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Using Citation Analysis to Pursue a Core Collection of Journals for Communication Disorders

Steven Black

A citation analysis from a purposive sample of two leading journals is employed to build a tentative core collection of journals in communication disorders. A core collection is defined for this study as those journals that provide 80% of the sample's article citations. The bibliometric concept of "success-breeds-success" is reviewed, and its application to this sample of journals is quantified. The special problems of defining a core collection in a multidisciplinary field are discussed. Data is also provided on the types of publications cited, and the age distribution of cited journals.

The field of communication disorders encompasses the study of impairments and disabilities in speech, language, and hearing. The American Speech-Language-Hearing Association (ASHA), founded in 1925, accredits practitioners, programs, and college and university graduate programs in communication disorders, and has 97,062 members (American Speech-Language-Hearing Association 2000). ASHA's Council of Academic Accreditation (2000) has accredited 253 graduate programs in the United States in speech-language pathology and audiology (www.asha.org/students/caa_programs/caaprog.htm).

Communication disorders draws from multiple disciplines, yet it is clearly a discipline in its own right. It satisfies Kuhn's (1996) characteristics of a discipline, having its own specialized journals, an established professional society, and a special place in the academic curriculum. Accredited professionals, students in programs, and the libraries serving them need to access literature from a wide range of fields. The broad, multidisciplinary nature of communication disorders is demonstrated by the works cited in articles published in journals such as the *Journal of Speech, Language and Hearing Research* and the *Journal of Communication Disorders*. Works cited in these communication-disorders journals draw from publications in many fields, including audiology, neurology, linguistics, medicine, physiology, psychology, psychiatry, education, and special education.

Identifying the most important journals helps professionals use their time efficiently, and helps libraries make the most of their budgets. Typically, an academic library will develop a core collection of journals in each of the disciplines taught in the institution's programs, and also subscribe to additional journals that strengthen and enhance the core collections. But defining a core collection is not easy. Many journals are used in more than one discipline, and titles often cease,

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merge, change names, or are newly created. Also, the quality of individual journals changes over time, so reputation may overestimate or underestimate the current quality of a journal.

Citation Analysis

Citation analysis is an established method for identifying the leading journals that belong in a discipline's core collection. Citation analysis is the systematic, quantitative study of works cited. It is part of the broader field of bibliometrics, the application of mathematical and statistical methods in the study of the use of documents and publication patterns (Osareh 1996). Osareh (1996) reviewed a body of citation analysis research used to rank publications according to their importance, to identify core collections, to measure the impact of publications, and to study subject interrelationships. Despite potential problems with citation analysis data discussed below, measuring cited use in professional journals is a well-established, objective, quantitative method for measuring the value of published literature.

Citation analysis is based on the premise that citations to literature more or less accurately represent the influence of that literature on authors. Cole and Cole (1972) used that premise to show that a small number of researchers produce most scientifically important papers, and then defended the use of citation analysis in a subsequent reply to letters to the editor (Cole and Cole 1974). MacRoberts and MacRoberts (1989) described flaws in this assumption and the practices that flow from it. Formal and informal influences are not always cited, authors may have bias in citing works, authors often cite themselves, types of citation are not consistent, and citation rates vary considerably among disciplines, nations, and times.

Many citation analyses are based on data provided by published citation indexes, notably the Institute for Scientific Information's (ISI) *Journal Citation Reports*, based on data in the *Science Citation Index* (*SCI*) and *Social Science Citation Index* (*SSCI*). Critics of the reliability of data in the ISI databases have identified potential problems with measurement errors caused by title changes, aberrant title abbreviations, and incomplete coverage (Rice et al. 1989). Funkhouser (1996) found that a significant portion of the references in communications journals were not covered in the ISI databases.

Citation analysis has consistently shown there to be a highly skewed distribution of cited works, whereby successful articles gain the most attention, and thus become even more successful. Success-breeds-success is often referred to as the Matthew Effect, from the book of Matthew (13:12): "for unto every one that hath shall be given, and he shall have abundance: but from him that hath not shall be taken away even that which he hath." Merton (1968) first described the Matthew Effect in terms of the disproportionate amount of attention given to the work of the most prominent scientists. Models of journal citation distribution models all show a pattern of success-breeds-success, although there is no standard mathematical formula for the skewed distribution of cited works (Oluic-Vukovic 1997). Bensman and Wilder (1998) described in some detail this and related expressions of the skewed distribution of citations, including "Bradford's law of scattering," "Garfield's law of concentration," and the negative binomial distribution. Other success-breeds-success "laws" have been devised by Pareto, Lotka, and Zipf (Oluic-Vukovic, 1997).

All expressions of the distribution have a common model of concentrated use in a small portion of the whole, and a large, gradually diminishing portion that receives little use. According to Bradford (1953), the numbers of periodicals in a nucleus of journals and succeeding zones will follow the formula $l{:}n{:}n^2$. Unfortunately, one has to perform a citation analysis of the journals of a particular discipline to determine the n in Bradford's law of scattering. A core collection can be determined by following Bradford's law, but the law of scattering leaves to reasoned judgment the cutoff between core and other journals. There is no clear boundary for a core collection in Bradford's law, or in any other success-breeds-success model.

A very common, albeit less formal expression of the skewed distribution is known as the "80/20 rule": 80% of uses come from 20% of sources. The 80/20 rule of thumb can be applied to citations, inventories, profits, or journal collections. In business the 80/20 rule can be expressed as "a business gets 80 percent of its activity from 20 percent of its product line" (Rosenberg 1993, 117). The library corollary would be that 20% of the collection receives 80% of the use. One goal of this study will be to measure the degree to which the 80/20 rule of thumb matches patterns of professionals' use of journals in communication disorders.

Problem Statement

A known set of core journals helps one see the boundaries of a discipline (Zipp 1999), and a core collection list is a valuable collection development tool. *Magazines for Libraries* (Katz 1969–97) identified basic periodicals considered by subject specialist librarians to be essential to library collections. However, contributors' interpretations of "essential" vary a great deal, so the number of journals deemed "basic" varies widely among the listed disciplines. Unfortunately, communication disorders is not a subject heading in *Magazines for Libraries* (1997), so its journals do not receive a specialist's treatment there. Neither is communication dis-

orders identified as a separate subject in ISI's *Journal Citation Reports* (Institute for Scientific Information 1996).

The multidisciplinary nature of communication disorders makes identifying a core collection difficult. The corpus of literature devoted exclusively to communication disorders is small, and relatively few journals cover the entire field. As is true in many fields, many important journals are devoted to subspecialties, for example, the *Journal of Fluency Disorders* and *Ear and Hearing.* Many of the most important journals for researchers in communication disorders are associated with other fields, such as the *Journal of the Acoustical Society of America*, *Child Development*, and *Pediatrics*. The literature researchers need thus comes from disparate sources, including sources that are not immediately obvious from titles, subject headings, or classification numbers.

A thorough search in indexes by the author unearthed no published lists of core journals in communication disorders. Therefore, there is a particular need to employ citation analysis to study the bibliometric characteristics of publications serving researchers in communication disorders. This study will address three interrelated research questions. The primary research question is:

- Which journals are frequently cited by publishing researchers in communication disorders?

The method employed also provides data to answer two related questions:

- What proportion of citations come from various types of sources, i.e., journals, books, conferences, tests and assessments, and others?
- What is the age distribution of cited journal articles? That is, for how long do journal articles influence authors?

Method

An independent collection of data was undertaken because citation analysis data published in ISI's *Journal Citation Reports (JCR)* for sciences and social sciences do not include communication disorders as an identified field of study, and because not all significant journals are in the *JCR* data set. Furthermore, citation data in the *JCR* on CD-ROM are divided into separate databases for Science and Social Science. Journals important for communication disorders are divided into two separate data sets. The separated data must be integrated to get a true picture of journal use.

From the population of journals targeted to professionals in communication disorders, a purposive sample of recent volumes of two journals was chosen. Purposive, or judgment, sampling is used when probability sampling is practically impossible (Miller 1991). Probability samples are only possible when the population can be defined, and all members of the population can be listed. Because of the dispersed nature of articles used by researchers in communication disorders, a probability sampling technique was practically impossible for this study. Miller (1991) also states that data from judgment samples only suggest or indicate conclusions, meaning that the purposive sampling technique used here precludes a strictly defined core collection.

The two journals selected were the *Journal of Communication Disorders* and the *Journal of Speech, Language, and Hearing Disorders.* The *Journal of Speech, Language, and Hearing Disorders (JSLHR)* was chosen because of its leadership in the field as the flagship journal of ASHA. Each issue of *JSLHR* has three sections, covering research encompassing disorders of speech, disorders of language, and hearing impairments. This distribution of research articles serves to cover the full field of communication disorders. The *Journal of Communication Disorders (JCD),* an Elsevier journal, also publishes original articles relating to all three areas of disorders of speech, language, and hearing. Both *JSLHR* and *JCD* mostly publish articles based on primary research, and both are known by the author to be highly regarded by the faculty and frequently used by the students in communication disorders at the College of Saint Rose. Both journals state that their purpose is to address topics across the entire field, and both are specifically targeted solely to communication disorders. As mentioned above, many important journals focus on a subspecialty (e.g., audiology, fluency disorders, brain injury, or educational aspects of communication disorders). Many others cover more than communication disorders (e.g., cognitive psychology, linguistics, pediatrics). The two journals chosen accurately express the multidisciplinary scope of the field.

Every cited work from every article in ALL issues of the *Journal of Communication Disorders* from 1997, 1998, and 1999 were entered into a spreadsheet. Data entered included the citing journal, year of the citing journal, cited work, and year of cited work. Full journal names were entered exactly as they appeared in the articles. Other sources were identified by their type, such as "book," "conference," "dissertation." The *JCD* for these three years yielded 2,660 cited works. Equivalent data entered from all issues of the *JSLHR* from 1997 and 1999 yielded 9,034 cited works. Data were not entered for the *JSLHR* for 1998 in order to reduce data entry time, and to avoid having the data from it statistically overwhelm data from the *JCD*.

Only issues published since 1997 were used. It was considered important to measure, as much as possible, the current actual use of journals. It was deemed more important

from a collection development standpoint to see what has been used recently, and less important to know what has been used in the past. A previously reputable journal that has slipped in actual use will then receive its fair place in the measurement of relative importance. Also, citation analysis is unavoidably biased against new journals. Counting citations from older volumes increases that bias.

Since a judgment sample was employed, the degree to which this sample represents the population of communication disorders journals is unknown. Although the total of works cited is 11,704, representing a substantial investment of data entry time, the data were drawn from only two respected sources. These results must be taken as estimates, recognizing that journals cited in all communication disorders journals vary by an unknown amount from the data reported here.

Results

Figure 1 shows the distribution of works cited by type of source (n=11,704). The books category is interpreted rather broadly, and includes reports and manuals, except for test manuals. The tests category is for all tests and assessments, and the manuals that accompany them. "Conferences" includes published proceedings, papers presented, and posters presented at conferences. The "other" category includes dissertations, theses, standards, and computer programs. Notably, of all citations, only two were to any type of Web site. Citations to journal articles comprised 7,792 of the 11,704 works cited.

Figure 2 illustrates the age distribution of cited journal articles, calculated by subtracting the year of the cited article from the year of the citing article. Articles in press were counted as being published in the year of the citing article in hand. As figure 2 shows, the age of cited articles rises quickly to those two years old, peaks at articles five years old, and gradually decreases thereafter. Sources 20 or more years old contributed 16% of all the cited articles. That fact underscores the importance of collection development as a long-term process, and indicates researchers' need to have a reliable archival record of published research.

The appendix lists, in descending order, the shortest possible list of journals that provide 80% of articles cited in the sample (n=7792). The first data column shows the number of citations, and the second shows this number as a percentage of all citations. The rightmost column shows the cumulative subtotal, by percentage, of all citations to journals. The appendix displays data on 103 of the 791 journals that were cited at least once. Cited sources are indeed concentrated in a small number of titles, since 13% of the cited journals provided 80% of the cited articles. Of the cited journals, 31%, or 144 additional journals, would be required to provide 90% of the cited articles. As predicted by the theory of skewed distribution, the "tail" of infrequently cited journals is long. Among the 791 cited journals, 156 are cited only twice, and 361 are cited but once.

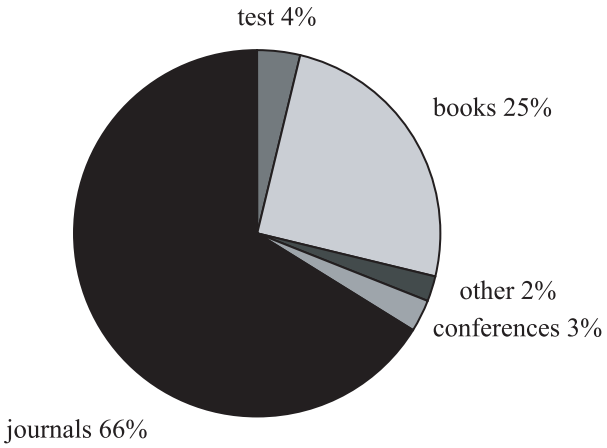

Figure 1. Sources of Citations

Figure 2. Age Distribution of Cited Articles

Title changes complicate the citation analysis. If a journal changed its name, the citation counts for the previous title(s) were added to the current title. The one exception to the grouping together of name changes is the journals that preceded the *Journal of Speech, Language, and Hearing Research*. In addition to the title change for the *Journal of Speech [and Hearing] Disorders*, that journal merged with the *Journal of Speech and Hearing Research* in 1991. The merged journal changed its name from *Journal of Speech and Hearing Research* to *Journal of Speech, Language, and Hearing Research* in 1997. All versions of what is now represented by *Journal of Speech, Language, and Hearing Research* contributed almost one quarter of all cited articles, and 17% of articles cited in the *Journal of Communication Disorders*.

Discussion

The information presented here suggests a core collection in communication disorders, and highlights some characteristics of publishing within the field. Journals and books are the primary sources of cited information. It is noteworthy that within this sample, online journals and Web resources were not cited. As the theory of skewed distribution predicted, a small percentage of journals provided a large percentage of cited references. In this study, 13% of cited journals provided 80% of the citations to journal articles. Articles are used over a long period of time, with fully half of the cited articles being at least 8 years old. The longevity of journal articles emphasizes the need for long-term maintenance of journal collections.

The journals listed in table 1 suggest, but do not define, a core collection. The selection of 80% of cited articles, in this case from journals cited 12 or more times, is an arbitrary cutoff. It makes little sense to say that a journal cited 12 times in this sample is a core journal, and one cited 11 times is not. But the list has to be cut off at some point. Only one journal was cited 12 times, five were cited 11 times, and four were cited 10 times, so there is something resembling a natural break at the 80% mark. Nevertheless, one should not automatically exclude journals not listed here when collecting for communication disorders. The sample used was not large enough to determine that a journal not on the list is not valuable. It is also important to note that the method employed has a bias for established journals. The age of citations shown in figure 2 demonstrates that a new journal has less of a chance to be frequently cited, and a great chance of being left out of appendix A.

Faculty opinion is very important to core collection definition, because faculty know their field, and give assignments that require journal use. Local use studies can provide additional valuable data, since students may use different journals than publishing authors use. Special circumstances must also be considered. For example, the College of Saint Rose's program is ASHA-certified for speech-language pathology, but we have no audiology program. So the serials librarian and the department both believe it is unnecessary to subscribe to the *Journal of the Acoustical Society of America* or *Ear and Hearing*, despite those journals' high standing in table 1.

The general stature of certain medical and scientific journals is well known, but their ranking as core titles for communication disorders came as somewhat of a surprise. Subscriptions to *Pediatrics*, *Science*, *Nature*, and the *New England Journal of Medicine* benefit researchers in this field more than the author would have guessed. The lesson could be that it is important for librarians to protect subscriptions to general titles that serve multiple departments.

Further citation analysis of communication disorders journals could provide a more broadly based and authoritative set of leading journals. Unfortunately, a more reliable list of core journals in communication disorders can only be determined by expanding the sample size. This work would be easier if *Journal Citation Reports* (Institute for Scientific Information 1996) recognized communication disorders as a distinct discipline. As it now stands, there is no way to avoid tedious and time-consuming data entry to pursue a more comprehensive citation analysis. But despite the constrained sample, this study provides objective information suggesting a core of journals in communication disorders.

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Appendix
Core Journals in Communication Disorders (*n*=7,792)

Cited Journal	Frequency of Journal Cites	% of Journal Cites	Cumulative% of Journal Cites
Journal of Speech and Hearing Research	1344	17.25	17.25
Journal of the Acoustical Society of America	636	8.16	25.41
Journal of Speech and Hearing Disorders and *Journal of Speech Disorders*	396	5.08	30.49
Brain and Language	189	2.43	32.92
Journal of Speech, Language, and Hearing Research	161	2.07	34.98
Journal of Fluency Disorders	138	1.77	36.76
Ear and Hearing	120	1.54	38.30
Language, Speech and Hearing Services in Schools	117	1.50	39.80
Journal of Communication Disorders	108	1.39	41.18
Journal of Phonetics	108	1.39	42.57
Journal of Child Language	94	1.21	43.78
Applied Psycholinguistics	93	1.19	44.97
Child Development	90	1.16	46.12
ASHA	81	1.04	47.16
American Journal of Speech-Language Pathology	76	0.98	48.14
Clinical Linguistics and Phonetics	69	0.89	49.02
Journal of Memory and Language and *Journal of Verbal Learning and Verbal Behavior*	64	0.82	49.85
Pediatrics	61	0.78	50.63
British Journal of Disorders of Communication and *European Journal of Disorders of Communication*	60	0.77	51.40
Journal of Voice	60	0.77	52.17
Science	58	0.74	52.91
Cognition	57	0.73	53.64
Seminars in Hearing	57	0.73	54.38
Psychological Review	55	0.71	55.08
Topics in Language Disorders	55	0.71	55.79
Folia Phoniatrica et Logopaedica	54	0.69	56.48
Laryngoscope	50	0.64	57.12
Journal of the American Academy of Audiology	47	0.60	57.73
Perception and Psychophysics	46	0.59	58.32
Aphasiology	44	0.56	58.88
Journal of Child Psychology and Psychiatry and Allied Disciplines	44	0.56	59.45
Phonetica	44	0.56	60.01
Language and Speech	43	0.55	60.56
Developmental Psychology	41	0.53	61.09
Neuropsychologia	41	0.53	61.61
Nature	40	0.51	62.13
Journal of Learning Disabilities	38	0.49	62.62
Journal of Neurophysiology	37	0.47	63.09
Archives of Otolaryngology Head and Neck Surgery	36	0.46	63.55
Developmental Medicine and Child Neurology	36	0.46	64.01
Electroencephalography and Clinical Neurophysiology	35	0.45	64.46
Journal of Autism and Developmental Disorders	35	0.45	64.91
Journal of Experimental Child Psychology	32	0.41	65.32

Audiology	31	0.40	65.72
Journal of Experimental Psychology: Human Perception and Performance	31	0.40	66.12
Acta Otolaryngologica	29	0.37	66.49
Language	29	0.37	66.86
American Journal of Audiology	28	0.36	67.22
Hearing Research	28	0.36	67.58
Journal of Pediatrics	27	0.35	67.93
Perceptual and Motor Skills	27	0.35	68.28
Psychological Bulletin	27	0.35	68.62
Archives of Neurology	26	0.33	68.96
Brain	26	0.33	69.29
Augmentative and Alternative Communication	25	0.32	69.61
American Journal of Otology	24	0.31	69.92
Journal of Psycholinguistic Research	24	0.31	70.23
Annals of Otology, Rhinology and Laryngology	23	0.30	70.52
Cortex	23	0.30	70.82
British Journal of Audiology	22	0.28	71.10
Experimental Brain Research	22	0.28	71.38
First Language	21	0.27	71.65
Neurology	21	0.27	71.92
Quarterly Journal of Experimental Psychology (A and B)	21	0.27	72.19
Scandinavian Audiology	21	0.27	72.46
Language Acquisition	20	0.26	72.72
New England Journal of Medicine	20	0.26	72.97
Speech Monographs and *Communication Monographs*	20	0.26	73.23
American Journal of Public Health	19	0.24	73.47
Annals of Neurology	19	0.24	73.72
Journal of Educational Psychology	19	0.24	73.96
Seminars in Speech and Language	19	0.24	74.20
Volta Review	19	0.24	74.45
Clinical Aphasiology	18	0.23	74.68
Cognitive Neuropsychology	18	0.23	74.91
Journal of Experimental Psychology: Learning, Memory and Cognition	18	0.23	75.14
Journal of Applied Physiology	17	0.22	75.36
Memory and Cognition	17	0.22	75.58
Annals of Dyslexia	16	0.21	75.78
Cognitive Psychology	16	0.21	75.99
Journal of Applied Behavior Analysis	16	0.21	76.19
Journal of the Academy of Rehabilitative Audiology	16	0.21	76.40
Linguistic Inquiry	16	0.21	76.60
Otolaryngology Head and Neck Surgery	16	0.21	76.81
Speech Communication	16	0.21	77.01
Brain Research	15	0.19	77.21
Merrill-Palmer Quarterly	15	0.19	77.40
Monographs of the Society for Research in Child Development	15	0.19	77.59
American Journal of Medical Genetics	14	0.18	77.77
Audiology Today	14	0.18	77.95
Cleft Palate-Craniofacial Journal	14	0.18	78.13
International Journal of Pediatric Otorhinolaryngology	14	0.18	78.31
Journal of Gerontology (split into A and B)	14	0.18	78.49
Journal of Neurology, Neurosurgery, and Psychiatry	14	0.18	78.67
American Annals of the Deaf	13	0.17	78.84
Dysphagia	13	0.17	79.00
Infant Behavior and Development	13	0.17	79.17
JAMA	13	0.17	79.34
Journal of the American Academy of Child and Adolescent Psychiatry	13	0.17	79.50
Psychology and Aging	13	0.17	79.67
Sign Language Studies	13	0.17	79.84
British Journal of Psychology	12	0.15	79.99

Book Vendor Records in the OCLC Database

Boon or Bane?

Laura D. Shedenhelm and Bartley A. Burk

This case study is based on a 1998 sample of recently acquired Spanish-language firm-ordered materials, all of which had vendor records in the OCLC database. Vendor records were compared to final fully cataloged records to study differences in the basic bibliographic description fields (1xx, 245, 300, 4xx, 5xx). Identified were the types of errors found in the records and the duplication rate with records already in the database (full LC and member records, partial member records, and other vendors). Both areas are problematic for cataloging units. Secondary research objectives included tracking titles for usable copy cataloging and analyzing the cost impact for typical cataloging workflow. The researchers conclude that the records, though sometimes problematic, are useful. Suggestions are given for areas of improvement.

In recent years, there has been an exceptionally close scrutiny over public funds. Libraries are included in this realm and are among the most cost-conscious entities in the public sector. This undoubtedly reflects our innately conservative approach to fulfill our responsibility to acquire, maintain, and preserve the intellectual and cultural patrimony of our parent institutions and to serve our clients. While we have watched the steady increase of prices for the materials we purchase, we have sought innovative ways to hold down costs for acquiring and providing access to our collections. Book vendors are also seeking ways to lower their overhead costs, provide needed services to their clients, acquire new clients, and maintain a profit margin which will allow them to stay in business. There is a symbiotic relationship between libraries and book vendors that is necessary for both groups to succeed in a fast-paced and competitive world. This study looks at part of the symbiosis that appears to be deleterious to one part of that relationship: the impact on cataloging processing units within libraries of vendor-produced records in the national bibliographic databases.

Vendor records are very brief bibliographic records originally designed to advertise an item for sale by the vendor. They are based on the files the vendors use to create their own sales catalogs and include minimal information: the author and title of the work, publication information, and extent of the item. Often, they also will have notes about the work, "edition" information, and some subject analysis. When this information is accurate, it is very useful for bibliographers who must decide if they want to purchase the item for their collections. However, a problem arises when the data presented do not accurately represent the bibliographic item they are meant to describe. The descriptions in vendor catalogs are often so brief it takes real skill to decide if the item would be a unique addition to a collection. For example, "edition" entries in these catalogs often merely indicate new printings, not new versions of the works. The form of

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Terry Peet of the Library of Congress (LC) kindly provided the authors with an oral history of the LC's use of vendor records. Russell Marr, also from LC, helped gather information about vendors' use of LC's authority files. Jay Weitz from OCLC sent information about OCLC's deduplication process. The authors also wish to thank Richard Shedenhelm, John Riemer, and Barbara Winters, all from the University of Georgia, for their helpful comments during the drafting of this article.

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the author's name, and sometimes even the choice of author entry, rarely matches a library's entry in its catalog. Once the item is purchased for a collection, catalogers must describe it in terms of library cataloging rules more detailed than those adequate to advertise an item. Catalogers must distinguish the basic bibliographic unit from all other renditions of the intellectual content presented, and they must make it fit intelligently into the larger bibliographic universe. What happens, then, when these minimal records are added to the national databases that traditionally provide accurate and full cataloging that generally meet industrywide agreed-upon standards? Is there an impact on the work performed in libraries' cataloging units?

Our premise is that there is an impact. We took a small sample of vendor records as a basis for a study on their impact on a typical cataloging workflow. We looked at:

1. How much manipulation of the data in vendor-produced records must be done in order to bring them into alignment with library standards for cataloging. We did this by comparing the original versions of the vendor records to the title pages of the works they represented. We asked: Are there errors in vendor records that make them difficult to utilize as nationally acceptable standardized library cataloging records? If the answer is yes, is there a pattern to the errors?
2. How well vendor records fit into the greater bibliographic universe. We searched the OCLC database for any other records that would also represent the items in the sample. We asked: Do vendor records duplicate any records in the national bibliographic databases? If so, at what rate?

