conduct.[16] Some of the more common provisions of these codes relate to the need to respect the privacy of the client and the need to be impartial in providing information. These codes, however, grew out of and still reflect the traditional library setting—that of the librarian dealing primarily with books and journals. Information practice today draws professionals from a wide variety of backgrounds who work not only in libraries or for corporations but also as solo or group practitioners.[17] They deal with information in diverse formats. Not all share a common educational preparation, and there is no single professional organization to which all belong. As Shaver noted, no license is required for the "practice of information."[18] Thus, the application of library-based codes of ethics to the "new breed" of information professional can be problematic.

For information professionals in the online environment, breaches of confidentiality and the misuse of information gained in the course of professional employment are the most likely ethical dilemmas. While traditional codes of ethics considered confidentiality mainly in the context of protecting circulation records, online searching has added a whole new dimension to the problem. For billing purposes, most search-intermediaries keep detailed records of the searches performed for clients, and the bills themselves often show the client's identification and the files searched, if not the actual content of the search. In addition, the use of online SDI services makes it possible to monitor and record a client's ongoing research. Ethical precepts designed to foster intellectual freedom and to protect the freedom to read do not adequately account for the competing concerns these situations present.

The following hypothetical case illustrates some of the ways nontraditional information providers run into problems with confidentiality issues. An independent information broker recently completed a project for Client A, for which A paid a fee. The broker kept extensive records and files of the search process and results. Today prospective Client B requested that the broker take on a substantially similar project for him. Clients A and B could be competing corporations, law firms representing

opposing parties, or simply unrelated persons engaging in similar research. They happen to have consulted the same information broker.

Can the information broker accept the assignment, and if so, can the broker make any use of the information in A's files? The mere resale of information prepared for Client A to Client B would clearly be improper. As professionals, we have a duty to perform for B the services for which the client is paying. We also should recognize that even similar requests may require different search strategies to fulfill the client's particular needs, and by simply giving the previously compiled information to B we have failed to consider his needs fully.

The more difficult question is whether we can make any use of what we did for A—surely there is a profit-motivated desire to do so, and reference back to an earlier successful search may even improve our service to B. But any reference to A's request may raise questions about the breach of client confidentiality or even conflicts of interest. The Congressional Research Service of the Library of Congress has established a policy for this very situation. If two members of Congress make similar research requests, each request must be treated independently.[19] Breaches of confidentiality and conflicts of interest are matters typically governed by professional codes of ethics. We as a profession must ensure that our codes cover these issues, as they occur outside the traditional library setting.

A related problem is the misuse of information gained in the course of rendering professional services to one's client or employer. About two years ago, a former librarian at a New York law firm was charged by the SEC with violating the insider trading laws.[20] The librarian was responsible for files containing confidential information concerning the takeover plans of certain corporate clients of the law firm. According to the SEC, the librarian "routinely performed computer research on target companies and obtained documents and information for . . . attorneys working on proposed business combinations involving clients of the firm."[21] The SEC stated that the librarian's "position and assignments caused him to be entrusted with or enabled him to gain access to highly confidential information."[22] The suit alleges that the librarian leaked this confidential information to family members who used the information to make profits of over $400,000 trading in the stock of the companies concerned. This is a clear example of the increased economic value of information and the temptations that value might pose to information professionals.

These examples illustrate a few of the ethical dilemmas information professionals might face. Although code revisions might provide better guidance, ethical conduct ultimately must rest on the individual determination of the professional. This is especially true in an unlicensed profession whose codes of ethics typically have no enforcement mechanism.

REASONABLE CARE

That brings us to the second component of a professional's duty, the requirement for exercising reasonable care, skill, and diligence in the rendering of professional services. Problems related to the lack of reasonable skill are more difficult to define than ethical problems, in part because the concept of "reasonable skill" itself is hazy. The standard courts use to judge whether or not the professional breached a duty is what a member of the profession in good standing would have done under the same circumstances.[23] The members of any profession are expected "to possess a standard minimum of special knowledge and ability" not shared by the general public.[24]

Two additional hypotheticals further explicate the application of these concepts of breach of duty to information professionals. In the first, an information consultant was retained to advise a law firm on litigation support systems for a complex class action lawsuit it is handling, perhaps a case like the Agent Orange or Dalkon Shield litigation. The client's two main objectives were that information entered into the system be retrievable and that information about trial strategy and the like not be subject to discovery by the other side. As it happens, the system has not performed well in retrieving documents, and the entire database has been held discoverable.

In terms of retrieval ability, the consul-

tant should have known the relative merits of the available systems, as well as any unique features of the data the client intended to include in the database that might have affected retrieval. The consultant should also have known that systems frequently have not performed to clients' satisfaction[25] and that fulltext-only systems, at least, have been shown by some studies to retrieve as little as 20 percent of the relevant documents in the database.[26]

As regards the discovery issue, the consultant should have been aware of rulings on the discoverability of information contained in various types of litigation support systems.[27] If the consultant recommended a fulltext-only system, for example, the consultant should have advised the client that the work-product exception to the discovery rules likely would not protect information in the database.

It's difficult to tell, of course, from these limited facts, whether the consultant failed to exercise reasonable knowledge and judgment in the selection of a system or merely failed to advise the client adequately about the expected performance of such systems in general. Either way, it is possible that the consultant could be found negligent if expert testimony by other information professionals convinces the court that his/her performance was not "reasonable."

In the second hypothetical, the information professional runs a legal research service for law firms. The researcher assigned to a particular project failed to locate a recently decided case that bears directly on the issue to be researched. Certainly this is a serious failure, but we cannot determine whether it was the result of negligence without knowing what steps the researcher took and where the information could have been found.

Let's consider a few possibilities. The case might have been available either online or in print, and the researcher simply missed it. Although this is the easiest case, it may still be difficult to prove that the researcher failed to exercise reasonable care in the search. Or, the case might have been available online but not yet in print. The researcher had access to the online systems but did not consult them. Was the researcher required to do so? Conversely, the researcher might have used only the online services, not realizing that some concepts are more easily or reliably located through controlled and coordinated indexes than by means of fulltext searching.[28] Or, the recent case might have been available on either Lexis or Westlaw but not both.[29] The researcher has access to both systems, but since they generally contain the same information, the researcher only searched one, in this case the one that didn't include the relevant case. Should the professional have searched both? Or, the case might have been available on both systems, but on one system the case contained a typographical error that prevented retrieval.[30] As it happens, this is the only system the researcher tried. Was the researcher negligent in failing to consult both systems?

The information profession has not articulated standards by which to judge this researcher's performance. We must define acceptable practice for information providers, not only in terms of ethical standards, but also by establishing procedural guidelines to ensure the quality of our services. That won't be easy, especially in the online environment. New databases appear almost daily, contents change, search logic and communications methods are improved. Clearly, we must stay on top of these changes by reading the literature, obtaining continuing education, and the like. But in the midst of such changes, who can say what a reasonable search might have been on a given day?

COURT CASES

The traditional library malpractice hypotheticals failed because no professional-client relationship sufficient to give rise to a legal duty existed. But the problem they posed was, ultimately, whether the librarian could be held responsible for the information contained in the sources the professional recommended. Similar problems may face information professionals in many situations where there is a duty. We are all aware, for example, of inaccurate or "dirty" data online.[31] In fact, the problem of assuring the accuracy or validity of information provided to clients may be more acute in the online arena because our knowledge of and ability to access online

information so far outstrips that of most clients. Our duty to the client requires that we exercise our professional knowledge and judgment. The question is whether we can be held responsible for retrieving information that is itself inaccurate.

There are no reported cases addressing this issue. Three cases arising in very different circumstances may nevertheless offer some guidance to information professionals. In *EWAP v. Osmond*, a defamation case, a video store was held not liable for disseminating libelous information contained in a video tape by showing that there was no reason for it to believe that the information was libelous.[32]

The court stated that "one who merely plays a secondary role in disseminating information published by another, as in the case of libraries, news vendors, or carriers," could not be held liable for defamation unless it knew or had reason to believe the information was libelous.[33] The court further stated that when the books of a "reputable author or publishing house" are offered for sale or free circulation, the vendor or lender is not required to examine them to determine whether they contain any defamatory information. But if a particular author or publisher "has frequently published notoriously sensational or scandalous books," a shop or library that offers them to the public may run the risk of liability to anyone defamed by them.

Although the law of defamation has many special rules, this holding suggests that information providers might not be found liable for malpractice in cases where the faulty information originated elsewhere. We cannot be held responsible for knowing and verifying the contents of all the sources we use, whether in print or online. We should heed carefully, however, the caution regarding the reputation of the authors or publishers of the information we provide. Information professionals are in a position in most cases to make some judgment about the general quality and reputation of the sources of information, and in our role as consultants on the information needs of our clients we should apprise them of the source and reputed quality of the information we provide.

In *Brocklesby v. Jeppesen*,[34] a $12,000,000 verdict was upheld against Jeppesen, a company that publishes aeronautical charts based entirely on data provided by the Federal Aviation Administration. The FAA data are originally published in tabular form; Jeppesen converts it into graphic form. In *Brocklesby*, a pilot used one of Jeppesen's charts to make a landing and crashed into a mountain, killing the entire crew and destroying the plane. The chart was followed correctly but provided erroneous instructions. It was stipulated that the inaccuracies were contained in the original FAA data, not created by Jeppesen.

Jeppesen is an information provider. It gathers data, repackages it, and sells it. If it merely passed on erroneous data provided by the government, how could it now be required to pay $12,000,000 to the survivors of the crew members? The court treated Jeppesen's chart as a product, thus allowing the case to be considered under the strict liability provisions of products liability law. This determination turned mainly on the fact that Jeppesen's charts are mass-produced, not developed at the request of an individual client.[35] The court emphasized that Jeppesen had a duty to test its product and to warn users of its dangers.[36]

The *Osmond* and *Brocklesby* rulings pose an apparent conflict on our duty to test or verify the information contained in sources we use. The distinction turns, I think, on our role vis-à-vis the originator of the data. The video store in *Osmond* was merely a disseminator of information produced by someone else. Jeppesen, on the other hand, used information published by the FAA to produce a conceptually different package of information. Most of our practice falls somewhere between these two extremes. Taken together, these cases suggest that our potential for liability increases significantly as we become more active in providing raw data and especially in synthesizing the data into information useable by the client, rather than merely leading the client to sources of information.

In both *Osmond* and *Brocklesby*, the information was produced for the mass market. A third case, however, comes closer to approximating the situation of information professionals who provide information to

specific clients. In *Dun & Bradstreet, Inc. v. Greenmoss Builders,*[37] the credit reporting agency erroneously reported to subscribers that Greenmoss had filed for bankruptcy. Dun & Bradstreet's employee had mistakenly attributed to Greenmoss a bankruptcy petition filed by one of its former employees. The jury awarded $50,000 in compensatory damages and $300,000 in punitive damages. Dun & Bradstreet moved for a new trial on the ground that punitive damages cannot be awarded absent proof of actual malice. The request for the new trial was granted but later reversed by the Vermont Supreme Court.

The United States Supreme Court agreed that a new trial was not required. The Court held that "permitting recovery of . . . punitive damages in defamation cases absent a showing of 'actual malice' does not violate the First Amendment when the defamatory statements do not involve matters of public concern."[38] The Court's focus on the law of defamation, along with the convoluted procedural history of the case, obscures the critical importance of this case to information professionals. Of the cases discussed in this paper, the facts of this case are most closely analogous to the practice of information professionals. Dun & Bradstreet's business is to research various records to find information on the financial status of companies. It is also a database producer that could face liability for erroneous information contained in its database and used by others. It should be of great interest and concern to us that a jury saw fit to award $300,000 in *punitive* damages for the provision of erroneous information, and the Supreme Court held that knowledge of or reckless disregard for the falsity of the information need not be proved to sustain the award.

CONCLUSION

The most fascinating and vexing aspect of the online environment is that the information universe with which we deal is invisible to us. This would make the independent verification of data exceedingly difficult. We cannot examine the source as a whole; we can only retrieve bits of it. The invisibility of the source also impedes judgments about the quality of our service. While it is relatively easy for doctors or lawyers to determine the state of medical or legal knowledge at a particular point in time so as to judge the performance of a peer in a particular case, information providers often cannot know what was in a database at a given time. The information in many databases is not "date-stamped," and even more importantly, changes in the data can be made without a trace.

Still, we as a profession can and should work towards a collective judgment about our standards of practice. Some of the questions we might consider are: What kinds of education and training do our present and future circumstances demand? What are the qualitative differences between print and online versions of the "same" source, and when should we use one format over the other? What role does cost play in that determination? How far should we go in analyzing, synthesizing, and repackaging, rather than merely gathering, information for clients?

To sum up, our concerns about malpractice may be speculative, but we do not engage in idle speculation. The incredible economic value of the information industry, the increase in malpractice suits against other professionals, and the suits against disseminators and producers of information in other contexts are ample evidence of the potential for liability on our part.

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Global Change Capabilities to Improve Authority Control in an Online Catalog

Judith A. Fox and Kay Kanafani

Authority control is a vital component of an online catalog. A global change capability that allows correction of a single heading in a large file of bibliographic records through programmatic identification and replacement is a powerful catalog management tool. Washington University in St. Louis developed such a capability as a local extension to the NOTIS software. This article describes the local development and implementation of these programs, which update headings in the bibliographic database based on an online command issued from an authority record.

Authority control issues have received increasing attention in the last several years. Janet Swan Hill stated that "the coincidence of AACR2 implementation and development of online catalogs revived interest in authority control, and if the subject is not much better understood by noncatalogers than it used to be, at least it is generally recognized as one that has significant relevance for bibliographic retrieval."[1] Although arguments have been advanced for the need for both more and less authority control in the age of online catalogs, authority control is still vital to provide the collocation function of a catalog. Consistent use of headings allows much greater precision than can be achieved by keyword access to a catalog with uncontrolled headings. Hill[2] and Baer and Johnson[3] have written excellent reviews of the literature on this topic.

Interest in authority control at the John M. Olin Library, Washington University in St. Louis, has also increased in the last several years with the implementation of both AACR2 and a local online catalog. However, it is not a new issue; large amounts of time have been invested in authority work by cataloging staff for forty years. Manual authority control consisted of:

1. Maintenance of a name authority card file for names requiring references;
2. Maintenance of a series authority card file for all series;
3. Annotation of the printed Library of Congress Subject Headings (LCSH); and
4. Filing of "see" and "see also" references for names, series, and subjects in the union catalog and seven departmental and school library catalogs.

In 1985 manual authority control procedures were replaced by creation of authority records in the online authority file for all new names, series, and subjects. Creation of online subject authority records ceased in 1987, when the feasibility of loading the machine-readable LCSH headings into the online authority file increased.

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Helen Schmierer described authority control as being divided into the basic activities of "1. collecting, recording and maintaining authority data; 2. verifying; and 3. using established, authorized forms as access points in the library catalog."[4] The authority control policies followed by Washington University allowed us to perform these basic activities with high-quality results until the late 1970s. However, these policies were becoming increasingly labor-intensive and thus an increasingly expensive process.

The implementation of AACR2 and the ever-larger number of changes to subject headings in LCSH were among the reasons we began to investigate online catalogs in the late 1970s. The cost of maintaining a card catalog was skyrocketing. We decided very early in the process that we wanted an integrated system rather than to try connecting several different systems for various functions. We were suffering from a proliferation of files for different tasks, and we knew the difficulties in trying to maintain current information for one title in multiple files. Our goal was creation of a database with unit records that could be used for the online catalog, circulation, acquisitions, and serials control functions. We also wanted the flexibility to use the database to meet future needs.

In 1981 we selected the NOTIS system developed and marketed by the Northwestern University Library. One of our primary reasons for selecting NOTIS was the fact that we could obtain the source code, which allows us to make local modifications as necessary. We did not want to "reinvent the wheel," but neither did we want to be locked into a system that could not be modified as our needs changed. From the beginning of the implementation process, we had planned to have a dedicated computer and a systems staff in the library to manage the system. This decision has enabled us to supplement and modify the NOTIS software to meet our local needs in a manner that might otherwise not have been possible.

In their 1985 article on authority systems provided by networks and vendors, Taylor, Maxwell, and Frost[5] listed several features of automated authority control systems not available in manual systems. These included machine validation of new terms, authority-to-authority links to generate references and deblind them automatically, and global changes to convert all occurrences of a superseded form of a name to a new authorized form. They divided the major vendor and network systems then available into two groups. The first group was defined as a system that processes a library's machine-readable files on tape against an automated authority file, correcting invalid headings and, if desired, creating a machine-readable authority file for the local library. Blackwell North America's tape processing service was given as an example of this type of system. Many libraries have chosen this approach to clean up their databases. Washington University did not use this approach because of a lack of time and resources.

The second type of authority system described offers online access to bibliographic and authority records. This group was further subdivided into linked or integrated systems and unlinked systems. In a linked system, a change to a heading in the authority file is automatically reflected in the bibliographic file. In unlinked systems, the only linkage between the files is intellectual.

The NOTIS software presently installed at Washington University falls into the category of online access with separate unlinked bibliographic and authority files. This architecture determines the types of authority control activities that must be undertaken. One advantage to this design is the ability to have headings represented in the bibliographic records as access points in the catalog without having to create authority records for them. Although we have recently tape-loaded the LCSH machine-readable base file into our online authority file, we have created online name authority records only for names requiring references. Online series authority records have been created for all series as they are encountered in current cataloging. These series records are used to record tracing decisions even if cross-references are unnecessary. Being selective in the types of online authority records we create has saved us time in the authority file creation

process. Unlike NOTIS, some linked authority systems, such as WLN (Western Library Network), require all headings to be represented in the authority file. This is necessary because the headings are stored only in the authority record, with pointers or links in the bibliographic records to the appropriate authority record.[6] A linked system of this type therefore requires a much larger authority file than an unlinked system such as NOTIS.

DATABASE LOAD ISSUES

Washington University's first priority for the online system was to get the online catalog up and running. The system software was installed in the summer of 1982, and the OPAC was unveiled in June 1983. The initial database consisted of titles cataloged on OCLC from 1980 to June 1983. Records for titles cataloged on OCLC in 1978 and 1979 were added in 1984. Currently, cataloging records are added weekly from OCLC archival tapes. Card production for the union catalog ceased as of January 1985 and for most departmental and school libraries in July 1988.

For various reasons, including a requirement to have the online catalog operational quickly, Washington University needed to perform all of the database load tasks locally. An OCLC load program was supplied by Northwestern to convert records from the OCLC to the NOTIS format. This program was supplemented by a complex series of locally developed programs to convert holdings information at a more detailed level and identify numerous potential error conditions. These locally written programs, which supplement the basic NOTIS load program, have evolved over time, becoming more and more sophisticated. For instance, modifications have been made locally to handle filing indicator problems, addition of brackets around GMDs, and replacement of provisional cataloging records with permanent bibliographic records. All editing of records identified as potential problems has been performed by existing cataloging staff.

Because we have not had the resources to undertake a retrospective conversion project, the library database contains only 200,000 bibliographic records. Since they include all cataloging performed since 1977, these records have a mixture of AACR2 and pre-AACR2 headings as well as a mixture of old and new subject headings. As a result, we had several large files under individual headings that needed to be converted to AACR2 or current LCSH headings. We therefore began to investigate the methods available locally to convert these files.

The NOTIS architecture is not structured to enable an update to an authority record to be reflected automatically in all affected bibliographic records, as would occur in a linked authority system. Modifying large numbers of bibliographic records as individual headings change can be a very cumbersome process even in an online environment. We analyzed the categories of headings in bibliographic records requiring catalog maintenance. They were identified as follows:

1. Personal name main and added entries
2. Personal names used as subjects
3. Corporate name main and added entries
4. Corporate names used as subjects
5. Geographic names used as subjects
6. Series added entries
7. Topical subjects

NOTIS GLOBAL CHANGE SOFTWARE

The NOTIS software we acquired includes a global change component designed to change programmatically a term in multiple bibliographic records wherever it occurs. Staff in Cataloging and Library Systems began studying these programs to determine how best to use them to handle the seven categories of heading changes identified above.

The NOTIS software has three sets of global change batch programs representing three different techniques.[7] The first technique is the most attractive for cataloging staff, because it is based on the existence of an authority record in the database and the issuance of an online command. However, this technique can be used for only three of the seven categories of headings listed above (personal name main and added entries, corporate name main and added entries, and series added entries). It also re-

quires multiple authority records to change various subordinate units of a corporate body. The second and third NOTIS techniques were designed to accommodate changes not possible in the first technique. These two techniques are based on coding into the program parameters that specify the terms to be replaced and the fields or subfields to be searched. They require reading the entire bibliographic file rather than just the index, as in the first technique.

We chose to use the first NOTIS technique as a model and to expand its capabilities to meet our local needs better. Many of the procedures for coding and annotating the authority records are based on procedures developed for the first technique at Northwestern University. The capability for making online requests (such as the global change command) for batch products and processes is a generalized feature of the NOTIS online software. These requests are accumulated in a special journal file and are serviced on demand or at predetermined intervals. Because of the particular function and characteristics of this file, another NOTIS program is used to read it when needed. The specific NOTIS feature used as a model from the first technique batch programs was the use of an online index to identify bibliographic records as potential targets for change. Although NOTIS provides a program to do this, Washington University decided to begin at this early stage of processing to develop local programs. Once the request types have been selected, all subsequent processing, except for index generation, is achieved through the use of programs developed at Washington University. This allowed greater control (e.g., error detection to reflect local procedures) and flexibility and also made it possible to use the same basic methodology for all seven categories of changes. It was important to maintain as much consistency as possible to facilitate program/process maintenance and to minimize any negative impact of system reconfiguration. While we recognized specific changes as "one-shot" events, we knew that the need to make headings changes in the bibliographic file would be an ongoing one.

WASHINGTON UNIVERSITY GLOBAL CHANGE SOFTWARE DEVELOPMENT

The Washington University global change programs were written in the PL/I programming language. Because of its string handling capabilities, PL/I is particularly suitable as a tool for manipulating textual data. Writing and testing the programs proceeded in stages. The first program converted name headings represented in the author/title index. This was followed by name headings in the subject index. Changes to names were tackled first because the volume of these changes was much lower and our manual authority control for names was at a higher level than that for subjects. Later programs were developed to handle topical subjects and geographic headings. The geographic programs were also used to convert headings from "direct" to "indirect" subdivision. Programs to use one authority record to change free-floating and pattern subdivisions used under multiple headings are under development. To date, geographic subdivisions are the only type of subdivision under multiple subject headings that we have changed. The scope of the programs includes processing multiple authority records against one bibliographic record, using one authority record for main as well as subheading changes, replacing tags, changing indicators, and retaining required punctuation at the end of fields and subfields.

IDENTIFICATION OF PROBLEM HEADINGS

Headings to be changed are identified by Cataloging staff through a variety of methods. When Washington University implemented AACR2 in 1981, we knew we would eventually have an online catalog. Procedures for keeping the information on our OCLC archival tapes current had been implemented in 1978 and revised extensively in 1980. These procedures specified updating all information on the OCLC record whenever any correction was made locally. We knew, however, that we could

not handle the large volume of AACR2-generated name changes through updating of individual records on OCLC. An "Online Catalog Form" was developed to record both the old and new headings for AACR2 changes. This form was initially used as a source document for preparation of references in the card catalogs. The forms were saved and later used to identify potential headings requiring updating in the online database. After all the archival tapes were loaded into the database, the headings on these forms were searched in the online catalog to identify records to be changed. Manual editing was done if less than ten bibliographic records were involved. The heading was marked for a global change if ten or more bibliographic records needed correction. Other headings requiring global changes have been identified in several ways. The major detection methods are:

1. Changes encountered in the routine authority activities for cataloging of new materials;
2. Examination of the new name headings and new subject headings lists prepared as part of the weekly load of OCLC records into the online bibliographic file;
3. Examination of the reports of deleted and changed LCSH records prepared as part of the monthly load of LCSH records into the online authority file; and
4. Checking the list of subject heading changes in the *Cataloging Service Bulletin* produced by the Library of Congress.

CREATION OF THE LOCAL AUTHORITY FILE

Washington University had no online authority records in 1984 when we began to develop global change capabilities locally. Therefore, one of the first steps was the creation of authority records for headings to be changed. The headings were searched in the LC name authority file available on OCLC, and a paper printout was produced. A cataloger examined the record to determine if additional references were needed or if some of the LC references (such as variations of the name in other languages) could be omitted. An authority record was then created in the online authority file through manual input by staff in the Catalog Management Unit.

The established heading is entered in the 1xx field of the authority record. The invalid heading to be changed is listed in a 4xx field with byte 2 of the subfield $w (control subfield) set to "a," indicating that the heading in the tracing field is a form of heading established under earlier (i.e., pre-AACR2) descriptive cataloging rules. For example,

```
100 10  $a Twain, Mark, $d 1835–1910
400 10  $w nna :a Clemens, Samuel Langhorne,
        $d 1835–1910
```

If multiple invalid headings need to be changed to one authorized heading, such as for variations in punctuation or dates, multiple 4xx fields with subfield $w are included in the record.

```
151  0 $a Chicago (Ill.)
451  0 $w nnaa $a Chicago
451  0 $w nnaa $a Chicago, Ill.
```

The inclusion of these additional 4xx fields is a departure from the MARC format, which we use only for the purposes of the global change. The inappropriate subfield $w's are deleted from the authority records at the end of the global change process. We initially used "a" in byte 2 of subfield :w on topical subject records to indicate an earlier heading, even though this did not agree with the MARC definition. We are now using the code "e" (earlier established form of heading from a national authority file) for subjects, although the programs actually treat both codes as equivalent. For a description of the values of the four bytes in the subfield $w, consult the *USMARC Format for Authority Data*.[8]

DESCRIPTION OF PROCESSING

A catalog librarian initiates the global change process by verifying that all necessary 4xx fields are present in the authority record and adding a local note to the record indicating the date of the global change processing. The librarian then issues the NOTIS online GLOB command with the authority record displayed on the terminal screen. Close coordination between Cata-

loging and Library Systems is essential. Online indexes must be current and regenerated quickly after the bibliographic records have been changed to make the corrections publicly available and to facilitate the verification process. The actual running of the global change programs must be coordinated with other batch jobs that also update and index the database. Global changes for similar types of headings are grouped so that each run of the programs can handle several changes, although some very large changes, such as "St. Louis" to "Saint Louis (Mo.)," were done separately.