These two areas, editing of records and determining appropriate records to use for cataloging, constitute the majority of work performed in cataloging units. Anything that negatively impacts these two areas would have an unfavorable effect on cataloging production. Timely and cost-effective cataloging is a primary goal for any cataloging unit. Because of this we realized that there were two other questions (which we will call 3 and 4) that our study needed to address:

3. How soon does full-level copy cataloging appear in the national bibliographic databases for items represented by vendor records? We tracked the sample items through an eleven-month cycle to see when any source of copy cataloging would appear. We performed a follow-up search fourteen months later.
4. Do vendor records provide a cost-efficient method for giving access to our collections? We looked at costs for a typical cataloging routine to see if there were any savings as a result of vendor records being in the national databases.

Spanish-language catalogers were among the first to feel the impact of vendor records. During the last few years, though, other non-English-language catalogers have begun to see similar records appear for their materials. Most European vendors now routinely send tapes to be loaded into the bibliographic utilities. While this study looks specifically at records from Spanish-language vendors, the basic issues are applicable to all of these records. This was verified through colleagues working with German-language material at University of Notre Dame and French-language materials at University of Georgia. We note here that these issues apply most directly to OCLC, which uses the single "master record" method for displaying bibliographic cataloging and holdings. Our colleagues using the RLIN utility with its "clustering" technique have fewer dilemmas with these records.

History of Spanish-language Vendor Records in Bibliographic Utilities

The history of vendor records in the bibliographic utilities goes back to the early 1990s (Peet 1999). During 1990 and 1991, representatives of Casalini Libri approached the Library of Congress with the idea of using electronically formatted vendor records to streamline the acquisition process. Unfortunately, the idea was "before its time," since the online system at LC was not configured to be able to take advantage of this technological enhancement. LC decided not to pursue this idea.

Various factors converged during the next few years forcing the Library of Congress to take a more aggressive approach to implementing computer-based processing. There was a federal hiring freeze and a vacancy rate of library technicians at LC that reached nearly 40.00%. In May 1993, at the Guadalajara meeting of SALALM (Seminar on the Acquisition of Latin American Library Materials), members of LC's Hispanic Acquisitions approached Puvill Libros with this same idea of using electronically formatted vendor records in order to address the growing backlog of materials at the library that needed to move through the acquisition process. By 1993, LC had an overall backlog of 8,500 recent Spanish imprints (two- to three-year-old publications) that needed minimal-level records in their database. After several months of testing, LC received the first set of MARC-formatted records from Puvill in early July 1994. Always open to pursuing good, apparently cost-saving ideas, Puvill approached OCLC in 1995, suggesting the sharing of these records with a wider audience. Many other vendors have followed this same path, leading us to the current situation.

Literature Review

A quick search of library literature will show that minimal-level records in the utilities is not a new idea. Our initial literature search indicated that there had been nothing written about vendor-produced bibliographic records. However, this has recently changed.

Vendor-produced Bibliographic Records

Beall "subjectively examines the impact the addition of vendor record to the bibliographic utilities, chiefly OCLC, has had on cataloging" (Beall 2000, 230). He analyzed vendor records for content and quality, then looked at the impact on cataloging and patron access. His study is based on opinion and calls for three areas of quantitative analysis. Our study validates much of his commentary, and addresses in part his suggestion for research about the quantity of vendor records that were enhanced after one to two years in the utility.

Minimal-level Records and Duplication

Two of the best histories about minimal-level records are by Patton (1991) and Stamm (1996). Everyone is aware of CIP records and those of us who have been around for a while will remember the early days of mass tape-loading projects that added many minimal acquisition-level records to OCLC. In our drive to get the most out of our processing dollars, we seem to be wedded to the idea that "something is better than nothing."

Yet, as professionals, we have questioned that marriage often through the years. Fox and Preece (1991) and Preece and Fox (1992) cover issues most closely related to vendor records. They discuss three reasons to upgrade minimal-level records: (1) to provide increased patron service through complete cataloging; (2) to maintain the library's commitment to quality cataloging; and (3) to enhance record quality for the online catalog (Fox and Preece 1991). As with vendor records, the minimal-level records in their study had no subject headings and there was no authority control for access points. They note that accuracy in transcription and coding of the title and extent fields is an area of highest concern: "[to] support key word title access, accurate transcription of the entire 245 field is critical" (Fox and Preece 1991, 29). They conclude that very experienced catalogers must do a detailed review of the entire record. They go on to recommend ensuring that the minimal-level record is not a duplicate in the OCLC database. "Duplicate" means one or more record(s) representing one bibliographic item that do not exactly match, resulting in a duplication of the OCLC master record, which will not automatically combine with the master record when OCLC's merge program is run. In their subsequent article (Preece and Fox 1992), Preece and Fox review the theory that minimal-level records in the database help librarians predict when full-level records will appear. They use a similar technique to our study, checking for record upgrades over a six-month period. They found that minimal-level records duplicated full-cataloging member records at a rate of 20.00%. They also indicate that catalogers discovered upgrading minimal-level records took as much time to catalog as items without copy, and required additional work to verify if there were duplicate records in the OCLC database. When duplicates were found, OCLC was notified, adding more time to the process of what should be inexpensive, simple copy cataloging. They cite a 1990 survey of Association of Research Libraries as supporting their observations. Similar discussions on upgrading minimal-level records can be found in case studies by Ferguson (1991) and Handman (1991).

Horny (1991) and Intner (1994) both look at the promise of minimal-level cataloging versus the end product. Horny points out that if the materials are not processed through the system, they are not available to the patron. Minimal-level cataloging promises to move items through more quickly. However, she notes that the information most easily left out of records is the data that is most easily and quickly entered into them. The most time-consuming aspect of cataloging is authority control where "savings are difficult to achieve" (Horny 1991, 10). Intner concludes that the items that would most benefit from minimal-level cataloging are those most easily identified and available rather than the most esoteric (Intner 1994).

Duplication and Errors

Beyond Fox and Preece, much has been written about the difficulties arising in all areas of library work due to duplication of records in the database. Johnson and Josel (1981) discussed the types of errors that cause duplicates and the resulting costs of duplication. Wanninger (1982) looked at the impact of duplication on search results and difficulties related to multiple searching strategies. O'Neill, Rogers, and Oskins (1993) looked at typical errors found in records that result in duplication in the OCLC database. The characteristics include "(1) typographical errors, (2) erroneous tags and subfield codes, (3) omitted information, and (4) inconsistencies between the variable and fixed fields" (O'Neill, Rogers, and Oskins 1993, 61). Our findings closely parallel theirs. They assert that it is transcription in a form that is similar but not exactly the same that leads to most duplicate records, and point to batch loading as a major source of duplicate records. The most significant characteristics identified for duplication occurred in the date, author, or publisher areas of the record. In particular, one-third of the duplicated records contained author entries that did not match. It should not be assumed, however, that only records

that are duplicated show these characteristics. A study conducted by Romero (1994) that looked at typical errors made by both entry-level and experienced catalogers indicated that there were areas of difficulty in cataloging in general. She found that most errors occurred in choice of heading and description, but that typographical errors were minimal. In the area of description, the publication field was the most problematic. Our findings corroborate this. Also, the results of our study will demonstrate that all of the problems seen with earlier versions of batch-loading minimal-level records are intrinsic in loading of vendor tapes into the utilities.

History of the Project

From the first appearance of vendor records in the bibliographic utilities, there has been intense, often heated, discussion about these records during the SALALM annual meetings. While it was noted that acquisitions departments, including the Library of Congress' Hispanic Acquisitions Section, find these records useful, there was a diversity of opinion among catalogers at SALALM about their overall utility. The SALALM Cataloging and Bibliographic Technology Subcommittee has members from a variety of public and private, large and small institutions that subscribe to either RLIN or OCLC, or both. As such, the subcommittee is representative of the greater library community. Variations in processing workflow and attitudes about patron access at different libraries influence whether these records are more or less troublesome. This is especially true when coupled with a library's decision to catalog the items locally or nationally. SALALM members that catalog locally and only attach their holdings to a national utility through tapeloads have fewer complaints about vendor records than do members who catalog directly onto the utilities.

The seemingly endless discussion about these records prompted some of us at SALALM to do a study of the vendor records. Our hypothesis was that, while possibly useful at the acquisition stage, these records posed several problems for catalogers. Chief among these problems is that converting these records to nationally acceptable standardized library cataloging records would be time-consuming. We felt that it was easier and more cost-effective to create an original cataloging record. We believed that comparing the unenhanced vendor record to the actual item would illustrate this. We knew that the vendor records would always lack specific information we require in our fully cataloged records: classification (in this case Library of Congress Classification, or LCC), bibliographic and content notes in English, and subject access through Library of Congress Subject Headings (LCSH). All of this must be added to the record before it can pass out of processing as fully usable cataloging, which means that the library can never accept the record just as it originally appears from the vendor. Additionally, name headings would have to be verified, as it was unlikely that the vendors would create the nationally compliant access points. We also wanted to see how these records fit into the overall picture of bibliographic copy available to us in our daily work. Did these records represent any duplication of records already in the bibliographic utilities? If the answer is yes, then how much duplication is created? Finally, we realized that the deciding factor about the utility of these records would be based on whether they were cost-efficient or not. At what point could these records be handled by the least costly staff? A précis of the methodology and preliminary data used here was presented at the meeting of the Cataloging and Bibliographic Subcommittee during the 1999 annual meeting of SALALM held in Nashville, Tennessee.

Method

The purpose of this small study is to see if the complaints about the quality of vendor records (which were raised during the SALALM meetings), the rate of duplication in the OCLC database, and the resultant increased cataloging workload and cost are justified. To do this, we compared the vendor record to the item, seeking any errors in transcription or choice of data transcribed; we searched the OCLC database for any duplicate records; we tracked the records for potential use in copy cataloging; and we analyzed the costs.

Our sample was gathered from the workflow at the University of Notre Dame Hesburgh Library, which uses vendor records in its acquisition process, but is not an OCLC enhance library. All of the titles would have been searched in OCLC at the point of order. If a record existed at that time, it would have been downloaded into the local system to generate the order. Otherwise, a record would have been created on the local system. The items were always searched by the International Standard Book Number (ISBN). This is a simple and inexpensive search that should give good results provided the ISBN appears in the record. The assumption was that this search takes approximately five minutes per item.

When the items were received, the local database was searched. Items with full- or nearly full-cataloging records were appropriately distributed to the copy-cataloging unit. Items with strictly acquisition-level records were researched by ISBN in the OCLC database, then distributed accordingly. Normally, titles lacking full cataloging are put into a searching cycle for a maximum of 18 months. About every three months the title is searched for an acceptable record, and sent through processing or put back into the search cycle until it completes 18 months in the cycle. If there is no

full cataloging at the end of that period, the item is sent to the professional staff for local processing.

We collected a set of 64 titles from all items routed to the social sciences cataloger at Notre Dame from two shipments from Puvill Libros received in May and June of 1998. The sample was of titles that had only vendor records available when received. The original versions of the vendor records associated with the sample titles were printed. We kept these as examples of how they appeared in OCLC, prior to any upgrade or merging with other records.

In early July 1998, the title pages and versos of each sample title were photocopied and matched with the original vendor record. Using this process, we sometimes missed series information that would have appeared on covers, series title pages, or spines. Therefore we will not include any discussion of the series fields in our analysis. The title page and verso information was then compared to the original versions of the OCLC records, noting any discrepancies, such as typographical errors, omissions of data required by the cataloging code, miscoding of fields, etc. The 300 field (pagination, etc.), in general, was omitted from this review as the work was being done without the book. The exception was for multivolume sets. The issues related to these are discussed under "duplication" below.

During late July and early August of 1998, the OCLC database was searched for all records that might match the title pages. A combination of techniques was used in this process. We searched by ISBN, all types of derived searches, and scan title in order to ensure that we found any record that could be used in the cataloging process. This process was repeated in October of 1998 and April of 1999. Due to the appearance of the Beall (2000) article, another search was done in July of 2000 for any title that had not received full cataloging by April of 1999. Each time the records were searched, detailed notes were made about the records found. These notes include the number and type of duplicate records found (e.g., other records from LC, a member library, or a vendor), the number of holding libraries for each record, differences in the records versus the title pages, and differences in the records that might cause them not to merge using a duplicate-detection algorithm.

Finally, in order to try to analyze costs, we kept track of when each item would have been able to move through the copy-cataloging process that requires no additions or changes, the least expensive processing. Then, we looked at the overall costs associated with the processing of these titles.

Analyzing Collected Data

Our data involves four areas: (1) errors in the vendor records that lead to increased editing time, and that may be the cause of duplication in the bibliographic databases; (2) the amount of this duplication; (3) timeliness of copy cataloging for items represented by vendor records; and (4) processing costs for cataloging items using vendor-generated records.

Errors

As noted in the literature review, O'Neill, Rogers, and Oskins (1993) and Romero (1994) found characteristic types of errors records in the database. These errors are consistent with our findings for vendor records (see tables 1 and 2). While we saw some problems with accurate transcription, we believe the typing errors were typical of any randomly chosen set of records from the database. There was also the occasional odd decision for 245 filing indicators. These two problem areas would result in difficulty locating the record in the database and could contribute to duplication, but overall were minor.

Romero found that both experienced and beginning catalogers made the most errors (41.60% and 49.06%, respectively) in (1) choice and form of headings and (2) description of the items (Romero 1994). We also found that the most difficulties were in these two areas (see tables 1 and 2). The 260 field was particularly problematic due to inaccurate presentation of the publisher (33 of 49 errors, or 67.35% of description errors). From the information in table 1, one can conclude that the error rate in the description in vendor records is significantly higher (50.00%) than in records produced by people with minimal professional training. Additionally, one-fifth of the records (20.31%) had errors in choice or form of headings, either main or added entries.

Accurately editing fields that are inconsistently entered is time-consuming and difficult. Having to spend extra time meticulously correcting a record automatically raises the cost of using it. Romero concluded that these were errors that could only be addressed through improved training. We

Table 1. Types of Errors in Vendor Records

Typographical		Choice/ Form of Headings		Bibliographic Description	
# of records	% of records	# of records	% of records	# of records	% of records
7	10.94	13	20.31	49	76.56

Table 2. Multiple Error Types per Vendor Record

Typing and Heading		Typing and Description		Heading and Description		Typing, Heading, and Description	
# of records	% of records	# of records	% of records	# of records	% of records	# of records	% of records
1	1.56	4	6.25	7	10.94	1	1.56

absolutely agree with this assessment: these problems could be overcome through training programs developed specifically for vendors.

With regard to form of headings, Russell Marr, Library of Congress, Hispanic Acquisitions Section, helped us research the issue of vendors' access to the LC name authority file. According to LC personnel, this file is not used by the vendors that LC contracts for original acquisition tapes (Marr 1998). They would need to contract with OCLC or RLIN for access to it. The use of authorized versions of personal and corporate names is the heart of appropriate access and collocation in our catalogs. Anyone who has ever attempted to look for information in periodical and newspaper indexes about Muammar Qaddafi can attest to the problem inherent with multiple ways of entering a name! While most of the personal names in the sample could be relatively easily identified and corrected, corporate names, especially conference names, were rarely correct. These were usually tagged as 100 fields instead of the appropriate 110 or 111 designation. Again, the correct tagging of the fields could be easily improved with minimal training, but significantly more in-depth instruction would be necessary for confident construction of corporate names to fit into the bibliographic setting that our libraries use. The lack of authorized headings in the vendor records has the potential to be very costly over time. When one considers that the correction to name fields must be done by every library that uses the record, until such time as a library locks and corrects the record, one begins to see the extent of the associated costs. Unfortunately, without daily searching of each record, we would have no way of knowing at what exact point any particular record was upgraded, or how many libraries had used it prior to the enhancement. Therefore, we cannot state unequivocally how much libraries throughout the world are expending toward these corrections.

Duplication

Duplication of records in the OCLC database is problematic for efficient cataloging. We found that vendor records exacerbated this problem. Our initial search, using the variety of techniques described above, yielded duplicate records for 17 of the titles, 12 of which had usable cataloging copy. This means that 26.56% of our titles were duplicated in the database. Also, 18.75% of our sample had usable copy in the database without the distraction of the vendor records. (See table 3.) The second and third search cycles increased the duplication rate to 31.25% and 37.5%, respectively.

During the second search, one of the original records was upgraded by the Library of Congress (LC), one was upgraded by a member library, but also duplicated by a LC record, and two were duplicated (one by LC and one by a member record). This raised the overall rate of available copy cataloging to 25%. By the third search, the duplication rate had risen to 37% of the total. Of the 24 titles duplicated, 8 duplicates had been merged. Also, 23 had either been upgraded or the new duplicate represented full cataloging. The other title had been upgraded but lacked LC classification.

We believe that the two most common categories of errors noted above, description errors and incorrect form or choice of headings, are the roots of the duplication found in our sample. This is due to the very broad de-duplication algorithm used by OCLC that results in a lack of match when the program is run. Jay Weitz, Consulting Database Specialist for OCLC, sent us information about the Duplicate Detection and Resolution (DDR) software that was developed about a decade ago. He stated that the "DDR runs through the WorldCat database on an irregular basis (currently, roughly every six months)" (Weitz 2000a). He indicated that the algorithm uses fourteen descriptive elements on which to form a match for merging records. Also, there are about ten conditions that prevent merges. He noted that more than one million duplicate records for the books format have been merged since DDR first ran in June 1991. In his subsequent message, he listed the elements included in the algorithm: "cataloging library; LCCN [Library of Congress Control Number]; ISBN; government document classification number; media; author; title; statement of responsibility; edition statement; place of publication and publisher; publication date; number of pages or volumes; size; and series statement" (Weitz 2000b). He went on to say "we tend to err on the side of adding or leaving duplicates rather than merging away unique records whenever there is uncertainty" (Weitz 2000b). Given the need to match on publication data and choice and form of author, the areas with the most errors in the vendor records, it is not surprising that only eight of the duplicate records found during our study had been merged by the time of our third search of the database. It is also not surprising that so many duplicates are created at the initial tape loads. It would be interesting to know, of the eight merged records, how many were merged automatically and how many were reported by diligent libraries trying to clean the database.

Whenever there is duplication in the database, the cost of locating appropriate copy cataloging automatically increases. Instead of being able to do a simple numeric search of an ISBN, which should result in one record in OCLC, the

Table 3. Duplicates

Date	# of Duplicate Records	% of Total	# of Records with Full Copy	% of Total
Aug. 1998	17	26.6	12	18.8
Oct. 1998	20	31.3	16	25.0
Apr. 1999	24	37.5	23	35.9

library must pay more experienced, and therefore more expensive, personnel to distinguish among several records, and decide which is the best choice. Beall (2000) also shows that libraries, which had previously been able to utilize OCLC's Cataloging Micro Enhancer (CatME) software to great advantage in finding suitable copy cataloging, are now stymied by the influx of minimal-level records that the CatME software cannot distinguish from full-level cataloging. The automated search results in multiple records being downloaded, and the consequent increase in cost. The issue of duplication for vendor-produced records is particularly significant for Spanish-language cataloging as there are multiple vendors giving records to OCLC. Our study showed several cases when there were multiple vendor records for a single title.

The issue of multiple vendor records for a single title was particularly evident with multi-volume sets. In our sample, we found separate records for individual volumes of multivolume sets. Standard cataloging practice dictates that these volumes would be described on one bibliographic record in most cases. The exception, of course, would be a monographic set that warranted analysis of each individual volume (a rare case). We had two cases of multivolume/multirecords for items that were fully cataloged incomplete monographic sets. OCLC's reliance on machine-driven merge algorithms to identify and merge duplicate records will not work in these cases. We must rely on people to report these for manual merging, thereby increasing the cost of having them in the database (Johnson and Josel 1981).

Tracking Copy

When we looked at the time frame for appearance of copy cataloging for the titles in our sample, we were pleasantly surprised. There was a steady increase in the amount of copy available through either upgrades of the vendor record or duplication of these records by full-level LC or member-generated records (see table 4). Slightly more than 20.00% of the titles had usable copy at the time of the first search period during the summer of 1998. Twelve of the 13, however, came from duplicate records. In only one case was the record an upgrade of the vendor record, and it was done by Notre Dame. By October of 1998, almost half (46.87%) had usable copy. When the last search was done in April of 1999, 11 months after the sample records were gathered, 81% had usable copy. For our original study period, only 12 remained without complete cataloging. Of those, 2 only needed a classification number to complete the cataloging.

Beall posed three research questions, one of which focused on percentage of vendor records enhanced at the end of a one-year period, and a two-year period (Beall 2000). Since we had been looking at availability of full cataloging for titles represented by vendor records, we did searches for the 12 titles that did not have full-level cataloging at the end of our initial project. We hoped our findings would shed light on this issue. Our findings do not directly answer Beall's question since we looked for *any* available copy, not just enhancements to the vendor records. However, our findings show that full-level cataloging is available for items represented by vendor-produced records within his timeframe. In table 4, we show that 61 of the 64 sample titles had full cataloging at the end of two years. This accounted for 95.31% of our sample. We agree that further research needs to be done in this area. In particular, more study needs to be done based on the criticism that less original cataloging is being done because of the shift of the workload to upgrade these nonstandard minimal-level records (Beall 2000).

Another issue raised by Beall concerns uploading improved versions of the vendor records for national consumption (Beall 2000). An earlier study by Sercan (1994) found a marked decrease in the amount of full cataloging for Spanish-language materials available between 1983 and 1992 (18.00% versus 4.00% for LC copy, and 13.00% versus 5.00% for RLIN member copy). Erbolato-Ramsey and Grover's (1994) findings "would seem to indicate that most libraries accept and input less than full AACR2r [Anglo-American Cataloging Rules, 2d ed., rev.] level records online and do not update them [nationally] at a later time" (83). Beall points to the lack of financial incentive as a likely reason for the decrease in upgraded copy (Beall 2000). Our findings do not seem to support this theory. However, our sample is extremely small given the overall output of Spanish-language publications. A larger study would be useful.

Costs

The costs described here are based on the 1998 INCOLSA network prices and the labor costs at Notre Dame for that year. The following were the labor costs: support staff for transcription = $0.33 per item (figured at $15.00 per hour and 5 minutes per item); professional completion of records lacking only LCC = $3.75 per item; professional completion for other records = $21.86 per item. Network costs were: numeric or derived search = $0.34; update = $0.43; export (to local system) = $0.12. Network credits are: nonenhance

Table 4. Tracking Copy

Date	# with full copy	% with full copy	# lacking copy	% lacking copy
Aug. 1998	13	20.31	51	79.69
Oct. 1998	30	46.87	34	53.13
Apr. 1999	52	81.25	12	18.75
July 2000	61	95.31	3	4.69

upgrade = $2.10; enrichment (call numbers, subject headings, etc.) = $0.52; nonenhance original addition = $3.83. Beyond these specific costs, one must remember that there are additional hidden costs for sorting through multiple records as identified in the section about duplication above.

Table 5 shows the per-item processing costs during the original one-year period for titles in our sample using the cycle of searching scenario earlier. Overall, this information is fairly irrelevant since the items would have been processed regardless of the cost. However, these costs show the same disincentive to upgrade the record that Beall found (Beall 2000): an enrichment credit of $0.52 to add the classification number to a record does not compensate for the processing costs of $6.87. Similarly, a processing cost of $24.98 for an item needing essentially full cataloging will now only gain a credit of $2.10 to upgrade nationally where it formerly would have been credited at $3.83. This cost structure would seem to undermine the tenet of cooperation that traditionally has been the foundation of OCLC. We begin to see the dilemma presented by Sercan (1994) and Erbolato-Ramsey and Grover (1994). Is there enough financial incentive to upgrade these records, or will we begin to see less full-level cataloging at the national level as budgets for technical process continue to tighten?

Conclusions

Our original questions were:

1. How much manipulation of the records must be done for vendor records to fulfill the requirements of the nationally acceptable standardized library cataloging records? Is this reflected in errors in vendor records that make it difficult to utilize them as cataloging records?
2. What level of duplication in the bibliographic databases do vendor records represent?
3. When does copy cataloging for titles represented by vendor records appear in bibliographic databases?
4. What are the costs associated with vendor records in the database?

First, we determined that the vendor records would never fulfill the requirements for library cataloging records since they will always lack classification and subject headings needed for our catalogs. We also found that there was a pattern of data-entry errors that placed a burden on the library community to correct. Accurate editing is a time-consuming and labor-intensive process in the best of settings. The types of errors found in the vendor records were not usually simple typographical ones. Rather, they were content-oriented and inconsistent, thus tended to increase the time necessary to review each record. Among the content errors was choice and form of headings. We concur with Romero (1994) that appropriate training, in this case for vendors wanting their acquisition-level records represented in the OCLC database, would help alleviate many of these problems. Further we believe that access through OCLC to the name authority files would improve the quality of the headings on the vendor records.

Second, we found that these errors led to duplication in the database. Of our sample, 37.50% was duplicated by full-level records already in the database or added during our

Table 5. Processing Costs in Dollars per Item

Full Cataloging Available	Pre-order Search	Export	Labor	Subtotal	Search at Receipt	Update	Labor	Total or Sub-total
On receipt	0.335	0.12	0.33	0.785	0.335	0.43	0.33	1.88
1st cycle	0.335	0.12	0.33	0.785	0.335		0.33	1.45
2nd cycle	0.335	0.12	0.33	0.785	0.335		0.33	1.45
3rd cycle	0.335	0.12	0.33	0.785	0.335		0.33	1.45
3rd cycle plus class no	0.335	0.12	0.33	0.785	0.335		0.33	1.45
3rd cycle plus full review	0.335	0.12	0.33	0.785	0.335		0.33	1.45

Full Cataloging Available	1st Cycle Search	Update	Labor	Subtotal	2nd Cycle Search	Update	Labor	Total or Subtotal
1st cycle	0.335	0.43	0.33	2.55				
2nd cycle	0.335		0.33	2.12	0.335	0.43	0.33	3.21
3rd cycle	0.335		0.33	2.12	0.335		0.33	2.78
3rd cycle plus class no	0.335		0.33	2.12	0.335		0.33	2.78
3rd cycle plus full review	0.335		0.33	2.12	0.335		0.33	2.78

Full Cataloging Available	3rd Cycle Search	Update	Labor	Total Cost
3rd cycle	0.335	0.43	0.33	3.88
3rd cycle plus class no	0.335		3.75	6.88
3rd cycle plus full review	0.335		21.86	24.98

study. Therefore, more experienced people would have been needed during the searching process to accurately identify appropriate cataloging copy. We determined that OCLC's duplicate-detection algorithm errs on the side of adding duplicates in order to ensure unique records are not inappropriately merged (Weitz 2000a). This means that we must rely on people to report duplication as it is found. However, Johnson and Josel (1981) concluded that this is a course of action too expensive to pursue consistently.

The corollary to the duplication issue, however, is that two-thirds of the titles in our sample were new to the database. It is valid to ask, then, would there have been more or less full-level cataloging in the database if the vendor records did not exist? Does having a base record from which to work help or hinder the production of final cataloging? It can be argued that, since materials go through the acquisition process more quickly, they are in the cataloging workflow more quickly, and therefore are attended to sooner than before vendor records were available. Further study would have to be done in this area to verify any speed of access or costs savings this might represent.

Next we looked at when full cataloging appeared for titles represented by vendor records. We could not determine full-level cataloging availability based solely on the upgrade of vendor records because often full cataloging came from records that duplicated the vendor record. However, by tracking the materials through a cycle of searching the OCLC database for cataloging copy, we were able to determine how quickly they would have been made fully accessible to the library's patrons. We determined that 81.25% of the titles had full cataloging at the end of the original study. In response to Beall (2000), we searched the titles that lacked full cataloging at the end of the original study. This revealed that a total of 95.31% of our sample had full-level cataloging available at the end of two years: a very good return.

Finally, we looked at processing costs. Do vendor records provide a cost-efficient technique for providing quick access to our collections? Our answer would be a qualified yes. If our 95% rate of full cataloging over a two-year period is representative of vendor records in the database, and as long as a handful of libraries are willing to continue to bear the full burden to upgrade these records, the rest of us will enjoy inexpensive cataloging. However, should the burden become too great and the reward remain so little, we could well begin to see a drop in the percentage of full-level cataloging available. Further study would need to be done to determine if there is any other positive impact from the presence of vendor records. In particular, more analysis of the impact on the costs of processing due to the duplication rate associated with vendor records would be useful. Also, a study needs to be done to see if there is any correlation between the addition of new and unique titles entered as vendor records and how quickly these are upgraded.

Recommendations

Vendor records will be a permanent part of the bibliographic universe for processing materials in our libraries because they provide early notification of new materials. However, beyond timeliness, high quality records are also important for both the national databases and our local library catalogs. We believe that by adopting some or all of the following recommendations the bibliographic quality of vendor records will improve and the level of acceptance in the library community will increase.

Recommendation 1: OCLC should initiate a rigorous training campaign for all vendors adding records to the bibliographic utilities. This training should concentrate on the bibliographic description standards used by the majority of OCLC's constituency.

OCLC expects members to adhere to national-level standards for the records we place into the database. It is reasonable for members to expect this quality for any record we find in the database. Sally McCallum, Chief of LC's Network Development and MARC Standards Office would also seem to support this idea:

> [I]t is generally the responsibility of sending organizations to make records conform to community developed and approved standards, and if the original sender does not do this then many to whom the original sender distributed have to take on duplicative work (McCallum 1997).

The authors sent examples of typical errors found in this study to the Library of Congress for a training program it developed in the fall of 1998. These examples could be the basis for a training program to refine all vendor records to meet the community-developed standards noted above.

Recommendation 2: We encourage OCLC to make the authority files available to vendors. Further, we encourage extensive training in the construction and application of these files and the headings they contain.

One-fifth of the errors in our sample were from incorrect headings. Having the correct form of the name will lower the cost of upgrading the record. It will also help in the deduplication process given that "author" is one of the fourteen elements used in the OCLC deduplication program (Weitz 2000b).

Recommendation 3: We strongly encourage initiation of financial credit to libraries reporting duplicates in the OCLC database.

Every library must spend precious staffing funds wading through multiple records to find full cataloging. Libraries also spend funds notifying OCLC of these duplicates. Consequently, this process is rarely done according to Johnson and Josel (1981). It is clear that any savings vendor records

may provide to libraries in terms of the keying process can easily be consumed by the searching process when there is a high rate of duplication. We have noted that further study needs to be done to determine the costs to libraries of documenting and reporting duplicates. Since OCLC's deduplication program errs on the side of adding duplicates, OCLC should offer reasonable compensation to libraries reporting duplicates based on costs determined by the recommended study.

Recommendation 4: We strongly encourage OCLC to consider increasing credits to libraries for upgrades, enhancements, and enrichments to records in the database.

As more libraries move to systems that will allow them to download records from the catalogs of other libraries, and Internet searching of catalogs becomes easier, it is possible that we will see a decrease in upgrading of any less-than-adequate records found in the bibliographic utilities. Giving significantly higher credits for upgrading and enriching the database will give incentive for more member participation. This credit needs to be concomitant with the cost of doing the work. We determined that upgrading acquisition-level records was almost $25.00 per record. This falls within the range of $15.00 to $30.00 suggested by Steinhagen and Moynahan (1998). They go on to indicate that there is a strong relationship between cooperation and economic reimbursement. To avoid undermining the cooperative spirit behind internationally shared cataloging, more realistic and appropriately priced credits need to be given to the libraries providing the intellectual content of the database.

Recommendation 5: We encourage vendors to take the opportunity to include value-added information in the records they produce.

John Riemer of the University of Georgia suggested that vendors are in a unique position to give value-added service at the point of record creation. If vendors have scanning equipment, they could readily add tables of contents to their records with minimal increase of the labor costs. This would provide additional information to prospective buyers and act as an advertising technique, thus boosting sales. The added access would also give libraries more reason to look favorably on vendor records.

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The Effect of Interface Design on Item Selection in an Online Catalog

David H. Thomas

The effect that content and layout of bibliographic displays had on the ability of end-users to process catalog information was tested using a 2 x 2 factorial experimental design. Participants were asked to perform two related tasks during the course of the experiment. In the first task, they were asked to select a set of items that they would examine further for a hypothetical paper they must write, using a simulated online catalog to make their assessments of relevance. In the second task, they were asked to examine 20 bibliographic records, decide whether they would choose to examine these items further on the shelf, and identify the data elements that they used to formulate their relevance decision.

One group viewed bibliographic records on an interface similar to current online catalogs, one that used data labels and contained data elements commonly found. A second group viewed these records on an interface in which the labels had been removed, but the data elements were the same as those in the first. The third group viewed these records on a labeled display that included enhanced data elements on the brief record display. The final group viewed these records with the same brief record data elements as the third group, but with the labels removed, using ISBD and AACR2 punctuation standards.

For the first task, participants using enhanced brief screen interfaces viewed more brief screens and fewer full screens than their counterparts. Screen durations for the second 10 screens were found to have dropped from those of the first 10 screens. Statistical analyses comparing demographic variables to the screen frequencies uncovered many significant differences. Participants using the enhanced-content interfaces made fewer selections from index and full screens, and more selections from brief screens. For the second task, participants who used enhanced-content interfaces were able to make some sort of relevance judgment more frequently than those who used standard-content interfaces.

The widespread introduction of online public access catalogs into libraries over the last fifteen years has had a major impact on the way that end users utilize libraries and the resources that they contain. The development of online catalogs has transformed the primary locating tool in libraries—the card catalog—from a tool with limited means of exploitation to one with a much greater potential to help users find needed information objects. Research has suggested, however, that the online catalog brings with it a new set of problems for end users, as the added capabilities have also brought added complexities (e.g., Larson 1991a). Migrating bibliographic data from a print to an online environment has required reevaluation, redesign, and testing of many aspects of bibliographic information systems, from the methods of retrieval through the means of

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presenting this information. While a large number of researchers have examined functional aspects of the system-user interaction with online catalogs (e.g., Bates 1989; Borgman 1986; and Harman 1992), few have investigated the effect that screen content and layout might have on the effectiveness of the system-user interaction. The screen content and layout of online catalog interfaces have been designed almost entirely based on expert opinion, with little use of empirical data on user preferences.

The purpose of this research was to contribute to the knowledge about online catalogs in order to help improve the effectiveness of those catalogs. The primary objective was to examine the communication process between the user and the catalog by gathering basic empirical data about user performance on different types of online catalogs. This was done by testing whether the content and layout of bibliographic displays in an online catalog influenced the effectiveness of the interface between online catalogs and end users.

The Information Seeking Process

In the information seeking process, an individual lacking knowledge to solve some need or problem *seeks* to remedy that lack by obtaining knowledge from some information resource (Buckland 1991). Such resources can range from other people (e.g., authorities) to museums or libraries. When the resource that the user consults is a library, the individual may employ the library's locating devices to identify potential informing instruments. The mechanisms in a library by which an individual can obtain needed information include consulting a reference librarian, reference sources, or the library's collections. In the latter two cases, the individual often must use the library's bibliographic catalog to locate the specific informing entities (e.g., almanacs, encyclopedias, journals, monographs, etc.) that are needed.

However, because the library serves the needs of many different users, its catalog contains data designed to address many potential problems or needs, and the process of locating useful informing entities for an individual's particular need can be difficult and frustrating. Individuals might seek information about particular attributes of a library's holdings, as when they look for items created on or after a certain date; they might require a particular bibliographic entity in the collection; or they might need information of a more general topical nature. Moreover, individuals must try to match their conceptualizations of the problems with the terminology used by the information system to represent those problems. These factors make a complicated process of bringing the information seeker together with the information sought.

This search process can be made easier or more difficult depending on many conditions, ranging from the ability of individuals to articulate their problems to the degree of helpfulness or obstructiveness of the library's information retrieval systems. However, the information system's failure might occur because the system fails to communicate clearly the content of the database. A failure of this type can occur because the user does not understand that the system has successfully retrieved bibliographic records to meet the user's need. A system that presents the user with incomplete or unclear data about the items it describes can mislead the user into thinking that the system does not contain items that meet the information need. For example, the data element that caused a particular record to be retrieved in response to an information seeker's request may be embedded in a part of that record that the seeker does not initially see. This might occur, for example, when an individual requests a specific work that is listed in a contents note and an added entry, neither of which the user sees on initial screens. In other words, how the system presents its findings to the user can influence the success of the communication process in an information retrieval exchange.

This problem underscores the fact that an information storage and retrieval system is, in fact, an information storage, retrieval, *and presentation* system. It is not enough for the system merely to store and retrieve information; to be useful, this information must be presented to the user in a manner that the individual can interpret meaningfully.

The adoption of cataloging standards, such as the *Anglo American Cataloguing Rules*, 2d. ed. (AACR2), represents a recognition of the user's need for standardized bibliographic descriptions. Without such standards, the user would have to interpret each library's catalog separately, which can hinder the communication process. Similarly, the International Standard Bibliographic Description (ISBD) represents an effort to establish guidelines for the arrangement of bibliographic data in a unit description, in part to make it possible for the user to interpret the contents of the description more easily.

With the advent of online catalogs, awareness of the user's need for standardized bibliographic description seemingly waned. This might have been due in part to the fact that the complexity of introducing computer technology in bibliographic applications distracted system developers, and it might have been due in part to the desire of developers to experiment with the power that the new technology offered. Moreover, the ability to manipulate the content of the online catalog more freely has given the library profession the ability to question the bibliographic display content guidelines previously established. The wide variation in current online catalog screen designs supports this view.

One negative result of this experimentation has been the loss of familiarity for the user, as each library's catalog can have different features and displays. The user is once again placed in the situation of having to learn how each library's catalog functions and how to interpret the output of

each of these systems. Different displays may contain the same kinds of data, while seemingly similar displays may have different information. Such confusion makes using online catalogs more complicated for the individual.

An examination of the library literature reveals that the content and layout of few—if any—online catalog displays have been rigorously tested to determine whether they meet users' needs, and that most catalogs have been designed without such input or testing. In human factors research into computer screen design, researchers have established broad guidelines for efficient and clear screen design—broad guidelines that library systems designers have used to inform online catalog designs. However, these researchers, too, have largely failed to base screen display design principles on empirically gathered data. This might be because the wide variation in applications makes such detailed study meaningless, inasmuch as the layout of data onscreen is so dependent on the purpose and content of the data. Library catalogs are bounded, however, by function and content. By and large, they serve the same purposes (identification and location of information objects), use the same data structure (the MARC format), and use the same data content (as prescribed by cataloging rules such as AACR2).

In addition, bibliographic data differ from typical computer data structures. Examination of manuals of screen design suggests that most applications use data of repetitive content and fixed length. In contrast, bibliographic data are highly variable in content and length, thus making the wholesale application of these general guidelines difficult. For example, labeling the data elements of even a simple MARC record can be challenging, because different types of data can reside in the same position of a display—as in the instance of the main entry, which can be a personal name, a corporate body, a conference name, or a uniform title. Furthermore, the existence of pre-established formatting standards for bibliographic data frequently render conventional design formulae inapplicable. ISBD, academic citation forms, and the catalog card—all of which existed prior to the introduction of online catalogs—are each familiar, alternative means of presentation of bibliographic data. These two factors—the nature of bibliographic data and alternative means of formatting bibliographic data—suggest that standard screen design criteria should be examined and tested.

Literature Review

The literature of human-computer interaction is large and diverse, and researchers in both the field of human factors and that of library and information science have studied many aspects of interface design. Researchers in the library and information science field have been concerned with the human-computer interaction specifically as it is manifested in the exchange between the online catalog and the library user. Indeed, the need for ongoing research into this interaction has been recognized for some time. For example, Cochrane and Markey (1983, 340) list "analyzing user requirements and behavior" as the first of four priorities in need of systematic study with online catalogs. In response to these perceived needs, a large body of data has been gathered regarding online catalog user behavior, but few authors have examined user preferences for online catalog displays. Human factors research is more varied, as the number and type of applications. It ranges from studies in which authors examine the effect that particular design attributes, such as color or highlighting, have on interface usability, to broad-based handbooks on general interface design. This literature includes numerous empirical studies that might inform online catalog design.

The efficiency of the information exchange between the user and the information system is a major concern in this study. The central question is whether participants perform better when using screens with particular data on them in particular layouts. Consequently, this review begins with a description of research about library catalog performance. Also examined is literature about human factors research and interface design, and cognitive aspects of users' utilization of an interface. Researchers interested in a more detailed review can see Thomas (1997).

Authors in each of these areas consider the human-computer interaction from different perspectives. Those who conduct system-oriented research examine this interaction in terms of information system features, and attempt to determine whether the system provides the user with appropriate functions and usability. This is relevant because screen design is integral to system design, and tests of system performance can include tests of screen layout. Some researchers in human factors attempt to view more specifically the effects of the presentation of system content and function on the human-computer interaction. Authors who study cognitive aspects of information system components seek to test the human-computer interaction in terms of how the brain processes information. Most of the researchers in each of these areas consider only the ability of the system to communicate to the user the structure and functions of the information system, however, and do not consider the effect of content presentation on the efficiency of the human-computer interaction.

System-Oriented Research

With the introduction of online catalogs to the library, the field of catalog use research has flourished. Computer-based systems have made it possible to gather data on users' searches that could not be gathered in the manual catalog environment. This capability has given librarians and researchers an

unprecedented opportunity to examine what users do with catalogs. Investigations of catalog use are relevant here because in this study the communication process between the user and the system is examined in an attempt to analyze sources of communications breakdowns. With regard to this research, however, most researchers have sought ways to improve the search engine or the database mechanics, rather than questioning the content of specific displays.

Two aspects of catalog use that have received a great deal of attention from researchers are subject searching and indexing, in large part because of their problematic natures (Larson 1991a; Markey 1985). Subject searching has been identified by users as the most difficult aspect of catalog use. Despite this, subject searching is one of the most frequently used methods of searching (Bates 1986). Authors of many such studies consider the mode of presentation of this information to be substantially deficient. Larson (1991a), in discussing the problems of zero retrievals and information overload, envisions a future interface with user-definable screen formats and functions. Similarly, Bates (1989) proposes an interface that uses a "Super-Thesaurus" to assist users in entering the catalog. Neither Bates nor Larson give details of how such innovative systems might be presented to the end user, although Larson does consider, in his discussion of methods for remedying subject search problems, the catalog interface to be one important factor in the overall success of the information transfer process.

Similarly, Borgman (1986) examines the difficulties that online retrieval systems pose to end users. Borgman identifies numerous problem areas that have been studied, grouping these into problems with mechanical aspects of retrieval systems and problems with conceptual aspects of the process of retrieval. She reviews the research concerned with the effect that individual differences play in this process, noting that most researchers have found that the search process differed depending on cognitive style, but that search results did not. Other researchers have found that overall experience with retrieval systems affected search results. Borgman points out, however, that little research has been conducted into the effect that interface design has on the success of searches. The only authors whom Borgman cites who are concerned particularly with online catalog interfaces, Martin (1974) and Hildreth (1982), list online catalog features, but do not evaluate how these features might be valued, interpreted, or used by the end user.

Harman (1992) places a different emphasis on this issue, and questions whether changes in the user interface can make a complex Boolean retrieval system truly easier to use. At their most basic level, the author argues, these systems require the end user to understand the theory behind Boolean logic, a requirement that she implies is too demanding. The author then describes four prototype search systems based on statistical retrieval techniques, each with a custom-tailored interface. Nonetheless, Harman concentrates on improving the functional aspects of the catalog—on improving search capabilities—rather than on improving displays. While these systems do offer a range of different display types, there appears to have been little testing of the screens on users, and thus little effort to determine whether they present the user with information in a more comprehensible manner.

Similarly, the majority of researchers who have gathered empirical data on user actions at online catalogs have attempted only to document the functional aspects of a system that are used, and not how users evaluated the data presented to them or whether they understood the meaning of these data. Both Borgman (1988) and Seymour (1991) provide reviews of this literature. Seymour arranges them by the method of data collection, with categories for surveys, experiments, transaction log analyses, interviews, and direct observation. In addition to the method of data gathering, Borgman also attempts to identify and categorize the variables studied. In this list, Borgman includes as a final variable for study the "effect of different interface methods (e.g., command, menu, form fill-in) on behavior," but then notes that this area "has not been studied empirically for information systems" (145). The need for research into mode of presentation is not raised.

Examples of use studies of online catalogs include: Larson (1991b); Millsap and Ferl (1993); Hancock-Beaulieu, Robertson, and Neilson (1991); and Siegfried, Bates, and Wilde (1993). The authors of these studies examine aspects of user online behavior, and typically offer suggestions on how these aspects might be changed or assisted in some way. Larson (1991b) used nearly complete transaction logs of a major academic library system for a six-year period to examine changes in search patterns. Using logs for the University of California's MELVYL online catalog, Larson found that subject searching over the period declined by about 2% per year as a percentage of searches performed. He suggested that this decline was the result of an increase in title word searching, as users moved away from the complexities and failures of subject searching. Larson recommended that online catalogs offer users assistance in mechanical aspects of searching, such as partial matching and stemming of terms, but he did not question whether the mode of presenting this information might be improved.

Millsap and Ferl (1993) examined the transaction logs of more than 1300 remote uses of MELVYL and found that a large number of searches were basic and retrieved one or more citations. However, a substantial minority of users had difficulty using the system, retrieving either no entries, or unmanageably large numbers of them. Again, the authors proposed adding online catalog features that would assist the user with mechanical aspects of searching.

Siegfried, Bates, and Wilde (1993) explored the search behavior of humanities scholars through transaction log and

protocol analysis. In their conclusion, they stated (288) that their "results suggest that the design of database search services . . . is still far from optimal for meeting the needs of humanities scholars." As before, the authors' main concerns were with finding means of improving the mechanical aspects of searching, and not the content of the user interface itself.

Thus, researchers in library and information science have focused largely on improving and documenting mechanical aspects of these systems. Most researchers would probably agree that online interfaces continue to need improvement; however, few have suggested that screen content or layout could play a role in this improvement.

Human Factors Research

Researchers into the human-computer interaction at online catalogs are acutely aware of the limitations of current-generation online catalogs, but their focus in finding solutions to these problems is on making the functions of the online catalog easier and clearer for end users. In the developmental stage of a new technology such as online catalogs, this focus is understandable and warranted. However, as online catalogs have become easier to use on a functional level, it has become increasingly important to test the ease of use of catalogs on an informational level—i.e., to test the means of conveying database content to the user. Library and information science professionals might look to the field of human factors research to find a body of research that can help inform many aspects of the design of online catalogs.

Human factors research is a broadly defined field that examines many aspects of the interaction that humans have with many different technologies. One facet of human factors research, however—that of computer interface design—has attempted to examine precisely some of the concerns that library and information science professionals need to consider. Human factors research into computer interface design will be examined here, with particular attention paid to the issue of screen layout and the effects that screen layout might have on system usability.

Several authors have written textbooks devoted to the design of user interfaces (e.g., Shneiderman 1992; Galitz 1989; Brown 1988; Dumas 1988; Crawford 1987; Norman 1990; Rubin 1994). Although the authors of these volumes support most of their design principles with empirical research results, this support weakens when each discusses layout and content choices. Instead, the authors tend to offer common-sense guidelines when discussing screen layout. The authors of these general texts rely largely upon common sense because there has been little empirical data gathered on the effect of a screen's layout on system usability.

Examples of empirical research in screen design include the work of Tullis (1981; 1983). In the first of these studies, Tullis (1981) found that reformatting screens to make them clearer significantly reduced decision-making time for users. From this, Tullis (1983) developed a means of measuring the complexity of screens based on groups defined by character proximity. Marcus (1982) discussed the role that graphic design principles played in the design of an interface for a geographic information management system. Kruk and Muter (1984) tested several aspects of reading text on video screens. The researchers found that reading text on video screens was slower than from printed matter, and that the vertical spacing of text on screen affected reading speed, but that screen contrast and distance from the screen had no effect on reading speed.

Trollip and Sales (1986) tested the effect that fill-justified text (i.e., text that has even margins on both sides) had on reading speed and comprehension. They found that reading speed was significantly slower for fill-justified text than for left-justified text, although comprehension did not differ. These studies, which were concerned with issues related to the impact that the layout of data has on interface effectiveness, might guide library systems designers in designing their displays, assisting with some of the many design decisions that must go into a typical online catalog display.

Tullis (1988) describes research conducted to identify and test the correlation between subjective and objective measures of screen complexity. In a preliminary experiment, Tullis isolated the correlation between these two measures by presenting participants with various screen displays and having them give a subjective rating of the screens. Participants were timed during the task, and these times were used to correlate the measures of screen complexity with time to complete the task. Tullis found that both time to complete the task and subjective rating were positively correlated to screen complexity. In a follow-up experiment, Tullis used the results of the first experiment to predict the outcome of a similarly structured experiment. Tullis found a high positive correlation between time and complexity, while the subjective rating/complexity correlation was not significant. The researcher then applied the evaluation criteria to earlier experiments of screen display, and found high correlation between the predicted values found by his criteria to the actual findings of those earlier studies, which lends support to the use of these criteria.

Tullis (1988) offers several design criteria that could be used to test alternative bibliographic displays. Tullis found that the number and size of the groups of elements onscreen had the greatest impact on search time, while the density of characters onscreen and the layout complexity (as defined by vertical alignment of screen elements) had the greatest impact on subjective rating. These criteria might well be applied to bibliographic displays, although the complex nature of bibliographic data and their potential for great length would need to be accommodated. Specifically, Tullis identifies methods for grouping data elements on-screen,

assuming that each element will occupy the same amount of space in every case—something that can't be assumed with bibliographic data. In online catalogs, data layout decisions must either be made once on a best guess basis, or for each record as it is prepared for display. Online catalogs to date have used the former method.

It is perhaps understandable that authors of human factors research—with the exception of Tullis—have given such scant attention to testing particular aspects of screen layout. Screen utility is closely related to the function of the application, the data that the system must convey, and the purpose to which the user will put the information. Given the variation in computer applications, such studies would likely be limited in their generalizability, and of only minor interest to nonusers of the particular application. Indeed, where there are areas of general concern, such as optimal menu design or the relative benefits of menu and command interfaces, there exists a body of research. For the purposes of this research, however, an examination of the human factors literature offers little guidance, because the authors of this literature mainly focus on conceptual and functional aspects of interfaces, whereas this study has been focused on those aspects of the interface that facilitate communication of information between system and user after the user has already navigated the conceptual barriers.