The processing of all categories of global changes follows the same general pattern (see figure 1). First, an online request for a global change results in a transaction being written to a special "batch request" file. These records contain the type of request and the keys of the authority records being processed. The online authority file is read using the request records, and transactions are generated from appropriately coded 4xx fields. These transaction records will then be used to find bibliographic records that are potential candidates for change. The structure of these transactions depends on which index will be searched, since the transactions must match exactly the headings as they are stored. There are variations in length and in the special characters used to delimit subfield data. For example, the data in subfield :t (title data) is preceded by a slash sign in the subject index and by a plus sign in the author/title index. Since the index records have been edited for display and do not contain subfield coding, prescribed punctuation, etc., it is probable that there will be a number of "false hits." These will be identified by the program that performs the replacement in the fields of the bibliographic record.

The next step involves searching the transaction records against the appropriate online index for matches. Since the local techniques for implementing global changes have developed over a number of years, there have been significant improvements made, particularly in the method for finding matches for the 4xx headings in bibliographic records. In the past, except for name heading changes, the file used for identifying potential matches was the intermediate work file created as the first step in index generation. Programs were eventually developed to read any online NOTIS index. Furthermore, some of the index generation programs have been modified to include or exclude fields or subfields as needed. Currently, the author/title/keyword index is used for name heading changes and the subject index for all subject heading changes, both name and topical. Within the coming year, we plan to use the author/title/keyword index for making free-floating and geographic subdivision changes also. The keyword is a locally developed KWAC (keyword and context) index. The entries are derived by "rotating" the fields: the text before and after the keyword is the left and right context. Since subject fields are indexed in the KWAC index, subdivisions are searchable as primary search terms provided they are not on the stop list. The current index generation program would exclude many of the subdivision entries because inclusion on the stop list is based on the number of occurrences of a word in the database. Future plans are to preserve index entries on the stop list in a separate index file that can then be used for global changes. We would use this separate index to make changes such as

"Study and teaching—Foreign students"
to
"Study and teaching—Foreign speakers"

under various languages. Using the online indexes for matching purposes has simplified processing. We can avoid reading the entire bibliographic file, so that the run time is determined by the number of changes to be made and by the number of affected records, not by the overall size of the bibliographic file. If a match is found in the index, a transaction record is written with the key of the authority record to be processed and the key of the bibliographic record found in the index entry. A copy of the bibliographic record is then written to a work file. A revision date and time reflecting the date and time the copy was made is stored in this work file record.

The replacement programs reread the 4xx fields of the authority record and replace the heading or headings in the bibliographic record. Since processing is based on

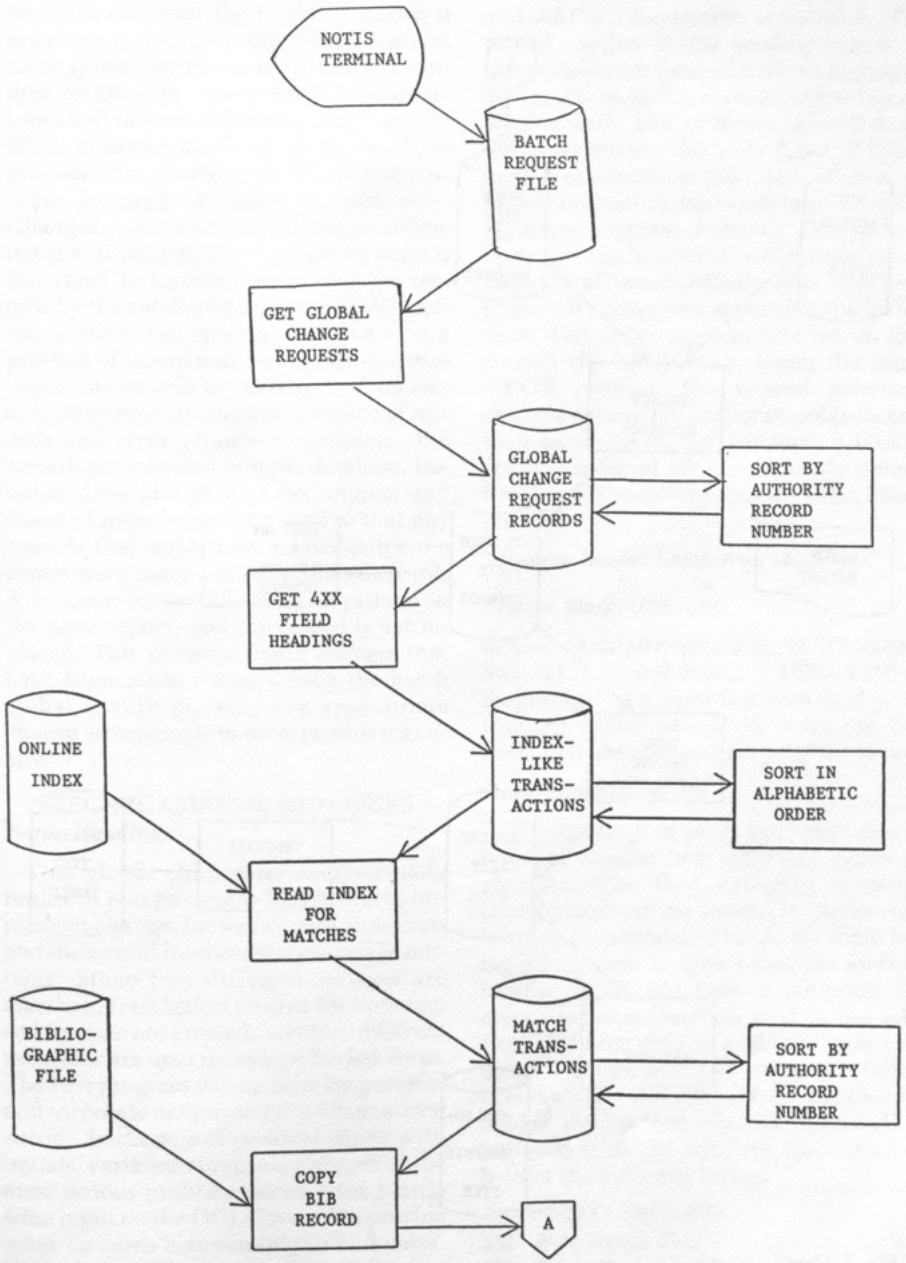

Fig. 1. Processing of All Categories of Global Changes.

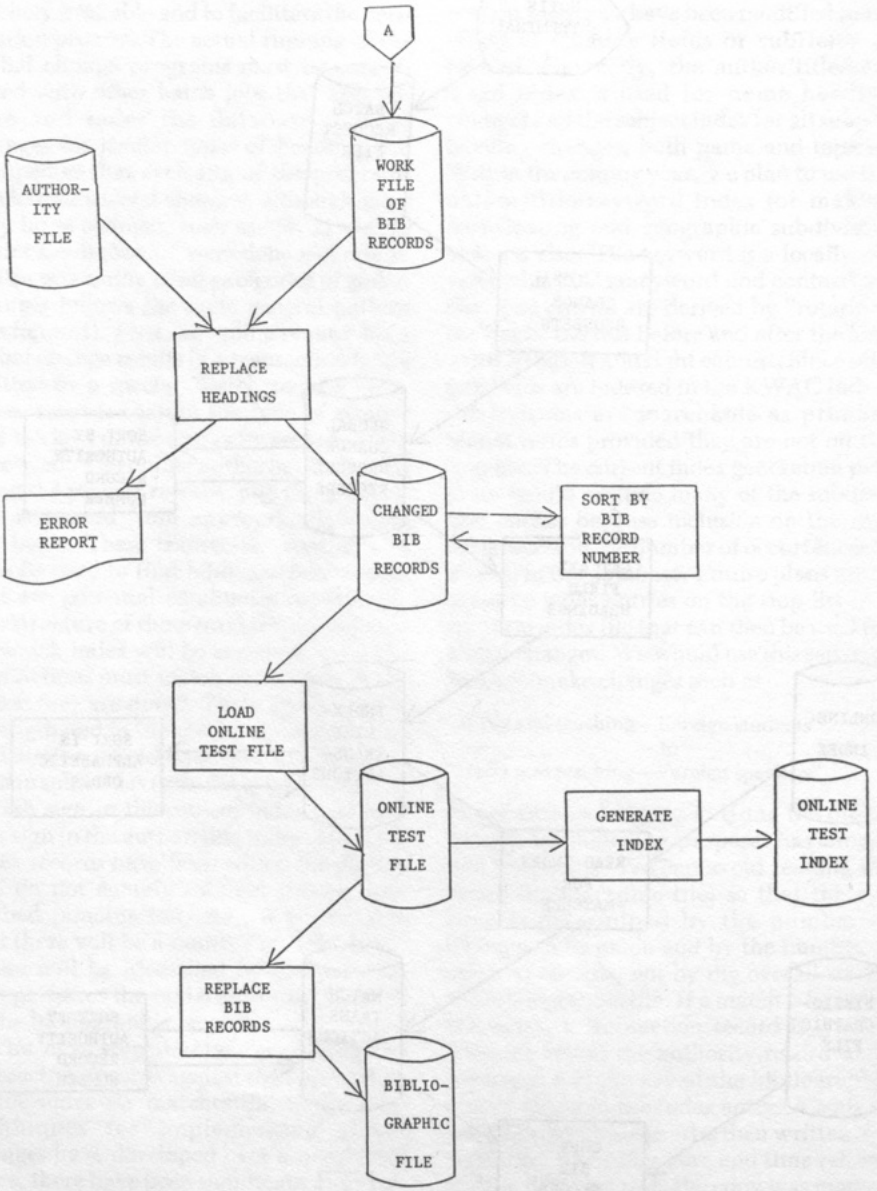
A
AUTHOR-
ITY
FILE
WORK
FILE
OF
BIB
RECORDS
REPLACE
HEADINGS
ERROR
REPORT
CHANGED
BIB
RECORDS
SORT BY
BIB
RECORD
NUMBER
LOAD
ONLINE
TEST FILE
ONLINE
TEST
FILE
GENERATE
INDEX
ONLINE
TEST
INDEX
REPLACE
BIB
RECORDS
BIBLIO-
GRAPHIC
FILE

Fig. 1. Cont.

the authority record, multiple authority records can be processed against one bibliographic record. Each time a bibliographic record is changed, the modified record is rewritten to the work file. The file access method used for this work file allows random retrieval by record key. Multiple retrievals of the record have no effect on previous changes made to it. A report is produced for mismatch errors, such as mistakes in tagging fields or subfields. Changed records are loaded into an online test file. If needed, the appropriate index is generated to facilitate reviewing the records by the catalog librarian. If an index is not needed, the catalog librarian uses a printout of record numbers of changed bibliographic records to check individual records randomly. After manual review of records and error reports is complete, the records are reloaded into the database. Revision dates and time of the original and changed records are compared so that any records that have been revised after the copies were made are not replaced. If this does occur, the record number is printed on the error report, and the record is not replaced. This prevents losing changes that have been made online during the batch global change process. The appropriate change is then made to those records manually.

SPECIFIC CHANGE PROCESSES

Name Headings

One global change request normally results in two processes. The first is to implement changes for names used as authors and the second for these names used as subjects. Since two different indexes are searched, transaction records for both record formats are created, and two different programs are used to replace the headings. The first program can be used for personal and corporate names used as main or added entries. In the case of personal names with initials, variations in spacing presented the most serious problem, since extra blanks were input on the OCLC record to provide space on cards between initials and dates. With the current programs, variations in punctuation and spacing do not prevent replacement, provided they remain within a fairly strict definition of allowable variation. For instance, multiple blanks are treated as equivalent to single blanks, and series punctuation for both pre-AACR2 and AACR2 description is allowed. The record number of any heading outside of this definition is printed with an appropriate error message for manual review by cataloging staff. This program, as well as all the programs for the other types of headings, accommodates diacritics. This is an important feature due to our large holdings of foreign language materials. One authority record can be used to modify a corporate body and all its subordinate units. This program will also replace name/title entries for series with series uniform title entries and correct the MARC tag. Using the same GLOB request, the second program changes personal or corporate subjects and their subdivisions. For instance, a GLOB command issued on the authority record for "Mark Twain" changes the main heading

"Clemens, Samuel Langhorne, 1835–1910"
to
"Twain, Mark, 1835–1910"

as well as subdivisions such as "Clemens, Samuel Langhorne, 1835–1910—Biography." If a name has been used in either the author or subject index but not both, only the appropriate program is run.

Geographic Headings

The geographic programs were developed to handle two different types of changes. The first category involves changes to countries, states, etc., where the heading immediately follows the topic being subdivided. In these cases, the form of heading in the 151 field of the authority record matches the form used in the subfield :z of a 6xx field on a bibliographic record. If the heading to be changed is found in either a subfield :a of a 651 field or a subfield :z of a 6xx field, the invalid subfield is replaced with the heading from the 1xx field of the authority record.

AUTHORITY RECORD
151 0 $a Middle East
451 0 $w nne $a Near East
HEADINGS ON BIBLIOGRAPHIC RECORD BEFORE CHANGES
651 0 $a Near East $x Economic conditions.

650 0 $a Income $z Near East.

HEADINGS ON BIBLIOGRAPHIC RECORD AFTER CHANGES

651 0 $a Middle East $x Economic conditions.
650 0 $a Income $z Middle East.

The second category of geographic headings to be changed involves cities and other areas that must be preceded by a larger political entity in geographic subdivision. These headings present two special problems. First, the form in the 151 field of the authority record can usually be substituted only for the subfield $a in a 651 field of a bibliographic record. As a geographic subdivision, the heading must be entered indirectly under its larger political entity, instead of having the larger entity as a qualifier ("Income—Missouri—Saint Louis" not "Income—Saint Louis (Mo.)"). Second, because both "direct" and "indirect" subdivision practices were followed in the past, bibliographic records for some subjects have geographic subdivisions for cities, etc., in one subfield $z, while others use two subfield $z's, as in the example below. We resolved these subdivision problems by adding the correct "indirect" subdivision form in a specially coded local notes (690) field. The presence of a subfield $i in the 690 field determines whether the special "indirect" processing is necessary. Part of the replacement process for these special cases involves determining whether the target field has one or two subfields $z's. If only one subfield $z is present (indicating "direct" subdivision practice had been followed), it is replaced with the data from the coded local notes field. If two are present (indicating "indirect" subdivison), these two subfields are replaced by the data from the 690 field. If this check for two subfield $z's were omitted, we would incorrectly replace "Universities and colleges $z Missouri $z St. Louis" with "Universities and colleges $z Missouri $z Missouri $z Saint Louis" in the example below.

AUTHORITY RECORD

151 0 $a Saint Louis (Mo.)
451 0 $w nna $a St. Louis
690 0 $i city $z Missouri $z Saint Louis

HEADINGS ON BIBLIOGRAPHIC RECORD BEFORE CHANGES

651 0 $a St. Louis $x Schools.
650 0 $a Education, Higher $z St. Louis.
650 0 $a Universities and colleges $z Missouri $z St. Louis.

HEADINGS ON BIBLIOGRAPHIC RECORD AFTER CHANGES

651 0 $a Saint Louis (Mo.) $x Schools.
650 0 $a Education, Higher $z Missouri $z Saint Louis.
650 0 $a Universities and colleges $z Missouri $z Saint Louis.

Since subdivisions are not directly searchable in the online subject index, a special file was created containing geographic headings found in subfield $a of 651 fields as well as all subject headings with one or two subfield $z's. A printout of this file was used by the catalog librarian to identify invalid headings. The file was then used as a source file by the programs to find matches in bibliographic records. The use of this file will be discontinued when programs are developed to use the keyword index in its place. This process would not be feasible as more than a one-time cleanup project because of the extensive manual review involved.

Topical Subject Headings

To date, the topical subject programs have been the least used, but this will soon change now that we have loaded the machine-readable LCSH to help in the process. A recent comparison of 4xx (see form) fields on authority records to the subject index identified 150 headings that require the global change process. As with name headings, a global change issued on an authority record for a topical subject can be used for the main topic as well as all its subdivisions.

CONCLUSION

Malinconico stated that "authority control of a cataloging data base is essential if that base is to support an effective machine readable catalog. Automated authority control can provide assistance with the difficult, intellectually demanding half of cataloging, i.e., integrating new items into a collection. If properly implemented, such a system can permit a degree of flexibility in reorganizing a catalog that is virtually impossible in a manual environment."[9] The global change programs developed at

Washington University give us this flexibility not only for integrating new items but also for merging records produced under different standards and for modifying headings as terminology and cataloging rules change. Even though our database load was very clean, maintenance of large files of changes was still necessary. Continued maintenance will occur as part of the dynamic nature of the bibliographic data.

Constant communication between Library Systems and Cataloging resulted in identification of areas where system enhancements were desired. The commitment of the library to purchase a system we could modify and to employ professional staff with the capabilities to develop these improvements locally has allowed us to pursue innovative approaches to online catalog management. These approaches, however, are products of the library and computing environments at Washington University. The programs were written based on local cataloging practices and procedures. Although the programs could probably not be used by another institution without modifications, the techniques and processes could be used as models for developing other methods for implementing authority control.

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Planning for Retrospective Conversion: A Simulation of the OCLC TAPECON Service

Heidi Hanson and Gregory Pronevitz

The following presents results of a simulation of OCLC's TAPECON retrospective conversion service and its impact on an OPAC in a large university research library. Two random samples were selected of candidate records for conversion. The simulation included analysis of: results of LCCN, author/title, and title searches, and hit rates based on an analysis of OCLC and locally generated reports. Detailed analysis of the use of the LCCN search key and its probable impact on a local OPAC is presented. The hit rate for the LCCN search key was 63.22%. Of these records, 95% were fully accurate matches, and 4.83% of nominal matches were for variant editions or printings of the same title.

The Ohio State University Libraries' (OSUL) online public access catalog, the Library Control System (LCS), contains a total of about 2.6 million records. The database provides a short location record display (call number/author/title) for all cataloged titles. Of these titles, about 1.2 million have *only* a brief record, most of which were created in the conversion of the OSUL shelf list in 1969–70 preparatory to the introduction of LCS, as a circulation system in 1970.[1] The categories of materials which have only a brief record in LCS include items on order or in processing, ERIC documents (via tape load of *RIE*), locally keyed entries for some microform sets, and 725,680 short records for materials cataloged by OSUL prior to 1972. In the mid-1980s, the possibility of receiving special funding to convert these 725,680 records (and some others which are only in card form) to full catalog status led to consideration of the options for how best (that is, most cost effectively) to carry out large-scale retrospective conversion.

OSUL is a large library system with holdings exceeding 4.25 million volumes. On the Columbus campus are 21 department libraries, one undergraduate library, and a main library, serving about 53,000 students, 7,000 staff members, and 3,800 faculty members. OSUL maintained full card catalogs in all library locations until 1982, when additions were stopped in favor of maintaining LCS as an online catalog, with the intent of converting pre-1972 (that is, pre-OCLC) records to full form in order to serve the users of the libraries.

OSUL has several ongoing retrospective conversion projects as well as two important projects in its past. At present, retrospective conversion is used to add full bibliographic records to LCS and add OSUL's holding symbol to OCLC in the following cases:

- When adding a newly acquired title

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that is found to be a second or subsequent copy of a title that is represented in LCS by a brief record;

- When adding a volume to a multi-part item that is represented in LCS by a brief record;
- When adding a record to LCS for a title which is in OSUL's paper shelf list file but was inadvertently missed in the 1969–70 conversion and thus was never added to the machine-readable LCS file. This is part of an ongoing inventory of the shelf list to identify such records to be added to LCS (and to OCLC);
- OSUL is currently conducting a test to determine how best to convert brief (author-title) records represented in a "tracing file" of analytic titles received prior to 1982–83. (Full records have been added to LCS when OCLC copy is found; minimal level records are added to OCLC (thence to LCS) when no copy is found.)

Retrospective conversion on a large scale at OSUL has already included two major projects. The above-mentioned original, partial, pre-OCLC conversion of author/title/date/LCCN/holdings data to LCS (for circulation purposes) occurred in 1969–70. This project involved sending out OSUL's shelf list to a vendor whose staff keyed these data elements and returned the shelf list cards and a machine-readable file.[2] This file on LCS became the basis for TAPECON, because it is easy to transfer these data elements to magnetic tape in the form of OCLC-acceptable search keys (with local data). Many of the problems resulting from this original conversion project have been reflected in the results of the TAPECON simulation reported in this article.

OSUL's second retrospective conversion project was funded by a Title II-C (Higher Education Act) grant to strengthen and improve access to OSUL's agriculture, education, and engineering collections. To meet the objective of improving access, the original grant proposal (1982–83) included an estimate of converting some 60,000 records at a cost of about $1.33 per record. The project final report notes that the actual number of records converted was about 38,700 at a cost of $2.06 per record. The staffing included an experienced cataloger and several part-time staff and students. The reasons given for not reaching original goals included: the need to upgrade (especially to AACR2 standards) more cataloging data than expected, slow response time and much downtime on the OCLC system, and an unexpectedly high rate of turnover of paraprofessional staff (three of five positions).

To determine if there was any potential to use the original brief LCS records for retrospective conversion, OSUL decided in 1986–87 to investigate the possibility of using the newly available OCLC TAPECON service. Present OSUL estimates for more conventional, that is, non-TAPECON, retrospective conversion are about $2.30 per record. It was believed that the brief records in LCS lent themselves to the relatively inexpensive TAPECON service ($.40/record supplied) because many of these records contain Library of Congress Card Numbers (LCCNs) keyed from shelf list cards, one of the search keys that can be used with TAPECON. It was hoped that University Systems (the administrative computer center which maintains LCS) could derive search keys from the LCS brief records, that is, create tapes to OCLC specifications with LCCN search keys and associated local data. The tapes could be sent to OCLC, where they would be searched against the Online Union Catalog (OLUC) and any "unique hit" would be written to tape as a full OCLC record to be sent to OSUL. It was clear that the process would be much more complex than this explanation might suggest, especially in terms of to what extent and in what ways such an "automatic" retrospective conversion would affect the content of LCS as an online catalog.

The issue of "quality" was discussed at length by those library staff members involved in planning for TAPECON. In addition to the items noted above, several issues of quality were considered as potential sources of problems, including: What would be the chance of retrieving the wrong record from OCLC and consequently erroneously adding the "OSU" holding symbol to an OCLC record and loading a ghost record to LCS? How many records would be loaded with headings that were in conflict with OSUL authority files

in LCS? Would resources be needed (and available) to review reports to detect these and other problems? If not all records retrieved were reviewed, how many errors would be loaded and therefore remain undetectable? Would TAPECON turn out to be as cost-effective as hoped? As such issues were identified, it was decided that a *simulation* of the TAPECON conversion process, using a random sample of LCS brief catalog records, would be needed to provide the data necessary to specify how search keys were to be derived from LCS and what measures could be taken to facilitate error detection during subsequent loads of records to LCS. In brief, the simulation was designed to provide information that could be used to select candidate records and to determine on what bases incoming OCLC records with certain characteristics, such as a difference between the initial characters in the title fields of the pre-existing brief LCS record and the incoming OCLC record, should be treated (for example, not loaded to LCS or loaded but reported for review by catalog maintenance personnel). This paper describes that simulation and reports its results.

DESCRIPTION OF TAPECON SERVICE

In October 1985 OCLC announced in a news release a new retrospective conversion service, TAPECON. TAPECON is designed to allow a library to submit to OCLC tapes containing a minimum of 20,000 search keys with associated local data. OCLC matches the search keys against the Online Union Catalog (OLUC) and copies records with unique hits to an OCLC MARC tape, adding local data supplied by the library. In addition, the library's OCLC symbol is added to records in the OLUC. TAPECON operates technically in a manner very similar to OCLC MICROCON, the main difference being that a library using MICROCON submits diskettes with search keys created by trained personnel, while TAPECON allows a library to submit a tape generated from a preexisting file.

According to OCLC's *TAPECON User Guide*, 2d ed. (Dublin, Ohio: OCLC, 1987), acceptable search keys are as follows: author/title, title, CODEN, ISBN, ISSN, LCCN, OCLC control number, MPN (Music Publisher Number), and GDN (Government Document Number). Search keys are limited to sixteen characters. The rules for building derived search keys are as complex as the rules for interactively searching the OLUC. For example, special consideration must be given to the omission of initial articles and for names beginning with "Mc" or "Mac." Search keys may be qualified by any combination of the following: type of material (for example, "bks" for Books format), publication year(s), and form of reproduction (for example, "nmf" for "not microform").