Other human factors researchers have conducted research into the mechanical aspects of the computer interface, examining the effects that various interface features have on user performance. However, the authors of these studies, like those in the library domain, have focused primarily on the mechanical or functional aspects of the interface, and not on the effect that layout might have on information transfer. Even so, such studies underscore the fact that display factors can affect user performance, even if the researchers do not generally address questions of screen layout.

In the more specialized area of library information systems, the literature is sparse and focused on content rather than presentation. Shaw (1991) reviewed the recent literature in this area, but did not discuss any studies that test the effect of layout on performance. It is interesting to note that several authors cited by Shaw noted the need for empirical evaluation of user interfaces. In a study of card catalog use, Palmer (1972) found that most users concentrated attention on author, title and call number data; subject headings were used by just under half of the users. From this, Palmer suggested that a five-item catalog using author, title, call number, subject headings, and date of publication would meet the needs of a substantial majority of the users' requests.

Seal (1983) reported that 90% of studied users were satisfied with a short entry catalog. Hufford (1991) found that the reference librarians he studied used only particular data elements in most situations, confirming the results of earlier studies. Matthews (1985) provided a set of guidelines for online catalog screen displays based on guidelines from human factors literature, again derived from common sense. Shires and Olszak (1992) reviewed basic interface design issues for online catalogs and focused almost exclusively on screen design for conveying command and search concepts more clearly. Yee (1991) surveyed research on user interfaces in order to identify research methods and findings applicable to the design of effective user interfaces to online catalogs. On the issue of single record display, Yee points out that many have asserted that labeled displays aid in user comprehension, but only one group of researchers has in fact studied this phenomenon.

In a handbook for library interface design, Crawford (1987) relies almost exclusively on his own judgments of interface design upon which to base design decisions. In this volume and in Crawford, Stovel, and Bales (1986), Crawford asserts the superiority of labeled displays without offering evidence to support this choice. He does examine this issue in some detail, noting, for example, the fact that choosing a citation format is complicated by the lack of standardized citation formats. In addition, he attempts to address some of the problems that bibliographic data commonly present in designing displays, especially the variability and complexity of the data, and its potential size. While the design principles that Crawford presents are sound, there is no attempt to test these principles empirically.

Crawford, Stovel, and Bales (1986, 2–3) identified five questions of importance to the design of bibliographic displays:

1. Does the display provide an appropriate amount of information?
2. Will patrons understand the information as it is displayed?
3. Is the display readable and attractive?
4. Will patrons be able to find information rapidly and to find all the information needed?
5. Will patrons be able to view the information on a single screen?

The first four questions deal with important display issues regarding the human-computer interface. The authors state that most work on interface design has been focused primarily on the first, and to a lesser degree the second, third, and fourth questions. The authors then examine the more practical fifth question. They do not attempt to address these first questions further; instead, they use aesthetic judgments to guide discussion of screen design. They then present a number of display options, and assert the relative value of these screens without offering any empirical data to support their claims. At no time do the researchers offer empirical evidence to support their choices of: fields to display, labels to use, or orders of information to present. Thus,

although the authors discuss the relative merits of differing display types, they do so from a perspective limited in its basis to personal opinion and not supported by the results of any wholly objective assessment.

In a different vein, Smiraglia (1992) provides a helpful outline of the basic goals of the catalog, which he labels identification, collocation, and evaluation. This outline might be used to help inform interface design. The first two functions, identification and collocation, depend upon presenting traditional bibliographic data elements. As Leazer (1993) notes, Smiraglia's identifying function closely parallels those of Cutter (1904) and the Paris Principles (1963)—that is, identifying particular items in a library collection. Two parts of Cutter's first function of the catalog—those of identifying whether a library has any given item by an author or with a particular title—clearly have as their primary focus the bibliographic item. The third part of this function—identifying whether a library has a book on a particular subject—does not focus as directly on the item. When users seek material on a given subject, they do not usually have particular items in mind. Because of this, this part of the function should perhaps be considered separately. For the first two parts, traditional bibliographic data elements—author, title, and publication information—might sufficiently serve in most cases, for specific item searches.

The collocation function seeks to bring together items with a particular attribute, e.g., author or subject. As with the identifying function, traditional bibliographic data elements serve this function in most cases. The most notable failure here is the lack of topical data elements included among most traditional bibliographic data elements. Moreover, this function is more complex, in that the nature of the use is less precise. Users who seek to know what a library has on a particular topic or by a particular author have a less precise knowledge of the items they seek than those who seek specific items. This places different demands on the information system, and requires that the system provide enough information to the user that an evaluation can be made.

The third function, the evaluative function, is problematic in that it is highly situational. It is the point at which the relevance of retrieved items is determined. Relevance is one primary means of measuring the effectiveness of an information retrieval system. However, the data necessary for deciding upon the worth of a given bibliographic item is dependent on the user's particular information need, a need that is likely to be poorly defined and subject to constant change. Indeed, the detailed study of the particular data elements that any user might need at any given time could form the nucleus of a large body of research, which is beyond the scope of this research.

Marchionini (1992) outlines the information retrieval process and features of systems to support that process. He uses three basic assumptions about information seeking, two of which have bearing on the current research: first, that end users aim to solve a problem, not use the information retrieval system; and, second, that end users seek to reduce the cognitive load of using an information retrieval system. This second observation is supported by Akeroyd (1990) as well as Tullis (1988). Marchionini, Akeroyd, and Tullis all seem to suggest that the online catalog interface should facilitate the search process in part by presenting bibliographic data to the user in the most effective manner.

Branching off the basic research in interface design is a broad area of research into prototype interfaces and system innovations. The authors of these studies typically take as their starting point an acknowledged failure of current interfaces, and devise some new means of providing the user with system features. As with system-oriented studies, however, many authors (e.g., Frei and Jauslin 1983; Davis and Shaw 1989; Noerr and Bivins Noerr 1985; and Belkin, Marchetti, and Cool 1993) focus on simplifying search functions, and not on clarifying screen content.

Authors in one area of specialization do concern themselves to a great extent with the best means of presenting information to the user. These researchers, who are all studying the problems associated with the visualization of information, have begun to examine whether modes of communication other than textual communication might facilitate information retrieval. Olsen et al. (1993) presented one such system, VIBE, where users perform an information retrieval task using a two-dimensional plane with "Points of Interest" that can be manipulated to find relevant materials. Beheshti (1992) outlined another such system, where MARC records are rendered as virtual books on shelves that are displayed to the user on screen. The researcher envisioned this system enhancing users' abilities to browse library collections. In recent years, this area has received substantial attention, and offers promise for alternative means of informing users of database content.

In summary, then, researchers in the human factors area, both within and outside the library field, have explored many features of interface design. The problem remains that, in addressing the issue of screen layout, a great deal of this literature is not based on empirical research, but rather on aesthetic judgments or common sense. There are notable exceptions. For example, Tullis's work does present such empirical evidence. Unfortunately, this research has not been replicated using bibliographic data.

Cognitive Research

Research into cognitive issues in information systems could lead to the development of predictive models of specific display need. In one area of this field, researchers attempt to create models of the cognitive makeup of users, so that sys-

tems might be designed to predict the particular needs of users in given situations. Individual user profiles can then be created by building on these base models, thus enabling the system to anticipate an individual's preferences, and to modify the model iteratively. One aspect that these systems could manipulate in response to these models is the screen design and layout. For example, an expert system designed to use cognitive models could provide greater or lesser screen complexity depending on a number of user variables.

Morehead and Rouse (1982) and Brajnik, Guida, and Tasso (1987) explored the use of such user models in information retrieval systems. Aykin and Aykin (1991) reviewed the literature of individual differences and their effect on human-computer interaction. The authors pointed out in their conclusion, however, that "there are only a few studies considering a limited number of user characteristics" (377). Although the authors of much of this research again focus on user models to predict system functional needs, research into screen design could potentially be affected by such considerations.

Several authors have examined the impact that cognitive differences between individuals can have in the information exchange process. Hensley (1991) offered suggestions on how reference librarians can use learning style theory to facilitate the reference process. Prorak, Gottschalk, and Pollastro (1994) tested the effect that teaching method has on teaching bibliographic instruction; the researchers found no significant preferences. Allen and Allen (1993) tested the relative cognitive abilities of librarians and students, and found significant differences. They found that librarians had higher logical and verbal comprehension capabilities, while students had higher perceptual speed. The authors considered that these differences might suggest that individuals use information retrieval systems differently as a result of cognitive differences. Again, these researchers did not examine the effects that these cognitive differences had on screen preferences.

Ford and Ford (1993) tested whether different cognitive strategies affect success in addressing an information need. The researchers asked students to learn about a particular indexing system using a knowledge base that included (unknown to the participants) two human experts. An examination of the search sessions showed that participants asked different types of questions of the knowledge base, and that the question types did affect problem-solving success. The researchers found that two approaches—one associated with female participants and focused on detailed information, the other with males and focused on broader analytic information—led to success, while a third, which focused on middle-level concepts, did not work. In their conclusion, they linked the two successful approaches with specific cognitive styles identified by earlier researchers: operation learners and comprehension learners. They then argued that establishing a system that accounted for cognitive style would be advisable, but that such a system should leave the choice of mode up to the user. However, asking all users to choose the search mode for a session seems cumbersome and requires users to be able to identify their own preferred style. The reader will recall, moreover, that Marchionini (1992) suggested that users do not care about how a system works, just that it works.

Allen (1994) used an experimental method to perform two tests of the relationship between a cognitive ability and the ability to perform a retrieval task. In the first test, Allen tested the relationship between logical reasoning, as demonstrated on a standardized test, and ability to identify relevant citations from two online catalog displays, one sorted in reverse chronological order, the other in relevance order. The researcher found a significant interaction between logical reasoning ability and the type of display, and particularly that users with lower logical reasoning ability benefited most from the relevance order display. The second experiment tested the relationship between perceptual speed and the ability to examine subject headings arranged either alphabetically or hierarchically. In this experiment, the researcher found no significant results. However, users of the hierarchical display examined substantially fewer lines to identify relevant headings, which might indicate that the method of presentation affected participants' perception of the system. Both experiments, then, offered evidence that the interface can affect usability of the system.

Kerr (1990) tested the impact that different screen enhancements have on assisting users in navigating through electronic information systems. The author found no significant difference in usability between systems with no screen enhancements and screens with enhancements of color, icons, textual headers, or a combination of the three. Coll, Coll, and Nandavar (1993) presented research designed to test whether good screen design depends on layout or conceptual considerations; the researchers found that conceptual structure plays a greater role. Participants were asked to choose items from menus that were arranged alphabetically, categorically or randomly, and on which the function key assignments changed from screen to screen. They found that task times for the two organized menus, while similar to one another, were significantly shorter than the unordered menu. This study reinforced the idea that how data are displayed can affect system performance.

Overall, the authors of the literature reviewed in this section focus primarily on testing aspects of the functional human-computer interface. Library researchers have extensively examined how users search and the errors that they have made, through transaction log analyses, user surveys, interviews, and other methods. A great deal of attention has been paid to the complexities of the search and retrieval process, with many studies comparing the performance of

different search methods. Similarly, researchers in human factors have tested the relative usability of command-driven and menu-driven interfaces, and the best means of organizing items in a menu. Some research into overall screen display has been conducted, and some measures of screen complexity have been devised, but these tests and guidelines have not been tested with bibliographic information.

Importance of the Study

Because end user access to remote databases of all types is rapidly increasing, library systems designers must assume greater ability to be responsive to the end user's needs. In a remote access situation, the user must rely entirely on the system designer's ability to present the system to the user sensibly; professional librarians cannot interpret displays. A library system that presents end users with data that are more directly related to the needs of the user's problem-solving process and are easier to interpret will require less explanation to the end user. As electronic resources become more central to library operations, libraries' overall effectiveness will be judged in large measure by the performance of their information systems.

To design systems that better serve the end user, it is essential that library and information science professionals understand more precisely what users need to see onscreen and how they want to see that information. While it is important to design more sensibly organized interfaces on a functional level, the question of display nonetheless remains critical—especially with data as complex as those found in a bibliographic database. An interface that offers information that is perceived as more pertinent will be less obtrusive, and will thus enable the user to focus on the primary task (Benbasat and Todd 1993).

It has been claimed (cf. e.g., Crawford 1986) that users of bibliographic systems are unaware of the content of particular screens, and that they cannot distinguish the different elements of a bibliographic record. While it might be true that typical end users do not consciously make these distinctions, they nevertheless might be aware of them on some level. It behooves librarians to make their systems as clearly organized as possible, both from functional and communications perspectives. This research was conducted in order to provide baseline data that could make it possible to determine how the content and layout of interfaces might be changed to make bibliographic displays easier for the end user to interpret.

Gaining an insight into the display needs of library catalog users should help librarians make informed decisions about changes to catalog content and structure. A number of library professionals have called for a radical reassessment of cataloging practices, so that both the MARC format and the cataloging process might be simplified (e.g., Gregor and Mandel 1991; Mandel 1985). Such reassessments have been hindered by the lack of data concerning such user preferences and needs. This study, while not aimed primarily at determining the importance of particular data elements in bibliographic databases, might nonetheless provide a baseline of preferences upon which others might build. Identifying individuals' preferences on display screens might provide a new perspective on which data elements they consider important to their problem-solving process.

It has been suggested that the need for evaluating user preferences in online catalog displays will soon be obviated in the client-server environment, where an individual will be able to configure the database view in any preferred format (e.g., Larson 1991a; Buckland, Norgard, and Plaunt 1993). While end user configuration might alleviate some problems of choice of sorting and display, it seems unlikely that it would help the casual user, who must use the online catalog "out of the box." Moreover, many users will not make the effort to customize their displays. For such users, default displays must exist to present online catalog results.

In the near term, it will continue to be necessary to provide all users with fixed display types, and common sense suggests that these displays should provide information to the end user in the most sensible context. Externally created limitations force users to adapt their needs to the system, and the system does little to mitigate the user's interpretive burden. Every such burden compounds the user's negative associations with the online catalog, while reducing this burden increases both the chances of a user's success and the user's positive associations with that system. An aim of the research reported here is to establish a basis for the design of more effective online catalog displays.

Method

A 2 x 2 factorial experimental design was used. The participants, first-year students in a four-year undergraduate program at a large university, were randomly assigned to one of four groups and then pretested for basic demographic information. They were asked to perform two related tasks during the course of the experiment. In the first task, they were asked to select a set of items that they would examine further for a hypothetical paper they must write. In the second task, they were asked to examine 20 bibliographic records, decide whether they would choose to examine these items further on the shelf, and identify the data elements that they used to formulate their relevance decision. In both tasks, the topic of the task was the same: big band music and the music of Duke Ellington. The instructions for forming relevance judgments in each task were also the same: participants were asked to use only the information provided on screen to make relevance decisions.

Each group was presented with a simulated online catalog that listed a set of bibliographic records sorted in reverse chronological order, from which they had to make their choices. The listing for each group differed in the data elements and screen layout used, but contained the same bibliographic information. That is, they all viewed the same bibliographic records, laid out in different on-screen configurations.

One group viewed bibliographic records on an interface similar to current online catalogs, one that used data labels and contained brief display data elements from MARC tags 1xx–3xx. A second group viewed these records on an interface in which the labels had been removed, but the brief display data elements were the same as those in the first. The third group used an interface that employed tags, but in which the brief display data elements were changed so that they included more subject-oriented fields (omitting main entry and physical description fields) while the full display was based on ISBD data elements. The final group viewed these records with the same brief record data elements as the third group, but with the labels removed, using ISBD and AACR2 punctuation standards. Using both tagged and untagged interfaces for each of the two content types helped control for differences in performance caused by particular layouts. Samples of these screens are provided in figures 1 through 9.

Retrieval speed and comprehension were tested in the first task by gathering transaction data for each participant. The system logged each participant's actions: the screens that were viewed and the time spent viewing them. Quantitative data were gathered on: the number of screens viewed; the number of citations examined at each level of specificity; the time to complete the task; and the time spent viewing particular screens.

Bibliographic records for the experiment were gathered by searching the Research Libraries Information Network (RLIN), the OCLC Online Union Catalog (OLUC), the Library of Congress catalog, and the University of Pittsburgh catalog. General searches were made for the keywords "Duke Ellington" and "Big Band Music"—both terms taken directly from the problem statement. Duplicate records were removed from the master list, under the assumption that a single library system would have one catalog entry for each of these items. 103 bibliographic records were used in the experiment. To populate the second task, a random set of 20 records was separated out, leaving the first task with a list of 83 records. For the second task, the 20 records were randomly ordered and randomly assigned to display in full or brief layout.

Screen Design Issues

The choice of screen elements for use in the different displays posed an important problem in the design of the experimental interfaces. Because the number of data elements included in the MARC formats numbers in the hundreds, an attempt to test the relative value of all different combinations of these elements would have been impossible. Previous research had shown that most users tend to employ only a limited portion of the bibliographic record (Palmer 1972; Seal 1983; Hufford 1991), and that briefer catalogs containing only a few of the data elements currently found in bibliographic databases would serve a substantial majority of end users' needs. Based on these earlier studies, brief display screens for this experiment were designed that included data elements from a limited set.

One method for choosing alternative data element sets for display to users might be to examine the data elements in a bibliographic record in relation to some of the accepted

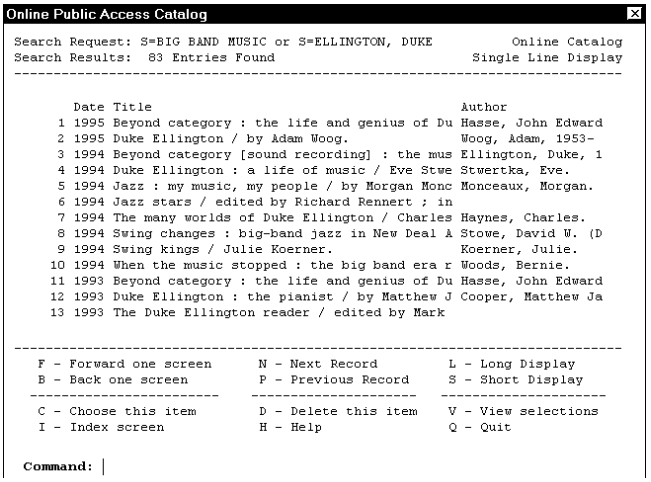

Figure 1. Single Line Listing, Used on All Interfaces

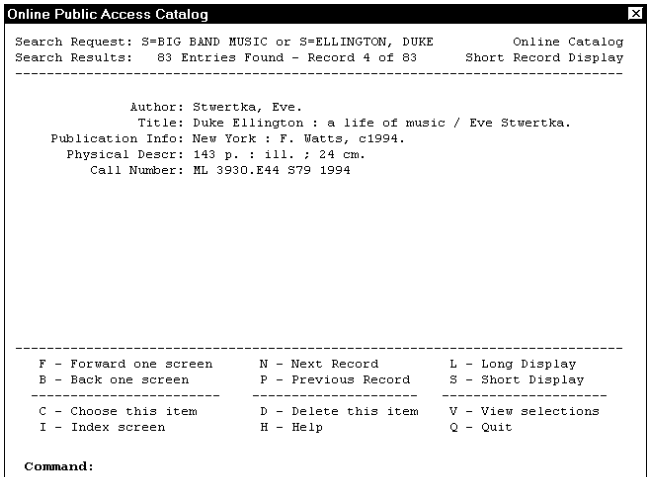

Figure 2. Standard Content, Labeled Brief Display

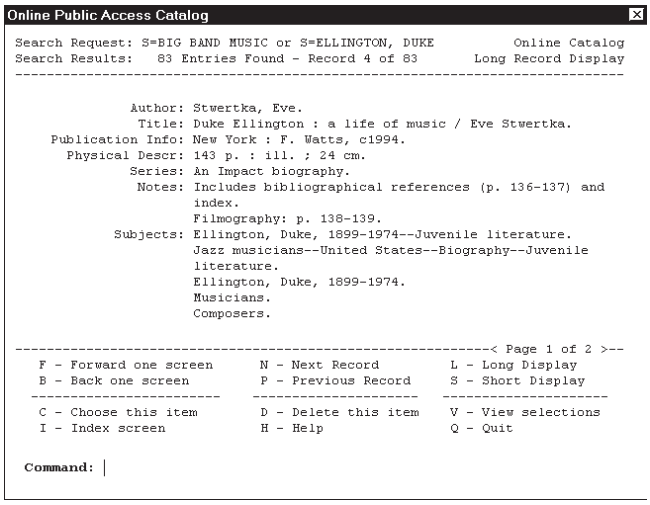

Figure 3. Standard Content, Labeled Full Display

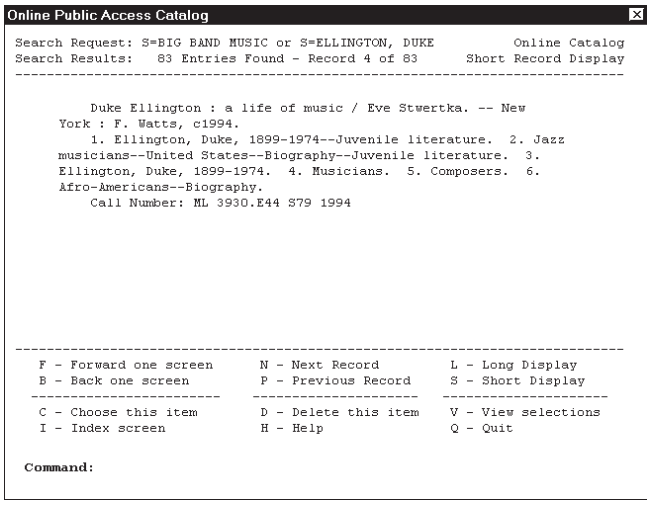

Figure 4. Enhanced Content, Unlabeled Brief Display

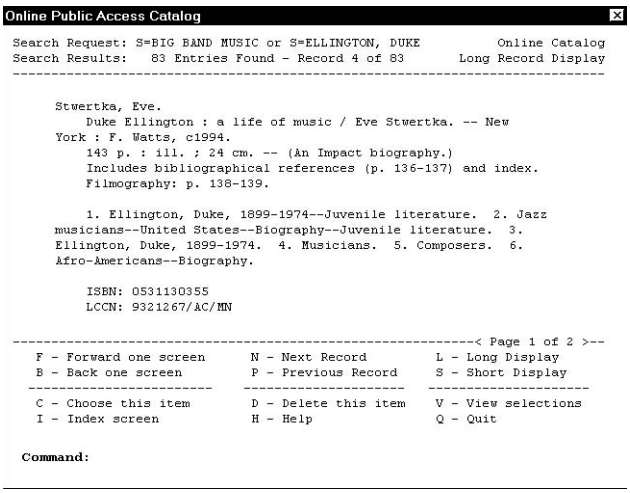

Figure 5. Enhanced Content, Unlabeled Full Display

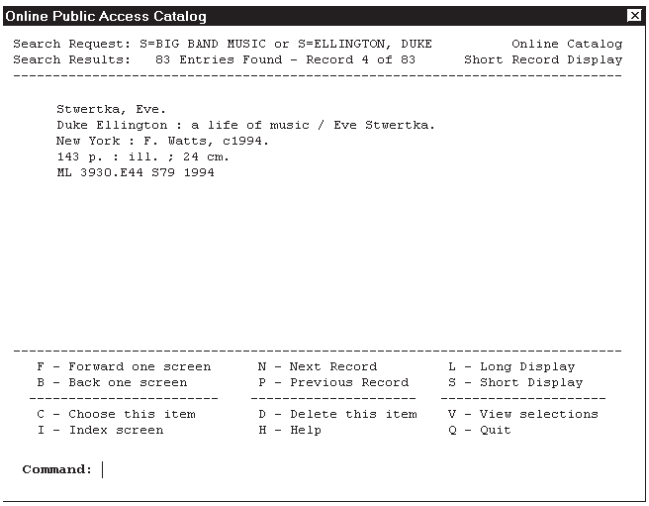

Figure 6. Standard Content, Unlabeled Brief Display

functions of the catalog—most notably Cutter's definitions (Cutter 1904) and those found in the Paris Principles (International Conference 1963). Based on such a functional analysis, a set of data elements can be chosen for inclusion in particular displays. These displays would then ostensibly support the stated functions of the catalog.

This functional approach was used, and provided a basic framework within which data elements were selected for inclusion on the bibliographic screens. In this research, attention was focused on the evaluative function of the online catalog by inducing the participants to use a topically oriented search strategy. By controlling the content of the user's information need—as in assigning an artificial task to a particular group—it might be possible to test whether the content and layout of a screen has any effect on participants' performance in that given situation.

The evaluative function was chosen because it would force the participants to rely more heavily on the information provided. Users who seek a particular known bibliographic item in a collection might not seek to view the same data elements as those users with a more generalized information need. Similarly, users who seek quick answers to solve an information need will potentially need to view different data elements (in this case, perhaps, the extent or availability of the bibliographic entity). For the purposes of this research, participants were given a topic of which they

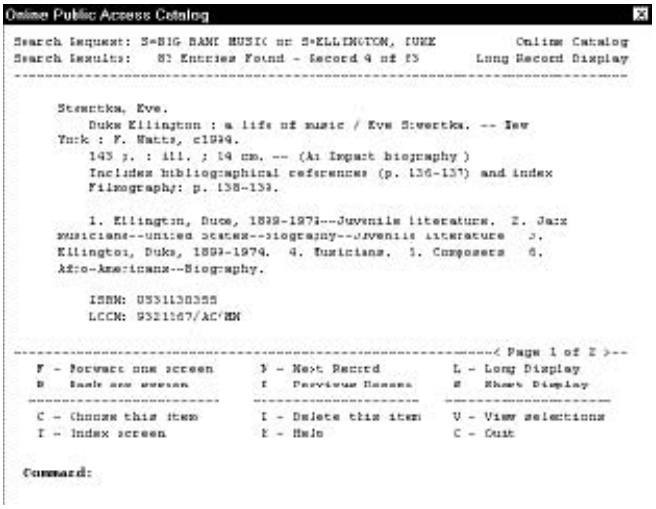

Figure 7. Standard Content, Unlabeled Full Display

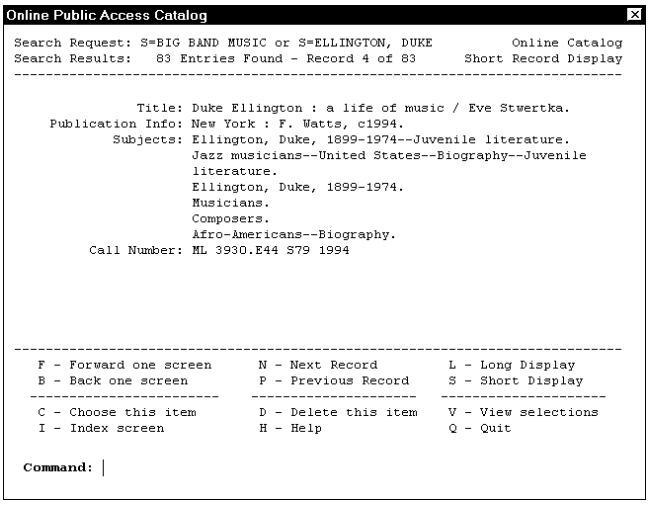

Figure 8. Enhanced Content, Labeled Brief Display

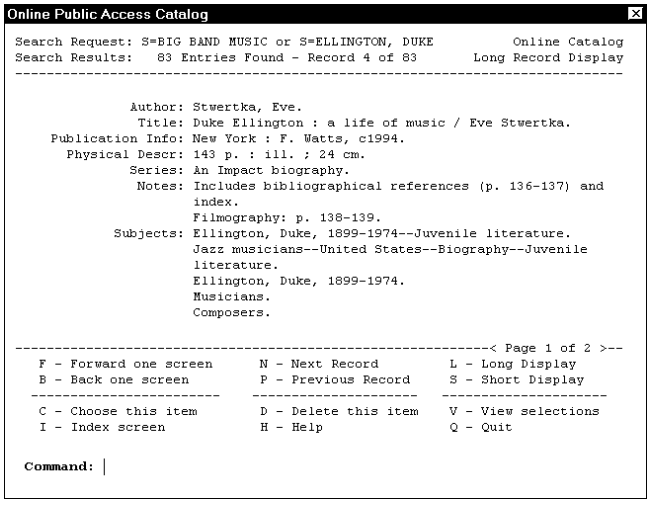

Figure 9. Enhanced Content, Labeled Full Display

presumably had little foreknowledge, and were asked to compile a list of most useful sources based on the information provided in the information system.

In known-item searches, users seek to verify or reinforce certain facts that are already known. In contrast, subject-oriented searches are more tentative and probing in nature. The user seeks to discover whether the library owns bibliographic entities—or more generally whether there exist any bibliographic entities—that might meet an information need. This more diffuse need places different requirements on the system. Users seeking known bibliographic items can rely on their ability to differentiate patterns of data and match on incomplete user knowledge, whereas those who seek to meet a more visceral need must evaluate the bibliographic data provided to them more closely. As a result, such users are more likely to rely heavily on the data presented by the system to determine the worth of those items for solving the information need. Such use places greater demands on the information system, which is the reason why this type of situation was established for this research.

In order to conduct this research, content designations for three screen types were designed: one that listed each item on a single line; a second that listed an individual item using a brief citation; and a third that listed the full contents of an individual item. These screens were designed based on the results of prior research (e.g., Palmer 1972; Seal 1983; Hufford 1991), as well as on library standards (e.g., ISBD and AACR2). For the single line display, brief title (MARC 245), author (MARC 1XX), and date information (MARC 008) were used; for the treatment group brief display, title (245), edition (250), publication information (260), subjects (6XX), and call number (090) were used; the treatment group full display included all MARC fields.

Administration of the Test

Participants volunteered for one of eight sessions over two days. Due to hardware limitations, 8 groups of 16 participants were scheduled for the experiment. Within each session, all four interfaces were tested, with each interface being assigned to an equal number of terminals, which were grouped together. Every participant thus had an equal chance of using any of the interfaces. They were grouped together to minimize the chance that neighbors would notice differences in the interfaces.

Participants were instructed to seat themselves at any terminal. Each interface used the same opening screen, which eliminated the possibility that participants might choose one interface over another based on some screen difference.

The use of several different administrations of the test to several groups of participants could have introduced bias in the administration of the experiment, as the investigator's behavior might have varied from session to session. To minimize this possibility, instructions for the experiment were scripted, and all groups thus received the same instructions. As a further means of guaranteeing impartiality, a third party was hired to administer the experiment. This person was responsible for interacting with and instructing the participants in the experimental setting. To minimize experimental bias, this person was not informed of the research questions. Additionally, the experiment administrator restricted her interactions with the participants. She stood apart from the participants, so she could not see any particular participant's progress, and only approached participants if they were having trouble and specifically requested assistance. When this occurred, the administrator answered only the particular question that the participant posed, and then moved away.

Participants were seated in the labs, and the administrator briefly explained the study, and said that all information gathered during the test was to be kept confidential. Participants then answered the questions of the pretest questionnaire. Participants were all given a tutorial session designed to help them familiarize themselves with the interface, during which time the administrator addressed any difficulties participants had using the system. Then the administrator presented to the participants the problem situation, reading from the problem statement. Participants selected the appropriate number of items for inclusion on their bibliography, and then answered the qualitative portion of the experiment. During the experiment, the administrator monitored the test site, to ensure that the experiment proceeded smoothly.

Results

The experiment was conducted in mid-October 1996. Eighty-two participants took part over a four-day period. The number of participants in each of the four interfaces was as follows: standard content, labeled display, 19 participants; enhanced content, unlabeled (ISBD) display, 19 participants; standard content, unlabeled display, 22 participants; and, enhanced content, labeled display, 22 participants. Thus, when examined by each of the two factors (absence or presence of labels, and standard or enhanced content brief screens), the total number of participants in each group was 41.

Data were compiled into a database, and output from this database was analyzed using a statistical software package and a spreadsheet program. Tests used for the analysis of the data are listed here, along with the identifying label used to state statistical results: student's t-test (t); Chi-squared (χ^2); One-way Analysis of Variance—ANOVA (f).

The statistical analysis covered three general areas: the demographic data gathered; the quantitative data gathered in the first task; and the qualitative data gathered from the second task. These results will be discussed later.

Overview of Demographic Data

Thirty-three males and 49 females participated. The participants ranged in age from 17 to 46, with a mean age of 20.21. As might be expected of a sample drawn from an undergraduate course, a large number of participants (67) were aged 17 to 20. Twenty-three participants (28%) had not yet determined their majors. The remaining data regarding majors were categorized broadly. Those that identified a major tended to indicate majors in the applied sciences (28, or 34.1%), social sciences (12, or 14.6%), or business (13, or 15.9%). The other categories were: humanities (3, or 3.7%); vocational (2, or 2.4%); and law (1, or 1.2%).

The participants claimed to use computers quite heavily: 44 (53.7%) said they used computers every day; 24 (29.3%) used them 2 to 4 times a week; 9 (11.0%) used them once a week; and 5 (6.1%) used them once a month. The mean computer use level was 3.30, which translates approximately to the 2 to 4 times a week category. Tests to see whether computer use differed between the factor groups found no significant differences(labels factor: χ^2=1.45758, p=.69210; content factor: χ^2=1.95758, p=.58126).

In contrast, library online catalog use was much lower: 6 (7.3%) stated they used library catalogs 2 to 4 times a week; 13 (15.9%) used them once a week; 34 (41.5%) used them once a month; and 29 (35.4%) had never used library online catalogs. Mean library online catalog use was .95, which translates to just below the once a month category. Once again, no significant differences were found between the groups for either of the factors.

It was found that that most participants had little knowledge of the problem topic. Knowledge of big band music broke down as follows: 2 (2.4%) said they knew a lot about it; 24 (29.3%) knew a bit about it; 32 (39.0%) had heard of it; and 24 (29.3%) knew nothing. The mean knowledge level of big band music was 1.05, which equates approximately to having heard about it. Knowledge of Duke Ellington broke down as: 2 (2.4%) were quite familiar with him; 16 (19.5%) knew a bit; 31 (37.8%) had heard of him; and 33 (40.2%) knew nothing. The mean level of knowledge about Duke Ellington was .84, which again equates approximately with having heard about him. No significant differences were found for knowledge of Duke Ellington on the primary factors.

There was no significant difference of knowledge of big band music when compared on the content factor; however, there was a significant difference when compared on the labels factor (χ^2=8.45833, p=.03743). Because this was the only significant difference found in the two topically oriented variables, a second comparison was made between the *average* of the two values in the topical questions and the experiment factors. When grouped this way, no significant differences were found.

In summary, the participants in the experiment were more likely to be female than male, and generally in the traditional age range for college students. They were most likely to be majoring in the sciences, although a good portion had not yet decided on a major. They used computers approximately 2 to 4 times a week, but rarely used library online catalogs. They had only a passing knowledge of the two aspects of the problem topic. The distribution of participants to the various experimental groups was not significant.

Task 1: Creating a Select List

Overview of the Data

For the first task in the experiment, a total of 5,970 log entries were tallied. A problem with the logging of the first screen in 24 of the sessions required that these entries be dropped from the data set, resulting in a valid set of 5,946 log entries. Help screens were also dropped, as they were used so infrequently (27 times overall), that their inclusion affected statistical analysis. The total number of log entries used for all further analysis thus was 5,919. Each log entry included: the command issued, the record number of the item being viewed, the type of screen being viewed (Index, Brief, Full, or Help), an error code, and the start and end times for the screen. These data elements make it possible to analyze the effects of the two factors on both the frequencies of screens viewed and on the duration of time spent on screens.

Within each data type category (i.e., frequencies and durations), analysis was performed in several different steps. First, all log entries for each complete session were analyzed in aggregate. Then, the data were separated by screen type to provide a more detailed method for testing the behavior of the participants while performing the task.

Making this distinction was necessary for a number of reasons. First, each of the three screen types used in the experiment had different content and complexity of data. Index screens are columnar, making scanning easier, because like elements are grouped visually on-screen. However, the inclusion of more than one bibliographic item complicates the user's decision on which items to view in greater detail. In contrast, both brief and full display screens present information for just one bibliographic item, thus eliminating this selection function; these screens differ in that the full screen is usually more difficult to process because there is more information on-screen to examine.

Another important reason for examining each type of screen separately was that the experiment's factors both relied on particular screen displays for the comparisons. The screen content factor—that is, the effect that enhanced screen content had on participant behavior—relied solely on the difference in brief display content for the different groups. Similarly, the absence or presence of labels occurred only on the single item brief and full display screens. Thus, it was decided to examine each type of screen separately, to test the effect these factors had on performance.

Further analysis was then carried out using data compiled for both the first 10 and the first 20 screens viewed. Because it was presumed that participants would become increasingly familiar with the interfaces they used, and that this learning process might manifest itself in behavior differences over the course of the session, it was concluded that an overall measure of session activity might not give an accurate view of the ease with which participants used these systems, and that separating the first screens each participant viewed might give a clearer sense of the learning process. It was judged, moreover, that comparing among the factors might also give an idea of whether one group of participants learned to use the system faster than others, and that further analysis based on a comparison of the data from the first 10 screens with those of the second 10 screens might enable us to pinpoint the rate at which the learning process occurs.

It must be noted that in compiling these initial screen statistics, erroneous durations for the first screen of 24 sessions were dropped from the sample; consequently, the statistics for these items includes data for screens beginning with the second screen viewed.

Several more analyses were carried out on the duration data alone. For this experiment, the question of the speed with which participants performed the tasks presented to them was an important one. Speed in a test like this might be measured in a number of different ways—for example, we can measure the overall time spent to perform the task or the mean time spent on specific screens. Another method for measuring speed is to use the number of characters processed per second to test participant performance. This measure can be derived by counting the total number of characters on each screen that the participant viewed and dividing that by the duration of time spent on the screen. This measure controls for the amount of information that participants viewed, and might help determine most accurately the speed with which they were able to use the catalog information presented to them.

Building on the idea that performance might change over time, analyses of screen durations for the first 5 screens

of each screen type were conducted. These were done based on the hypothesis that each screen type presents its own processing problems to participants; analyzing each screen separately might enable us to pinpoint to a greater degree where users have difficulties with catalogs.

One final category of data was gathered in this portion of the experiment: the participants' final selections for their hypothetical reading lists. Analyses of these data were conducted to test whether the experimental factors or demographic variables had any effect on the items that participants selected.

Analysis of Frequencies of Screens

Overall Frequencies. The mean number of screens viewed in each session was 72.51, with a standard deviation (SD) of 25.81 and a range from 30 to 177 screens viewed. Means for each of the groups in the two factors were compared using a t-test, with no significant differences being observed. Analyses of mean number of screens viewed for each type of screen were conducted. For index screens, the overall mean was 26.02 with a SD of 13.34 and a range from 1 to 58. Neither of the factor-based means varied from that noticeably. There was, however, a significant difference in the mean number of index screens viewed by gender, with males viewing on average 30.06 index screens and females viewing 23.31 (t=2.23, p=.030).

For brief screens, the overall mean number of screens viewed was 25.51 with a SD of 20.35 and a range from 0 brief screens viewed to 115. When examined by screen content, the means differed, with enhanced content participants viewing 29.46 brief screens compared to 21.56 screens viewed by standard content participants. This difference was not significant at the .05 level, but was significant at the .10 level—thus there is the likelihood that significant results would be found in further studies (t=-1.78, p=.08). When compared on the labels factor, the difference was not significant.

For full screens, the overall mean was 20.65 with a SD of 24.57 and a range from 0 to 146. When examined by screen content, the means differed. For full screens, the relationship of the numbers was reversed from that found with brief screens; enhanced content participants viewed on average 15.95 full screens, while standard content participants viewed 25.34 screens. Again, this difference was not significant at the .05 level, but was significant at the .10 level (t=1.75, p=.085). Differences between groups on the labels factor were not significant. The number of help screens viewed was so low as to preclude analysis.

Chi-squared tests were also performed, comparing frequencies of the different screens viewed to the two factors, as well as to the following demographic variables: gender, computer use, library use, big band knowledge, Duke Ellington knowledge, and major category. For the two main factors, the difference between groups on the label factor was not significant, while the difference on the content factor was significant (χ^2=138.40842, p=.00000); participants using the enhanced content interface viewed significantly more brief screens, and significantly fewer full screens.

Chi-squared tests on each of the demographic variables were found to be significant. Women viewed fewer index screens, fewer full screens, and more brief screens than did men (χ^2=62.28387, p=.00000). Infrequent users of computers viewed fewer index screens than did the heaviest users (χ^2=82.74381, p=.00000). Participants who said they had never used library catalogs, and those who used them weekly viewed fewer full screens than others, while monthly users viewed more index screens (χ^2=83.02628, p=.00000). Participants who knew nothing about big band music viewed fewer full screens (χ^2=100.41911, p=.00000). Similarly, those who knew nothing about Duke Ellington viewed fewer full screens (χ^2=32.52557, p=.00001). Participants who had not decided on a major and those in the social sciences both viewed fewer full screens, while those in applied sciences viewed more full screens (χ^2=182.65344, p=.00000).

First 10 Screens. Tests of the frequency of each screen type for the first 10 screens were conducted on both primary factors. No significant difference was found with the contents factor; a significant difference was found between groups on the labels factor. Participants using labeled displays viewed fewer full screens and more index screens than did those using unlabeled displays (χ^2=11.09244, p=.00390). T-tests for each screen type were conducted; a significant difference was found for the mean number of full screens viewed per session when compared on the labels factor (t=2.08, p=.040).

In analyzing the first 10 screens compared to the demographic data, a number of significant results were found. Chi-squared tests comparing screen type by level of computer use yielded significant results (χ^2=14.18658, p=.02762); participants with the least computer experience did not use full screens at all, while other groups used them in the neighborhood of 15% of the time. Novice users instead viewed more brief screens than others. Significant differences were also found when comparing library use to frequency of screen type (χ^2=20.16583, p=.00259). Those with the most library experience viewed more full screens than others.

Differences among groups with regard to knowledge of big band music were significant (χ^2=16.10567, p=.01320), while differences among groups based on Duke Ellington knowledge were not. Those who had heard of big band music viewed more brief and fewer full screens. Significant differences were found between gender groups (χ^2=15.16189, p=.00051); men viewed more index screens and fewer brief screens than did women. When examined

by major, those in the social sciences viewed more brief screens than other groups (χ^2=28.55680, p=.00458).

First 20 Screens. The first twenty screens of each session were analyzed separately, in order to isolate potential learning by the participants further. T-tests compare the mean number of each screen type viewed to each of the primary factors as well as to each of the demographic variables. No significant differences were found. Chi-squared tests of the frequency of each screen type yielded several significant results, similar to those found for the first 10 screens. For the labels factor, participants using labeled screens viewed more index screens and fewer full record screens than did those using the unlabeled screens (χ^2=7.94, p=.01889). For the content factor, participants using the enhanced content interfaces viewed more index and brief screens, and fewer full screens, than did those using the standard displays (χ^2=7.64, p=.02190).

Chi-squared tests on demographic variables were all significant. Men viewed fewer brief screens and more full screens than did women (χ^2=16.98349, p=.00021). Daily computer users viewed more index screens and fewer full screens than did others (χ^2=30.85779, p=.00003). Those who said they used library catalogs 2 to 4 times a week viewed more full screens than did those with less catalog use (χ^2=31.57513, p=.00002). Participants who knew nothing about big band music, or had only heard of it viewed fewer full screens than did those more familiar with the topic; in addition, those who had heard of it viewed more brief screens than did others (χ^2=30.45690, p=.00003).

Comparing Screens 1–10 with Screens 11–20. The frequencies of screens viewed in the first 10 screens were compared to the frequencies of the next 10 screens to determine whether there were any significant differences. Paired-sample t-tests were conducted for each type of screen; in each case, there were significant differences. Participants viewed fewer index screens in the second 10 screens than they did in the first 10 (t=5.03, p=.000), more brief screens (t=-2.31, p=.024), and more full screens (t=-4.19, p=.000).

Analysis of Screen Durations

Overall Duration. The first measure—overall time spent to perform the task—is a broad measure that might provide a rough overview of relative performance. The mean session duration was 595.11 seconds, with a SD of 181.14, and a range from 153 to 984 seconds. When examined by either of the main factors the overall means were virtually identical and not significantly different.

We can also examine the mean per screen duration for each session. Overall, the mean per screen duration was 8.54 seconds with a SD of 2.34 and a range from 3.48 to 18.92 seconds. Means between the groups on the labels factor differed, although this difference was not significant (t=-1.38, p=.172). Nor were the means significantly different when compared on the content factor (t=-.55, p=.583). No significant differences were found for overall mean per screen duration among any of the demographic groups.

Next, each session's data, separated by screen type, was examined. For index screens, the mean was 11.90 seconds with a SD of 4.85 and a range from 5.25 to 39.00 seconds. When examined by screen content, the means were 12.77 and 11.04 seconds for standard and enhanced screens respectively, a difference that was not significant (t=1.63, p=.108). Comparing by layout, the means were not found to be significantly different (t=-.03, p=.977). When examined by library use some variation is seen, especially between users with no experience (13.27 seconds) and once-a-month users (11.12 seconds), but these differences were not significant (f=1.31, p=.3134). Comparisons on other demographic variables were not significant. It is interesting to note that the index screens were identical, regardless of the interface viewed.

For brief screens, the mean was 5.56 seconds with a SD of 2.38 and a range from 0 to 13.76. No noticeable differences were found in the means for each factor; no significant differences were found in the means for demographic variables. For full screens, the mean duration was 7.70 seconds with a SD of 4.76 and a range from 0 to 22.00 seconds. No noticeable differences were found in the means for each primary factor. When examined by level of computer use, a significant difference was found (f=6.2535, p=.0007). Analyses on other demographic variables were negative.

First 10 Screens. The next group of data used for analysis was made up of data from the first 10 screens that each participant viewed. For the first 10 screens, the mean duration was 13.25 with a SD of 4.57 and a range from 3.30 to 30.90 seconds. When compared on the labels factor, the difference was not significant (t=-1.25, p=.214). The difference between groups on the content factor was much smaller and also not significant. When compared by gender, the differences were similar to those found for content.

The mean durations for the first 10 screens varied more when compared by computer use, and the differences were significant (f=4.4088, p=.0064). However, the means were as follows: once a month, 14.02; once a week, 12.72; 2 to 4 times a week, 15.81; every day, 11.88. Thus, the means did not seem to follow any pattern; perhaps this was a result of the limited numbers of participants in the lower experience groups (5 and 9). A Scheffé test run on these variables identified the difference between groups 3 and 4 as the source of significance. On other demographic variables, no significant differences were found.

When mean duration was examined by each screen type, there were no significant differences found when compared by content. Similarly, there were no significant differ-

ences in mean duration by each screen type when compared by labels.

First 20 Screens. The first 20 screens of each session were isolated and analyzed. For the aggregate first 20 screens, there were no significant differences found when comparing mean screen duration by content or by labels. Once again, computer use yielded significant results between groups 3 and 4 (t=3.09, p=.0318). Analysis on other demographic variables yielded no significant results. Comparing each screen type for overall duration and mean screen duration yielded no significant results on either of the primary factors. Analyses of each screen type by the demographic variables were not significant.

Comparing Screens 1–10 with Screens 11–20. When comparing data for screens 11–20 with screens 1–10, we find some interesting differences. The mean for screens 11–20 was 8.39 with a SD of 2.80 and a range from 3.20 to 19.30. This represents a substantial drop in mean duration, from 13.57 seconds. In addition, the standard deviation dropped substantially, from 4.57 to 2.80, which indicates that the variance also dropped substantially. When using a t-test for paired samples, the difference in mean times was found to be significant (t=11.79, p=.000). Moreover, the ranges and histograms in each grouping suggest that the learning process affected primarily the longest times in the range.

Mean durations for each screen type for screens 11–20 were examined. No significant differences were found when comparing index screens on the primary factors. Brief screen mean duration differed for participants viewing standard or enhanced screens; participants viewing enhanced screens spent longer on these screens (enhanced=5.90, standard=4.78). This difference was not significant at the .05 level, but was significant at the .10 level, suggesting that there is a likelihood that significant results would be found in a study designed specifically to test for this (t=-1.93, p=.058). Full screen mean duration was significantly different when compared by content (standard=10.44, enhanced=8.16) (t=2.02, p=.043). Participants using the normal screen interface took longer than those using the enhanced interfaces. There were no significant differences found when compared by the labels factor.

First 5 Screens of Each Type. The first 5 screens of each type were separated from the main body of data in order to isolate the performance differences that participants might have had in relation to the different screens. The mean duration of time spent on all of these screens was tested for significance against each of the factors and the demographic variables. There were no significant differences when the primary factors were examined. Significant differences were found between daily users of computers and those using them 2–4 times a week (f=4.9600, p=.0034). When examining each type of screen separately, no significantly different results were obtained on the primary factors. Significant differences were found when comparing full screen duration to the computer use variable (f=6.9444, p=.0003). Otherwise, no significant differences were found.

Duration by Screen Length. One final analysis was conducted using a measure based on the number of characters viewed per second. These data were calculated by measuring the number of characters on each screen viewed, and dividing by the number of seconds spent on the screen. Overall, the mean screen length was 531.055 characters, and the mean screen speed was 109.68 characters per second. The mean index screen speed was 167.97 characters per second; the mean brief screen speed was 67.97 characters per second; the mean full screen speed was 87.75 characters per second. Neither of the primary factor groups differed significantly when compared on the basis of these measures. Similarly, most demographic variables yielded no significant differences. When compared by gender, however, a significant difference was found; males processed more characters per second than did females (t=2.04, p=.045).

Analysis of Selection Data

Data regarding the items that each participant selected were compiled and examined. Of particular interest in this area was the type of screen from which the participants made their selections. Overall, the participants made 809 selections out of a possible 820; one participant selected only 8 items, while a second selected only 1 item. Participants selected 71 items directly from index displays, 390 from brief record displays, and 348 from full record displays. When chi-squared tests were conducted against the two factors, a significant difference was found between groups on the content factor (χ^2=8.93966, p=.01145). Participants using the enhanced interface made fewer selections from index screens and full screens, and more selections from brief screens.

No significant differences were found with the labels factor. Significant differences were found between groups on computer use (χ^2=26.31462, p=.00019) and library use (χ^2=55.07852, p=.00000). On both measures, novice users were more likely to select items directly from index screens than experienced users. On computer use, experienced users were also less likely than all other groups to use index screens to make selections. On library use, the most experienced participants were more likely to use full screens to make their selections than were all other groups.

Tests on gender, knowledge of big band music, and knowledge of Duke Ellington were not conclusive.