It must be pointed out that OCLC's specifications for input acceptable for TAPECON changed between the times the simulation occurred and this paper was prepared. When the simulation began, qualifiers could *not* be added to assigned search keys, for example, OCLC control number, LCCN, or ISBN. However, the simulation results have been checked and are represented here to reflect what would have been expected based on use of the latest version of TAPECON, that is, that described in the *TAPECON User Guide*, 2nd ed.

The TAPECON specifications permit libraries to include up to six local data fields with each search key. Each local data field is associated with appropriate tags and indicators. These local fields allow for a local system number, call number, local holdings, and three other local data fields.

The local system number must be tagged 035 and is limited to 14 numeric characters. The local call number tag allows for the use of tags 050, 060, 070, 080, 086, 090, 092, 096, 098, or 099, and the call number data field is limited to 36 alphanumeric characters. The local holdings field is limited to tag 049 or 059. This field is limited to 115 alphanumeric characters and must include at least one holding library code. The three other local data fields provide for the use of tags 059, 590, 690, 910, and 949. The first local data field is limited to 65 alphanumeric characters, while the others allow up to 115 alphanumeric characters.

The product of the TAPECON service is essentially the same as that of MICRO-

CON. The library receives magnetic tapes containing the converted records, paperprint reports that include statistics of processing, and a description of unconverted records. Following is a brief description of the results a library receives from OCLC:

Tapes: For unique hits, converted records are loaded to tapes along with local data. The library's holding symbol is attached to the matching record in the OLUC.

Reports: Statistics report. This is a list of processing totals for the most recent batch of search keys submitted, as well as cumulative totals.

Exception report—"2 to 10 Hits." This report provides the following information on search keys submitted: how many records matched, the search key and all local data, and an abbreviated copy of each of the "hit" records.

Exception report—"Over 10 Hits" and "No Hits." This report indicates search results of search keys producing either over 10 hits or no hits. The report includes the search key used, the local call number, and local holdings data.

LCS RECORD DESCRIPTION

In order to understand the reasoning for the steps taken in this TAPECON simulation, one must understand some characteristics of the LCS database. The full catalog records in the LCS database have complete indexing under all traditional catalog access points: call number, main entry, title, uniform title, series, subject entries, and other added entries. Full records also contain data fields that can be used to qualify searches, such as a code for language of text. The brief records that are subject to conversion, however, have a much more limited set of data fields, as follows:

1. call number
2. main entry
3. title
4. edition statement
5. publication date (limited to 4 characters)
6. a three-letter language code
7. LC card number
8. holdings data fields.

There are also "flags" that are set to indicate whether the item represented is a monograph or a serial, is oversize, is in English or a "non-English" language. To be clear, there are no fields in brief records for *any* added entries, so these records cannot be accessed under subject, series, uniform title, or any added author or title entries. Neither do these records contain publisher or place of publication.

The LCS database is structured in such a way that the holdings, headings, and bibliographic portions of a catalog record are stored in different files. Because of this structure, it is possible to modify the bibliographic portion of a record while retaining existing holdings information unchanged. Therefore, retrospective conversion of brief LCS records can be limited to the upgrading of bibliographic data and addition of access points, without needing to convert holdings data. Moreover, as all headings are stored in a separate headings file (each heading stored only once in full form and linked by headings index numbers to each associated catalog record), LCS can provide for global correction of headings.[3] Authority control of headings added through retrospective conversion therefore can be applied after the basic conversion is complete, using established LCS headings file maintenance computer programs and staff review routines.

TAPECON SIMULATION

As noted above, a simulation of the TAPECON process was judged necessary to evaluate TAPECON's suitability for conversion of brief catalog records in the LCS database before actually submitting thousands of search keys and loading resulting records to the online catalog. The evaluation would address two major questions: What would be the overall hit rate for LCS brief records in the OLUC? and What would be the comparative hit rates using different types of search keys, that is, LCCN, author/title, or title searches? In addition, an evaluation would be made of the quality of the records obtained, primarily to learn if OCLC records retrieved were in fact correct matches for the bibliographic items represented by brief LCS records, but also to evaluate those records for completeness of description, for example,

whether all required fields were present. The evaluation would not, however, include any assessment of the validity of the headings or of the currency of application of cataloging rules (for example, choice of entry).

The first step was to obtain a representative sample of the population of short LCS records. Discussion with a statistical consultant suggested that a carefully drawn sample of about 500 records would be adequate. It was decided to select and process separately two groups of about 500 records each, in order to ensure the validity of the test. Specifications were developed for random selection of brief records from the LCS database, based on limiting the population to be sampled to monographic records with call numbers within the LC classification range of the LCS shelf list sequence. ERIC documents, on-order records, and other special records were therefore excluded. Further defining the sample, any record with three or more alphabetic characters at the end of the call number would be excluded, having the effect of screening out records for such items as non-book materials, for example, any call number with a suffix such as FILM or MICROFICHE. The samples would include brief records with and without an LCCN present. The output format for the sample was a paper printout of one LCS record per sheet, showing all fields of the short record, including holdings. Thus, the population from which the samples would be drawn included 725,680 records.

The next step was to develop a procedure to imitate the TAPECON process of machine searching the OLUC and selecting matching records. Several cataloging department staff members were instructed in how to search the OLUC for each of the LCS records in the TAPECON sample, following precisely the rules set forth in the *TAPECON User Guide* for building search keys. It was emphasized that, since the searching during actual TAPECON processing would be done strictly in terms of machine-matching of data fields, staff searchers were not to interpret or alter any data in the LCS records in doing the simulation. Thus, if errors were evident in the LCS brief records, such as typographical errors in words of the title, the data were to be searched exactly as they appeared in the LCS record. Because it was also essential to the validity of the test to avoid any interjection of judgment by the searcher in choosing the search key, strict rules were established for choosing which type of search key to use, as follows:

1. If the LCS record contained a valid LCCN field, an LCCN search would be made.

2. If no valid LCCN was present but the title of the record was longer than two words (excluding initial articles), a title search would be made. If the title was only one or two words but the LCS record had either (a) no author field present or (b) an author's name beginning with one of the prefixes "Mc" or "Mac," a title search would be made.

3. If the title of the record was one or two words, with an author field present other than a name beginning with "Mc" or "Mac," an author/title search would be made.

All title and author/title searches were to be qualified with the record type "bks" and with a single date of publication if one were present in the LCS record.

All LCCN searches were originally made without qualifiers. However, the results presented here have been calculated assuming that the qualifiers for record type "bks" and single date of publication, if present, were used, as provided for in the more recent TAPECON standard.

The other aspect of the TAPECON simulation procedure was to have the searchers tally the results of the search for each record, record-by-record, as each simulated search was carried out. For each record, the following types of information would be tallied:

1. Which search was used and why (for example, title search done because no LCCN was present);

2. If a title or author/title search, whether a valid date was present to use in qualifying the search;

3. Whether the search resulted in no hit, one hit, from 2 to 10 hits, or more than 10 hits; and

4. If no hit was obtained, whether some obvious flaw in the LCS record was a prob-

able cause for the failure (for example, author's name erroneously entered in title field in the LCS record).

If the search resulted in one hit or in 2 to 10 hits, a printout of the OCLC record or list of records would be made and attached to the printout of the corresponding LCS record for later analysis of the validity of the hit.

A procedure was developed to emulate a machine-evaluation of the accuracy of the match between the preexisting brief LCS records and any records obtained from the OLUC to be added to LCS. This evaluation would have two aspects. First, unique hits could be passed through a simulation of a computer program match which would identify certain problems or potential problems by examining and comparing some fields present in nominally matching OCLC and LCS records. Specifications were established based on the limited set of fields present in the brief LCS record. Reports would be generated when designated characteristics were present in the OCLC/LCS record pairs.

The machine-assisted evaluation could provide data on these factors:

1. Whether the initial 10 characters of the title fields were the same in both records;

2. Whether a potential for difference in edition between the two records existed, based on the presence of edition statements in either record (or both records) or the presence of an alpha character (work mark) at the end of the call number in the LCS record; and

3. Whether the OCLC record fell into a category thought to be one that might require special handling because of the nature of the item represented by the LCS record (for example, an item in the Rare Books collection or one with a publication date of 1899 or earlier).

The second aspect of the evaluation of the records would be a thorough comparison of the OCLC records retrieved with the corresponding records in the OSUL shelf list and/or card catalog. This comparison was judged necessary because some of the information needed to determine whether an accurate match of records had been made is not available in the brief LCS records and thus could not be assessed fully through a machine-assisted evaluation based on checks of the brief LCS record. The most critical fields missing from the LCS brief records, but present on the catalog cards, are place of publication, publisher, physical description, and series information. The shelf list/card catalog comparison would also include an assessment of the completeness of the OCLC record (for example, whether all elements of the physical description area were present) and of other factors potentially affecting the quality of the match (for example, the presence of copy-specific or other local notes in the OCLC record or on an OSUL catalog/shelf list card).

As was done for the simulation of the TAPECON procedure for searching the OLUC, tally sheets (see figure 1) were also devised for the intensive two-phase evaluation planned for the records retrieved in the test. For LCS brief records with unique hits in the OLUC, machine-assisted evaluation was simulated by staff members reviewing both records manually and checking off on tally sheets aspects of the factors that could have been detected by computer match. The results of searches of the OLUC that retrieved 2 to 10 hits, more than 10 hits, or no hits were also evaluated. In the first sample group, among the 268 records searched by LCCN, there were 80 records that had no hits in the OLUC. Of these records, 31 were found to have had no corresponding record in the OLUC, while 49 had records in OCLC that could be retrieved using a search key other than the LCCN search key. Among the 31 titles with no hits in the OLUC, 3 were English language, and 28 were "non-English," including 14 Russian-language titles. For the 49 items that were found by a search key other than LCCN search, 21 had not initially been found because the OCLC record lacked an LCCN; 9 represented items for which OSUL had edited an LC catalog card, altering the publication date information but not the LCCN; and 7 were not found because of erroneous data in the LCCN field in the LCS records. The characteristics of the 12 other "zero hit" items were: the OCLC record was not in Books format (5 records) and errors in the LCS publication date (4 records), the

LCS Retrocon Test Data
Program: LCSRTSD

Call Number: Z642J6
Author: JONES, ROBERT WILLIAM
Title: COPYRIGHTS AND TRADE-MARKS
Pub. Date: 1949
Language: English
LCCN: 49-6900>

SHELF LIST CHECK

- o Shelflist Card Missing
- o Shelflist Card Incomplete
- o Author mismatch
- o Title mismatch
- o Edition statement mismatch
- o Place of publication mismatch
- o Publisher mismatch
- o Date of publication mismatch
- o Physical description mismatch
- o Series mismatch
- o Other mismatch, please specify:

Completeness of OCLC Record

- o Same
- o Better
- o Worse

Other Problems

- o Call Number Discrepancy
- o Local Notes in OCLC Record
- o Other, please specify:

RECORD EVALUATION

- o UNIQUE OCLC HIT
  - o Date of Publication Mismatch
  - o Ten Initial Title Characters Mismatch
  - o Not Books Format

  - o 250 $ Mark
  - o 250 $ -
  - o 250 - -
  - o - $ Mark
  - o - $ -
  - o 250 - Mark
  - o - - Mark
  - o FIN
  - o RAR
  - o MUS
  - o PD<1900

  - o Date absent in LCS
  - o Withdrawn
  - o Oversize mismatch
  - o Language Mismatch

- o 2-10 HITS
  - o Date absent on LCS
  - o Has likely hit
  - o No likely hit

- o MORE THAN 10 HITS
  - o Date absent on LCS
  - o Flawed Record on LCS

- o NO HITS
  - o Flawed Record on LCS
  - o Other:

TALLY SHEET FOR OCLC SEARCHING

- o LCCN Search
  - o LCCN Absent
  - o Invalid LCCN
  - o No Hit
  - o One Hit - Printout
  - o 2-10 Hits - Printout
  - o >10 Hits

- o Title Search
  - o No Date
  - o Incomplete Date
  - o Invalid Date
  - o <= 2 words, no author present, or author begins with Mc or Mac
  - o No Hit
  - o No Hit, Flawed Record on LCS
  - o One Hit - Printout
  - o 2-10 Hits - Printout
  - o >10 Hits

- o Author/Title Search
  - o No Date
  - o Incomplete Data
  - o Invalid Date
  - o No Hit
  - o No Hit, Flawed Record on LCS
  - o One Hit - Printout
  - o 2-10 Hits - Printout
  - o >10 Hits

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Fig. 1. Tally Sheet.

OCLC Dates fixed field (2 records), and an OCLC LCCN field (1 record).

Four items searched by LCCN in the first sample would have been reported as "2 to 10 hits." All four were the result of duplicate records in the OCLC database. Interestingly, one pair of duplicate records was for a title which did not match the LCS title, because of an error in the LCCN in the LCS record. There would have been no reported records with "more than 10 hits" in the first sample.

SUMMARY RESULTS OF FIRST SAMPLE

Analysis of results for the first sample of 502 records searched in the OLUC revealed the rate of unique hits for each type of search to be as follows:

two hundred sixty-eight LCCN searches produced 184 unique hits (68.66%), 53 author/title searches produced 20 unique hits (37.74%), and 181 title searches produced 67 unique hits (37.02%). Overall, 502 total records searched produced 271 unique hits (53.98%).

Analysis of the results of the manual search emulation for the two samples is presented in table 1. Based on the higher percentage of unique hits yielded by the LCCN search, and given the limits of time and OSUL personnel resources, it was decided to concentrate detailed analysis on that search key in the second sample. Results of the analysis of the LCCN search in samples 1 and 2 are presented in tables 2 through 4.

FINDINGS AND THEIR IMPLICATIONS

Analysis of the results of the simulation was to drive decision-making on implementation of TAPECON for OSUL's retrospective conversion. The simulation results suggest that approximately 271,000 of 428,000 brief monographic records with LCCN in the LCS database could be converted for use in the local OPAC accurately at low direct cost per record, and minimal human intervention and that OSUL's holding symbol therefore could be added to each appropriate OCLC record.

One of the first steps in the analysis of data was to identify categories of LCS records that had potential for mismatch with OCLC records, that is, to decide whether to accept all unique hit OCLC records retrieved and load them into LCS or to reject (that is, not load) some categories of records

Table 1. Description of Samples from LCS Brief Records for Monographs Searched in the OCLC Online Union Catalog

	Sample 1		Sample 2		Samples 1 and 2		
Record type	Quan.	% of 502*	Quan.	% of 500*	Quan.	% of 1,002*	Total projected to LCS†
Total LCCN searches	268	53.39	258	51.60	526	52.50	380,946
Records with clearly invalid LCCN	22	4.38	42	8.40	64	6.39	46,351
Records with LCCN	290	57.77	300	60.00	590	58.88	427,297
Records without LCCN	212	42.23	200	40.00	412	41.12	298,383
Title searches	181	36.06	179	35.80	360	35.93	260,723
Author/title searches	53	10.56	63	12.60	116	11.58	84,011
Total non-LCCN searches	234	46.61	242	48.40	476	47.50	344,734
Total sample	502	100.00	500	100.00	1,002	100.00	725,680

This table presents the characteristics of LCS brief records selected in the two samples drawn for the TAPECON simulation in terms of presence or absence of a valid LCCN and type of search performed.

*All percentages are rounded to nearest hundredth.

†Calculated total based on total of TAPECON candidate records (725,680).

Table 2. LCCN Search—Unique Hits (Including Records with and without Reports Generated)

Record type	Sample 1 Quan.	% of 290*	Sample 2 Quan.	% of 300*	Samples 1 and 2 Quan.	% of 590*	Total projected to LCS†
Records retrieved as matches	177	61.03	178	59.33	355	60.17	257,566
Records retrieved for identical titles with different editions, printings, imprints	7	2.41	11	3.67	18	3.05	13,060
Overall total	184	63.45	189	63.00	373	63.22	270,626

This table presents the characteristics of all unique hits in the OCLC OLUC from LCCN searches in the two random samples of 502 and 500 search keys. Samples 1 and 2 contained, respectively, 290 and 300 records with LCCN.

*All percentages are rounded to nearest hundredth.

†Calculated total based on the percentage of the population of brief records with LCCN (428,067) and rounded to nearest whole number. The difference between the actual number of records with LCCN (428,067) and the projected total in table 1 (427,297) is equal to 770 or about 0.18 percent of the actual total. This illustrates the difference between the projection based on the sample and the actual population.

Table 3. LCCN Search—Unique Hits with Reports Generated

Record type	Sample 1 Quan.	% of 290*	Sample 2 Quan.	% of 300*	Samples 1 and 2 Quan.	% of 590*	Total projected to LCS†
Matches without comments	49	16.90	36	12.00	85	14.41	61,671
Matches with comments‡	11	3.79	19	6.33	30	5.08	21,766
Total matches	60	20.69	55	18.33	115	19.49	83,437
Records retrieved for identical titles with different editions, printings, imprints	6	2.07	7	2.33	13	2.20	9,432
Overall total	66	22.76	62	20.66	128	21.69	92,869

The generation of a report indicates that the designated characteristics (listed on page 289) which would be detected by the computer program were present in the LCS/OCLC record pairs.

*All percentages are rounded to nearest hundredth.

†Calculated total based on the percentage of the population of brief records with LCCN (428,067) rounded to the nearest whole number.

‡Comments indicate one of the following characteristics: local notes differ, OCLC record better or worse than shelf list record in terms of completeness, additional or missing entries, OCLC record encoding level K (minimal level).

retrieved because of an expected high proportion of non-matching records. Clearly, if it were decided to reject certain categories of records judged to be "high risk" for mismatches, many correct matches in these categories would also be rejected. Moreover, since in the production of the TAPECON tapes the library's holdings symbol is added to the records in the OLUC, use of staff time to remove the OSU holdings symbol from non-matching records would have to be estimated.

It was planned that in a full-scale use of TAPECON, a paper-print report would be

generated for each conversion transaction having characteristics matching the potential problem categories previously defined, such as the presence of an edition statement in either or both the LCS and OCLC records. The report would show the existing brief LCS record and the OCLC record that would replace it. By comparing the two records, some judgments could be made about whether or not the OCLC record was a correct match for the LCS record. However, as described earlier, not all the fields necessary to verify the match would be present on these reports, as the brief LCS records do not contain any publication information other than a date and in many cases lack edition statements. For some categories of records, further comparison of the OCLC records with the OSUL shelf list and/or card catalogs would be required to verify a potentially problematic "match."

When the results of the simulation were projected to actual implementation conditions, it was determined that reports would be generated for 21.69% of all nominal matches, or about 93,000 items. The results further indicated that review of these reports could be expected to identify approximately 9,432 mismatches. The cost of staffing (in catalog maintenance) necessary to review and act on the reports would need to be determined and included in calculating the total cost of TAPECON retrospective conversion.

The TAPECON simulation demonstrated that, among the unique hits, a small proportion (about .85%) of clearly incorrect records (that is, non-matches) would be retrieved for LCS for which none of the automatically-to-be-checked problem categories would apply. This would mean that, using the TAPECON process, circa 3,600 full catalog records would be added to LCS that did not accurately represent the materials held under a given call number and that no report would be produced to aid in identifying these errors. In addition, of course, in these cases the OSUL holdings symbol would be added to records in the OLUC that did not match OSUL's holdings, a situation that could present problems for libraries using the OLUC for interlibrary loan.

Despite the expected problems noted above, the positive results of the TAPECON simulation must be stressed. The simulation results indicate that unique hits would be found for 63.22% of records with LCCN and that 95.17% of these (that is,

Table 4. LCCN Search—Unique Hits without Reports Generated

	Sample 1		Sample 2		Samples 1 and 2		
Record type	Quan.	% of 290*	Quan.	% of 300*	Quan.	% of 590*	Total projected to LCS†
Matches without comments	96	33.10	62	20.66	158	26.78	114,635
Matches with comments‡	21	7.24	61	20.33	82	13.90	59,494
Total matches	117	40.34	123	40.99	240	40.68	174,129
Records retrieved for identical titles with different editions, printings, imprints	1	.34	4	1.33	5	.85	3,628
Overall total	118	40.68	127	42.32	245	41.53	177,757

The absence of a report indicates that the designated characteristics (listed on page 289) which could be detected by the computer program were not present in the LCS/OCLC record pairs.

*All percentages are rounded to nearest hundredth.

†Calculated total based on the percentage of the population of brief records with LCCN (428,067) rounded to the nearest whole number.

‡Comments indicate one of the following characteristics: local notes differ, OCLC record better or worse than shelf list record in terms of completeness, additional or missing entries, OCLC record encoding level K (minimal level).

circa 257,566) would be correct. Moreover, in the simulation, using the LCCN search key, there were no cases in which a totally unrelated record would have been loaded to LCS to replace a brief record; that is, for the unique hits, the "non-matching" record pairs were all cases of variation in edition or imprint for records for the same title. In initial planning, the potential for loading unrelated records was expected to be larger. However, the change in TAPECON programming to allow qualification of LCCN searches by record type and date improved this situation greatly.

The results of this manual simulation of TAPECON were considered encouraging, such that OSUL has since conducted a test run of 20,000 search keys. Results are being analyzed.

The TAPECON process promises to assist in inexpensive conversion of many brief catalog records for OSUL, recognizing that full cost of conversion must include catalog maintenance/follow-up. One other important positive feature of the TAPECON service to be noted is its speed. Once search keys and local data are put on tape and shipped to OCLC, processing is completed and OCLC MARC records are returned to the library within a week.

Other issues which were not addressed in this paper but are candidates for further investigation include: analysis of the OCLC OLUC by other libraries to determine if the OSUL experience is common to other brief record databases; a detailed cost/benefit analysis of TAPECON compared with other methods of retrospective conversion, to include a study of the percentage of errors, records in need of editing, staffing needs, etc.; and analysis of card and online catalogs in research libraries to determine to what extent they accurately reflect items held.

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Refinement of a Method for Determining the Optimal Interactive Timeout Interval for OPAC Terminals

Christine M. Taylor, Raymond G. Taylor, and Janet Gebbie Edgerton

Several factors affect the efficiency of online public access (OPAC) terminals. The two most conspicuous factors are the average arrival rate of users during peak periods (Tolle et al., 1983; Lipetz, 1972) and the average time users stay on a terminal (Knox and Miller, 1981; Moore, 1981). Together these two factors permit the system designer to determine the number of terminals needed and to otherwise properly size the system (Tolle, 1984; Sage, 1981). Too few terminals will lead to a violation of the library's implicit or explicit service policy (Borgman and Kaske, 1981; Gebbie et al., 1988; Taylor, 1987). Excess terminals are simply wasteful.

Once the system is properly sized, other factors affecting the efficiency of the system can be studied and improved. One is the system response rate, that is, the delay at the terminal between the completion of the user's request and the response from the system. This rate is influenced by many considerations; for most systems, one of those considerations is the interactive timeout interval (ITI).

The ITI is ". . . the amount of time that is allowed to lapse between user entries before the computer assumes that the terminal is abandoned and stops polling the terminal" (Taylor and Edgerton, 1989). The time "between user entries" is the time between user-provided keystrokes, and is referred to throughout this study as "intertransaction time." The Interactive Timeout Interval (ITI) affects response rate for most systems by reducing the number of terminals that have to be polled during each input cycle. However, some systems poll all terminals whether they are active or not, and, of course, a short ITI will not improve the performance of such systems.

Generally, the shorter the ITI, the more efficient the system. However, an excessively short interval will interrupt too many legitimate sessions—sessions in which the user is still working at the terminal, perhaps browsing through the system documentation or taking notes from the screen.

The *optimal* ITI is the shortest interval that is consistent with the service policy of the library. In the study reported here, that policy was arbitrarily defined for illustrative purposes: Among all the sessions wherein there are intertransaction times of a minute or more, the Interactive Timeout Interval for OPAC terminals shall interrupt no more than one in ten legitimate working sessions.

AN EARLIER STUDY

Taylor and Edgerton (1989) provided the only report in the commonly available literature on an attempt to determine empirically the optimal timeout interval for OPAC terminals. They computed the intertransaction times for 3,500 transactions, using traces from four terminals in the main library at North Carolina State University. Using a variety of trial ITIs (mostly in the one to four-minute range), several librarians determined the number of legitimate sessions that would have been interrupted by each. The researchers had assumed that 3,500 transactions was a sufficiently large number to generate the data needed for their study. However, they discovered that they had very few intertrans-

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action times that were greater than four minutes and that most of the four-minute delays occurred during legitimate working sessions. So few transactions reached out to six minutes and beyond that the investigators were compelled to state their conclusion very cautiously; they claimed that an ITI of "about eight minutes" interrupts less than ten percent of legitimate sessions.

Taylor and Edgerton indicated that their study could be substantially improved in the next replication by: (1) examining a variety of ITI values in the five-to-nine-minute range, (2) examining a much larger number of transactions, (3) resolving the interrater reliability problem associated with several persons deciding whether or not a trial ITI interrupted a legitimate session, and (4) computing separate ITIs for slack and busy periods. The present study, reported below, incorporates the first three of these suggestions.

METHOD

The command traces of over 20,800 transactions from six OPAC terminals at North Carolina State University were written to an experimental file. They were then sorted by terminal, so that intertransaction times could be computed. A "two-pass" algorithm was used to prepare the documents needed for the study. On the first pass, (1) intertransaction times were computed, (2) every transaction was numbered, and (3) a file was generated which contained the transaction numbers and intertransaction times for every transaction that was preceded by an intertransaction time of six minutes or more. The latter file was then sorted by one minute intervals (6.000 to 6.999 minutes, 7.000 to 7.999, 8.000 . . .).