Task 2: Judging Relevance

Overview

The second task in the experiment required the participants to provide basic relevance ratings for 20 items on the same

topic as in the first task, along with an indication of the fields that they used to make their relevance judgment. In this task, participants were presented with either a full or brief record in the display mode for their session (i.e., labeled or not, enhanced content or not), and were asked to decide whether they would choose to examine this item further. Participants could choose:

1. that they would examine this item on the shelf;
2. that they would NOT examine this item on the shelf; or,
3. that they could not decide from the information provided.

If they chose either 1 or 2, they were required to indicate which data elements enabled them to make their decision, by checking boxes next to the data elements that they used to make their decision.

The data for this task thus consist of two broad categories: the relevance rating, and the fields used in decision making. The relevance rating was required, so each session had a total of 20 relevance ratings. For the fields used in the decision-making process, it was necessary (for statistical purposes) to determine the total frequency that each field was viewed by each participant. This was a result of the variability of MARC records. This frequency count differed for each interface, because the brief screens differed. For all the data gathered in this task, chi-squared tests were used.

Analysis of Ratings

Participants viewed a total of 1,640 bibliographic records in either brief or full display. They checked 999 items (60.91%) as being useful, 390 items (23.78%) as not useful, and 251 items (15.30%) as not providing enough information to make a decision. The differences in frequency between groups on the content factor were significant (χ^2=48.54232, p=.00000). These results occurred in large part because of the high number of Not Useful entries by the enhanced, labeled interface, as well as a combination of high and low counts among the groups in the Don't Know category. What is more important is that the high frequencies for this category were observed in the standard content interfaces, while the low frequencies were observed in the enhanced content interfaces.

Further analysis of the data revealed that the ratings were linked to the type of screen that was viewed. When comparing the screen type to the relevance rating, a significant difference was found (χ^2=60.21908, p=.00000). This difference was due to the effect of the high rate of Don't Know classifications for brief screens.

Secondary analysis was conducted on the data set, in which the Don't Know category was combined with the Not Useful category. Contrary to results received when these categories were separate, no significant results were obtained when these categories were conflated.

Analysis of Fields Checked

The final group of data to be analyzed in the second task consisted of the check rates for each of the fields that participants viewed. Participants checked 2,058 data elements as being useful to their decision, a rate of 1.48 items per selection. The rates at which participants checked particular fields as useful ranged from a high of 70.73% for the summary field (MARC 520) to 0% for several fields. The title field had the second highest check rate at 60.55%, followed by the subjects field at 50.8%. The next group of fields was checked at a much lower rate, and consisted of the series (13.72%) and general notes (12.56%) fields. Four additional fields were checked at rates near 5%, and 5 more at rates around 1.5%. Four fields were not present in the sample.

One thousand six hundred and nineteen (78.67%) of the checks were made by participants in one of two fields: the title field (MARC 245), and the subjects field (MARC 6xx). Overall, significant differences between factors were found for the following MARC fields: 300, 4xx, 6xx, and 090. Field 300 was significant (χ^2=30.35, p=.000) in large part because of an extremely high check rate for the standard labeled display; secondarily, a low check rate in the standard unlabeled interface also contributed. Field 4xx was significant (χ^2=17.30, p=.001) primarily because there were no checks at all in this field for the enhanced unlabeled interface. Field 6xx was significant (χ^2=10.86, p=.002) because of a high check rate in the enhanced labeled display and a low check rate in the standard unlabeled display. Field 090 was significant (χ^2=10.81, p=.002) because of variance found in all 4 interfaces. This result might not be reliable because of low overall frequencies.

When examined by demographic variables, many similar results were obtained. Using computer use as the grouping variable, significant results were found for the Not Useful and Don't Know categories, and fields 300 and 6xx. Using library catalog use as the grouping variable, significant results were found for categories Not Useful and Don't Know, and fields 245, 300, 6xx. In this instance, field 245 was significant in large part because of the low check rates by the most experienced library catalog users. When using knowledge of big band music, significant results were found for the Not Useful category, and fields 245, 300, and 6xx. Field 245 was significant here because of a high check rate by those with no knowledge of big band music. Significant differences were also found for fields 020 and 090, but the individual cell counts were too low for conclusions to be drawn.

Summary of Statistical Analysis

The statistical analysis was presented in two broad categories: analysis of data from the first task, and analysis of

data from the second. For the first task, participants using enhanced brief screen interfaces viewed more brief screens and fewer full screens than did their counterparts. Screen durations for the second 10 screens were found to have dropped from those of the first 10 screens. Statistical analyses comparing demographic variables to the screen frequencies uncovered many significant differences. Participants using the enhanced content interfaces made fewer selections from index and full screens, and more selections from brief screens. For the second task, participants who used enhanced content interfaces were able to make some sort of relevance judgment more frequently than were those who used standard content interfaces. In the next section, the importance of these results will be discussed, with specific regard to the research questions and hypotheses.

Discussion

Research Question 1: Screen Content

The first research question asked whether there was a correlation between screen content and the time it takes a participant to perform a task. Three hypotheses were derived from this broader question. The first was that the number of screens viewed would differ between treatment groups. The second was that the number of screens viewed at each level of specificity would differ between treatment groups. The third was that the screens used to make selections decisions would differ between treatment groups.

Hypothesis 1.1

In this experiment, screen content was varied between treatment groups so that some groups viewed more topically oriented data on the brief screen than did other groups. Frequency data were tabulated for all participants in several categories—by the main factors in the experiment, by the demographic variables, and broken down by type of screen—and statistical tests were run. There were no significant differences between the groups in the overall number of screens that participants viewed on either the content factor or the labels factor. Thus the null hypothesis, which states that there is no difference in the number of screens viewed, cannot be rejected. Therefore, the first hypothesis—that there will be a difference in the overall number of screens viewed—cannot be supported.

Hypothesis 1.2

When considering the second hypothesis for this question—i.e., whether there were differences in the number of individual screen types examined—significant differences were found. It was found that participants who used the interfaces with enhanced content brief screens viewed more brief screens and fewer full screens overall than did their counterparts. The enhanced content of the brief display enabled participants to avoid viewing full displays. Given that full displays contain more data, more data elements, and by all measures require more time to process, a reduction in the number of full display screens viewed most likely represented a reduction in the effort that users expended to achieve their goals. Thus, the null hypothesis in this case was rejected; the number of screens viewed at each level of specificity did differ based on whether participants used enhanced content brief displays or not.

It should be noted that these differences were not observed when the first 10 screens were examined in isolation. This finding suggests that the participants altered their behavior during the course of the test. That behavior had changed by the twentieth screen, however, as the frequency data for the first 20 screens already show a significant difference between the groups based on-screen content.

It is also interesting to note that participants using labeled displays viewed more index screens and fewer full screens for the first 10 and first 20 screens than did those using unlabeled displays. This contradicts results for the labels factor that were obtained from the overall data, where there were no significant differences. This suggests, in turn, that users of labeled interfaces initially preferred viewing index screens to single record displays. That the absence or presence of labels would affect a participant's screen selection—even for a short period of time—was not an anticipated outcome.

The behavior change noted above is also reflected when both the frequencies and the durations of the first 10 screens are compared to the next 10 screens. The participants viewed fewer index screens and more brief and full screens in the second 10 screens than they did in the first 10. This might reflect the fact that many participants appeared to use the first few screens to familiarize themselves with the data set and with the system. Or it might be that they found the brief and full screens more informative for their needs. One way or the other, a second change in activity is seen in the fact that mean screen duration dropped a significant amount in all types of screen, as well as for all screen types taken together. These drops suggest that the participants became familiar with the system, its content, and how to use both to solve the problem at a relatively rapid rate.

It is possible that these drops—both statistically significant and substantial—are the result of some other factor, such as that the participants became dissatisfied with the system and simply hurried through the task to be done. There is some evidence in the post-test comments that suggest that this might be the case, inasmuch as some participants commented that there was not enough information in the system for them to make the types of decision that were

requested of them. However, it would appear from the transaction logs that the participants figured out their preferred method of solving the problem within the first 20 or 30 screens, and then used that method with increasing efficiency as the problem progressed. The participants seemed to develop routines that they followed throughout the experiment—for example, one participant would view an item in the brief display, then the long display, and finally select that item. It is assumed that in adopting such a routine, users can work more quickly because they gain practice and experience in carrying out the steps in the task.

Hypothesis 1.3

Because the problem presented to the participants was subject-oriented in nature, it was thought that the use of enhanced content brief displays would have an effect on the selection behavior of the participants. The third hypothesis for research question 1 asked whether the screens from which participants made selections would differ based on the experimental factors. Specifically, it was thought that those who used an enhanced content interface would be more likely to make their decisions from brief record displays. Statistical analysis of the selections that participants made shows that this in fact occurred—users of the enhanced content interfaces selected 217 items from brief displays while their counterparts selected only 173. Confounding this is the fact that users of standard content interfaces selected a larger number of items from index screens. This might have been skewed by the actions of the one or two participants who made all their selections from index screens. Despite this anomaly, the null hypothesis was rejected, and the hypothesis confirmed; the screens used to make selection decisions did differ between treatment groups.

Additional support for this conclusion can be found in the data from the second task, where participants were asked to make basic relevance judgments for 20 items presented to them either in brief or full display. Users of the enhanced content interfaces checked that they could not decide the value of an item significantly fewer numbers of times than users of the standard interfaces. The decrease in the Don't Know category was largely transferred to the Not Useful category, which suggests that the increased information helped participants make negative selection decisions.

It should be noted that the secondary analysis—in which the Don't Know and Not Useful categories were combined—confounds these conclusions to a degree. These categories were combined under the assumption that a user's indecision would most likely translate into a decision not to examine an item further, and the results were not significant. However, this assumption might not be valid; in an active environment, the user might choose any of a number of different steps to follow up on this state of indecision—request more information, browse the shelf, etc. It is quite possible that these two categories cannot be conflated.

Demographic Effects

Further complicating the findings of this study are the significant results obtained on many of the demographic variables. Most noteworthy of these results are the consistent significant differences found when examining the results using computer use as a grouping variable. More experienced computer users generally viewed fewer detailed screens. This might be explained by the fact that these users were less likely to accept the system limitations—both in terms of content and function—than less experienced users. Computer users have become more demanding as the capabilities of computers have grown, and it seems reasonable to imagine that they would be demanding in this experiment. Several participants commented on the system limitations; for example, some complained that there was not enough information in the system to make a decision, while others complained at having to use the keyboard to issue commands.

In addition, gender had a significant effect on several of the measures. The most interesting of these was the difference that was found in the frequency that males and females viewed different screen types. Women viewed fewer index screens and more brief screens than did men. These results bring to mind the study conducted by Ford and Ford (1993), where the researchers found that experiment participants used three broad search strategies that were associated with one gender or the other. The results of this study serve to confirm those findings, because women in this experiment tended to view records at a greater level of detail than did men.

The third variable with noticeable effect on the results was the library use variable. Those with higher library catalog experience were more likely to view full display screens than those with less library catalog experience. This suggests that experienced library users are more likely to exploit the resources in a catalog more fully, because they are more likely to examine the fuller information. Finally, knowledge of the topic was linked to the likelihood that the participant would view fuller information.

It must be pointed out that tests to determine whether the main treatment groups differed on any of the demographic variables recorded were negative in all cases except in the instance of the knowledge of big band music. It was concluded, therefore, that these demographic variables did not have a significant or systematic effect on the tests of the primary factors. With regard to the knowledge of big band music variable, only two participants said they were familiar with big band music, which makes it unlikely that their actions would adversely affect the validity of the results.

Research Question 2: Screen Layout

Research question 2 asked whether the layout of bibliographic data on-screen would affect the speed with which a participant could extract information from it. Two hypotheses were derived from this broader question. The first was that the time needed to complete the task would differ between treatment groups. The second was that the time that participants spend on specific screen types would differ between treatment groups.

For this experiment, layout was defined as the absence or presence of on-screen labels delineating the data elements of the bibliographic record. The data gathered that address this question consist of the transaction logs and the screen duration information derived from those logs. While previous researchers have found that labeled displays are easier for users to read (Tullis 1983; 1988), no such assumption was made for this experiment; thus, the t-tests that were performed were two-tailed.

Hypothesis 2.1

To test whether screen layout had an effect on the time it took to perform the task, the data were examined from several different perspectives. First, overall session duration was compared against the labels factor. This test failed to reveal significant differences. Second, the mean durations for all screens in each session were compared, with no significant differences observed. Additional analyses of the effect of labels on-screen duration included: mean duration of the first 10 screens viewed and mean duration of the first 20 screens. No significant differences were found. Thus, the null hypothesis cannot be rejected, and the hypothesis that screen layout had an effect on participant performance cannot be supported.

Hypothesis 2.2

To test whether screen layout had an effect on the time that participants spent on particular screen types, a number of tests were conducted. First, the overall mean screen duration for each screen type was compared, with no significant differences found. Additional analyses of the effect of labels on-screen duration included: mean duration of the first 10 screens viewed, separated by screen type; mean duration of the first 20 screens by screen type; mean duration of the first 5 screens of each screen type; and, the number of characters processed per second. In all these tests, no significant differences were found. Thus, the null hypothesis here cannot be rejected; screen layout had no effect on-screen durations for particular screen types.

With regard to the characters per second measure, it should be noted that while overall screen density was used as a measure, it is quite possible that participants only processed part of the information on-screen. Thus, a participant might only have read the title and subject data elements on a given screen, rendering the total screen measure less meaningful.

Demographic Variables

While layout of the data on-screen had no measurable effect on the ability of participants to perform the task presented to them, other factors did. The level of computer use affected participant performance in the first 10 screens, the first 20 screens, and the first 5 screens of each type, although these results are clouded by the fact that the differences in each case failed to follow a single progression. This might have been due to the uneven distribution of individuals over the computer experience variable, as there were so few participants who had little experience with computers. Consequently, it is not clear how these data might be interpreted. The complex nature of the values for mean screen duration here suggest the possibility that some other variable interacted to create these results.

However, even this difference disappeared when the length of individual screens was introduced as a control. Using this more exacting measure of speed, the only significant difference was found on the gender variable—males processed more characters per second than did females. This result might have been due in part to the fact that males viewed significantly more index screens than did females. Index screens had a higher mean processing speed than either of the other two screens; higher levels of index screen viewing would thus result in higher overall processing speed.

Based on the data gathered in this experiment, there is no evidence that screen layout has an effect on user performance. Neither of the two hypotheses under this question were supported, regardless of the method of measuring this difference. This conclusion is remarkable, given the body of human factors research that has been conducted that contradicts this (c.f., esp., Tullis 1981).

One possible explanation for these results is that it is possible that the design of the experiment was not sophisticated enough to obtain wholly reliable results; for example, it is possible that some participants just selected the first records they viewed simply to be finished with the test. Examination of the transactions logs, however, suggests that most participants made at least a modest effort at carrying out the task. For example, while the frequency distribution of screens viewed for each record in the set shows a general decreasing trend as the record number increases, there still remains a wide dispersion of activity.

If large numbers of participants failed to give some effort to the experiment, it seems reasonable to expect that

extremely high view rates for the first and last records in the list would have been observed—those closest to the starting point of the task. This was not the case. Even if it were, the fact that some participants chose not to expend a great deal of energy trying to select items from the display does not necessarily invalidate the results—especially given the fact that users often do not seem to be extremely diligent when examining catalog search results (e.g., Millsap and Ferl 1993).

Another explanation for the lack of significant results in this area might be that beyond a certain point the complexity of layout has no effect. Bibliographic displays include a large amount of data arranged in a complex set of data elements, the combination of which can present a great deal of information to the user. In this experiment, the mean display length was 531 characters out of a possible 910—a 58% screen density level. Most researchers recommend screen densities more in the neighborhood of 30 to 40%, a much lower figure. Added to this is the fact that many of the data elements in a bibliographic display are neither clearly explained to users nor inherently known by them, minimizing the effect that the absence or presence of labels might have. In this experiment, every attempt was made to use clear and unambiguous terms for the labels; however, it is not clear to what extent the participants knew and understood the meaning of the information presented to them. These complexities could have overwhelmed the effect that labels might have had on participant performance.

Research Question 3: Relative Value of Data Elements to Relevance Judgments

Research question 3 asked whether there were particular data elements that participants used more often than others to make relevance decisions in topically oriented retrieval tasks. Two hypotheses were derived from this broader question. The first was that those data elements most associated with topical bibliographic data would be selected most frequently by participants of the assigned task. The second was that the fields deemed useful would differ between treatment groups.

Hypothesis 3.1

One purpose behind including this question was to support or refute past research that identified the fields considered helpful by library catalog users—notably Seal (1983), Hufford (1991), and Palmer (1972). Those researchers found that the substantial majority of users considered just a few fields to be necessary or useful for their needs. In this experiment, this hypothesis relied on the subjective feedback provided by the participants in the second task of the experiment. More than three quarters of the checks that participants made were placed in 2 fields: the title field (MARC 245) and subjects field (6xx).

This represents an even higher concentration of interest than found in those earlier studies, but might be explained by a couple of factors. First, the problem in this experiment was highly subject-oriented; participants were asked to select items on a given topic. This might have caused the participants to focus on those fields that had the most topical content. This can be further supported by the fact that the summary field (MARC 520), while not present in many records (82 chances overall), was selected by participants an extremely high percentage of the time that it was present (70.73%).

Second, the nature of the experiment limited the chances that participants had to select other fields. The randomly selected records and randomly selected display screens emphasized primary fields and downplayed secondary ones. The title field was on every screen presented to the participants, and the subjects field in most. In contrast, the contents field—among other potentially useful fields—was not viewed at all. This uneven representation probably affected the relevance indications of participants.

A third reason for this concentration might have to do with the fact that the experiment was a simulation. One of the fields that previous researchers said that library users found important was the call number field. Obviously, without the call number, locating the actual item on the shelf is greatly complicated. In this experiment, however, participants were not asked to retrieve the items they selected; thus, their perceived need for the call number may well have been mitigated. It is perhaps instructive to note that some participants selected call number despite the nature of the experiment. This might reflect an effort on the part of those participants to take the simulation seriously, or it might be a retrieval strategy that they use.

The check rates of four other fields differed from the results of earlier research. Both the author and publication fields in this experiment were selected as useful only a small percentage of the time—at rates only half that found for the series field. On the other hand, the series and general notes fields were fields that were not identified as important in earlier research, but that were checked by participants at a low but steady rate. It is unclear why these results were obtained.

The evidence regarding useful fields that was gathered in this experiment seems to suggest that novice library users consider only a few fields to be helpful to their selections decisions, and ignore the rest. In addition to the explicit check rates in the second task are the transaction logs in the first task, which indicated that novice library catalog users viewed more index screens and fewer detailed screens than more experienced library catalog users. One possible explanation for this behavior is that novice users, unfamiliar with

the data elements in a bibliographic record, focused on the simplest displays, where the data were presented in the most uniform and unambiguous manner. Detailed screens can contain any of a wide variety of data elements, many of which are identified by terminology that is unclear to the user (e.g., "LCCN," "ISBN," "Music Number," etc.). Avoiding these screens might reduce the user's uncertainty and unease in using the system.

Hypothesis 3.2

With regard to whether the fields deemed useful differed between treatment groups, the significant results obtained for several of the fields partially support the hypothesis. When these results are considered in relation to the core fields identified by earlier research, it was found that both the subjects and call number fields differed significantly between treatment groups. Looking first at the call number results, it was noted that the check rates in each interface diverged from the expected rates, and that these discrepancies crossed both treatment factors. It might be that the low overall check rate makes these data unreliable in this context.

Turning to the check rates in the subjects field, participants using the enhanced content labeled display selected subjects at an especially high rate, while users of the unlabeled standard content display selected this field fewer times than expected. Finally, with both remaining significant results, it is interesting to note that the low check rates in unlabeled displays were primary contributors to the result. In addition, a high number of checks in the labeled display contributed to the results for the physical description field.

Taken together, the significant results for subjects, physical description, and series fields follow a pattern: participants who did not use interfaces with identifying labels indicated that they found these data less useful than those viewing labeled displays. While these results do not form a compelling argument to support the use of labeled displays in all cases, they certainly suggest that in some cases labels affect user perceptions of the data they see. Thus, while the absence or presence of labels did not have a significant effect on the speed with which participants performed the first experiment task, the results in the second task still might affirm their importance to end users.

Summary of Discussion

This discussion of the statistical tests included an analysis and comparison to the research questions and hypotheses. On research question 1—whether screen content affected user behavior—hypothesis 1.1 was rejected, while hypotheses 1.2 and 1.3 were confirmed. With respect to research question 2—whether screen layout affected user performance—hypothesis 2.1 and 2.2 were both soundly rejected. For research question 3—whether some data elements are more commonly considered useful than others—hypothesis 3.1 was supported, while the results for the hypothesis 3.2 are more ambiguous. Participants in the treatment groups did select some data fields as useful at different rates; however, these could at best be considered tentative results.

Conclusions

This research began with a desire to contribute to the knowledge about online catalog use. The primary objective was to explore the effect that layout and content might have on a typical information retrieval task. An experiment was designed to isolate these aspects of online catalogs and the experiment was run with participants at the University of Pittsburgh. The data gathered in this experiment were analyzed and the results were presented.

In this research, several important discoveries have been made. First, it was found that alterations to the content of particular screens—in this case, enhancing the content of the brief display—had a significant effect on the behavior of the experiment participants. Participants who used brief display screens that contained more topically oriented data elements resorted to full display screens significantly fewer times than did those using standard, citation-oriented brief displays. This finding is important because it suggests that—for topically oriented tasks, at least—brief catalog displays might be redesigned to include more fields with subject-rich content (e.g., MARC 520 and 6xx fields). Such a redesign would presumably reduce both the number of screens that users would need to view and the complexity of those screens. This might, in turn, simplify the user's task of finding wanted items in the catalog.

A second important finding of this research was that the layout of information on-screen had little effect on the time it took experiment participants to complete the assigned task. Whether measured as overall time spent to perform the task or as average time spent on particular screens, no significant differences between treatment groups were found. When combined with the fact that mean screen duration dropped substantially over the course of the first 20 screens, it seems likely that the participants of the experiment adapted to the mode of information presentation rapidly, and became equally comfortable with that mode of presentation—regardless of the specifics of the mode of presentation. These results contradict earlier related research, and raise questions about whether bibliographic data somehow differ from the data used in that earlier research.

A third important finding was the support for earlier research regarding the fields that participants felt were use-

ful to their judgments of relevance. Authors of earlier studies had found that most users consider only a few fields important in the bibliographic record. The results of this study confirm these findings, and take those results further with regard to topically oriented catalog tasks. The participants in this study overwhelmingly considered three MARC fields to be useful to their judgments of relevance—a fewer number of fields than was found in earlier studies. This discovery is important because it might be used by online catalog designers to select fields for inclusion on given catalog screens. This would give users more of the data that they feel are useful, without cluttering screens with data they feel are not.

Method Considerations

During the course of this research, two broad methods of conducting the experiment were tried. The first of these employed HTML and the Hypertext Transfer Protocol as the mechanism for carrying out the experiment. Several observations can be made with regard to this system. First, although there were very few problems with participants using a mouse to navigate the system, one problem that was observed was that many had trouble with bibliographic records that were long enough to require scrolling. They did not know how to view the bottom of the record. It is unclear why these participants had these troubles, but that these troubles existed should serve as a point of consideration for others doing such tests.

A second observation is that data-gathering from participants in the HTML environment requires access to server-side processing. Without server-side control of the flow of the experiment, participants can ignore requests for information posed to them. In the pilot test, 40% of the requests for participant feedback were ignored. While this response rate was due in part to the design of the particular experiment, a good portion no doubt resulted from the inability to enforce compliance. Use of a dedicated HTTP server with access to server-side control would have enabled the pilot test to have more success in this area; with the advance in technologies, this approach would be more feasible now.

Finally, extreme care must be taken in any such test to ensure that the variable being tested is not confounded by other related variables. In designing the pilot test, the variables were tested simultaneously and interacted in such a way as to make reliable measure practically impossible. It was assumed that participants would proceed sequentially through the screens presented to them, using one screen to examine the bibliographic information, and the next to provide feedback regarding the data elements used for their relevance judgment. In fact, the participants became familiar with the interface and often appeared to anticipate several screens in advance. This enabled them to ignore certain screens and focus on others, thus rendering the duration of screen measure meaningless in that particular experimental context.

The second method of conducting the experiment used a custom-made Visual Basic application, and was generally more reliable in performance. There were some problems, however. Whereas the first task relied exclusively on keyboard input, the second relied on mouse actions, and this change in system modes caused some confusion among the participants—even after the instructions had been modified to emphasize this change.

Future Research

A great deal of further research still needs to be conducted on the effect that layout of data on-screen has on user performance. While the research outlined here showed that no differences were found in performance based on the absence or presence of data labels, many other tests could and should be conducted. For example, the effect that overall screen density has on usability should be explored with respect to bibliographic data. In fact, many studies that have been conducted with other types of information systems (e.g., Kruk and Muter 1984; Marcus 1982; Trollip and Sales 1986; Tullis 1981, 1983) should be replicated in the special context of bibliographic data.

A number of other areas for further research have been uncovered. One such area is the effect that user knowledge of bibliographic data has on user behavior. In the current study, participants were asked to identify the data elements that they used to make basic relevance judgments. Left unanswered is the question of how the individual participant's knowledge of bibliographic data content might have affected the results. It seems reasonable to assume that users who know more about the content and structure of an information system will be better able to exploit the information in that system. Indeed, Brunner et al. (1992) found some evidence to this effect. Similarly, the selection of data elements used in a basic relevance judgment might depend on the user's knowledge of bibliographic data structures. Research must be conducted in which the effects that this knowledge has on user behavior and on user relevance judgments are explored. Some research into the effect that user knowledge—both of topic and of system function—can have on user behavior has already been conducted (e.g., Hsieh-Yee 1993), but additional research focused directly on layout and content needs to be conducted.

Linked to this study of users' knowledge of bibliographic data structures would be research into the labels that are used in online catalogs. Bibliographic data contain a large number of data elements. The labels that have been selected for these data elements have not been tested with users to see how clearly they communicate content and meaning to users. Research into the effect that different labels have

on user comprehension would enable catalog designers to use terminology with the widest recognition among users.

Another area of research that needs further exploration is determining the data elements that are most important for particular types of retrieval situations. This research would have to start with a greater consideration of the types of tasks users typically come to the online catalog to solve. While it might be obvious that many users come to the catalog to find out what a library has on its shelves, other uses are evident, if less well defined (e.g., finding all the editions of a particular work, in order to identify the most authoritative edition). Anecdotal evidence regarding the uses to which catalogs are put has long been offered; what is needed are studies that offer substantive, empirical data regarding these uses. Such knowledge is necessary before the library and information science field can act to improve catalogs in a meaningful and purposive manner.

Once a basic topography of the types of retrieval situations and their relative frequencies has been achieved, research into the data needs for each of these situations should be conducted. Common sense would suggest that certain data elements would be more useful in some situations than in others, and the research described here confirms that assumption in one particular instance. Moreover, it might be that the usefulness of data elements follows the same skewed patterns found in other areas of library and information science research. Using the frequencies of occurrence as a means of setting priorities, library and information science professionals can systematically begin to evaluate the typical data needs in each retrieval situation. Such research would make it possible to design online catalogs with basic screens that more closely reflect the needs of the user in a particular retrieval situation.

Research in this area might also be broadened to consider such basic display issues as the order of display of data elements on-screen. While online catalog displays have taken as their model the catalog card—a familiar, comfortable display—it is certainly possible that a different ordering of data elements on-screen might be more quickly and easily processed. Research should be conducted to determine the effects that data order might have on user performance.

It might be possible to use the results of these studies as a basis for redesign of online catalogs not just from a display perspective, but also from a functional perspective. With a clearer understanding of the types of retrieval problems with which users approach online catalogs, indexes and search modes could be reorganized to match those problems. For example, instead of indexing a bibliographic database using MARC fields as the focus, the indexing might be designed so that related data elements are joined in one index. To some extent, library systems designers have begun to create such indexes, as when they create keyword indexes that combine title and subject fields. With a better understanding of the types of fields that users utilize in given retrieval situations, this process can be accelerated, and indexes can be designed that truly match the user's information need.

It is necessary for additional research to examine the relationship between gender and online behavior from a number of perspectives. The current study seems to corroborate the findings of Ford and Ford (1993), who found behavioral differences between the genders in online text use. Studies that specifically test the effect that gender has on the types of bibliographic information deemed useful in given situations must also be conducted.

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The Year's Work in Cataloging, 1999

Amy K. Weiss and Timothy V. Carstens

The challenge of cataloging Web sites and electronic resources was the most important issue facing the cataloging world in the last year. This article reviews attempts to analyze and revise the cataloging code in view of the new electronic environment. The difficulties of applying traditional library cataloging standards to Web resources has led some to favor metadata as the best means of providing access to these materials. The appropriate education and training for library cataloging personnel remains crucial during this transitional period. Articles on user understanding of Library of Congress subject headings and on cataloging practice are also reviewed.

This review of the literature on cataloging for 1999 reveals a discipline in transition. The "Year's Work in Cataloging" articles that have appeared in earlier issues of *Library Resources & Technical Services* have been overviews of a relatively confined universe of print materials. Like them, this article surveys the many significant contributions to cataloging that have recently appeared in the print literature. It also, however, examines working documents publicly available on the Web that were created by the Association for Library Collections & Technical Services Committee on Cataloging: Description and Access (CC:DA), the Joint Steering Committee for the Revision of AACR (JSC), and by other bodies responsible for the creation of cataloging rules. The JSC is now in the process of making the most important revision to the cataloging code since the adoption of AACR2 in 1981. Without an examination of these materials it is not possible to fully grasp the scope of the major changes on the horizon in cataloging.

The Internet, still a novelty in 1993 when the last "Year's Work in Cataloging" articles were published, has become the single most important phenomenon in contemporary librarianship. The pressure and problems of integrating Web materials into the library have changed the environment in libraries enormously, and the full impact and implications of the Web cannot at this juncture be accounted. The mercurial, infinitely flexible Web forces us to examine in depth all aspects of current cataloging, from the difference between monographs and serials, to the relationship of monographic materials to one another, to the continued viability of the Machine Readable Cataloging (MARC) communications format, to the underpinnings of the Anglo-American Cataloging Rules themselves.

Theory

In response to problems with the code that have become more apparent in the current electronic environment, a number of researchers have attempted to examine the underlying assumptions and structure of the cataloging rules with a view toward establishing the foundations for "more logical and comprehensive cataloging codes" (Taniguchi 1999, 448). Taniguchi studies the structure of the

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rules using conceptual modeling. He analyzes a variety of cataloging rules, chiefly from AACR2, 1988 revision, chapter 1, in terms of whether the rules promote or "orient" toward cost-effectiveness, identity, contents, or consistency. Delsey's work, "The Logical Structure of the Anglo-American Cataloging Rules," is probably the most influential and comprehensive examination of the structure of the cataloging rules. Delsey stated, "the methodology used in this study is derived from techniques used in system development projects . . . entity-relationship and object-oriented models [which] are used as the basis for identifying the key entities or objects about which an organization needs to keep data and clarifying the data-related business rules that apply within the organization prior to designing the layout of databases to support the organizations' business activities" (Delsey 1998, 1). Šauperl and Saye analyzed previous research on the possibility of creating expert systems for descriptive cataloging and summarize the obstacles to the creation of such a system. They concluded that inconsistencies in the language and structure of the code are major difficulties for the creation of expert systems, but consider that cataloger experience and the ability to interpret rules are also significant (Šauperl and Saye 1999).

Relationships in the catalog were the focus of Leazer and Smiraglia's work on the complexity of bibliographic relationships. They found that many works are part of bibliographic families and have a system of relationships that are not well explored in the library catalog, since uniform titles and uniform name headings do not express all aspects of interrelation (Leazer and Smiraglia 1999). Works that are canonical (or popular) have a particularly complex set of relationships (Smiraglia and Leazer 1999).

Seymour Lubetzky remains a powerful influence on those studying the form of the catalog and the form of cataloging rules. Leazer mentioned him as an influence (St. Lifer 1999). Taniguchi also references him. His paper on "form headings" (currently either uniform titles or corporate headings), written for an ALA committee in the mid-1950s, is noteworthy since it deals with the problem of modifying standards to meet a presumed difference in circumstance. Lubetzky's analytical approach remains relevant, and his references to the earliest history of cataloging serve to remind us how much things stay the same even though the technology of the catalog has changed.

While not published in 1999, the pivotal recent works on the nature of the code continue to be the papers presented at the International Conference on the Principles and Future Development of AACR held in Toronto in 1997. The conference proceedings, published in 1998, include important works by Hirons and Graham, Yee, Howarth, and Delsey. These papers have become the philosophical underpinning for much of the work currently being done on the cataloging codes.

Revising AACR

A number of critical problems with the code, as it is currently written, were illuminated at the conference. Two critical problems, in the terminology of the CC:DA, are known as the multiple characteristics problem and the format variation problem (ALCTS CC:DA 1999, 1). The multiple characteristics problem results from the fact that, in addition to physical format, every document potentially also has the following aspects: type of publication, published vs. unpublished, fundamental content, and method of management and reproduction. AACR2 rule 0.24 appears to give primacy to the "physical carrier" aspect. In other words, a videocassette is cataloged using chapter 7 of the rules because it is a recording of visual images on magnetic tape. Delsey (1998) has demonstrated that AACR2 is inconsistent about the physical carrier principle. For example, cartographic information—whether on paper, transparencies, or three-dimensional models—is cataloged using chapter 3 because of the cartographic content of the items. In this case, the content of the item, not the carrier, determines its category. In addition, AACR2 makes the unwarranted assumption that each physical carrier is restricted to only one of the class of materials chapters in AACR2 (ALCTS CC:DA Task Force on Rule 0.24 [ALCTS CC:DA TF 0.24] 1999). This means that a relevant rule cannot be applied when it is not part of the class of material chapter being used to catalog the document. Confusion is also caused by the fact that many different types of content can often be put on the same carrier. For example, maps, music, and text can all be digital. In some cases, the scope notes in AACR2 chapters appear to exclude altogether certain categories of materials from treatment by AACR2 (ALCTS CC:DA TF 0.24 2000).

The format variation (or multiple versions) problem relates to another function of rule 0.24. Rule 0.24 is the only place in AACR2 that addresses the question of whether to create a new record if a record for a similar item already exits in the catalog. As it is now written, the rule implies that a new record should be created whenever there is any variation in "physical carrier" between two documents, even if the documents contain the same intellectual or artistic content (ALCTS CC:DA TF 0.24 1999). For example, under the current rules, separate records are created for the film and video versions of a feature motion picture. Separate records are also created for the print, microfilm, and online versions of a periodical, even if all three versions contain exactly the same content. The growth in the number and variety of electronic resources has made this problem more acute since electronic resources are capable of carrying so many different types of content. As a result of the format variation problem, the catalog user may have to wade through many catalog records that represent essentially the same thing. In their local catalogs, many libraries are already adding holdings for various

versions of serials to only one catalog record. Even though this local practice has been sanctioned by the Cooperative Online Serials Program (CONSER), it is still contrary to AACR2 rules.

Another problem that has become especially acute with the advent of electronic resources resides in AACR2's concept of seriality. Because they do not have a predetermined conclusion, Web sites and databases exhibit many of the attributes of serials. Yet these resources are not issued in successive parts and do not bear numeric or chronological designations, which are the other AACR2 attributes of seriality. Since these electronic resources lack the other "serial" attributes, they cannot be treated as serials by AACR2; yet because of their continuing nature they cannot be handled effectively as monographs. This means that there is now a large and growing category of bibliographic resources that cannot be handled effectively by the code.

A final problem with the code is that it assumes that the content of a document is permanently fixed within a physical object. Again, this is not necessarily the case with remotely accessible electronic items, which can change from one viewing to another. Although the current rules allow the cataloger to handle this material by taking a "snapshot" (Delsey 1998, 35) of the item while at the same time leaving certain variables vague, this technique is not adequate because there is no way to know when content might have changed or whether the "snapshots" compiled by various catalogers will be sufficiently similar to identify the item.

A number of different committees and organizations have been working on the above-mentioned problems with the code. The definition of seriality was tackled in a report prepared for the JSC by Hirons and others entitled "Revising AACR2 to Accommodate Seriality" (1999). Hirons began by distinguishing "finite" publications from "continuing" publications. Finite publications are complete or are intended to be complete and include traditional monographs. Continuing publications are intended to be continued for an indeterminate period and include traditional serials. They also include a conceptually new type of publication called integrating resources (though certain types of integrating resources can also be finite publications). Hirons defined integrating issuance as "a form of issuance that describes bibliographic resources that are added to or changed by means of updates that do not remain discrete and are integrated into the whole" (Hirons 1999). Integrating resources include loose-leaf publications, Web sites, and databases. Hirons also recommended refinement of the AACR2 definition of serial to make the distinction between a traditional serial and an integrating resource clearer. The JSC has endorsed the concept of integrating resources and Hirons has been commissioned by the JSC to propose specific descriptive rules to deal with them (JSC 1999). The proposed revisions are now available for review (Hirons 2000). These new rules, if adopted, should allow AACR2 to handle more effectively this rapidly growing category of resources.

Hirons's report also recommended a series of modifications to AACR2 to deal with the fact that continuing resources change continually over time (Hirons 1999). As noted above, the current rules only allow the cataloger to consider a "snapshot" of the evolution of these resources. Hirons's solution is to require catalogers to consider the whole publication, not just a single issue or manifestation (as in the case of integrating resources). Proposed changes emphasize identification of the whole publication over merely transcribing information from the most current manifestation. Hirons recommended focusing on the description of variable information, ignoring obvious errors in titles, minor title changes, and most "other title information" when cataloging continuing resources. Hirons would require the identification of all of the item(s) used as the basis of description (or, in the case of integrating resources, all times that the resource was viewed). She would also apply to integrating resources and the use of notes indicating other titles by which a resource is known. Her report recommended that the source for the title or statement of responsibility should be the latest issue or iteration of a resource. Closely connected with this suggestion is the recommendation that a uniform title be added to successively cataloged titles in order to provide these resources with a stable title. These two recommendations would provide the user with a more holistic approach to the whole work—i.e., both earliest and latest titles—while still providing stability. JSC has now endorsed many of these changes. The use of title information from the latest piece in hand was endorsed for integrating resources but not for traditional serials (JSC 1999). Another major change recommended by Hirons and intended to emphasize the whole work is the elimination of the concept of chief source of information for continuing resources. JSC is currently exploring the possibility of making the entire resource the chief source of information for all types of materials, not just for continuing resources (JSC 1999).

CC:DA has recommended a two-pronged solution to the multiple version problem.

It suggested that AACR2 should be reorganized by International Standard Bibliographic Description (ISBD) area so that all rules related to title, edition, etc., appear together (ALCTS CC:DA 1999, 4). The new arrangement would allow the cataloger to use every rule relevant to the resource being cataloged and does not restrict the cataloger to the rules in only one class of material chapter. It also recommended that rule 0.24 be rewritten so that all aspects of a document are brought out and so that physical carrier is no longer given primacy. The key first sentence of the proposed rule revision reads, "It is important to bring out all aspects

of the item being described, including its content, its carrier, its type of publication, its relationship to other expressions of the same work, and whether it is published or unpublished . . . all relevant aspects should be described with no one relevant aspect taking precedence over any other" (ALCTS CC:DA 1999, 5). JSC has endorsed a staged approach to the implementation of these revisions with some changes to rule 0.24 being made immediately and further changes made should AACR2 be reorganized by ISBD area (JSC 1999). JSC is currently developing a prototype to test the feasibility of reorganizing AACR2 by ISBD area. JSC's eventual disposition of the ISBD reorganization proposal is highly uncertain at this time.

CC:DA has also made recommendations related to the format variation problem. According to CC:DA, this problem results from confusion about the purpose of bibliographic records. Should bibliographic records represent a particular expression of a work, or should they represent a manifestation of a work? Expression is "the intellectual or artistic realization of a work in the form of alpha-numeric, musical, or choreographic notation, sound, image, object, movement, etc. or any combination of the above forms." Expression excludes "aspects of physical form . . . that are not integral to the intellectual or artistic realization of the work as such" (ALCTS CC:DA TF 0.24 1999). Manifestation, on the other hand, is "the physical embodiment of an expression of a work." A manifestation represents all the physical objects that bear the same characteristics, in respect to both intellectual content and physical form. When the production involves changes in physical form, the resulting product is considered a new manifestation. Changes in physical form include changes affecting display characteristics . . . changes in physical medium . . . changes in container" (ALCTS CC:DA TF 0.24 1999). Currently, new records are created whenever there is a new manifestation of a work. CC:DA has suggested that the rules be changed so that new records are created only if the expression changes (ALCTS CC:DA 1999). JSC has reserved judgment on this recommendation (JSC 1999).

Related to the format variation problem is the question of whether minor variations in a resource require a new catalog record. Although various entities (including OCLC and the LCRIs) have addressed this issue, AACR2 remains silent. JSC has endorsed this idea and has asked CC:DA to draft an appendix to AACR2 defining what constitutes major and minor changes (JSC 1999). Major changes would require the creation of a new record; minor changes would not. JSC has also asked the Library Association/British Library to prepare a draft introduction to AACR2 that would discuss the major/minor changes issue as well as other general issues related to the entire code (JSC 1999).

Since so many of the changes to the code discussed above were stimulated by the increasing importance of electronic resources, it is not surprising that the section of the code that deals with these resources has also been undergoing a major revision. The process began at the international level when the International Federation of Library Associations and Institutions (IFLA) published a major revision of the International Standard Bibliographic Description for Electronic Resources [ISBD (ER), formerly ISBD (CF)]. CC:DA was charged with "harmonizing" AACR2 chapter 9 with ISBD (ER). The CC:DA Task Force on Harmonization of ISBD (ER) and AACR2 has now produced a final report, including recommendations for specific changes to the code (ALCTS CC:DA Task Force on Harmonization of ISBD (ER) with AACR2, 1999). These recommendations parallel many of the ones made by those committees dealing with rule 0.24 and seriality and, indeed, the chapter 9 recommendations influenced and were influenced by the other activities that have been under discussion.

The replacement of the term "computer file" with the term "electronic resource" throughout chapter 9 is the first change recommended by the CC:DA Task Force on Harmonization. Also recommended were changes to the definition of the edition of an electronic resource. Like the CC:DA report on 0.24, the chapter 9 task force urged that a resource be considered a new edition only if there are significant changes in the intellectual or artistic content. Statements such as new release, version, level, or update, as well as changes in physical carrier, display format, or printer-related file formats would require a new record only if there were also a change in content. Like Hirons, the task force recommended that the chief source of information for an electronic resource be the entire resource, not the title screen. Other task force recommendations were concerned mainly with broadening the rules so as to make them more applicable to the large variety of electronic resources that now exist. These recommendations included broadening the scope of the rules to include new types of electronic resources; creating more specific terms for use in the file characteristics area; and the inclusion of many more current examples, particularly those related to remote resources, in the note fields.

Summary of Proposed Changes

The task forces and committees working on revision of AACR2 have proposed numerous fundamental changes to the cataloging code. Among the historic changes suggested have been the defining of the new type of resource, the integrating resource, and the creation of a new set of rules to handle this type of resource. Another proposal was to create new records only when there is a new "expression" of a work and not for every "manifestation." A new appendix and

introduction to AACR2, as well as its reorganization by ISBD area, are possible changes that would radically alter its appearance in addition to changing its content. Finally, the many proposed changes to chapter 9 and to other parts of AACR2 to accommodate the slippery new forms of electronic resources would contribute to substantial reworking of the code. Taken together, these rule revision efforts represent some of the most important work being done in cataloging today. Catalogers are urged to follow the progress of this revision process via the Web sites listed in the bibliography of this article.

Metadata

While the JSC and others work on revision of the cataloging code and MARC to accommodate electronic resources, others have tried new approaches to bibliographic control. These new approaches revolve around the nebulous concept of metadata. Metadata is commonly defined as data about data. Aside from that rather glib definition, which is usually followed by the observation that even catalog cards are metadata, it has been rather difficult for noninitiates to discover what the furor over metadata is about and why metadata is important in information retrieval. Fietzer noted that an ALCTS subcommittee has found "more than twenty working definitions in the course of its deliberations, each one viable for the community that created it" (Fietzer 1999, 13). The confusion over how to define metadata has been well analyzed by Hopkins, who stated, "Metadata is . . . information about, primarily, electronic resources, with that information being encoded according to some scheme which is often electronic" (Hopkins 1999, 56). Compounding the confusion is the large number of metadata standards. A number of articles attempt to explain metadata. Ahronheim (1998) has written one of the most comprehensive articles, and is a good place for the novice to start reading. It describes the markup languages used and a number of the most important standards and initiatives. Summers provided links to current metadata projects and gives instructions for viewing the metadata (Summers 1999).

The Dublin Core has become the emergent standard of greatest interest to librarians because it is flexible, highly developed, and promoted by OCLC. Chepesiuk and Burk both described the genesis of the Dublin Core and describe its key elements (Chepesiuk 1999; Burk 1999).

Metadata is frequently offered as a workable alternative to full library cataloging for Web resources. Some arguments against using AACR2R and the MARC format for Web resources are noted in Chepesiuk (1999): MARC records are too difficult to make and it is not cost-effective to make MARC records for often ephemeral Web materials. Gradmann (1999) noted that the Dublin Core was intended for Web authors to make their own metadata, and one Dublin Core enthusiast quoted in Chepsiuk implied that the lack of rules for Dublin Core records makes them easy to create (Chepesiuk 1999). Gradmann made the argument that metadata is fundamentally different from cataloging, since it focuses on discovery of resources rather than description of resources, and further states that traditional description is not end user-oriented (Gradmann 1999).

For some, these arguments are reductive of the problems of description and show nothing more than an incomplete grasp of both AACR2 and the capabilities of the MARC format. Gorman discussed the difference between framework standards such as MARC or metadata, which merely name elements in the description, and content standards, such as AACR2, which specify what content is included in the catalog record (Gorman 1999). He shows the strong similarity between MARC and the Dublin Core, and warns against ignoring content standards or confusing content with framework. Gradmann as well as Milstead and Feldman are guilty of this confusion, since they emphasize controlled language in metadata as essential for increased retrieval while failing to acknowledge that metadata standards do not in any manner require controlled language (Gradmann 1999; Milstead and Feldman 1999). Milstead and Feldman admitted that the variety of metadata standards limits the usefulness of metadata for searching. They included the development of thesauri as one of the goals for unification (Milstead and Feldman 1999).

Weinberg's argument that the Web represents no more than a wrinkle on traditional problems of indexing makes a number of valuable points. She stated that the number of Web sites is not as prohibitively large as has been portrayed, noting that there were at the time of her writing approximately two million Web sites, compared to thirty-nine million records for unique materials in OCLC, and thirty million in RLIN. She also compared the structure of Web sites to periodicals, noting that even a single edition of a book can contain variants and that merely being mutable (like a loose-leaf publication) does not make Web materials unusually novel. She exhorted librarians to work on cooperative cataloging and indexing efforts, rather than spending time developing elaborate local Web pages that more often than not reference the same essential sites (Weinberg 1999).

One feature of the current environment is a large number of local or specialized initiatives. Doran's case study described the development of metadata for a large corporate Intranet, using a metadata template and controlled language terms. Her case study is notable for the fact that it emphasizes how much work was involved in the retrospective indexing of Web pages, and how difficult it was for staff, who had volunteered to assist but who had no official time set aside for performing the work, to meet deadlines (Doran 1999). Veatch emphasized how traditional library tools such

as collection development and MARC format can be utilized in Web control. Veatch emphasized a selective approach: finding the resources that will augment the library's holdings in a given area and committing to full MARC cataloging and any associated maintenance (Veatch 1999). Porter and Bayard described a similar project undertaken at the University of Notre Dame. They emphasized cataloging sites by "reliable" producers of information and committing to using link-checking software as a database maintenance procedure. Few of their sites changed URLs or went under during the project. They noted that it took catalogers approximately thirty minutes to catalog Web sites initially and twenty minutes by the end of the project, which seems to invalidate the perception that current standards and processes are unworkable for Web materials (Porter and Bayard 1999, 391–92).

One challenge of Internet cataloging, which appears to be receiving little consideration, is that there is no definable Internet catalog. From the various forms of the book catalog, through the card catalog, and even through contemporary automated systems, there is a known universe of possible searching behaviors and strategies limited by the nature of the catalog itself. The simplicity of the card catalog is the source of its nostalgic appeal. The Internet's endless sprawl can be searched by any number of tools whose search strategies can be ambiguous. Because of the diverse algorithms of various search engines it is difficult to know where to locate and how to format metadata for optimum user searching. Turner and Brackbill's (1998) research on how the use of embedded metadata (specifically the HTML META tag) affects retrieval of Web pages is significant. Pages with keyword metatags were ranked as "more relevant" to a search designed to retrieve the pages than pages without the keyword metatags. However, another type of metatag (a description metatag) exhibited no improvement in retrieval, apparently because the search engines stopped examining the document for multiple occurrences of the term after examining the description tag (Turner and Brackbill, 1998). Valauskas's examples of search engine failures in retrieving an electronic article containing imbedded metadata are also instructive. Drabenstott et al. (1999) cited Bates as stating that successful catalog searchers are those who understand the structure of the catalog rather than those who are experts on the topic that they are searching. If so, the diversity and complexity of Web search tools may continue to confound catalogers in their search for the best means of access through metadata of whatever type.

Most authors, despite their vague longing for controlled language, have focused on the descriptive aspects of metadata rather than subject retrieval. Interesting new ideas for subject access include Dovey's short article on meta-objects, which proposes intelligent documents that read and understand their own imbedded metadata and dynamically form links with other relevant documents. Ellis and Vasconcelos explored how facet analysis might be used to bridge the gap in retrieval capabilities between the word approach (used by most search engines) and true subject searches (1999). Hopefully a concrete project can be created pursuing this intriguing idea.

The MARC format was developed in 1967, making it ancient in automation terms. Hopkinson noted that the underpinnings of MARC, designed to facilitate the exchange of information on digital tape, are dated. Despite that drawback, the stability of MARC has created a near universal ability to exchange bibliographic information. "MARC use has increased since people began to prophesy its death [in 1985]" (Hopkinson 1999, 18). Metadata, with its multiple standards and formats, may not prove as resilient as MARC.

Metadata cannot currently be integrated into a standard library catalog. Instead, metadata must be attached to Web pages or it can be confined to a separate database of metadata records. This limitation leads to the issue of how many places and in how many ways it is advisable to provide access to electronic resources. It is ironic that at a time when even the largest research libraries have realized that a purchased ILS is more efficient than attempting to maintain a proprietary system, that even many small libraries feel obliged to create proprietary home pages to provide access to electronic materials. In some cases library Web pages have evolved into a shadow catalog—a nontransferable effort of the sort decried by Weinberg.