On the second pass, one printed page was generated for every trial interrupt, that is, for every transaction that was preceded by an intertransaction time of six minutes or more. The trial interrupt appeared as the middle line of the report and was preceded and followed by lines of asterisks and other data needed for identification. The twenty-five preceding transactions were printed on the lines above the interrupt; below the interrupt, the twenty-five trailing transactions were printed.

Table 1. Number of Trial Interrupts Examined and Percentage of Actual Interrupts at Each of Several Time Periods

Time	Number	Percentage
6	96	.125
7	70	.114
8	57	.088
9	60	.083
12*	104	.010

*Note: The longest time category was 10 minutes or more. The approximate median value is reported here.

A single rater was used in order to meet the recommendation of the earlier study that the interrater reliability issue be addressed. In both studies, the rater's responsibility was to examine the nature of the transactions above and below the trial interrupt and make a determination of whether or not a legitimate working session had been interrupted. This judgement was to be based on a shift in subject or type of author, a change in search style, or the presence of log-ons or log-offs immediately preceding or following the trial interrupt.

Of the 20,827 transactions examined by the first pass, 391 transactions were associated with intertransaction times in excess of six minutes. The 391 transactions were sorted into one-minute intervals as indicated in table 1. Sixteen of these transactions occurred after log-offs and were automatically regarded as non-interrupts.

The number of interrupted sessions as a percentage of trial interrupts was then computed for each time interval. The results are shown in table 1. Perhaps of greatest interest is a verification of the finding of the previous study. In both cases, an ITI of less than eight minutes interrupted more than 10% of legitimate sessions, while an ITI of eight minutes or more did not. In the previous study, the percentage of legitimate session interrupts at eight minutes was .083, and in the present study it was .088! Both studies show that the subject library could set its ITI at eight minutes and still maintain a policy of not interrupting more than 10% of the legitimate sessions.

As one might expect, as the ITI increases, the number of true interrupts decreases. It appears that this relationship traces a negative exponential curve, as shown in figure 1. The graph is instructive because it allows one to estimate the optimal ITI for any

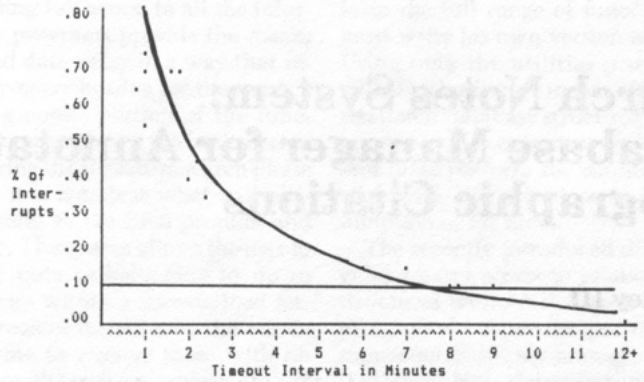

Fig. 1. Percentage of Interrupted Sessions as a Function of the Interactive Timeout Interval.

level of policy; alternatively, it indicates the proportion of interrupted sessions that would occur at each ITI. A fine horizontal line appears on the figure to indicate the decision value for the sample policy cited in the present study (the "10% policy").

CONCLUSION

By addressing several issues reported in a previous study, the present researchers confirmed their earlier conclusion that an interactive timeout interval of eight minutes or longer would not interrupt more than 10% of legitimate user sessions at an OPAC terminal. Given this information, systems designers can work toward improving the efficiency of an online system by reducing unnecessary polling of terminals while continuing to maintain a desired level of service. Even greater efficiency might be possible by varying the ITI for periods of heavy and light use.

For libraries that have already implemented online systems and have reached their optimal size (in terms of numbers of terminals), the next great challenge is to increase the efficiency of those systems. Knowing the optimal interactive timeout interval consistent with a given service policy allows adjustments with predictable results to be made in those systems where the ITI can be varied.

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Research Notes System: A Database Manager for Annotated Bibliographic Citations

D. S. Hartley III

A computer system can be an invaluable aid to the author of a professional document by helping him to gather, maintain, and use reference notes made during the literature search phase of his research. The sources for the notes can be books, journal articles, reports, private conversations, conference papers, audiovisuals, etc. The researcher/author can build his own set of cross-references as he goes and then retrieve those he later determines to be most relevant to his topic. As the database continues to grow, the system's usefulness increases.

The system described in this report is the result of an effort to help the researcher collect and organize information from many sources covering many topics. At the beginning of a project, it is necessary to search the literature with a broad goal in mind, making notes on relevant material as the search progresses. The working phase begins when the researcher defines a narrower goal for the project. During this phase, he must refer to those documents pertaining to the narrower goal and then search additional documents based on this goal, continuing all the while to take notes. At the end of the research phase, the author must compile and summarize the results of his search, selecting the proper notes and their references. He needs help in maintaining the information discovered so that he can find the notes he wants and make good decisions about their use. The Research Notes System (RNS) provides this help.

This report focuses on the needs of the researcher and how the RNS meets those needs. It also provides a brief overview of the system's hardware and software and a comparison with alternative ways of meeting the researcher's needs.

FUNCTIONAL REQUIREMENTS

The RNS is a set of programs and databases designed to aid the research worker in *gathering*, *maintaining*, and *using* notes taken from the literature. The sources for the notes can be books, journal articles, reports, private conversations, conference papers, audiovisuals, etc. The system ties the databases together in a relational structure, thus eliminating data redundancy

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while providing full access to all the information. The programs provide the means for access and data entry in a way that reduces the key-entry burden for the user.

The "using notes" portion of the functional requirements drives the basic design concept. During the literature search phase of a project, it is not clear what will ultimately be useful in the final product and what will not. The system allows the user to classify each note as belonging to up to three categories within a user-defined set. The user segregates the notes by this classification scheme to remove those with no real bearing on the current project.

Much research is an extension of or follow-up to earlier work; for example, notes taken that were not directly usable for a first project may be critical to a later project. The system allows the user to enter all notes that *may* be of interest. By coding each note with subject keys, those unrelated to the direct thrust of the research are available at a later time. The database system allows the retention of all notes, while providing for additions and retrievals at any time in the future. This design satisfies the "maintaining notes" portion of the requirements.

The "gathering notes" phase provides the final design consideration. The system allows notes to be entered at the time the literature is being read, with minimal interruptions for reference data input (document/article title, authors, etc.). The system design minimizes input errors but contains a considerable edit facility to correct any errors that do occur.

ALTERNATIVES

As with any support system, the Research Notes System (RNS) must be measured against alternative systems as to characteristics of use and performance according to the user's needs. The alternative systems consist of user-definable applications of commercial software such as dBASE III, PFS File, Lotus 1-2-3, commercial citation support DBMSs, and the traditional index-card method.

Because the RNS uses dBASE III programming, that software is obviously adequate to fulfill the functions required. However, for a user-defined system to perform the full range of functions, the user must write his own version of this system. Using only the utilities provided by the dBASE III software means either the use of relational database structure to reduce the input requirements must be forgone or the user must perform the connections manually, with the risk of error and the consumption of his time.

The recently introduced dBASE IV provides greater access to relational database structures without the need for programming, as do other comparable IBM PC-supported database management systems (DBMSs). Also, the recent introduction of Structured Query Language (SQL) DBMSs to the PC provides potentially more powerful vehicles for implementing RNS-like applications. The discussions of the functions of these DBMSs contained in reviews and advertisements indicate that constructing an analog to the RNS would be simpler than the original construction of the RNS; however, a programming level knowledge of the candidate underlying DBMS would still be required.[1-10]

Software such as PFS File and Lotus 1-2-3 provide simple, flat-file database structures with retrieval and sort capabilities. Such software makes data entry relatively straightforward; however, each note must have the complete document/article data entered in the same record as the note. This increases the storage space and time required to enter the data.

The index-card method provides the advantages of portability and low cost. Notes can be made on index cards at random and the method does not require the use of a computer or its accompanying software. However, index cards are not easy to cross-index: redundant data must be maintained on multiple cards. Often a user will make more than one note on a card, leading to separability problems.

Commercial software packages such as Pro-Cite and the Sci-Mate Manager are available that provide many of the features needed by the researcher; however, their design orientations impose additional data entry, file storage space, and time constraints on the user over the RNS. They are designed for bibliographical work and allow for very detailed decisions on the for-

mat of the output bibliography. These systems allow for notes to be maintained about each document; however, the notes are subsidiary to the main purposes of the packages. The basic concept of one record per document in these packages restricts notes and subject connections to notes on the document as a whole.[11-17] The RNS design allows for unlimited notes for each document, each with its own set of subject connections. Some automated library systems may also provide for annotated citations; however, they are generally costly and limited to one note per document.[18]

IMPLEMENTATION

The RNS runs on an IBM PC or PC-compatible computer. Full functionality requires a printer that will operate using the IBM Graphics Printer setup codes. Other printers can be used; however, there are restrictions on the print-size option. The monitor may be either a monochrome or a color monitor (color being preferable). The required software consists of DOS, dBASE III Plus, and the RNS itself. The IBM PC-based hardware, which is widely available to users, provides the power (both native hardware power and software power through the large base of programs it supports) needed for such a system.

The basic architecture of the system is a database structure together with software to make the relational connections and perform the required functions. Figure 1 illustrates the architecture. The relational structure minimizes both storage requirements and the user's input time. The RNS uses the dBASE III Plus commercial database command language and DBMS as its basis. This makes it possible for knowledgeable users to write their own retrieval reports for specialized uses.

Each note has several data fields. Included are the text of the note, the subject classification (for retrieval), and the reference identification data. These data are divided into four databases:

1. Document data: title, author, editor, publisher, etc., fields to identify the book or journal;
2. Article data: title, author, volume, pages, etc., fields to identify the article within the document (e.g., an article within a journal). Some documents will not require this data (e.g., a textbook with all of its chapters written by the book's author(s));
3. Note data: text and page of the note; and
4. Subject data: subject categories to ensure uniform spelling for searches.

Additionally, there are subsidiary files used by the system, including database index files and temporary work files.

SYSTEM/USER INTERFACE

The system is a full-featured, specialized application DBMS. In addition to the functional requirements previously described, the system is designed to *aid* the researcher, which means that the system/user interface must facilitate research, not impede it.

The system/user interface fits almost seamlessly into the research process. Each phase has a corresponding phase within the system. The initialization phase, during which the subject matter is considered, may also include the setup of the RNS. This setup includes those things necessary to make the system run on the user's computer.

The RNS has a menu structure to reduce the learning investment and the physical involvement of the user (who is more interested in reading the source material than in writing commands into the computer). The features are grouped into six operational categories:

1. entering data;
2. viewing the data on the screen;
3. editing data;
4. changing the relationships among the data (moving notes to different articles [may be necessary to correct errors], deleting data, etc.);
5. printing reports and writing data to computer files; and
6. miscellaneous utilities (changing print size, deleting all data, etc.).

The user selects the category at the main menu level, which yields a submenu for each choice. Figure 2 illustrates the menu system.

Data entry is oriented toward recording notes and organizing them into categories or subjects. Thus, whether the user chooses to enter a new document into the database,

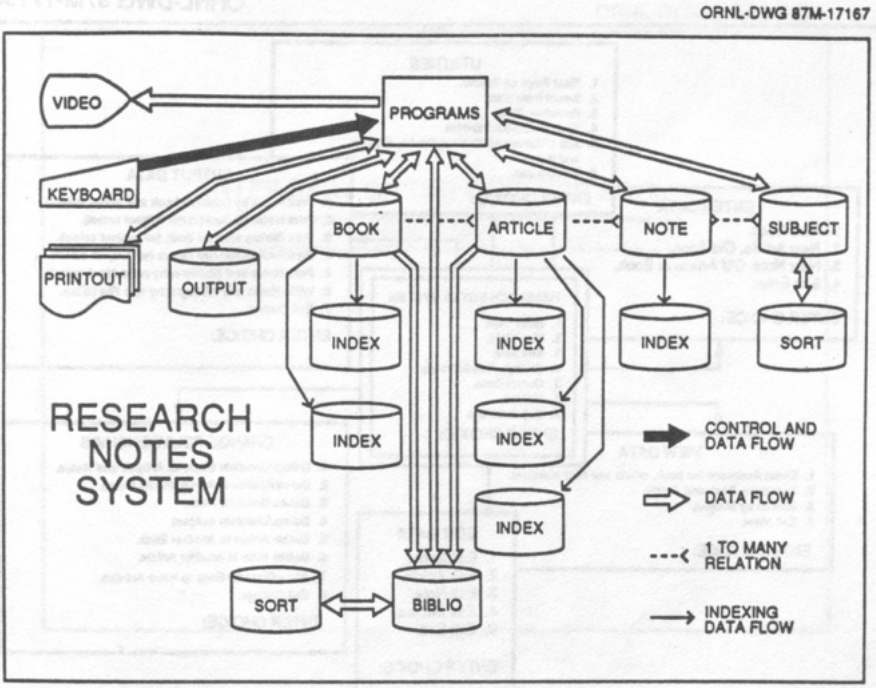

Fig. 1. Architecture of the System.

a new article for an old document, or a new note, the system leads him to the note-entry process. Naturally, the reference data for the note is necessary; therefore, at each level he must specify either an old set of references or input a new set.

The system uses many error-prevention techniques. Before data is stored, the user is given a chance to make changes. The system provides escapes from selections made incorrectly. Although data entry is somewhat slowed, correcting errors is a slower process. The net result is a more responsive system.

The first active research phase is the literature search, starting with a general search and loosely defined objectives. When the user makes his first note, he will be making an entry for the first article or document. Selecting the data-entry choice from the main menu, followed by the document-entry choice, will produce the data-entry screen for the document data. The type of document will determine what information needs to be provided. If the document is an edited book of articles, it will have editors, not authors, and the notes will refer to articles. If it is an authored book, the reverse will be true. If it is a journal, the user will enter the title only once, with the articles carrying the date, volume, and number data. The user may want to create a document with the title "Private Conversations," to which he will tie all "articles" that are conversations with various people.

Once the document data is complete, the system asks for article data (if articles are specified for the document) and then the note. After the user enters the note, he specifies a subject. At the beginning, the system contains no subjects (except for ".UNKNOWN" and ".ERASE"), so the user will add a subject. Because each note may have up to three subjects attached to it, a reasonable amount of cross-referencing is possible. The limited size of the note makes three subjects a realistic limit. (The user may get around this size limit by using several system notes, all with the same set of subjects and references.) The user is free to create

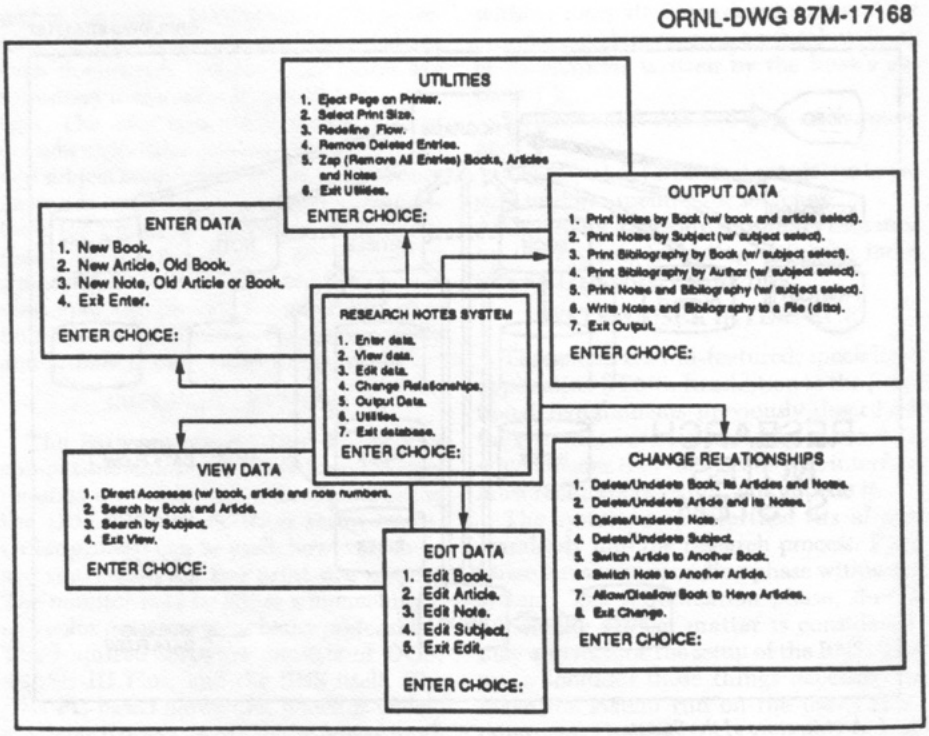

Fig. 2. The Menu System.

any subject coding scheme he desires.

The RNS minimizes data reentry through a data selection process. To specify a document, the user enters some portion of its title (see figure 3), then picks from a list of titles containing the entered string of characters (see figure 4). If the title is not in the database, the user enters the character "A" rather than a record number. The system then gives the user a document data input screen (see figure 5) to fill out. To specify an article, the user goes through a similar process (see figures 6–8). The list of possible articles is restricted to those contained in the selected document.

Once the note is complete, the system gives the user a blank note screen attached to the same document and article and the same subjects. The idea is that the user reads the article, makes a note, and continues reading. Presumably, the next note will also be from the same article, often with the same subject matter. However, if, after typing the new note, the user decides the subjects are different, an entry to the screen (see figure 9) will cause the system to inquire about new subjects. The RNS provides for the entry of new subjects at the time of subject selection. Figures 10 and 11 illustrate this process. Similarly, a response that this note is for a different article will bring up the article definition screen. (The assumption is that the article is for the same document, although the user may override this assumption.) If the user changes the article, the assumption is that the subjects are no longer correct. If the user responds that the document is not the same for the new note, he must enter new document, article, and subject data. If the user decides to quit the entry process rather than adding a new note, he may do so.

Since the literature search for a research project is not done in one sitting, the user may reenter the data-entry process at any point. He may add a new note to an article or a new article to a document at any time. When a new article is added, it is assumed

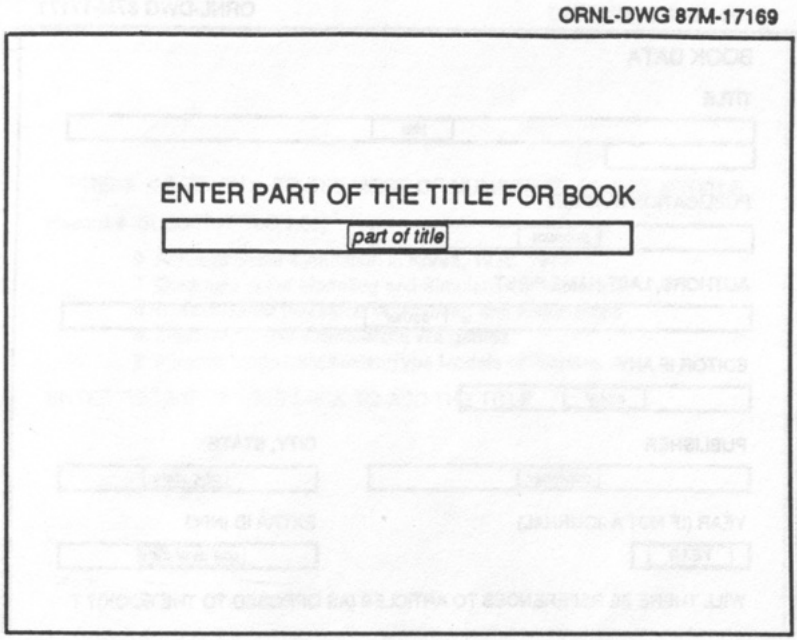

Fig. 3. Book Title Discriminator.

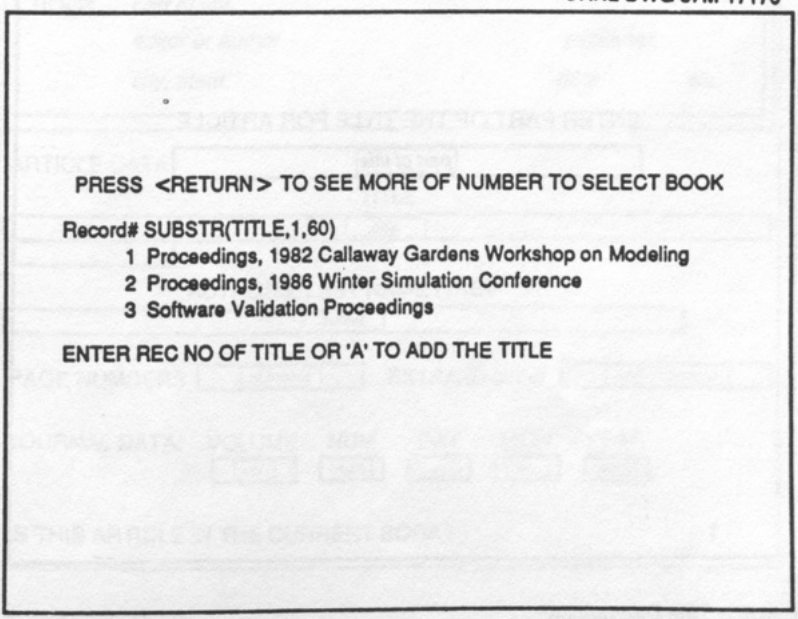

Fig. 4. Book List.

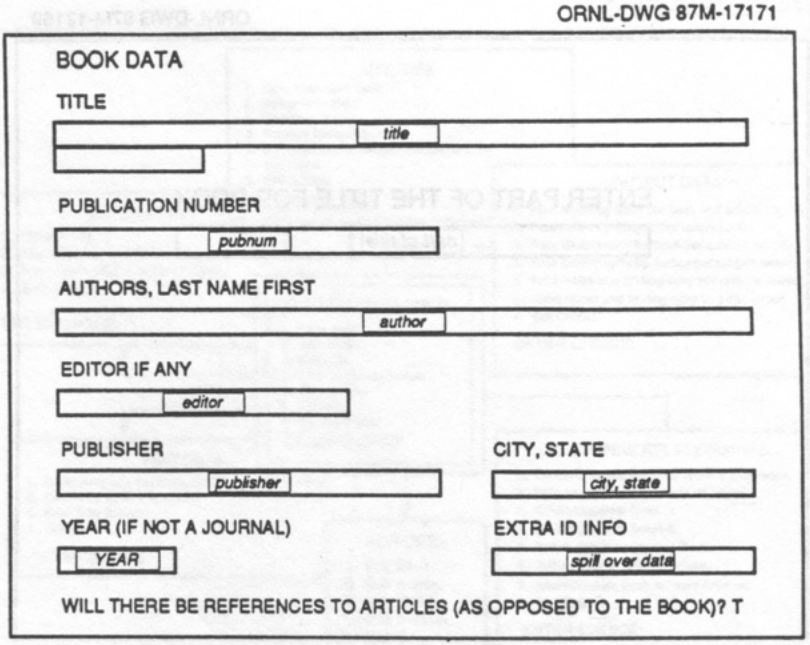

Fig. 5. Book Input Screen.

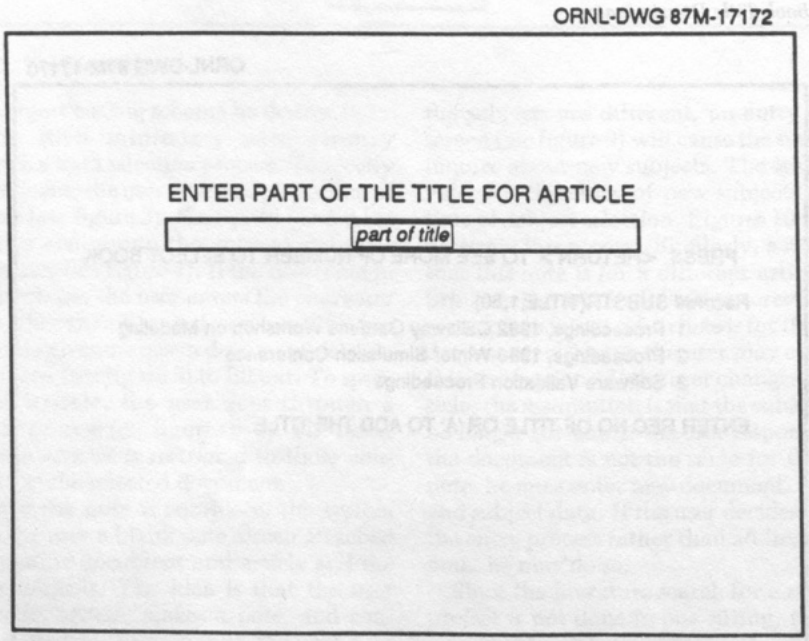

Fig. 6. Article Title Discriminator.

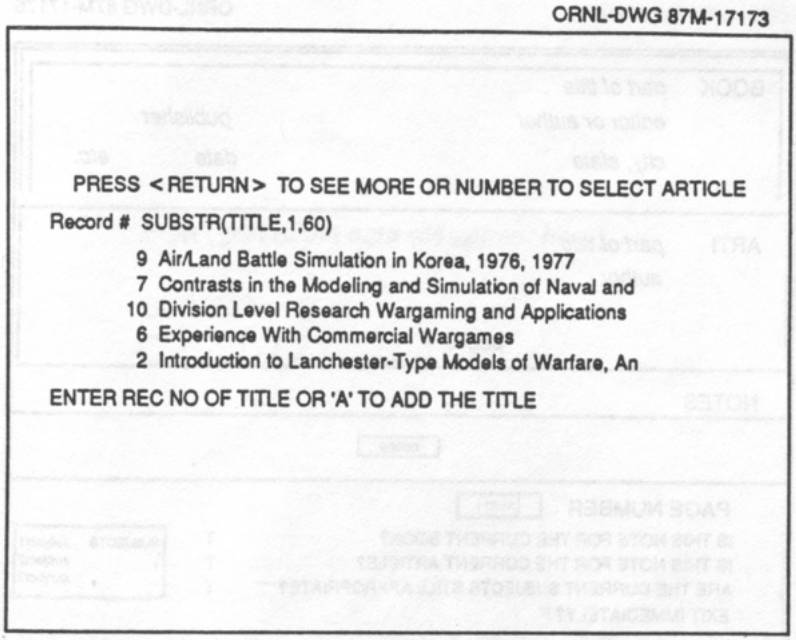

Fig. 7. Article List.

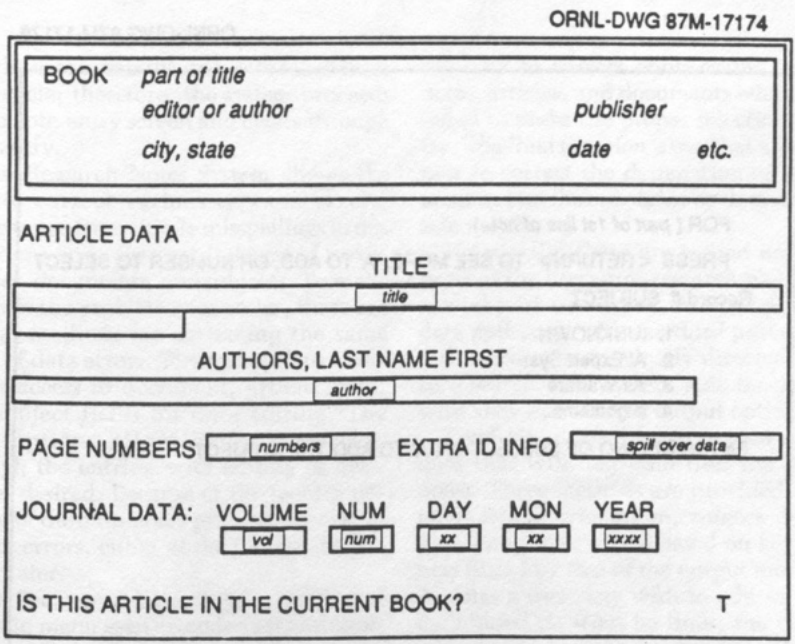

Fig. 8. Article Input Screen.

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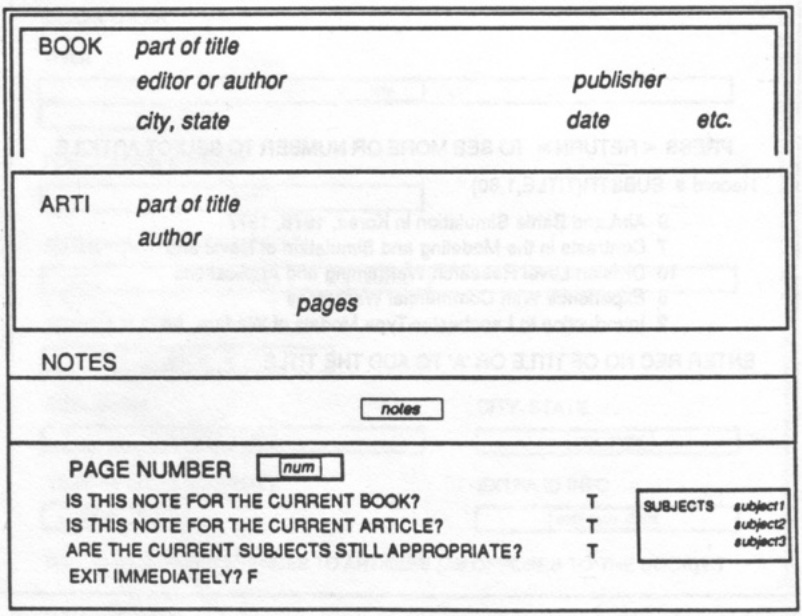

Fig. 9. Note Input Screen.

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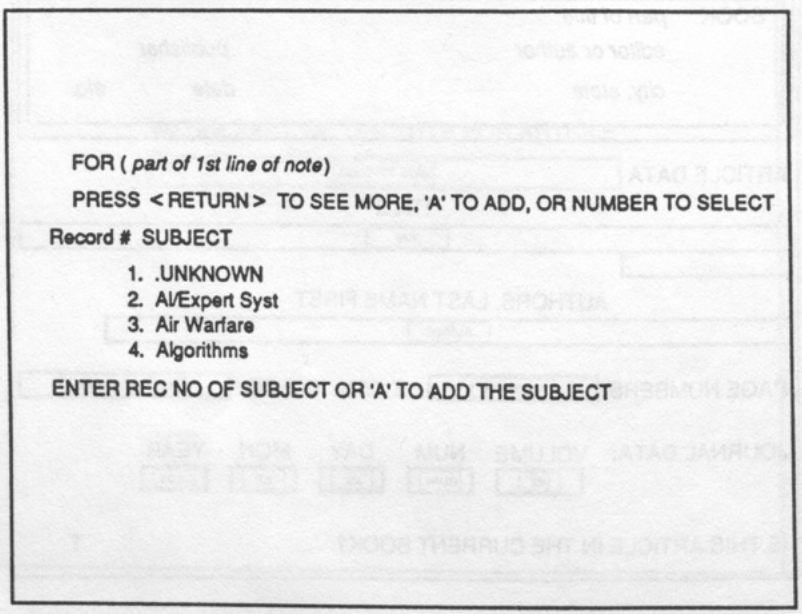

Fig. 10. Subject List.

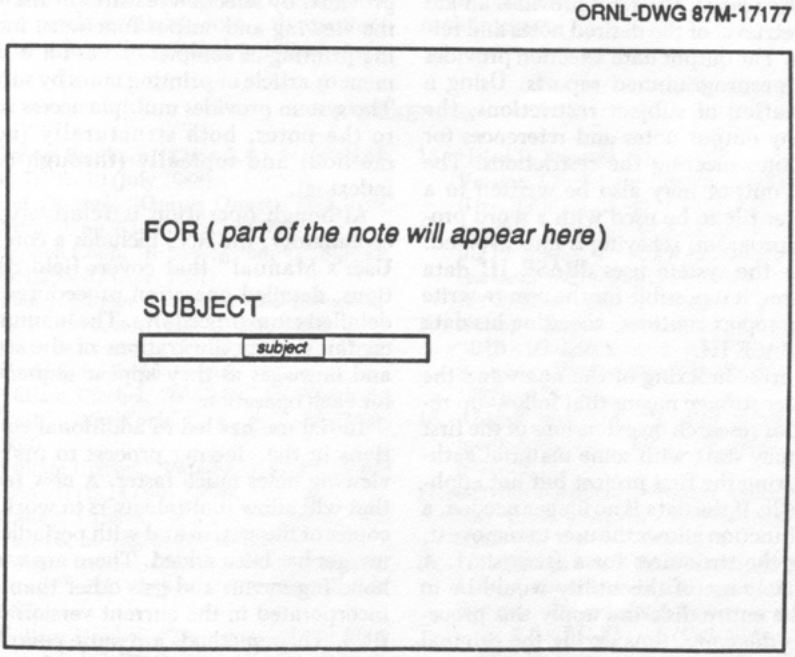

Fig. 11. New Subject Entry.

that the user wants to add a note taken from the article; therefore, the system proceeds to the note-entry screen and cycles through note entry.

The Research Notes System allows the user to correct various types of errors. These range from simple misspellings to duplications and incorrect linkages of notes, articles, documents, and subjects. To make access to the problem area easier, there are several methods for correcting the same kinds of data errors. The edit options allow direct access to document, article, note, and subject fields for data editing. The view options allow indirect searches through the entries, with editing or deletion as desired. Because of the reentry potential of the data-entry process, it is easy to correct errors, either at the time of discovery or later.

The "change relationships" selection of the main menu is an extended editing facility that allows the user to delete a document, an article, a note, or a subject. Associated bookkeeping functions are handled automatically. This selection also allows the user to correct connections between notes, articles, and documents when he has failed to make the proper selection on entry. The final function is one that allows the user to correct the designation of a document as one that contains or does not contain articles.

Frequently, there are second and third parts of the literature-research phase. The second part consists of an analysis of the data gathered, with the third part being a redirected or more closely directed literature search. The system aids the analysis with view options and output options.

The RNS allows the user to view specific data that will help him find the desired notes. Three methods are provided: document/article orientation, subject orientation, and direct access based on key numbers (listed by two of the output methods). Because a user may wish to edit or delete data based on what he finds, the viewing selection connects to these functions for each data element.

Once the user reaches the final phase of his research, that is, compiling and summa-

rizing his results, the RNS provides an aid to the retrieval of the desired notes and references. The output data selection provides for six preprogrammed reports. Using a combination of subject restrictions, the user may output notes and references for those notes meeting the restrictions. The desired output may also be written to a computer file to be used with a word processing program; rekeying is thus avoided. Because the system uses dBASE III data structures, it is possible for the user to write his own report routines, accessing his data with dBASE III.

The cross-indexing of the notes and the computer storage means that follow-up research, or research on extensions of the first work, may start with some material gathered during the first project but not applicable to it. If the data is no longer needed, a utility function allows the user to remove it, leaving the structures for a fresh start. A more likely use of this utility would be to copy the entire disk and apply this procedure to the copy, thus saving the original data and providing for a new start.

There are several utilities available to the user. These provide control of the print format and data file selection. They also allow the user to purge those records marked for deletion and to remove all the data from the database to start a new research project.

CONCLUSIONS AND FURTHER AREAS FOR WORK

The RNS provides an easy-to-use method of maintaining cross-indexed notes, minimizing the time and space required for recording reference data. The data-entry system matches the needs and habits of a researcher with starting points at the document, article, or note level, each capable of invoking the others. Data entry minimizes typing by working with a menu structure and by allowing selections from lists of those references and subjects already entered. The choice and structure of the subject references are completely controlled by the user. Error handling consists of error prevention (in the entry process) and error correction, with full-featured editing functions for correcting each type of error that a user might make. Analysis of the data is provided by selection features available in the viewing and output functions, including printing of complete notes for a document or article or printing notes by subject. The system provides multiple access routes to the notes, both structurally (access method) and topically (through cross-indexing).

Although operation is relatively self-explanatory, the RNS includes a complete User's Manual[19] that covers field definitions, detailed operation procedures, and detailed setup procedures. The manual also contains many illustrations of the screens and messages as they appear sequentially for each operation.

Initial use has led to additional connections in the viewing process to make reviewing notes much faster. A new feature that will allow multiple users to work with copies of the system and with periodic data merges has been added. There are ways of handling menus and lists other than those incorporated in the current version of the RNS. These methods are more complex to implement and may be slower than those now in the system. They were omitted to avoid complicating the initial design and testing. With further use, other desirable features may be identified and added to the system.

Because dBASE III is an interpreted language, screen refreshes are slow; as the database grows larger, searches with selection criteria become slower. When the system has been used long enough to find and correct any errors, and all desired enhancements have been added and tested, the programs will be compiled. This will increase program speed while leaving the dBASE file structure available for user-written routines.

The RNS is available through the National Energy Software Center (U.S. Department of Energy, National Energy Software Center, Argonne National Laboratory, 9700 S. Cass Ave., Argonne, IL 60439) to all government agencies and their contractors. It is not currently available to private individuals; however, the Department of Energy and Oak Ridge National Laboratory are very interested in technology transfer to private industry. If

there is sufficient interest in the RNS, it may be made available to a private company for sale to the general public. Letters to the author will be used as evidence of such interest.

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Planning for Collection Barcoding in a Medium-sized Library

Andrea T. Weas

All state-operated colleges of arts and science (four-year colleges) in New York state were given funds in fiscal year 1987–88 for collection preparation and barcoding. The experiences of one of the twelve colleges (with a collection of approximately 325,000 titles) are described, detailing major decisions and outcomes of the project.

The library community is moving slowly and inexorably towards automation. Many libraries have already installed automated systems. According to *Library Journal*'s annual "Automated System Marketplace" for 1987, a total of 1,389 systems[1] have been installed by major vendors. Although the marketplace has continued to grow steadily since 1982,[2] this represents only a small fraction of the 31,475 libraries in the United States.[3] For the most part, only the very largest and the very smallest libraries have been able to automate to date. Many have yet to embark on the path to automation or are just now starting to plan for that future. The College Libraries at SUNY Geneseo comprise a medium-sized (380,000 volumes, thirty-one FTE staff) academic library. We smart barcoded our collection during a six-week project during the spring semester of 1988. Our experiences may be useful to others.

CHOOSING SMART BARCODES

The State University of New York (SUNY) four-year college libraries[4] received money for the first step (Collection Preparation) towards automation in fiscal 1987–88. Monies were to be utilized for an inventory of the collection and for barcoding. Although each college library was allowed to spend the money as it saw fit, some effort was made to advise librarians in their decision making. An important first decision was whether to use smart or dumb barcodes. As a starting point, Mary Beilby and David Ritchie of the State University College at Cortland drafted "Collection Preparation Considerations—SUNY Libraries." This document was edited and distributed by the SUNY Task Force on Major Library Automation,[5] a steering group for SUNY-wide automation. The task force also sponsored a workshop, "Collection Barcoding: Techniques and Strategies," designed to help librarians to decide between smart or dumb barcoding in light of their particular library's situation. Both smart and dumb barcode vendors gave presentations, after which case studies were presented by librarians from libraries using each of these systems. A decision chart (see figure 1) was distributed to help guide SUNY librarians in their final decision.

Because (1) we had completed (or very nearly completed) all retrospective conversion; (2) we felt that we had been consistent in the use of the holdings field, call number field(s), and title field; and (3) we had CANCELed records on OCLC at the time

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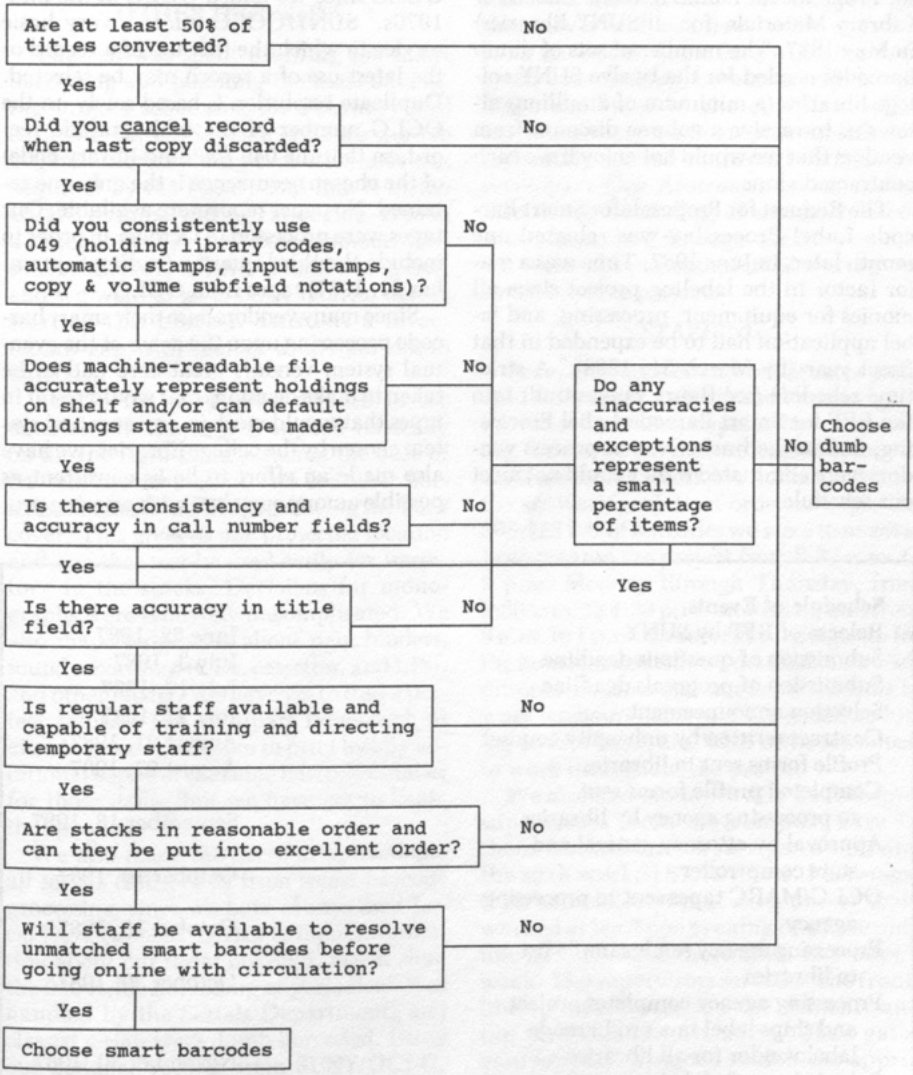


Fig. 1. Should I Choose Smart or Dumb Barcodes?

the last copy was withdrawn, we, along with four other SUNY college libraries, chose smart barcodes. In consultation with the Task Force on Major Library Automation, the Office of Library Services (State University of New York) released a Request for Proposals for Dumb Barcode Labels for Library Materials (for all SUNY libraries) in May 1987. The number of sets of dumb barcodes needed for the twelve SUNY college libraries (a minimum of 2 million) allows us to receive a volume discount from vendors that we would not enjoy if we each contracted alone.

The Request for Proposals for Smart Barcode Label Processing was released one month later, in June 1987. Time was a major factor in the labeling project since all monies for equipment, processing, and label application had to be expended in that fiscal year (by March 31, 1988).[6] A strict time schedule (see figure 2) was built into the RFP for Smart Barcode Label Processing, and in the final selection process vendors were eliminated if they could not meet our schedule.

The libraries that chose smart barcoding decided in the interest of time not to write an additional RFP for tape processing and instead to rely on SUNY Central to dedupe our OCLC/MARC tapes. These archive tapes have been stored for us at SUNY/OCLC since we joined OCLC in the mid-1970s.[7] SUNY/OCLC offers a very basic service in which the first use of a record or the latest use of a record may be selected. Duplicate resolution is based solely on the OCLC number of the bibliographic record, so that the 049 (holding-library code) of the chosen occurrence is the only one retained. No paper reports are available. Our tapes were processed in October in order to include the third-quarter (ending September 21, 1987) tapes from OCLC.

Since many vendors base their smart barcode processing upon the needs of the eventual system vendor, great care had to be taken to make decisions that would result in tapes that would work in any eventual system chosen by the college libraries (we have also made an effort to be as consistent as possible among ourselves with ongoing pro-

Schedule of Events

Release of RFP by SUNY	June 22, 1987
Submission of questions deadline	July 3, 1987
Submission of proposals deadline	July 17, 1987
Selection announcement	July 22, 1987
Contract written by university counsel	August 21, 1987
Profile forms sent to libraries	August 27, 1987
Completed profile forms sent to processing agency by libraries	September 18, 1987
Approval by attorney general and state comptroller	October 16, 1987
OCLC/MARC tapes sent to processing agency	October 16, 1987*
Processing agency sends sample list to libraries	October 30, 1987
Processing agency completes project and ships label tapes to barcode label vendor for all libraries	November 30, 1987
Sample barcode labels sent to libraries	December 11, 1987
Final production run of labels completed for all libraries	January 8, 1988

*This will allow for the deduping of the last quarter's tapes (ending September 21, 1987).

Fig. 2. Schedule of Events.

cedures). At the time decisions were being made, surveys of system vendors allowed us to feel comfortable with our choices of Code 39 barcode symbology, Modulus 10, Type 1 check digit, and the use of the 949 field for barcode item records.

OTHER DECISIONS

The fall was spent profiling for smart barcoding and planning the mass barcoding project scheduled for February and early March. On September 24 we were to begin dumb barcoding each item as it was acquired by the library and link it at the OCLC terminal during cataloging. Due to a series of problems with equipment, barcode readers did not arrive until December, and we were to go another quarter before starting this process. This left a three-month gap with neither smart nor dumb barcodes.

At SUNY Geneseo, we decided to use doubles. One barcode is applied vertically on the top right-hand corner of the back of an item near the spine, and the other horizontally inside on the page facing the back cover. This gives us one protected location and one that can be used easily for inventory in the stacks. Decisions for monographs were relatively uncomplicated. We also made judgments about pam binders, sound recordings (CDs, cassettes, and LPs), and other media. We have yet to find a perfect solution for multipart items such as kits. At present, we plan to print locally additional copies of the same barcode number for those items, but we have yet to begin that process.

We also made the decision to eliminate all serials (Bib 1v1 S) from smart barcode processing, since we have always used Local Data Records (LDRs) to input information about our serial holdings, rather than the 049 field. Barcoding of periodicals was handled by the Serials Department, and classed serials were dumb barcoded. Using our deduped records from SUNY/OCLC, we had a tape run containing serials only and contracted with SUNY Albany for a printout of each serial record on a single sheet of paper. We hand sorted these serial records into call number order by collection, then used the printouts instead of the shelflist to help maintain bibliographic control of the items and the barcodes as they were applied. In addition to the two barcodes placed on the item, a third was placed on the printout along with distinguishing enumeration and/or chronology information. When a system is eventually in place, linking, can be done at the terminal with the printouts and the volumes themselves will not have to be removed from the stacks. Some care will have to be given when linking, because students were often oblivious to the complexities of successive-entry bibliographic records and separately named multipart serials (the seven-part *Geo Abstracts*, for example). The dumb barcoding of serials followed smart barcoding through the library, and we were able to complete it during the smart barcode project.

STAFFING

From estimates of barcoding rates gathered from other sources[8] and knowledge of the time constraints imposed by state funding,[9] I determined that we needed to hire 80 students each to work ten hours a week for the six-week project in order to apply the 308,125 sets of barcodes we were to receive. We operated the project from 8:30 a.m. to 9 p.m. Monday through Thursday, from 8:30 a.m. to 4:30 p.m. on Friday, and from 9 a.m. to 1 p.m. on Saturday. As sign-up for the hours proceeded, we decided to hire additional students and not force students to work ten hours per week. We ended up hiring 104 students, and 90 of them continued to work throughout the project.

We also had money to hire six full-time supervisors from off campus. Five of them worked forty hours per week, and the sixth worked 27.75 hours. I arranged their schedules so that each one of them worked at least one evening or a Saturday but none worked more than five days a week. The supervisors served as the front-line interface between the students and the project administration. They gathered supplies, assigned students to appropriate sections of the library, did spot-checking for accuracy, and answered questions. They began work on February 1 in order to have a week of orientation and training before the students began work on February 8.

A decision was made to downplay training for the project. I drafted a set of instruc-

tions that fit on one side of a single sheet of paper (see figure 3). We did not schedule training sessions for the students but rather had the supervisors train them during their first scheduled work time slot. I was aware that after the project was under way, each team of students would find its own best way of working and that any lengthy instructions were certain to be ignored. In addition, finding one or even several time slots in which to train students in a group is nearly impossible because each student has a unique schedule.[10]

Even after repeated samples and proofs, we found that smart barcode processing left us with some interesting surprises. Some we discovered before the project began; others we did not even realize until problem resolution and cleanup began afterwards. One interesting problem is that final small x's have been suppressed in call number fields. This causes a large problem in one section of our collection that has locally defined Dewey-like numbers that can end with a small x. Others are computer-generated problems such as filing order: 1, *11*, 12 . . . 19, 2, 20, 21, etc., and the fact that records with call numbers in the 099 field cannot be interfiled with those having call numbers in other fields. None of these problems proved to be too serious during the mass project, although they did cause some inconvenience.

COSTS

3,625.25 hours were spent for the first pass of smart barcoding. This includes 272.25 staff hours (each member of the staff is to put in 15 hours over the life of the project) plus 3,353 student hours. 249,539 sets of barcodes were applied, representing 80.98 percent of those we received. In all, 293,640 sets of barcodes were handled (95 percent). The overall barcoding rate was 74.88 sets of barcodes applied per person per hour. The overall handling rate was 80.99 sets of barcodes per person per hour. Those that we did not handle are for items in several of our special collections plus approximately 2,925 sets of barcodes inexplicably printed for items which have been withdrawn (notably items from our former library science collection). I suspect that these latter problems are due to a glitch in SUNY tape processing, and with proper (but possibly complex) tape processing in the future, I hope that they will cause no further problem.

Smart barcoding is very cost-intensive up front, but the entire project can be completed within a year or less. The personnel cost of linking over a period of years is eliminated. Our total essential OTPS (Other Than Personal Service) expenditures for the year were $43,004.88. Tape processing and smart barcode production took the major part of this sum: $34,121.28. The remainder of the money was used to purchase dumb barcodes and barcode readers, to buy barcoding supplies, and to print problem cards. We were able to pay students $4.00 an hour (about $ .50 an hour more than most student jobs locally) as an incentive to keep the students coming back to work over the duration of the project. The total student payroll was $23,664.50. Although we hired six supervisors, the project could have been run with fewer. We could possibly have run it with two, and four definitely would have been enough. We were able to utilize fully the supervisors' time by using them to work on some problem barcodes and to organize the printouts for dumb barcoding. The total payroll for supervisors was $12,354.61.

If all of the essential project expenses are considered, the cost was less than $ .32 per book actually barcoded during the six weeks. The cost was just about $ .27 per book handled. Although we must still come up with personal service money to attach the remainder of the barcodes, all of the processing is complete, and we can handle items as they are returned from circulation. Because our budget was set for us externally (and before vendors were selected and actual costs were known), we did not have the normal pressures of the budget upon us. Although time was a major limiting factor for us, money was not.

CONCLUSIONS

Because we did not make any attempt to recall books before beginning the project,[11] three students and I have been working to barcode all items as they are returned from circulation. We have been able to apply approximately 375 sets of smart barcodes per week to date. This process also turns up

1) Barcoding will be done in teams of two.

2) Sign in, then take a book truck equipped with the following items to your assigned area: barcode label sheets, clipboard, problem cards, pencils.

3) One team member (the reader) will read the entire call number on the barcode label, including the volume number (if any), the year (if any), and copy number (if any). The other team member (the searcher) will check the shelf for the item. the searcher will hand the item to the reader who will verify the call number of the item and apply the two barcodes. If you find a system that works better for you, use it, but follow the remainder of the directions below.

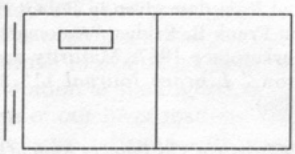
4) EACH CHARACTER OF THE CALL NUMBER ON THE BARCODE MUST EXACTLY MATCH THE CALL NUMBER ON THE ITEM.

5) PLEASE NOTE: Volume numbers are often in computer order, i.e.: 1, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 2, 20, 21, etc. Please be careful with these.

6) There are two barcodes. One will go on the back cover vertically (see diagram 1), then open the back cover of the book and apply the second horizontally on the page facing the inside of the back cover (see diagram 2).

1)

2)



7) If one of the following problems occur, leave the barcodes on the sheet, and fill out a problem card:

A) any line of the call number does not match,
B) the title on the barcode label varies greatly from that on the title page of the book,
C) you do not know where to put the barcodes on the item, or the barcode will cover text (if this happens, do not apply either barcode to the item),
D) the item is already barcoded.

8) If you find an item on the shelf for which there is no barcode, check to see that it is shelved correctly, if it is, fill out a problem card.

9) When you find incorrectly shelved items, give them to the supervisor.

10) If you run across an item with barcodes already attached, continue with the next item on the shelf. There should not be a smart barcode for that item.

11) After barcoding, return item to the shelf.

12) If you have a problem not covered by these instructions, report it to the supervisor.

13) At end of session, return your book truck, rubber band your problem cards together, and sign the log. Please leave enough time to do this before the next teams arrive.

14) If you cannot work your hours, you must find someone to take your place (a file of schedules will be available 8:00-4:00 in Janet Neese's office). Failure to report for work may result in termination.

Fig. 3. Smart Barcode Label Application Procedures.

problems which I am working to resolve as they appear. The problems include (in descending order of occurrence): (1) call number errors (this is by far the largest group); (2) records produced during "the gap" (September-December 1987) that were covered by neither smart nor dumb barcoding; (3) multivolume sets that were incorrectly identified in the 049 field; (4) items which have never been converted; and (5) "bound togethers." With the exception of the items from "the gap," I have been completely editing and updating the bibliographic record on OCLC for these problems. "Bound togethers" remain problematic, and we have not come up with a workable solution for them. For now, we are dumb barcoding them and hoping that our eventual local system will provide a solution.

The College Libraries at SUNY Geneseo now has a sizable portion of its collection (250,000 + items) barcoded and linked. Another large group of items (serials and additional copies) has been barcoded and controlled to some degree (22,500 + items). In my opinion, smart barcoding was a very efficient use of our fiscal 1987-1988 collection preparation funds.

ACKNOWLEDGEMENTS

My thanks go to Mary Beilby and David Ritchie, State University College at Cortland (New York), who did much of the writing and research upon which the rest of us relied throughout the project.

REFERENCES AND NOTES

1. Extrapolated from data given in Robert A. Walton and Frank R. Bridge, "Automated System Marketplace 1987: Maturity and Competition," *Library Journal* 113:34 (April 1, 1988).
2. Ibid., p.33.
3. Based on 1986 data in *The Bowker Annual of Library & Book Trade Information, 1987* (New York: Bowker, 1987), p.354.
4. Located in Brockport, Buffalo, Cortland, Fredonia, Geneseo, New Paltz, Old Westbury, Oneonta, Oswego, Plattsburgh, Potsdam, and Purchase.
5. This Task Force, originally formed by the directors of the SUNY four-year college libraries, convened for the first time in January 1986. It underwent several structural and titular changes from its inception as a six-member group (five staff librarians and one library director, all from the four-year colleges) to a final ten-member group (three staff librarians and three library directors from the colleges, plus representatives from the specialized colleges, the community colleges, the agricultural and technical colleges (two-year), and the university centers). In addition to helping to edit this document, designed to help libraries make collection preparation decisions, the Task Force wrote a White Paper on Library Automation that was sent to all SUNY college presidents and compiled a Requirements Document (a pre-RFP wish list).
6. Although money for equipment could be encumbered, the personal service money used to pay students and outside supervisors during the barcode project could not. All barcode application had to be completed within the fiscal year time frame.
7. SUNY Geneseo joined OCLC on November 20, 1974. All of the other colleges joined between September 30, 1974, and February 26, 1975.
8. I had gathered estimates from a sister institution (3–4 per minute per team of two), from another university (72 + per hour), and from ARL's SPEC kit *Barcoding of Collections in ARL Libraries* (Washington, D.C.: Office of Management Studies, Association of Research Libraries, 1986). Like the authors of the SPEC Kit, I decided that "(s)ince there was such a wide range in responses, there seemed to be no safe average production rate" (p.5) and felt little confidence in any of the estimates. We were also applying doubles, and this information was often not specified. I was forced, however, to make hiring decisions, so I decided to use the more conservative estimate of 72 + per hour.
9. In addition to the March 31 deadline, classes for the spring semester at Geneseo did not begin until January 27, and with the drop and add period not completed for another week, we did not feel that we could begin the project before February 8.
10. Now that the project is completed and I can look back at the results, I am very pleased with the accuracy of the student workers that we hired and am glad that we did not put more effort into training. Barcoding is very much work that is learned best on the job.
11. This will be done during fall semester 1988 to help wrap up the project. ■■

Communications

Conversion of Batch Records for Use in an Online System

Halcyon R. Enssle and Lou E. Anderson

This article will describe the process used to convert machine-readable records from a batch-mode circulation system into brief circulation records for use in an online system. The methods used were somewhat unique in that they allowed us to create a temporary database for use with the online system prior to the loading of our bibliographic database. In this way we were able to begin circulation using NOTIS (Northwestern Online Total Integrated System) more than two years before our bibliographic data would eventually be loaded. Procedures described here may be useful to other libraries in bringing up an online circulation system prior to a full database load.

BACKGROUND

The charge to the committee at Colorado State University Libraries was to study alternatives to the circulation system then in use. The system was a batch-mode system, supplied by Mohawk Data Systems, developed locally, and in use at that time for seven years. Hollerith-coded book cards and user IDs formed the basis of the circulation transactions, which were captured on magnetic tape and processed daily by the university computer center. The daily tape was merged into a master tape, which then became the basis for a yearly history file of circulation transactions.

As planning for an online system matured, the urgency of replacing the Mohawk circulation system became more acute. Because of such factors as the Mohawk system wearing out, replacement parts becoming unavailable, and service no longer being supplied, an administrative decision was made not to wait for conversion of our bibliographic records (in machine-readable form since 1977, first with OCLC and then in 1980 with RLIN).

The committee was given a mandate to continue to evaluate online systems, with circulation as the highest priority and the focus of our investigations. Initial conversations were begun with vendors, and it soon became apparent that some sort of a database would have to be developed, since the circulation system would not have an online bibliographic database to use as the basis of conversion.

In the development of a conversion plan to create circulation records for our online system, several factors were considered paramount. First, it was very important to utilize as much machine-readable data as was available. Second, patron inconvenience in the switchover must be minimized. Last, it was extremely important to have as many records as possible of items which would circulate in the database. With these factors in mind, we explored all possible avenues for using available machine-readable records as a basis for the new circulation system.

We found two main sources of machine-readable records—OCLC/RLIN tapes from 1977 on and a large file of brief circulation history records dating back for nine years. In addition, we had the ongoing capability of creating new records for circulation by adding an OCR number to RLIN records as they were created; this was begun in March 1983. Since the bibliographic

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data load would follow the implementation of the circulation system, it was important to find a way to create records for items which would circulate, without jeopardizing the integrity of the bibliographic records.

It was decided that this could be accomplished by focusing on the creation of item records—the lowest-level record in the "physical" hierarchy. These could later be matched by call number to the full bibliographic record and linked to that record when our archival tapes were processed and loaded.

Since it was important to identify items which would circulate, a deduped tape was generated of brief records (call number and brief title) from the past three years of the circulation history file. The resulting tape gave us 181,344 records of items which had circulated during this period. This tape was used to create a book-image file in call-number sequence that reflected a record for each unique call number. Each unique record was also given a page and line number as an additional identifier.

From this a report was generated (appendix A) that was used by library personnel to attach a second (duplicate) OCR label next to each entry as the first label was attached to the book. It was decided to work in teams of two, with one person reading the call number from the printout and the second locating the volume and reading the call number back for verification. A detailed one-page instruction sheet (appendix B) was developed for use by students and full-time staff working on the project. Log sheets (appendix C) were also used to track sections of the 7,556-page report through the labeling process. By logging sections of the report, several teams could work in different call-number sequences at the same time. In addition, the OCR numbers in the books were coded to show the origin of the record. (Items processed through the history file were coded "H"; those receiving labels in the cataloging process were coded "F," to indicate full records.)

As the report was processed, sections were sent to University Information Systems (appendix D), where the OCR number, page number, and line number were input and merged back to the book-image file, using the page number and line number as matching points.

Image file:
pg. no. line no. call no. title
OCR file:
pg. no. line no. OCR no.

The final merged tape thus reflected the call number, title, and OCR number that had been attached to the physical piece.

call no. title OCR no.

During the development of this methodology, our consultant from Information Systems proposed a second method for capturing OCR data which could be entered into the online system for circulation purposes. As material was returned after checkout, the Hollerith cards were read at a discharge station to capture the discharge information. A modification of the software allowed us to use this same procedure to capture OCR information and link it to the call number and title of the physical piece. By entering a one-digit code on the keyboard of the terminal (C-Dek) and the significant digits of the OCR number, the Hollerith card could be read a second time and the OCR number attached to a record on magnetic tape for each piece. Since much of the work of keying in this information was to be done by student workers, a detailed instruction sheet was prepared (Appendix E) for use by staff and students. Records created at the C-Dek were coded "C" to indicate the source of the record. As these records were created containing call number, brief title, and OCR number, they were then pulled off the circulation tape using the one-digit code as identification and merged with the tape created from the circulation history file, resulting in a single database for use in the online system.

RESULTS

The project began in January 1983. By March 1984 the entire report generated by the history file tape had been processed through the stacks and keyed by information systems staff. The final number of records created from the history printout was 100,454, or 55 percent of the total number of unique items identified. (No attempt was made to re-search items which were not located on the first search in the stacks.) During the period of time from December 1982

through December 1984, an additional 74,223 records were created at the point of discharge using the C-Dek. Sample surveys were kept during this process to examine the hit-rate which was being reached. The first sample, taken approximately three months after beginning the labeling process (March 1983) showed that 29 percent of the material circulating already had an OCR label attached to the piece. Nearly one year later (February 1984) the percentage of items which had circulated at least once after being labeled had risen to between 65 and 70 percent. This showed that we were, indeed, targeting the material most likely to circulate after we went online.

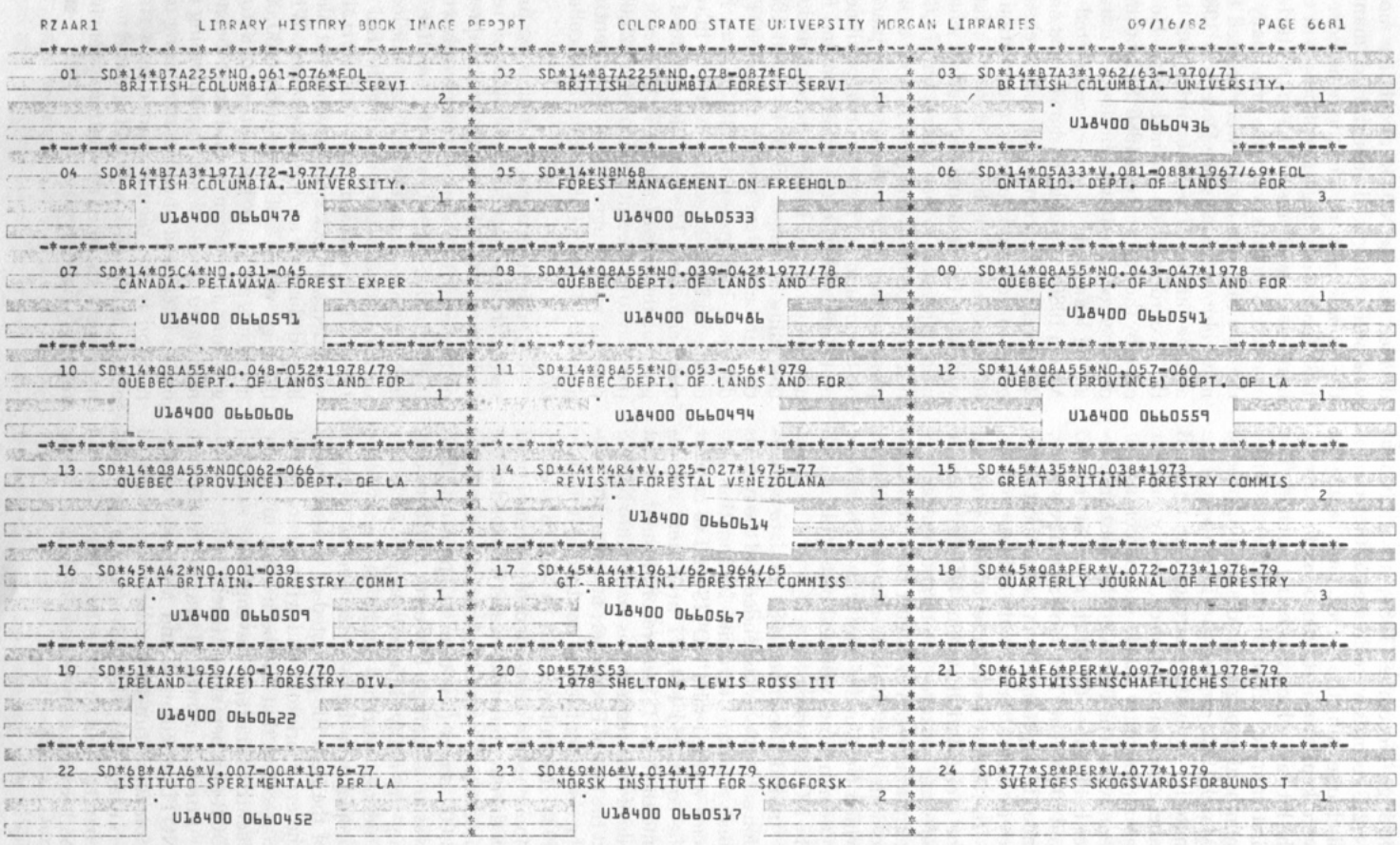
In 1984 we issued a request for proposal for a circulation system. NOTIS was the software package chosen, and contract negotiations began in August 1984. It was determined that the data-conversion efforts, which were under way with a Dataphase system in mind, would also be applicable to the NOTIS system.

In mid-December 1984 all data conversion activity was suspended and the systems analyst from University Information Systems worked with NOTIS staff to convert the combined 174,677 brief item records into the NOTIS item record format. A test file of item records was loaded into NOTIS at the end of December; however, the production item file was not loaded until July 1985, due in large part to NOTIS production schedule delays in completion of parts of the circulation software. The load of the production item file generated only about 3,000 errors (less than 1.7 percent). This was an amazingly low error rate considering the many different people, including students, working on the data conversion project over the two-year period. Cleanup of the item file consisted of working with the error printout and with a card file of corrections that had been made to catalog records for items having been assigned OCR numbers since March 1983.

For the month of August 1985 both NOTIS circulation and Mohawk circulation were run in parallel mode with all transactions, including charges, discharges, holds, recalls, etc., being done on both systems. By the end of August, it was decided that the NOTIS circulation mode was performing well enough to dismantle the Mohawk system. For the remainder of 1985 there were long lines of people at the loan desk waiting to have materials charged. The lines were due principally to the fact that no records were created for new volumes added since December 1984, and the number of items requiring "on-the-fly" record creation seemed large. However, by the beginning of 1986 the long lines disappeared, and it was "business as usual" at the loan desk. A survey conducted in March 1986 (Appendix F) showed that only 22 percent of the items presented for checkout at the loan desk required the creation of item records. This happy state of affairs was due to the data conversion effort which made it possible to load records for 174,677 heavily used items into NOTIS prior to implementation and to the emphasis placed on the creation of item records for all new materials added to the collection and for any materials sent to a commercial bindery beginning in August 1985. By April 1986 the number of item records in the NOTIS database had grown to 245,389, an increase of 70,712 records over the initial number loaded. The item file continued to grow at the rate of almost 75,000 records per year to its present count of over 425,000 records as of August 1988, representing about 28.6 percent of the total book collection.

A combination of circumstances has prevented the loading of our bibliographic records into NOTIS and the subsequent matching of the unlinked item records with bibliographic records and the creation of linked item records. The bibliographic load was tentatively scheduled for the fall of 1988. It is certain that the mortally wounded Mohawk system would not have limped along for another three years. With the high volume of circulation (430,000 checkouts per year), having to go to a stopgap manual system would have been a nightmare for us. While implementing an online integrated library system using our method is not recommended as a first choice, it did work well and allowed us to implement an online circulation system in a relatively painless way. ■■

APPENDIX A. LIBRARY HISTORY BOOK IMAGE REPORT



RZAAR1 LIBRARY HISTORY BOOK IMAGE REPORT COLORADO STATE UNIVERSITY MORGAN LIBRARIES 09/16/82 PAGE 6681

01 SD*14*87A225*NO.061-076*FOL BRITISH COLUMBIA FOREST SERVI 2	02 SD*14*87A225*NO.078-087*FOL BRITISH COLUMBIA FOREST SERVI 1	03 SD*14*87A3*1962/63-1970/71 BRITISH COLUMBIA. UNIVERSITY. 1 U18400 0660436
04 SD*14*87A3*1971/72-1977/78 BRITISH COLUMBIA. UNIVERSITY. 1 U18400 0660478	05 SD*14*N8N68 FOREST MANAGEMENT ON FREEHOLD 1 U18400 0660533	06 SD*14*05A33*V.081-088*1967/69*FOL ONTARIO. DEPT. OF LANDS FOR 3
07 SD*14*05C4*NO.031-045 CANADA. PETAWAWA FOREST EXPER 1 U18400 0660591	08 SD*14*08A55*NO.039-042*1977/78 QUEBEC DEPT. OF LANDS AND FOR 1 U18400 0660486	09 SD*14*08A55*NO.043-047*1978 QUEBEC DEPT. OF LANDS AND FOR 1 U18400 0660541
10 SD*14*08A55*NO.048-052*1978/79 QUEBEC DEPT. OF LANDS AND FOR 1 U18400 0660606	11 SD*14*08A55*NO.053-056*1979 QUEBEC DEPT. OF LANDS AND FOR 1 U18400 0660494	12 SD*14*08A55*NO.057-060 QUEBEC (PROVINCE) DEPT. OF LA 1 U18400 0660559
13 SD*14*08A55*NOC062-066 QUEBEC (PROVINCE) DEPT. OF LA 1	14 SD*641*M4R4*V.025-027*1975-77 REVISTA FORESTAL VENEZOLANA 1 U18400 0660614	15 SD*45*A35*NO.038*1973 GREAT BRITAIN FORESTRY COMMIS 2
16 SD*45*A42*NO.001-039 GREAT BRITAIN. FORESTRY COMMI 1 U18400 0660509	17 SD*45*A44*1961/62-1964/65 GT. BRITAIN. FORESTRY COMMISS 1 U18400 0660567	18 SD*45*08*PER*V.072-073*1978-79 QUARTERLY JOURNAL OF FORESTRY 3
19 SD*51*A3*1959/60-1969/70 IRELAND (EIRE) FORESTRY DIV. 1 U18400 0660622	20 SD*57*S53 1978 SHELTON, LEWIS ROSS III 1	21 SD*61*E6*PER*V.097-098*1978-79 FORSTWISSENSCHAFTLICHES CENTR 1
22 SD*68*A7A6*V.007-008*1976-77 ISTITUTO SPERIMENTALE PER LA 1 U18400 0660452	23 SD*69*N6*V.034*1977/79 NORSK INSTITUTT FOR SKOGFORSK 2 U18400 0660517	24 SD*77*S8*PER*V.077*1979 SVERIGES SKOGSVARDSFORBUNDS T 1

APPENDIX B. PROCESSING HISTORY PRINTOUT

Code to be entered next to label in book: "H" (in ink)

1. Take a section of the printout to the stacks on a truck, along with a supply of OCR labels.

2. The labels are produced "double up" e.g. two labels will have exactly the same number.

3. Working in pairs, one person will read off a call number from the printout which the other searches the stacks for the book.

4. If the book cannot be located, write the month and day (in pencil) above the call number and to the right (in small figures). See example (a) below:

```
**************************************************
*                                                *
*                    (a) 11/82                   *
*  17  QE * 181 * A33 * No. 001 * 1961           *
*                                                *
*             BIG CREEK                          *
*                                                *
*       (b) U184 123456789                 1     *
*                                                *
**************************************************
```

5. Move on to the next call number on the printout. When you find a match the person checking stacks will read the call number back to the person checking the printout for verification! If there is an exact match:

   - Take one pair of OCR Labels.
   - Place one Label on the book in the upper left hand corner of the inside front cover. Code the Label "H" at the right hand end of the label.
   - Place the second label under the title of the piece on the printout. (See b on example.)

6. Ignore any periodical titles on the printout. They will have the letter PER following the call number.

7. If you do not have an EXACT MATCH between the call number in the printout and the book, do NOT put a label in that book. Pay particular attention to COPY NUMBER, DATE and VOLUME NUMBER.

APPENDIX C. LOG FOR WORKING HISTORY FILE

DATE	NAMES	TIME ON	TIME OFF	START PAGE #	END PAGE #

APPENDIX D. HISTORY FILE LOG

Pages	Labeled	Sent to I.S.	Returned from I.S.	Reserve	Transferred to OCLC/RLIN Merge List

PS: 90(82)

APPENDIX E. INSTRUCTIONS FOR ENTERING OCR NUMBERS ON C-DEK

1. Enter code on keyboard:

Column	1	2	3	4	5	6	7	8	9	10	11	12	13
Code	1	Leave blank	4	0	0	0	Last seven digits on OCR label						

2. Lock in keyboard. (Final digits of the OCR number for each book will have to be changed, but the rest of the keyboard will remain the same.)

3. Check the call number on the computer card against the call number on the spine of the book.

4. Peel an OCR label from sheet and place in the upper left hand corner of the inside cover.

5. Key in the OCR number.

6. Enter card.

7. Press red bar,

    a. If you get a red error light, try card one more time. If you get a second red light, give the book to a supervisor.

    b. If you accidentally enter the same OCR number for two different books (for instance, if you enter a card for a second book and then realize that you did not change the keyboard from the previous book's OCR number), fill out a slip with the call number of the second book and the OCR number on the first book. This will allow us to delete the incorrect OCR number from the record of the second book. You may now enter an OCR number for the second book.

    c. If you enter an incorrect OCR number, then fill out card with the call number of the book and the incorrect OCR number. Then enter the OCR number correctly.

8. Write "C" in ink to the right of OCR label to indicate the OCR number has been entered in the C-Dek. If the book cover has a dark background, write a small "c" lightly in the upper left corner of the OCR label.

9. When you are done, clear keyboard, and give all books with errors and error cards or slips to a supervisor.

NOTE: - Periodically check keyboard to be sure all columns are correct.
- If there is an "H", "C", or "F" already written beside the label don't re-enter on C-Dek.

APPENDIX F. SAMPLE SURVEY

Monographs with computer cards which have circulated at least once after receiving OCR Labels.

Date	Call No.	Total	C-Dek	%	History PO	%	Total	%

PS: 91(82)

News and Announcements

AMIGOS Adds RLIN Conversion Services

AMIGOS Bibliographic Council, Inc., has added RLIN as a database option for retrospective conversion projects performed by AMIGOS' Bibliographic Resource Center. A recently established agreement between AMIGOS and the Cooperative Library Agency for Systems and Services (CLASS) provides AMIGOS with online shared cataloging access to RLIN (Research Libraries Information Network). AMIGOS will use this access to perform retrospective conversion projects for existing RLIN users.

RLIN users can contract directly with AMIGOS for the desired retrospective conversion project, which may include a wide range of customized editing and data entry services. AMIGOS will access the RLIN database via leased lines provided by CLASS and will perform all conversion activities under clients' RLIN computer accounts. CLASS is providing startup support for AMIGOS staff to ensure that all work conforms to RLIN standards. ■■

Carnegie Mellon University Libraries Receive $1.2 Million Pew Grant

The Carnegie Mellon University Libraries have received a $1.2 million grant from the Pew Charitable Trusts of Philadelphia for a three-year project to develop a state-of-the-art automated library system.

The current Library Information System (LIS) used by Carnegie Mellon Libraries provides automated access to the library catalog, the *Academic American Encyclopedia*, *American Heritage Dictionary*, bibliographic databases produced by the Information Access Company, and several local databases, including the campus directory.

The Pew Memorial Trust grant will support the development of LIS II, which will offer several improvements to this computer system, including

- an expansion of resources and reference material available to users;
- the capacity to store and display the full text of a document;
- a user interface to incorporate the power of personal computers and the campus "Andrew" computer network;
- better integration with word processors; and
- the use of cost-saving server computers instead of a central mainframe. ■■

OCLC Begins Field Test of the EPIC Service in Six Libraries

On May 15, six libraries began participating in a field test of the EPIC service, an online reference system that will provide subject access to a variety of databases including the OCLC Online Union Catalog. The field test sites are:

Arthur D. Little, Inc.
Cambridge, Mass.

Bailey-Howe Memorial Library
University of Vermont & State Agricultural College
Burlington, Vt.

City of Pasadena Department of Information Service Library
Pasadena, Calif.

Indiana Cooperative Library Services Authority (INCOLSA)
Indianapolis, Ind.

Northwestern University Library
Evanston, Ill.

School of Information & Library Science
University of North Carolina at Chapel Hill

The field test is scheduled to last 12 weeks. During and after the field test, the service will be refined based on the experi-

ences and comments of the field test participants. The OCLC EPIC service is expected to be available in January 1990.

Designed as a reference tool to be used in all types of libraries by librarians, scholars, and researchers, the EPIC service will feature a variety of databases and offer a choice of interfaces to accommodate expert, casual, and novice users.

The field test began with a 9-million record segment of the OCLC Online Union Catalog. As the field test progresses, additional records will be added. The entire 19-million record OCLC database will be the first database available to EPIC users for in-depth searching by keywords and phrases. It is a multidisciplinary database with more bibliographic records in a wider range of subjects and formats than any other information source.

EPIC service features will include:

Keyword and phrase searches including subject fields
Boolean operators
Adjacency operators
Range searching
Right and internal truncation
Nested searching
Browsable indexes
Multiple record formats
User-defined formats
Command stacking
Online and offline prints
Saved searches
Practice files
Estimated time and cost at logoff
Online help

Three search protocols will be supported: a command interface using the proposed NISO Common Command Language for Interactive Information Retrieval (Z39.58-198x), a menu driven interface for the novice or casual searcher, and the Search CD450 interface. The EPIC service will be accessible via dial-access terminals and via any terminals on the OCLC dedicated-line network, including Model 1xx terminals. ■■

The MELVYL Catalog's Five Millionth Record

The MELVYL catalog, the online library catalog serving the University of California's nine-campus system, has acquired its five millionth book record, continuing the database growth and expansion that has made the catalog one of the largest online public access systems in the nation.

The five millionth book record is *Guide to Integrating Digital Services: T1, DDS, and Voice Integrated Network Architecture* by Robert L. Dayton. New York, N.Y.: Intertext Publications: McGraw-Hill 1989.

In addition to book records, the MELVYL catalog contains over a half million serials records, as well as records of other UC materials, such as maps and music. It also holds book records of the California State Library and, in the MELVYL MEDLINE database, the current three-year file of the National Library of Medicine's MEDLINE database, with over 600,000 article citations indexed from over 4,000 health sciences journals.

As of May 1, 1989, the number of book records in the catalog was 5,011,183, representing approximately 9,733,400 holdings, while for periodicals the number of records was 622,127, representing approximately 1,175,456 holdings. ■■

OCLC Introduces Version 3.0 of Search CD450

OCLC has introduced Version 3.0 of its Search CD450 retrieval software. According to OCLC, Version 3.0 is faster and easier to use than earlier versions of Search CD450.

Version 3.0 features include

- Faster searching with significantly improved access performance and record display;
- Improved use of multiple term searching from the index;
- Browsable indexes and new entry format for searching specific fields and phrases. This will enable Search CD450 to work with the EPIC service, the new online reference searching system to be released in 1990;
- A new "pull" feature allows use of any term or terms from a displayed record for a search, eliminating retyping;
- A brief results listing from which the user selects the records to view or print;

- Automatic timeout option;
- Automatic saving of searches for use with other Search CD450 databases;
- Limited and embedded truncation;
- An improved system administration module consistent with the basic searching system design; and
- Version 3.0 will also support the ISO 9660 standard (Information processing—Volume and file structure of CD-ROM for information interchange).

Current subscribers will receive all new compact discs, software, and documentation. New subscribers will receive this new version beginning in June.

OCLC now offers 16 databases in the Search CD450 series for agriculture, education, science and technology, and general reference. ■■

Collection Analysis Compact Disc System Introduced

Collection Analysis CD, a new compact disc-based collection analysis tool developed by OCLC, was introduced at the Association of College and Research Libraries' fifth national conference in Cincinnati, Ohio.

Collection Analysis CD allows OCLC-member academic libraries to compare their collection development activity against representative holdings of predetermined peer institutions, based on bibliographic and holdings data derived from the OCLC Online Union Catalog. In addition to the standard peer groups provided by the system, subscribers may define a peer group of their own choice.

An interactive microcomputer format enables subscribers to conduct hands-on analyses at the local level. The analyses generate statistical data that describe user and peer group holdings within subject categories based on Library of Congress classification and the National Shelflist Count. Bibliographic listings can also be produced. ■■

MultiLIS Installation in Academic Consortium

MultiLIS Corporation has announced the installation of its integrated library system at Hobart & William Smith Colleges in Geneva, N.Y. The implementation will include the online catalog, cataloging, authority control, circulation, and the report generator for the colleges, plus the holdings of four libraries in the region. The software is operational on a VAX 8530 under the VMS operating system.

Paul W. Crumlish, director of the colleges, states that "with two years' experience using the LePac CD-ROM Public Access Catalog, we have a very good idea what our students want and need in an online public access catalog—powerful searching capability presented in a useable manner. We feel that the multiLIS online public access catalog contains the appropriate level of search power for our collection size. The users' ability to choose either menu or command searching provides the flexibility needed to accommodate both the novice and the experienced searcher. We have been impressed with the thoroughness and mastery of the software by both support and development staff, plus the company's commitment to the continued development of multiLIS. In sixteen months of dealing with the company, we have seen substantial enhancement of multiLIS' functionality." ■■

ARL Reaffirms Statement on Unlimited Use and Exchange of Bibliographic Records

At the February 1989 meeting, the board of directors of the Association of Research Libraries (ARL) reaffirmed the association's endorsement of a statement on the unlimited use and exchange of bibliographic records (adopted by the ARL Board of Directors, February 3, 1987) and adopted an addendum outlining specific goals to underscore ARL's commitment to the principle of unrestricted access to bibliographic records.

ARL believes that systems of scholarly communication are more effective when bibliographic records are available to librarians and scholars regardless of the system in which they reside. Access to the machine-readable bibliographic records created by member libraries and maintained in bibliographic utilities is the key-

stone for the implementation of programs for cooperative action in collection management, resource sharing, and preservation of research library materials. Access to these machine-readable bibliographic records is also the foundation for the establishment of a true North American database of bibliographic records via electronic links.

Copies of the statement are available from the ARL Office. Please enclose a stamped self-addressed envelope with the request for the statement.

The Association of Research Libraries is an organization of 119 major research institutions committed to strengthening and extending the capacities of research libraries. Members include 107 large libraries, the national libraries of the United States and Canada, and a number of public and special libraries with substantial research collections. ■■

Baltimore County Community Information File on Auto-Graphics CD-ROM

Baltimore County Public Library's Community Information File has been converted to electronic form and is being tested as a CD-ROM directory. The BCPL project, an application of Auto-Graphics' IMPACT public access catalog system, uses newly developed CD-ROM software for information and referral databases.

The file was formerly available only in print form, in four boxes of 5-by-8-inch cards housed at BCPL's fifteen full-service branch information desks. Because access was limited to one person at a time and required prior knowledge of the file in order to use it, BCPL staff have been its primary users.

The file, which was converted using Auto-Graphics' online bibliographic systems, contains information about the programs and services of 2,600 county, state, and national organizations serving the interests and needs of the citizens of Baltimore County. It emphasizes county government departments and their services. Information on agencies listed can be accessed either by agency name or type of service. Because the file's records are structured in a MARC format, they are compatible with MARC bibliographic structures in IMPACT and can thus be accessed by users with the same search interface and equipment as their library catalog.

In addition to BCPL branches, the standalone catalog/Community Information File will be placed in Baltimore County's departments of aging, family resource coordination, citizens' assistance, and family information and assistance to aid their delivery of human services. ■■

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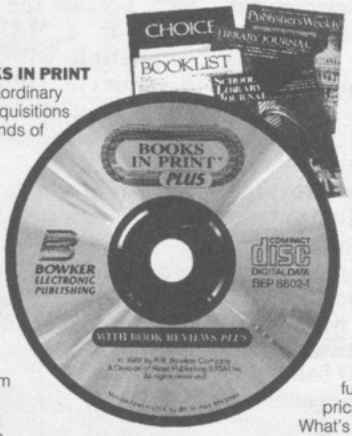

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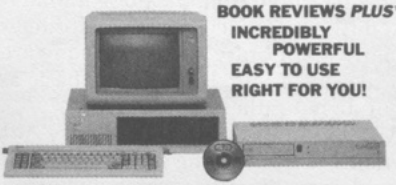

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Recent Publications

Book Reviews

Advances in Library Automation and Networking: A Research Annual. Ed. by Joe A. Hewitt. Advances in Library Automation and Networking, v.1. Greenwich, Conn., and London: Jai, 1987. 232p. $28.25 (indiv.) $56.50 (instit.)(ISBN 0-89232-385-X).

In his introduction to ALAN, *Advances in Library Automation and Networking*, series editor Joe Hewitt presents this first volume in a projected series of monographs as an attempt to intersect two highly developed technologies—the technology of bibliography and the technology of computers and telecommunication. Aimed at the "informed nonspecialist," the professional whose area of expertise resides in one of the many related to library automation and networking, this collection of articles attempts to provide the reader with the information that is needed to acquire a sound, realistic understanding of the effect automation is having on the traditional practice of bibliography. Highlighting the intersection of traditional and new technologies, advancing an understanding of library technology to the nonspecialist and projecting the impact that automation and networking may have on library services are ALAN's stated goals.

The articles begin with an historical review of the Linked Systems Project. Sally H. McCallum traces the history of the attempt by the Library of Congress to search for a medium to enable cost-effective system-to-system communication that would facilitate sharing the records generated by WLN, OCLC, and RLIN. Succinct presentations of both the technological and political history make for crisp, informative background material. This paper is followed by articles authored by Larry L. Learn, Robert P. Holley, and Sue A. Dodd, which in sequence review the impact of telecommunication on library and information systems, analyze classification in relation to the implications it has for the online catalog, and analyze the process of extending bibliographic control to machine-readable datafiles. Here all three of the authors adopt Larry Learn's concept of "advanced introduction" in clarifying issues of technology and terminology.

The last set of articles is more conceptual in nature. Michael Gorman examines the organization of academic libraries in the light of automation and rediscovers the law of inertia. Ruth M. Katz reviews trends in the development of state networks and notes that success will most likely come when an aggressive state librarian champions the cause, but only if the political and financial climates are right. Joe A. Hewitt and John S. Shipman conclude that based upon the results of questionnaires sent to major academic libraries, the "idea" of collection development has been widely accepted, but specific approaches and set policy are still ill-defined.

The articles are all sound and of high quality, yet the composite result is somewhat unsatisfactory. Perhaps ALAN has been too successful in its goal to speak to the "informed nonspecialist." In those areas where my knowledge was that of the generalist, I benefited from the presentation but had difficulty in focusing that information to particular library concerns. In my areas of expertise, I found the articles basic and accurate but rather uninformative.

Volume I of *Advances in Library Automation and Networking* saves the librarian from doing a literature search and arranging for document delivery. It is a collection destined for the supplemental reading lists of appropriate library and information science courses. In conclusion, Joe Hewitt has assembled a collection of articles for the in-

formed nonspecialist who has an eclectic taste in professional reading.—*Joseph McElroy, Serra Cooperative Library System, San Diego, California.* ■■

Bennett, George E. ***Librarians in Search of Science and Identity: The Elusive Profession.*** Metuchen, N.J., and London: Scarecrow, 1988. $25 (ISBN 0-8108-2075-7).

Bennett's book, an interpretive and historical study of efforts within academic librarianship to establish a secure professional identity, is unusual on several counts. First, the opening and closing chapters are in dialogue form. Given the subject matter and the approach, this technique works well. The dialogue of the opening chapter draws the reader into the issues of the book, while also unfolding a complex method for their treatment. Moreover, the informality of the final chapter enlivens the presentation of Bennett's concluding ideas.

Second, Bennett brings to the subject an uncommon approach to library literature, hermeneutics. Hermeneutics, or textual theory of interpretation, is a major movement in modern philosophy. Martin Heidegger and Hans-Georg Gadamer are the best known philosophers in this tradition. Hermeneutics, originally developed by nineteenth-century philologists, biblical scholars, and legal historians as an application of critical interpretive canons to classical literature, biblical texts, and legal documents, has been taken up and expanded by philosophers like Gadamer to apply to philosophical issues. Hermeneutical philosophers show how language disguises assumption-guiding metaphors or controlling models of discourse. All language is "theory laden" as historian of science Thomas Kuhn says, meaning that language is embedded with an interpretive structure of which its users may be completely unaware. The philosopher's job is to uncover this underlying interpretive structure in language and account for its origin.

Bennett focuses on the language used by academic librarians to define and redefine the meaning of librarianship as an esteemed and respected profession. Embedded in this language are certain reoccurring themes, or, as Bennett calls them, "interpretative conventions," which betray a number of invidious preconceptions about librarianship. Bennett also subjects to critical analysis the often facile "information age" rhetoric that so frequently guides the discourse of librarians.

Bennett examines the literature of librarianship beginning in the 1920s with the publication in 1923 of the Carnegie Corporation report (*Training for Library Service*) and ending in the 1980s with the polemical exchanges between Jesse Shera and Manfred Kochen in *The Study of Information*, edited by Fritz Machlup and Una Mansfield. The Carnegie Corporation, we discover, was instrumental in shaping the profession of librarianship. Its 1923 report focused on the clerical and "feminized" nature of library work and strongly recommended that library education become more "research" oriented and "scholarly." The "predominance of women" in librarianship, the report cited, was one of the major reasons for its lowly status. It was also the Carnegie Corporation, in the face of strong opposition at the University of Chicago, that provided the funds and lobbied for the establishment of a doctoral program in librarianship at that institution. The language of the Carnegie Report and of those writers subsequently influenced by it reflects a concern with the need for librarians to make themselves professionally more like researchers, scholars, and scientists so as to upgrade their status. The driving force, then, was the interest in obtaining a higher prestige for librarianship by making it more *like* those professions whose members were well paid and esteemed.

Thus Bennett uncovers the "interpretive convention" or theme of "subordination" which reoccurs throughout these writings in the form of entreaties to make librarianship scientific and research oriented, and in the form of a perpetual search for other disciplines (e.g., information science) to provide the theoretical foundation for professional respectability. In the late 1940s and early 1950s schools of librarianship became schools of *library science*, and then later, schools of library and *information science*. This, Bennett argues, was the effect of (a) the professional inferiority complex brought about by the invidious comparison of the feminized, practically oriented, ser-

vice character of librarianship with "masculine" power-conferring professions and (b) the uneasy alliance with the ADI (American Documentation Institute), later to become ASIS (American Society for Information Science). Information science was to become the "discipline" that librarians would appropriate as the theoretical foundation of the profession in spite of the fact that documentalists, and later information scientists, in many instances assiduously attempted to separate themselves from librarianship, and in spite of the fact "information science" itself has no universally agreed upon meaning. Fritz Machlup, in the Prologue to his *The Study of Information* has cited at least thirty different fields of inquiry or instruction which are in some ways "information" disciplines. In effect, the "information" that makes up Information Science—the foundation of librarianship—is so vague that it means just about whatever one wants it to.

Bennett's book is interesting, and raises important issues for librarians. It does have some flaws. As a published doctoral dissertation the book suffers from the "overdone" tone that ensues from the dissertation writer's need to display the requisite "virtuosity" to impress dissertation committee members. This, added to the fact that philosophical hermeneutics itself employs muddled, obtuse, and rebarbative language, at times makes for unnecessary obscurity in the text. Also, there are some infelicities of expression, inexcusable for someone trained in philosophy. He speaks, for example, of "bad knowledge," an oxymoron, and of a particular argument that he raises, as being a "more rational argument," when he probably meant a "better argument." He also speaks of a "humanistic" view of librarianship without ever indicating, as far as I could determine, what that might be. I would, however, highly recommend Bennett's book to anyone interested in critically examining the historical and philosophical issues underlying librarianship.—*Stephen Paul Foster, University of Arkansas, Fayetteville.* ■■

Connecting With Technology 1988: Microcomputers in Libraries. Ed. by Nancy Melin Nelson. Westport, Conn., and London: Meckler, 1988. $29.50 (ISBN 0-88736-330-X).

The goal of librarians, according to William Gray Potter, "must be to make the connection between the reader and the author as easy, straightforward, simple, fast, and painless as possible. Microcomputers . . . greatly enhance our ability to deliver excellent service as unobtrusively as possible."

Often, with the pressures of workloads, deadlines, and budgets, it is easy to forget the basic goal of our profession. We get immersed in the details of immediate tasks and need to be reminded of the essential purpose of our work. Fortunately, the library profession provides such opportunities as local, regional, and national conferences to help members regain the zeal we had in library school and to keep up with changing technology. If budgets are a problem, we can at least read journals, books, and proceedings, since the time devoted is returned through improved planning and delivery of services to our patrons.

This collection of papers from the 1988 Small Computers in Libraries Conference offers librarians practical information about using microcomputers, as well as challenges for adapting to the future of libraries in the electronic age. It is not specifically a how-to book, but a thoughtful, practical review of the subject, and, according to Nancy Melin Nelson, it is more complete than the original conference presentations, with bibliographies and an index.

Gary Kildall, as keynote speaker, rationalized the use of technology in libraries with his discussion of knowledge. Through technology, he affirms, we can take information and transform it into an understanding of what is known. Knowledge must then be conserved, made accessible, and connected in some way. This "knowlogy" or library science is evolutionary.

"Librarians will be able to provide an extremely valuable service by acting as guides who can make sense of and personalize the enormous amount of information," says Monica Ertel. "This is going to become one of the greatest services in the twenty-first century. . . . Librarians are going to become knowledge workers, specialized in

many different types of information management." In her paper she agrees with Kildall that the tools used by librarians will evolve with technology, to allow them to gather information and make decisions about knowledge.

Jennifer Cargill presents a comprehensive view of specific applications for microcomputers in libraries, including user services, processing activities, maintenance for support services, publishing, and administrative uses. Her annotated lists should inspire librarians to adapt their own microcomputers to new services. The impact of microcomputers on work habits is discussed, and summarized by the statement that "what was desirable in the past but not possible is now not only possible but also commonly available." Through brainstorming and sharing of ideas, staff can discover new, appropriate applications for microcomputers to libraries in the future.

Dorice L. Horne urges librarians to develop and follow guidelines for management of software, just as there are policies for other library materials. Her presentation includes a sample software user survey and bibliography. Karl Beiser presents a realistic view of the microcomputer market, with advice for selecting appropriate microcomputer hardware for library applications. Dan Marmion describes how microcomputers have been adapted rather haphazardly to library applications, the good and bad results of library computer procedures, and he presents a guide for improving the adaptation of libraries to microcomputing through training and support. He discusses options, including self-training, the in-house expert, the full-time expert, commercial training, videotapes, computer-based instruction, and network experts. Marmion describes how to stay informed about microcomputing to obtain the best in hardware and software most economically.

William Gray Potter, cited at the opening of this review, closes the volume by urging librarians to adapt hardware, software, and products to our needs. The real power of microcomputers, he says, lies in their dual ability to provide stand-alone uses and to act as front-end connections to a variety of external systems, such as online catalogs, online databases, networked CD-ROM products, and eventually to full-text delivery. Potter states that it is up to librarians "to recognize and embrace the important role we have in developing these systems, in serving as advocates for our readers."

Nancy Melin Nelson's collection, so far as it goes, effectively supports inspiration for the management and planning of library resources through knowledgeable use of microcomputers. Although libraries of all kinds have already implemented many of the applications and ideas presented by the authors, perhaps none has implemented them as successfully or comprehensively as they could. While this collection of papers provides a scholarly guide for improving our approach to microcomputing in libraries, it needs to be followed by a collection of papers from an additional conference that focuses with equal practicality on the implementation and management of library data communications options, such as local area networking, direct connections to host systems, data switches, and modems. I look forward to attending that conference.—*Russ Buchanan, Alumni Memorial Library, University of Scranton, Pennsylvania.* ■■

Desmarais, Norman. *The Librarian's CD-ROM Handbook.* Westport, Conn.: Meckler, 1989. 174p. $35 (ISBN 0-88736-331-8).

As stated in the introduction to this work, Mr. Desmarais' intention is to "demystify the experience" of "selecting and implementing a CD-ROM based information system." The result is an excellent overview of the numerous aspects one must consider when deciding to purchase one or more CD-ROM products as part of a library's electronic information offerings.

The content is logically arranged beginning with product selection. Basic to the selection of computerized applications is the clear identification of purpose and intended use of the product. This takes precedence over hardware considerations. The author proceeds to identify carefully specific product components to be considered. These include database content, relevancy, and scope of search, retrieval software and

indexing, interfaces, data access time, costs and cost-effectiveness, and standardization. His caveats are right on the mark as he raises a variety of issues to be confronted. One major issue is the frustration created by references to citations with no full-text document delivery immediately available in the library. Another concern is the integrity of the datas as it relates to the manufacturer's quality control. The user-friendliness of the access software as well as the provision of online tutorials, documentation, and the need for increased staff time for point of use instruction must not be ignored. The degree of customer service support provided by the CD-ROM producer is crucial to the successful integration of the product for use by the public and/or staff.

The chapter on hardware deals with what we have come to know as the CD-ROM workstation, consisting of a PC, monitor, floppy disk drive, CD-ROM drive, hard disk (may be optional), printer, controller cards, and cables. Here the issues are those of standardization, compatibility, color versus monochrome monitors, internal or external CD-ROM drives, and security of the hardware and software. A list of CD-ROM drives available from a variety of manufacturers is provided giving hardware specifications and list prices. Also included is a very complete checklist of questions relating to software and hardware that should be answered before making any decisions regarding the purchase of a CD-ROM product.

Management issues are addressed in Chapter 3. Again, Mr. Desmarais knows of what he speaks. Optical information systems are a form of automation and they should be considered and coordinated with a library's overall automation plan. What are the priorities of that plan? Where does CD-ROM fit in terms of LANS (Local Area Networks) versus single product user stations? What will be the policy toward dedicated product use or maximizing use of the PC for other microcomputer applications? The reader is made aware of the potential limitations stipulated by license or purchase agreements where reading of the fine print is critical in identifying whether the product fits the purchaser's intended use. Management is reminded that CD-ROM will have an effect on other services offered by the library, e.g., online searching and interlibrary loan. Paramount in selecting a CD-ROM product is consideration of the intended user. Is there an interest, a need by users for the product? What is the sophistication of use level of your user? How much assistance by staff is needed? All of these questions must be considered in justifying the purchase and continued funding of CD-ROM products.

There is an entire chapter devoted to concerns. Again they reflect issues that cannot be ignored, such as the limitations of the CD-ROM technology itself, the lack of standards for applications software, graphics, and user interfaces. The CD-ROM industry is constantly evolving and changing. What does this mean in terms of hardware and software investments? Will the workstation purchased today be obsolete tomorrow? Pricing for CD-ROM products is very high in comparison to corresponding print versions and prevents experimentation with the technology in libraries with limited budgets.

Two chapters describe the variety of library and specialized subject applications on the market at the time of writing. Many more have since appeared, e.g., Gale's *Global Access, Facts On File News Digest,* and UMI's *Business Periodicals OnDisc,* a full-text product. Library applications are broken down into the following categories: cataloging, public access catalogs, interlibrary loan, acquisitions, reference works, and indexes and abstracts. The information describing each product includes comments on subject content, user interface, online interface, and special features. The information is factual and straightforward. It is not intended to be evaluative in any way.

The final chapter projects future developments in CD-ROM. Issues of the future involve networking CD-ROM products, multi-media CD-ROMs, integrated workstations and doubling of disc capacity. In one respect the future is here. Several CD-ROM publishers or vendors currently have CD-ROM network systems on the market: Silver Platter, Online Computer Systems, Meridian Data, and Information Access Company.

As coordinator of information services with responsibility for identifying, testing, and purchasing CD-ROM information for use by the public, I have consulted many of the references cited in the book's bibliography. It is helpful to have information from those sources synthesized and available in one place. Using the table of contents and the index, the reader can easily identify areas of specific interest.

Desmarais's *Librarian's CD-ROM Handbook* has become a useful resource for my decision-making process. This title should be required reading for any library that is considering or is currently involved with CD-ROM products.—*Laura J. Seff, Baltimore County Public LIbrary, Towson, Maryland.* ■■

Expert Systems: Concepts and Applications. Ed. by Charles Fenly and Howard Harris. Advances in Library Information Technology, no.1. Washington D.C.: Library of Congress Cataloging Distribution Service, 1988. 37p. paper, $15 (ISBN 0-8444-0611-2).

Expert systems, an application field of Artificial Intelligence (AI), are increasingly catching the attention of the library world. Library conferences and library literature are filled with discussions on this topic. Amidst all the high hopes and enthusiasm, however, some librarians are beginning to wonder, "Where is the beef?" We hear many good things about expert systems, but we have yet to witness full-fledged systems in action in our field.

It appears that we may need to reexamine our approach to this new technology. Probably what we need to do as a first step is to develop a better understanding of the system, and to have more realistic expectations regarding what can be accomplished. To this end, Fenly and Harris's small booklet will be of substantial service to librarianship. It presents concrete examples of feasible expert systems. This feasibility study includes a whole range of investigations, from the fundamentals of AI to full-fledged library expert systems.

The report is divided into two parts. Part I concentrates on developing a basic theoretical and practical understanding of both AI and expert systems. Part II discusses application studies.

Part I is subdivided into five sections. Section one is a brief review of the discipline of AI. By examining the fundamentals of AI, one gets a better perspective and understanding of expert systems.

AI is a complex discipline of technology. The focal point of AI research is problem-solving, through automatic searching of a solution (goal) in a "domain" that contains all possible solutions. In practice, a "domain" becomes a search-space. Obviously, the smaller the search-space, the easier and faster the problem will be solved. As the solution to the problem in question resides within the "domain," sooner or later it will be found in the searching process. However, if the solution lies outside the "domain" and the search mechanism is only capable of searching within that "domain," the problem-solving process will likely end up in a never-never land. During the solution-searching process, each step of the process is represented as a "state." The search proceeds from the initial "state" to the goal "state." The search paths are usually illustrated in a tree structure, starting from a root node and ending with a set of leaf-nodes.

Sections two through four deal with various aspects of expert systems. Included in these sections are discussions of the components of the system, its attributes, steps in development, etc. The easy style here is refreshing for those who already have some knowledge of the subject. For others, these sections provide a sound introduction to expert systems.

Part II of the report is, in my opinion, the most valuable part. It addresses concrete issues related to the implementation of expert systems. The study examines each operational unit of Library of Congress's technical service division, and, using the justification criteria mentioned in Section five of Part I, determines which tasks are most feasible for applying an expert system. Three LC cataloging operations are chosen to be the application areas: shelflisting, series cataloging, and subject cataloging.

These choices seem to be the result of good understanding and prudent thinking. All three tasks require extensive human re-

sources, and all appear to be domain-specific. Furthermore the descriptions in the report are specific enough to give the reader a clear picture of how the systems might work.

The shelflisting operation is mainly involved with assigning Cutter numbers. In order to construct a Cutter number, the cataloger needs to consult the Cutter table. It would be an easy and automatic task if the job were merely to unvaryingly follow the table in assigning a Cutter number. However the Cutter table serves only as a guideline. In practice, constructing a Cutter number requires judgment and decision-making. If a topic has many publications, the Cutter number has to be extended. Translated material also requires an extended number. Sometimes it is necessary to have a double-Cutter number. Since shelflisting is a labor-intensive job at LC, and since the knowledge domain is narrow and well-confined, it is quite feasible to develop an expert system for this operation. In fact, an expert system implemented here would likely realize a high pay-off.

Series cataloging, on the other hand, is a bit more complicated. Since it also involved checking of the series authority file, the system would need to interface with its machine-readable authority file. For establishing a new series, a set of rules can be applied. The system may guide the cataloger in going through a check-list type of process before determining the entry. However, it is a challenging job to develop such a system because of the complexity of series cataloging problems.

The third proposed task is the subject cataloging operation. Even working with an expert system, a cataloger would still have to read the material in question in order to determine the subject matter of the item in hand. The cataloger then would have to search for and identify or establish a proper subject heading. The subject consultant system would serve to aid the cataloger in making these decisions.

Of course, the authors' proposals are made with the Library of Congress's operations in mind. It would not be feasible for most other libraries to implement such sys-

tems because they do not have the same operational needs.

Nevertheless, the proposals are well-considered and well-selected ones. Most likely, such proposals would result in successful expert systems in library field. The report is very well-written; consisting of only thirty-eight pages, it is concise, clear, and to the point. Any reader interested in how expert systems can aid library operations would find reading this study well worth the time.—*Roy Chang, Western Illinois University Library, Macomb.* ■■

Markey, Karen and Diane Vizine-Goetz. ***Characteristics of Subject Authority Records in the Machine-Readable Library of Congress Subject Headings.*** OCLC Research Report Series. Dublin, Ohio: OCLC, 1988. 164p. spiralbound, $14.75.

With online public access catalogs firmly entrenched in most libraries, attention has turned beyond providing basic searching capabilities to the challenge of providing sophisticated subject access. The distribution of the Library of Congress Subject Headings in machine-readable form (LCSH-mr), first available in spring 1986, has motivated library systems staff, designers, and vendors to address this challenge, primarily by incorporating LCSH-mr into their online catalogs.

This interim report is the first of a four-phase research project designed to "prepare the way for an effective systems design for incorporating LCSH-mr in online cataloging systems and online catalogs [and to] provide recommendations to enable system designers to forge LCSH-mr into a subject searcher's tool for exploring relationships among subject headings and locating appropriate headings to express a topic of interest."

This study builds on three key findings gleaned from online catalog use studies: that the majority of subject access points entered by online catalog users fail to match the catalog's controlled vocabulary; that library catalog users do not know that the source of the catalog's subject terms is a controlled vocabulary; and that online catalog users want related subject term lists incorporated in the catalog. Markey and Vizine-Goetz propose to answer three primary questions during the course of their project:

1. What are the characteristics of authority records for topical and geographical headings in LCSH-mr?
2. To what extent can assigned subject headings with subdivisions be linked to LSCH-mr through the systematic removal of subdivisions?
3. To what extent can user-entered subject access points be linked to the library catalog's controlled vocabulary through the application of a series of matching techniques?

The authors answer their first question by documenting an exhaustive statistical analysis of the characteristics of authority records for topical subject headings and geographical names in LCSH-mr.

They have summarized their key findings and data in the preface with specific findings and more detailed analysis presented in seven chapters. Chapter 1, an overview of the project, presents clearly the project premise, purposes, and phases. Chapter 2 describes the LSCH-mr master tape used for the project: its conversion into a processing format, the enhancement of see also references, the designation of broader, narrower, and related terms, and the interpretation of the geographic subdivision code. Chapter 3 presents the characteristics of subject authority records in LSCH-mr in general, and specifically by tag (150 and 151). Special attention is given to the characteristics of the cross-reference structure in the LCSH-mr records. The records are analyzed by field statistics, subfield statistics and patterns, and broader and narrower terms. The statistics are presented both in tables and in narration, with summary statistics for each subsection.

Chapter 4 analyzes unsubdivided and subdivided established headings, while Chapter 5 focuses on subject headings and geographical names that can and cannot be subdivided geographically. Chapter 6 is especially interesting in its analysis of fields other than established headings and cross-references such as LC classification numbers and scope notes. Chapter 7 explores the different forms of established headings.

Each chapter is amply illustrated with figures and tables, and there are several examples of specific subject headings.

The summaries following each section, in conjunction with the chapter summaries, are very useful for focusing on particular questions and as an introduction to the more detailed and complex information in each chapter. While this report is a comprehensive source of data, it is not likely to be read cover to cover at one sitting.

This book provides technical, detailed, and finally empirical data about the structure of the records in LCSH-mr. It graphically points out the inconsistencies and problems with the broader, narrower, and related term structure within LSCH-mr. It successfully answers the question: What is LSCH-mr and what is really on those tapes? This study may be the only place system designers can find this level of information, and thus a true picture of the records in LCSH-mr. It will be helpful, as intended, for system designers who are planning the integration of LCSH-mr into their own online catalogs by allowing decision making based on empirical data, rather than intuition.

The future phases of this project have the potential to reach exciting and significant conclusions and to present recommendations which will have far-reaching impact on the integration of LSCH-mr into online catalogs and the enhancement of subject access.—*Diane Bisom, University of California, Los Angeles.* ■■

Software Reviews

Get-A-Ref. Version 4.1. DatAid, Inc., P.O. Box 8865, Madison, WI 53708-8865. Hardware requirements: IBM PC or compatible, 256K RAM, hard disk recommended. Price: $250.

Get-A-Ref is a reference handling system that boasts several advantages over its competitors. Originally developed by a Swedish medical researcher, the package was created to aid scientists in the management of bibliographic information from their personal reprint libraries. Aside from the ability to sort and format lists of citations, *Get-A-Ref* offers traditional features designed to ease the problems associated with accessing and utilizing collected references. For one thing, a memory resident program allows for the transfer of formatted references directly into the text of word processors. *Get-A-Ref* also provides programs for converting dumps from selected online databases. The complete package is priced competitively with other reference management software. If *Get-A-Ref* performs as advertised, it could prove useful to researchers in other disciplines. Let's take a closer look at the system's strengths and weaknesses.

The "command dispatcher" (see figure 1) provides access to *Get-A-Ref* and accompanying programs. Some confusion may result from the fact that the name *Get-A-Ref* applies not only to the package as a whole, but also to the memory resident program listed in the command dispatcher. The RAM resident *Get-A-Ref* program requires approximately 106K of memory. Procedures for loading *Get-A-Ref* and its performance with other resident programs are detailed in the manual. I experienced no problems in this area.

Once loaded, *Get-A-Ref* locates and displays individual citations, abstracts, and comments from a designated reference file through a system of pull-down command menus (see figure 2). Using the manual along with the program's "help lines," and experimenting with the commands themselves, I was able to access and manipulate references within a reasonable amount of time. However, I was left with the feeling that *Get-A-Ref's* command structure could be more straightforward. For example, use of the term DISPLAY rather than PRESENT would make that function readily recognizable. The rationale for the somewhat redundant design of the GET and SELECT commands was not immediately obvious. In addition, although the editing features are functional, the keystroke method employed is less than handy.

Get-A-Ref searches the entire text of each reference, not just keywords, in rapid fashion. Reference files may have up to 32,000 references, each containing as many as 16,000 characters. In the SELECT mode, the Boolean operators AND and OR may be

```
===‹ Get-A-Ref command dispatcher 1.0 ›===
Select command using ⇑⇓ and then press ↵
Load Get-A-Ref.............. C:›GetARef
Sort references............. C:›GarSort
Create reference formats... C:›CreForm
List references............. C:›GarList
Convert database dump...... C:›Convert
Install Get-A-Ref.......... C:›GarInst
Return to DOS
          = DatAid AB (c) = 1988
```

Fig. 1. The Command Dispatcher.

used for searches. This feature works adequately, but has some idiosyncrasies. Instead of actually using AND and OR, the symbols "@" and "|" are substituted in search strings. Instructions and examples in the "AND and OR Strings" section of the manual are confusing.

The transfer of specific references by means of hot keys into the text of WordPerfect 5.0 documents works well enough. This is accomplished using *Get-A-Ref's* FORMAT command. Both abbreviated and full forms of references can be moved directly into documents. Minor editing of transferred references may be necessary, depending on how successful one is at utilizing *Get-A-Ref's* format creation program (CreForm). The manual's appendix supplies a list of word processing programs that have been successfully tested with *Get-A-Ref*.

One of the most important features of any reference handling system is the accuracy and ease with which it can format references generated from a variety of document types. Given the many formats one may encounter, this is no simple task. CreForm offers short and long formats for three categories of materials: (1) journals, (2) edited books, and (3) single author books. Formatting of references in each category is accomplished by defining information blocks (see figure 3) and key sequences. Despite the availability of online help in CreForm, I found the method of creating formats rather primitive. This task could be much better accomplished through workforms. The use of workforms would also greatly simplify the process of manually inputting references. At any rate, scientists and other researchers, who deal regularly with conference proceedings, technical reports, etc., will need to decide if *Get-A-Ref's* CreForm can meet their needs.

Another program listed in the command dispatcher, GarList, allows for the creation of reference lists in ASCII format. A given reference file can be sorted by journal, author, or year for output to a printer or word processor. GarList eliminates duplicate references automatically. Again, one's satisfaction with bibliographies produced by GarList depends at least partially on the adequacy of formats created using CreForm. *Get-A-Ref* also provides a sorting program, GarSort, which functions like GarList, but does not produce ASCII lists.

Finally, let's examine *Get-A-Ref's* ability to convert database dumps for use by the system. The Convert program presently handles dumps from the following databases: MedLine (via DataStar, MIC/Stockholm, Compact Cambridge, and Dialog on CD); BIOSIS, Chemical Abstracts, Excerpta Medica, and IRIS (all via DataStar). According to the manual, conversion programs for additional databases can be obtained upon request. A description of the database and several sample dumps containing at least 15 references should be sent to the dealer. While the idea of including

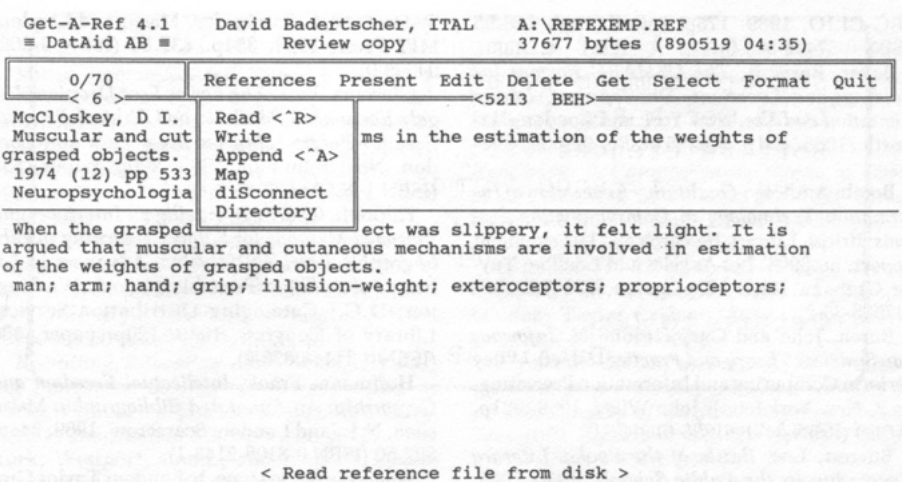


Fig. 2. Get-A-Ref's *Command Menu.*

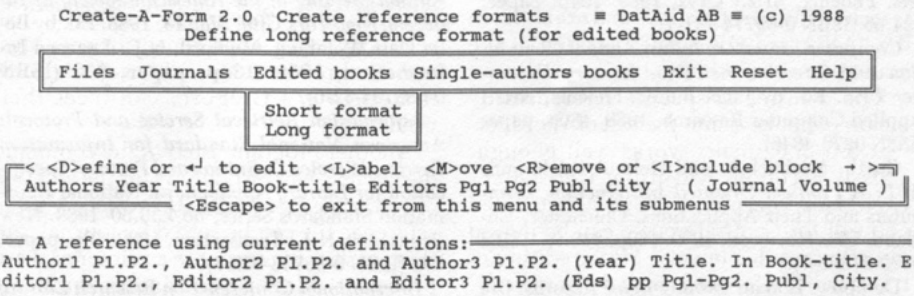


Fig. 3. Creform Screen.

database conversion programs with *Get-A-Ref* is commendable, it is hard to imagine that this scheme would be practical given the number and variety of databases in existence.

Get-A-Ref attempts to provide a single reference management package, which takes the user from database conversion through direct placement of references into the text of documents. This effort deserves some credit. However, the mechanics and transparency of *Get-A-Ref's* programs leave something to be desired. Also, the manual is poorly organized and in need of proofreading. Information specialists will want to look further than *Get-A-Ref*. Scientists and other researchers should weigh their personal reference handling requirements against the capabilities and cost of *Get-A-Ref.—David A. Badertscher, Washington and Lee University Library, Lexington, Va.* ■■

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.

Aversa, Elizabeth S. and Jacqueline C. Mancall. *Management of Online Search Services in Schools.* Santa Barbara, Calif., and Oxford:

ABC-CLIO, 1989. 175p. spiralbound, $28.95 (ISBN 0-87436-513-9).

Baker, Barry B. *The USMARC Format for Holdings and Locations: Development, Implementation and Use.* New York and London: Haworth, 1988. 231p. $32.95 (ISBN 0-86656-695-3).

Booth, Anthony. *Qualitative Evaluation of Information Technology in Communication Systems.* British Library Research and Development Report, no.5968. Los Angeles and London: Taylor Graham, 1988. 103p. paper, $39 (ISBN 0-947568-35-2).

Burch, John and Gary Grudnitski. *Information Systems: Theory and Practice.* 5th ed. Wiley Series in Computing and Information Processing, no.2. New York [etc.]: John Wiley, 1989. 921p. $46.95 (ISBN 0471-61293-6).

Burress, Lee. *Battle of the Books: Literary Censorship in the Public Schools, 1950–1985.* Metuchen, N.J., and London: Scarecrow, 1989. 385p. $42.50 (ISBN 0-8108-2151-6).

Callison, Daniel and Jacqueline Morris. *Case Studies in Managing School Library Media Centers.* Phoenix, Ariz.: Oryx, 1989. 194p. paper, $24.50 (ISBN 0-89774-441-1).

Computer Literature Index: Annual Cumulation 1988 Covering the Period January–December 1988. Ed. by Janet Butler. Phoenix, Ariz.: Applied Computer Research, 1988. 480p. paper (ISSN 0270-4846).

Curth, Michael A. and Helmut Edelmann. *APL: A Problem-Oriented Introduction.* Computers and Their Applications. Chichester, England: Ellis Horwood, 1989. 180p. $49.95 (ISBN 0470-21395-7).

Dempsey, Lorcan. *Bibliographic Records: Use of Data Elements in the Book World.* Bath, England: Bath University Library, 1989. 56p. paper, £10 (ISBN 0-86197-085-3).

DePew, John N. *Statewide Disaster Preparedness and Recovery Program for Florida Libraries.* University of Illinois Graduate School of Library and Information Science Occasional Papers, no.185. Urbana-Champaign, Ill.: Graduate School of Library and Information Science, Univ. of Illinois, 1989. 51p. paper, $7 (ISSN 0276-1769).

Directory of Telefacsimile Sites in North American Libraries. 4th ed. Ed. by C. Lee Jones and Pegi S. Jones. Buchanan Dam, Tex.: CBR Consulting Services, 1989. 163p. paper, $24.

Eaglen, Audrey. *Buying Books: A How-To-Do-It Manual for Librarians.* How-To-Do-It Manuals for Libraries, no.4. New York and London: Neal-Schuman, 1989. 166p. paper, $35 (ISBN 1-55570-013-6).

Effective Documentation: What We Have Learned from Research. Ed. by Stephen Doheny-Farina. MIT Press Series in Information Systems, no.4. Cambridge, Mass., and London: MIT Press, 1988. 354p. $37.50 (ISBN 0-262-04098-0).

Giacoma, Pete. *The Fee or Free Decision: Legal, Economic, Political, and Ethical Perspectives for Public Libraries.* New York and London: Neal-Schuman, 1989. 200p. paper, $35 (ISBN 1-55570-030-6).

Hildreth, Charles R. *Intelligent Interfaces and Retrieval Methods for Subject Searching in Bibliographic Retrieval Systems.* Advances in Library Information Technology, no.2. Washington, D.C.: Cataloging Distribution Service, Library of Congress, 1989. 120p. paper, $20 (ISBN 0-8444-0626-0).

Hoffmann, Frank. *Intellectual Freedom and Censorship: An Annotated Bibliography.* Metuchen, N.J., and London: Scarecrow, 1989. 244p. $27.50 (ISBN 0-8108-2145-1).

Hypermedia. v.1., no.1. London: Taylor Graham, 1989. 91p. paper, $85 for three issues per year (ISSN 0955-8543).

Indexing: The State of Our Knowledge and the State of Our Ignorance; Proceedings of the 20th Annual Meeting of the American Society of Indexers, New York City, May 13, 1988. Ed. by Bella Hass Weinberg. Medford, N.J.: Learned Information, 1989. 134p. paper, $30 (ISBN 0-938734-32-6).

Information Retrieval Service and Protocol: American National Standard for Information Retrieval Service Definition and Protocol Specification for Library Applications. National Information Standards Series, no.Z39.50–1988. New Brunswick, N.J.: Transaction, 1989. 50p. paper, $35 (ISBN 0-88738-953-8).

International Conference on Research Library Cooperation. Ed. by The Research Libraries Group, Inc. Collection Management Series, v.9. New York and London: Haworth [1989]. 168p. $39.95 (ISBN 0-86656-596-5). Previously published as *Collection Management,* v.9, nos.2/3, summer/fall 1987.

Knowledge Elicitation: Principles, Techniques and Applications. Ed. by Dan Diaper. Expert Systems. Chichester, England: Ellis Horwood, 1989. 270p. $49.95 (ISBN 0470-21422-8).

Language Technology. nos. 8-9. Amsterdam: INK International, 1988. paper, $80 per year to institutions and $50 to others for 6 issues annually.

Machalow, Robert. *Using Lotus 1-2-3: A How-To-Do-It Manual for Library Applications.* How-To-Do-It Manuals for Libraries, no.1. New York and London: Neal-Schuman, 1989. 166p. $35 (ISBN 1-55570-033-0).

Maddix, Frank and Gareth Morgan. *Systems Software: An Introduction to Language Processors and Operating Systems. Computers and Their Applications.* Chichester, England: Ellis

Horwood, 1989. 234p. $49.95 (ISBN 0470-21410-4).

Miller, Jerome K., and others. *Video Copyright Permissions: A Guide to Securing Permission to Retain, Perform, and Transmit Television Programs Videotaped Off the Air.* Copyright Information Bulletin Series, no.5. Friday Harbor, Wash.: Copyright Information Services, 1989. 132p. $29.95 (ISBN 0-914143-13-1).

Modern Copyright Fundamentals: Key Writings on Technological and Other Issues. Ed. by Ben H. Weil and Barbara Friedman Polansky. Medford, N.J.: Learned Information, 1989. 460p. $39.50 (ISBN 0-938734-33-4).

Recruiting, Educating, and Training Cataloging Librarians: Solving the Problems. Ed. by Sheila S. Intner and Janet Swan Hill. New Directions in Information Management, no.19. New York, Westport, Conn., and London: Greenwood, 1989. 430p. $45 (ISBN 0-313-26693-X).

Rethinking the Library in the Information Age: Building an Infrastructure for Library Research. Ed. by Anne J. Mathews. Issues in Library Research: Proposals for the 1990s, v.3. Washington, D.C.: U.S. Department of Education [1989]. 71p. paper.

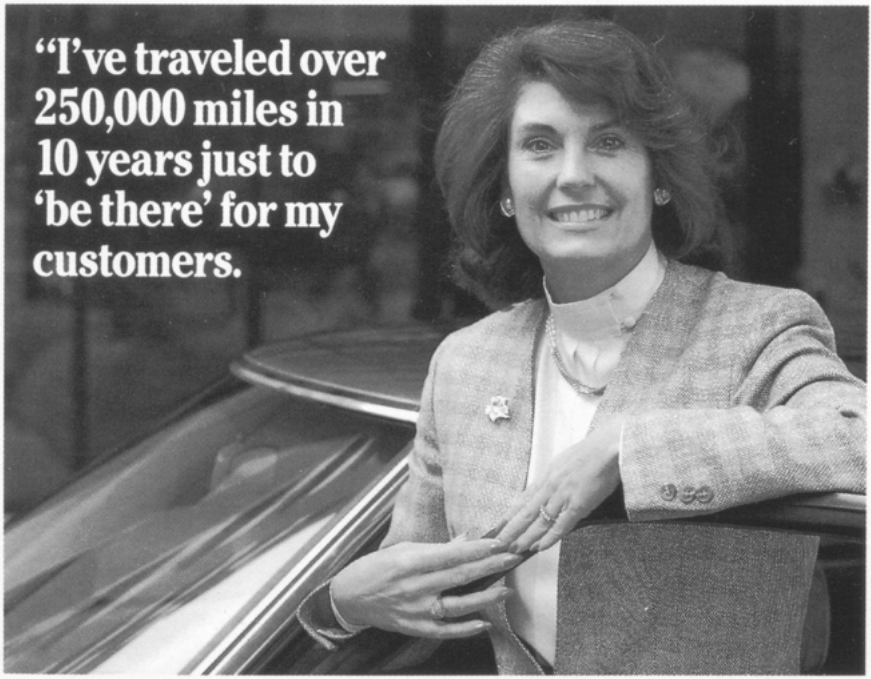
Saffady, William. *Macintosh Word Processing: A Guide to the Software.* Westport, Conn.: Meckler, 1989. 155p. paper, $19.95 (ISBN 0-88736-343-1).

Sitarz, Daniel. *The Desktop Publisher's Legal Handbook: A Comprehensive Guide to Computer Publishing Law.* Legal Self-Help Series. Carbondale, Ill.: Nova, 1989. 240p. paper, $19.95 (ISBN 0-935755-02-0).

Thesaurus of Information Technology Terms. Comp. by Silvina Peniston. Los Angeles and London: Taylor Graham, 1988. 410p. paper, $90 (ISBN 0-947568-36-0).

Whitaker, Marian, and others. *Bibliography of Information Technology: An Annotated Critical Bibliography of English Language Sources Since 1980.* Brookfield, Vt.: Gower, 1989. 313p. $52.95 (ISBN 1-85278-040-1).

Whittington, R. P. *Database Systems Engineering.* Oxford Applied Mathematics and Computing Science Series, no.18. Oxford: Clarendon, 1988. 430p. paper, $32.50 (ISBN 0-19-859672-3). ■■



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