Education of Catalogers and Cataloging Staff

The realization that library standards may be useful in organizing the chaotic Internet means that the skill of catalogers may be in demand "Now that Cataloging Is Cool!" as one article trumpets (Garman 1999, 6). This excitement has not, unfortunately, translated into an interest in cataloging as an academic discipline. A study by Spillane showed that in 1998 only 52.1% of library schools required a cataloging course, compared to 77.1% in 1986. This discouraging statistic is somewhat offset by the fact that the number of cataloging courses taught overall has risen (Spillane 1999). The removal of required cataloging courses would seem to portend that fewer prospective librarians will have exposure to cataloging and therefore not only will fewer people become catalogers, but fewer librarians overall will have a solid grasp of how to use the catalog.

Bordeianu and Seiser's article discussed educational requirements for paraprofessional catalogers in academic libraries. There is no single educational standard for paraprofessional catalogers, but most ARL libraries do not require postsecondary education for copy catalogers,

although many accept postsecondary education in place of experience (Bordeianu and Seiser 1999). There is a general assumption of on-the-job training for professionals and paraprofessionals alike. Sill's article offered a proposed "curriculum" for on-the-job training for a professional serials cataloger (1999). Wiles-Young and Novak's article expressed concern for loss of training expertise, as professional librarians in cataloging departments become managers (1999, 450).

It is ironic that formal training in cataloging standards is considered irrelevant to the presumed creators of the new information infrastructure. In contrast, Banks convincingly showed how learning the rudiments of cataloging assists users in locating needed materials in the catalog (1999).

Subject Cataloging

The most significant research of the year was the Drabenstott study of user understanding of Library of Congress subject headings. Results of the survey, as published and analyzed in several journals, showed a uniformly low level of understanding of LCSH, with a 31% accuracy rating for child users and a 39% accuracy rating for adult users (Drabenstott, Simcox, and Fenton 1999b). Using a similar methodology, it was shown that expert users (i.e., librarians) were more accurate at assessing the meaning of LC subject headings, but that reference and technical services librarians still scored rather low rates of 52% and 55% respectively (Drabenstott, Simcox, and Williams 1999). Drabenstott et al. argue against eliminating LCSH, but point out that the subject headings they asked the participants to analyze were extremely complex, comprising three or more concepts. It may be that fewer concepts should be worked into single headings. Another implication is that the order of headings does not seem to make much difference to any group of users. Therefore a standard order of subdivisions would save money and time in cataloging departments (Drabenstott, Simcox, and Fenton, 1999b). Certainly given the relative flexibility of contemporary OPACS, with their ability to invert headings or search keyword components, this suggestion appears sensible.

Lundgren and Simpson surveyed graduate student perceptions of the usefulness of various aspects of bibliographic description for Web materials. While they regarded subject terms as useful, the graduate students preferred summary notes or abstracts (Lundgren and Simpson 1999). One might conclude that summary notes are simply less nebulous than subject strings and do not require special knowledge to interpret.

The MARC format subject subfield was finally implemented in February 1999, but not without controversy, as reflected in the postings to AUTOCAT that followed the implementation. Hemmasi et al. give the history of subfield v implementation, and admit that the controversial v is only the first step in a larger implementation of form headings that will have to include implementation of search capabilities by the creators of integrated library systems (Hemmasi, Miller, and Lasater 1999).

Harvard University has already implemented MARC field 655 in its catalog, in response to requests from reference librarians. Beall discussed the use of form/genre headings in the Hollis catalog. The form/genre terms in the catalog are derived from multiple thesauri and include many unverified headings from copy records, activated when the field was implemented for indexing and display. The use of form/genre terms to limit searches is still largely confined to the reference users, but it appears that they do offer a useful way to improve access and search precision. Hopefully, other libraries will follow suit in adding 655 to their search indexes, which would generate impetus to create the standard thesaurus called for by Beall (1999).

Practice

While the Internet monopolized much of recent cataloging literature, other formats of material also received attention. Freeborn (1999) discussed some unusual problems in 3-D audiovisual cataloging, demonstrating another case where strict reading of AACR2 may fail to illuminate the frustrated cataloger.

The two volumes of *Cataloging and Classification Quarterly* devoted to cataloging of cartographic materials are an excellent addition to the complex area of map cataloging practice. Even with two volumes, the editors admitted to gaps in the coverage of topic (Andrew and Larsgaard 1999), which speaks to the need for a revision of the long out-of-print *Cartographic Materials* (Stibbe 1982) and some simplification in map cataloging practice.

Frohnsdorff's article is that rare bird: an entertaining article on cataloging. It explores problems with the veracity of publication information contained in erotica and bootleg recordings. Because their creators are usually operating barely within the law or outside of it, publication information on these materials is generally spurious.

With the Library of Congress's move to Pinyin romanization, issues of language transcription and display have been highlighted. Riedlmayer's article contains dramatic examples of how the failure of online catalogs to display vernacular alphabets and diacritics affects retrieval and access to materials. His examples range from the familiar (the many versions of the name Qaddafi) to the less familiar but possibly more egregious (showing how the removal of diacritics from Hungarian words reduces the language to gibberish) (Riedlmayer 1999). Automated authority control

processes strip diacritics from headings as part of the normalization process for comparing headings. Bolick demonstrated how this can lead to erroneous name headings when applied to Chinese-language materials (1999).

There have been several articles this year on archival cataloging practice, most notably Hamburger's useful case study of three grant-funded retrospective conversion projects. Hamburger's conclusions on administration, staffing, and record quality are worthwhile reading for anyone planning a retrospective cataloging project (1999).

In summation, we stand on the threshold of a new era. The momentum is in place. In the next few years, there will undoubtedly be sweeping changes made to our cataloging rules, to our online catalogs and the records contained in them, and to the structure of subject access and analysis. The question of whether we will make things better for users is an open one. It is hoped that more research will be performed to determine how users categorize and locate information and materials and guide us in the change process.

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Book Reviews

Margaret Rohdy, Editor

From Carnegie to Internet2: Forging the Serials Future: Proceedings of the North American Serials Interest Group, Inc.: 14th Annual Conference, June 10–13, 1999. Ed. P. Michelle Fiander, Joseph C. Harmon, and Jonathan David Makepeace. New York: Haworth Information Pr., 2000. 398p. $69.95 (ISBN 0-7890-1007-0); $39.95 paper, (ISBN 0-7890-1035-6). LC00-23223.

The North American Serials Interest Group (NASIG) is unusual among library organizations because it is completely independent, unaffiliated with any other body. It is also catholic in its membership, embracing anyone interested in the serials world—librarians, publishers, subscription agents, system vendors. There are no institutional or corporate members, so all players are equal. The result has been a dynamic, productive organization that has gained respect in all corners of the industry. Its annual conferences have become known as good places for frank and interesting discussions, both formal and informal, of serials-related issues. Haworth Press has published the NASIG proceedings since their beginning, both in *The Serials Librarian* and, as is its standard practice, as monograph separates.

The NASIG conference mixes plenary speeches on general subjects, given by industry leaders, with practical workshops conducted by NASIG members. In recent conferences, the plenary sessions have become more general and visionary, less focused on serials and more on the new information society. This trend continues in the 1999 conference, with a particularly good essay by Stephen Abram, a vice president of the Canadian firm Micromedia. He enumerates ten trends in the new information economy and ten strategies for success. This might seem outside the traditional scope of serials work, but it reflects how the work of serialists has expanded in the last ten years. His thoughts make interesting reading even for librarians not involved with the serials chain.

Balancing the visionary talks are NASIG's many practical, serials-focused workshops that mine the broad and varied talents of NASIG's membership. While focused on local examples, NASIG workshops tend to transcend the "how we done it good" genre and provide insights that can be more broadly applied. The workshop topics show how NASIG's focus has changed with the times. Many of the workshops present practical advice for handling the rise of electronic serials and databases. Electronic acquisitions methods were one major focus: there were workshops on bundling and aggregation, consortial licensing, push technology, and desktop article delivery. At a licensing workshop, participants found real examples to critique and a discussion of the major pitfalls of licenses.

On the other hand, some topics defy the passage of time. A popular workshop featured a panel discussion by two subscription agents, a publisher, and a librarian on classic serials acquisitions questions: direct vs. agency orders, handling unsolicited material, switching from print to electronic versions. Most of the questions might have been asked five years earlier, and some even at the first NASIG conference in 1986. Another workshop focused on the preservation challenges of serials that are still mostly printed on acidic paper, decades after preservation awareness became common in libraries.

Between the plenary sessions and workshops are a series of "issues sessions." These are case studies and broader discussions of current topics that occupy a useful middle ground between the theoretical plenaries and the practicality of the workshops. Most of the 1999 sessions focused on electronic issues. Several publishers described projects they had undertaken and what they had learned from them. A diverse group of presenters tackled licensing issues from each party's perspective. There is an intriguing set of talks on advertising in scholarly journals, with a communications professor arguing in favor and a giant scientific journal publisher sounding notes of caution.

A few sessions highlighted planning and management skills for librarians. Mary Devlin, a professional communication specialist, presented an issue session on nonverbal communication in the work environment. Two librarians from Maryland conducted a preconference on scenario building as an alternative to strategic planning for libraries. Library directors Glorianna St. Clair of Carnegie Mellon University and Rush Miller of the University of Pittsburgh spoke of the ACRL Redefining Scholarship Project, an attempt to describe and validate the research done by academic librarians. The interest in these sessions also underscores the wide-ranging and far-sighted interests of serialists.

The publication lag for any proceedings volume can date material quickly. NASIG's material is not

immune; in fact, it can illustrate how quickly some things change. Jean Hirons of the Library of Congress and Les Hawkins of the National Serials Data Program presented one of the first discussions of the proposed changes in the definition of "seriality" at NASIG in 1998. The proposal moved forward quickly and is now well known and accepted in the serials community. The 1999 NASIG workshop, however, still presents a succinct and clear summary of the proposal. Similarly, the preconference on metadata might seem less relevant now that there have been many articles and larger workshops on the topic, but the NASIG report is still a good, straightforward introduction to metadata.

The special feature of the annual NASIG proceedings, as opposed to the rest of the serial literature, is its careful blend of theory and practice. NASIG's program planning committee has perfected the mixture of the two, while maintaining the generally high quality of the presentations. This makes the NASIG proceedings one of the few library science annuals actually worth reading every year.—*Bob Persing (persing@pobox.upenn.edu), University of Pennsylvania Libraries, Philadelphia*

From Gutenberg to the Global Information Infrastructure: Access to Information in the Networked World. By Christine L. Borgman. Digital Libraries and Electronic Publishing. Cambridge, Mass.: The MIT Pr., 2000. 324p. $42 (ISBN 0-262-02473-X).

An outpouring of titles about the "D" word—digital libraries, digital publishing, digital technologies, digitizing for preservation, digital materials, etc.—gluts the professional literature. Readers have a right to ask why we need this book too, which is about digital libraries even if it doesn't use the "D" word in its title. The answer is twofold: first, it is eminently readable; and, second, it takes a step back from the fray, aiming to assess the larger picture into which all the large and small individual digital initiatives might fit. *From Gutenberg to the Global Information Infrastructure* pulls together what we know now about the world of networked information systems with what research and intuition lead us to anticipate in the future. The author attempts to integrate what we know about technology, human behavior, and policy regarding access to information.

Borgman begins with definitions. First, she defines digital libraries as both "a set of electronic resources and associated technical capabilities for creating, searching, and using information" and an entity "constructed—collected and organized—by [and for] a community of users" (42). Then, she seeks to enlarge the reader's vision still further as well as to match it with the complexity of the real world, stating, "I propose 'global digital library' as a construct to encompass digital libraries that are connected to, and accessible through, a global information infrastructure. A global digital library would not be a single entity, nor would it be controlled by any single organization" (52). The words are straightforward and clear; the ideas are compelling and reflect with ease the diversity—some might say chaos—that now characterizes our professional environment.

In the first four chapters, Borgman defines and explains the basic elements of the GII (Global Information Infrastructure), and explores relationships among them: chapter 1, "The Premise and the Promise of a Global Information Infrastructure"; chapter 2, "Is It Digital or Is It a Library? Digital Libraries and Information Infrastructure"; chapter 3, "Access to Information"; and chapter 4, "Books, Bytes, and Behavior." As their titles suggest, chapter 1 defines what is meant by GII and explains how it might be expected to function; chapter 2 describes digital libraries as both document collections (using "document" generically) and systems in which users interact with the documents, much like libraries are both discrete collections of materials and systems in which users interact with those materials; chapter 3 covers familiar territory about methods of providing access to information, including the latest metadata schemas; and chapter 4, on electronic publishing, technology, and institutions, examines the life cycle of information and how developing technologies and society's institutions affect it.

Chapters 5 and 6, "Why Are Digital Libraries Hard to Use?" and "Making Digital Libraries Easier to Use," contain the central core of ideas for which the first four chapters prepare the reader. Here Borgman lays out her principal theses. Digital libraries were not easy to use in the past; but, now, design must aim for ease of use. She says, "The audience for digital libraries has changed radically since the early days of information retrieval, from expert search intermediaries to 'every citizen' who has access to the network. The next generation of digital libraries must serve a large and diverse community and provide a large and diverse collection of information resources" (141). Research and development can do more than address today's problems. Chapter 7 outlines "a research agenda for making the next generation of digital libraries better suited to people's information-related behavior in work, education, and leisure contexts" (166–67). Four trends provide the skeleton around which research should develop: (1) availability of full-text databases, not just bibliographic data, and (2) linked, not stand-alone, systems; (3) systems that require users to navigate, not just perform simple searches; and (4) concentrating on group processes and social context, not merely the individual user's search behavior. Borgman sees a "fundamental challenge of balancing the need for

tailoring digital libraries to a community of users with the need to construct a vast, interoperable, global digital library" (168).

The final three chapters suggest ways of meeting the challenges of the future, including the possible implementation of the GII. Chapter 7, "Whither, or Wither, Libraries?" is an examination of the issues for libraries, and chapter 8, "Acting Locally, Thinking Globally," is a similar discussion of successful, contributing digital library initiatives. In chapter 9, "Toward a Global Digital Library: Progress and Prospects," Borgman speculates on what may lie ahead, concluding, "Among the greatest challenges faced in realizing a GII is to scale the present-day Internet to a much larger, more complex, and more diverse information infrastructure that will support many more users" (267). That is a sobering thought for readers who believed the Internet was too much to handle.

More than forty pages of references document the author's sources and furnish a bibliography of relevant material for the reader interested in deeper exploration of these themes. The listing is international and draws on the literatures of several disciplines, including computers, human behavior, social science, telecommunications, and more, in addition to the familiar areas of library and information science. While welcome, it lacks the usual formatting, such as italicized titles or indented lines, and is hard to read and use. The book closes with a detailed index.

From Gutenberg to the Global Information Structure is highly recommended to all its potential readers—librarians and information specialists, technologists, network specialists, policymakers, scholars, publishers, and other information industrialists. Borgman offers a well-focused assessment of likely areas of contention and problems in the evolution of a GII, and wisely eschews giving any easy answers. Instead, she asks that, while we may not know exactly where we are going, we pay attention to what we already have learned about where we are, and use it in deciding how we might set about achieving new, productive results. That shouldn't be too much to ask.—*Sheila S. Intner (shemat@aol.com), Simmons College Graduate School of Library and Information Science, Boston*

The Future of Cataloging: Insights from the Lubetzky Symposium, April 18, 1998, University of California, Los Angeles. Ed. Tschera Harkness Connell and Robert L. Maxwell. Chicago: ALA, 2000. 184p. $65 (ISBN 0-8389-0778-4). LC99-87247.

This slim volume, like Gaul, is divided into three parts: "The History of Cataloging and the Contributions of Seymour Lubetzky," "Current Research in Cataloging," and "The Future of Cataloging." A small number of pages is devoted to expected and appropriate sentiments expressed for the honoree, who was about to celebrate his one-hundredth birthday at the time the symposium was held. These include a photograph of Lubetsky receiving an honorary degree from the University of California at Los Angeles (UCLA), excerpts from letters pertaining to his career, commentaries on his works, a partial bibliography of his publications, and a clever poem by one of his colleagues. Fifteen authors, including the honoree, contributed fourteen papers (the first is a collaboration of Lubetzky and Elaine Svenonius). One could easily anticipate the authors represented here, since most are associated with UCLA: Marcia Bates, Michael Carpenter (a UCLA Ph.D., now teaching at Louisiana State University), Michèle Cloonan, Sara Shatford Layne, Gregory Leazer, Svenonius, Barbara Tillett (also a UCLA Ph.D., now director for the Integrated Library System at the Library of Congress), and Martha Yee. The rest are closely associated with cataloging or Lubetzky: John Byrum, Allyson Carlyle, Maurice Freedman, Michael Gorman, Michael Malinconico, and Margaret Maxwell. Together, they cover a broad spectrum, though not all, of the theoretical territory in the world of cataloging.

Part 1 consists of three chapters. The papers focus on Lubetzky and the origins of Anglo-American cataloging: "The Vicissitudes of Ideology and Technology in Anglo-American Cataloging since Panizzi" by Lubetzky and Svenonius; "Seymour Lubetzky, Man of Principle" by Gorman; and "Musings on Cataloging and Information Science" by Cloonan. Lubetzky and Svenonius highlight the two elements guiding our cataloging traditions—the objectives of the catalog, which Lubetzky reinterpreted, based on the turn-of-the-century statement by Charles A. Cutter, and technology. Gorman, as always, provides readers with a literary delight as well as a piece worth reading for professional reasons. He bridges the gap between Lubetzky's adherence to the principle of authorship and its misinterpretation as being the same as main entry. The book is worth buying and reading for this chapter alone. Cloonan discusses the ideas of Vannevar Bush and the similarities and differences from Lubetzky's work in a chapter that opens the way to deeper exploration of the world of digital information, expanded in subsequent papers in the book.

Part II contains five chapters: "Modeling Relevance in Art History" by Layne; "Creating Efficient and Systematic Catalogs" by Carlyle; "Main and Added Entries" by Carpenter; "Lubetzky's Work Principle" by Yee; and "Applying the Concept of the Work to New Environments" by Leazer. Although all five illuminate important aspects of research in areas in which Lubetzky pioneered study, Yee's paper is by far the most intriguing. After giving a

thorough and fascinating report of her research into certain characteristics of main entry and the works they represent, she summarizes: "One of Lubetzky's gifts to library users who seek particular works was his explication of the work principle, which has the potential to allow us to design OPACs [online public access catalogs] that meet the cataloging objectives better than any catalogs we have ever seen before. The generations of library leaders that followed Lubetzky dropped the ball, however, and allowed the development of OPACs that impede the user who seeks particular works much more than the card catalog ever did" (102). That should give pause to the people who design online catalogs and, if they are made aware of this and other studies, prompt them to begin thinking of catalogs as intellectual rather than mechanical devices.

The third and final part consists of six chapters: "The Ideology and Technology of Cataloging at the End of the Millennium" by Freedman; "Cataloging Virtual Libraries" by Malinconico; "World Wide Web Opportunities in Subject Cataloging and Access" by Bates; "Cataloging at Crossroads: Preservation and Accommodation" by Byrum; "Guidelines for a Future Anglo-American Cataloging Code" by Margaret Maxwell; and "Current Activities in Cataloging Code Revision" by Tillett. Again, each of these papers is worth time and thought. They move from the theoretical plane to the practical, describing potential changes to the Anglo-American Cataloguing Rules (AACR) in the context of goals to be achieved and the new environment in which a cataloging code must function.

The book is well edited and simply, but neatly, formatted. Editors Connell and Maxwell did not contribute original papers to the volume, but their work is evident in the smooth flow of language and lack of errors. Notes at the ends of chapters offer some material for subsequent follow-up, though references to AACR abound. Unfortunately, the print is small and the margins narrow, indicating that the book was not intended to withstand heavy use or be rebound after many readings and rereadings. More is the pity, because this book is worth understanding by the masses—myriad practitioners working with online catalogs, which remain the library's basic tool for patron service.

Because the core of the text is focused on research, this book promises to have an active, useful life for the foreseeable future. It will always have historical value and be of interest for a while for its prognostications; but the likelihood that practical payoffs from the research reported here will take years to realize means that the influence of the Lubetsky Symposium should remain fresh and vital for quite some time.—*Sheila S. Intner (shemat@aol.com), Simmons College Graduate School of Library and Information Science, Boston*

Progress in Visual Information Access and Retrieval. Ed. Beth Sandore. *Library Trends* 48, no.2 (fall 1999): 283–524. Champaign: University of Illinois Graduate School of Library and Information Science, 1999. Single issue, $18.50 (ISSN 0024-2594).

Sandore's stated goal in this compilation of papers is to present a diverse audience "with a current perspective on the development of visual information retrieval and access tools" (283). She succeeds admirably in accomplishing this goal, providing not a single perspective but rather several perspectives on a variety of issues. The authors of the papers come from different backgrounds, encompassing both library science and computer science. In the past, the library science approach to providing access to images has concentrated on "concept-based" analysis of images that relies on textual terminology usually assigned by human indexers. The computer science approach, on the other hand, has concentrated on "content-based" analysis that relies on automated processing of the images themselves. It is good to see in this compilation that most of the authors now view the two approaches to image analysis as complementary rather than as an either-or choice.

The three papers in the first section, "Foundations of Access to Visual Information," are devoted to the problems of access to images from three different perspectives. Hsin-liang Chen and Edie M. Rasmussen, in "Intellectual Access to Images," describe briefly the tools currently available for providing intellectual access to images and the contexts in which these tools are being used. P. Bryan Heidorn, in "Image Retrieval as Linguistic and Nonlinguistic Visual Model Matching," explores the complexities of visual perception and memories and describes ways in which systems might be designed to assist users in retrieving images that match the mental models of the images they are seeking. Heidorn focuses on users who have mental models of the images that they are seeking, but does not address the needs of users who may be seeking images because they do not know what something looks like. In "Computer Vision Tools for Finding Images and Video Sequences," D. A. Forsyth concentrates on automatic tools for providing access to images, describing their current limitations and suggesting ways in which these limitations might be overcome.

The second section, "Implementation and Evaluation," is richer in content than its title might imply. The papers in this section are not simply of the show-and-tell variety, but rather incorporate thoughtful analysis of the often-complex issues surrounding access to images. Practical guidance may be found here, but always in the context of theoretical issues and users' needs. Teresa Grose Beamsley, in

"Securing Digital Image Assets in Museums and Libraries: A Risk Management Approach," discusses the details of digitizing images but at the same time explores the problems of preserving image integrity and image context. Beamsley also addresses some of the issues surrounding copyright and control of images in the digital world. In "Getting the Picture: Observations from the Library of Congress on Providing Access to Pictorial Images," Caroline R. Arms describes the processing of images in the vast collections of the Prints and Photographs Division of the Library of Congress. She details all aspects of processing, from specifications for digitizing images to the design of the retrieval interface. Arms's paper is particularly valuable because she describes methods for processing a large collection of images, including the creation of collection-level and group-level records, and for integrating access to images with access to other materials, as occurs, for example, in the Library of Congress' online catalog. Christie Stephenson, in "Recent Developments in Cultural Heritage Image Databases: Directions for User-Centered Design," describes the experience of the Museum Educational Site Licensing Project (MESL) and in the process explores the issues involved in providing access to images from museum collections. In "Evaluation of Image Retrieval Systems: Role of User Feedback," Samantha K. Hastings describes a study performed using a relatively small and homogeneous set of users and images. Based on this study, Hastings categorizes user queries and suggests the types of tools that are best suited to address these queries, as well as the best ways of evaluating the success of these tools.

The final section, "Experimental Approaches," consists of three experimental automated approaches to providing access to images. It is an interesting and welcome development that all three of these approaches make use of textual information as well as automated analysis of the image itself. Yong Rui et al., in "Information Retrieval beyond the Text Document," describe an experimental technique tested in the context of images of museum objects. They focus on what the computer can do best—provide an analysis of color, texture, and shape—and suggest that this analysis is most successful when used in conjunction with manually supplied, text-based access. Both Neil C. Rowe in "Precise and Efficient Retrieval of Captioned Images" and Rohini K. Srihari and Zhongfei Zhang in "Exploiting Multimodal Context in Image Retrieval" describe experiments in which automated text processing is combined with image processing in order to retrieve images from Web pages. All three papers in this section include detailed descriptions of the methodology used in the automated analysis.

In summary, the papers in this compilation provide a theoretical exploration of issues, a description of the current state of access to images, some practical guidance, and a look at possibilities for the future. This compilation should be useful to both librarians and computer scientists and to anyone involved in providing access to image collections.—*Sara Shatford Layne (slayne@library.ucla.edu), Science and Engineering Library, University of California, Los Angeles*

The Social Life of Information. By John Seely Brown and Paul Duguid. Boston: Harvard Business School Pr., 2000. 320p. $25.95 (ISBN 0-87584-762-5). LC99-49068.

The authors are, respectively, the director of the Xerox Palo Alto Research Center and a historian and social theorist research specialist at the University of California-Berkeley. They come garlanded with encomia from a variety of the digital great and the good who praise their efforts to prove that "information is inevitably embedded in social relations" (Robert D. Putnam, 3) and that "information technology does not work unless supported by viable communities and institutions" (Bruce Kogut, 3). Even a cursory reading of this text demonstrates that Brown and Duguid are serious fellows appropriately skeptical of the prevalent cyberhype but, at the same time, convinced of the transcendent importance of the changes that technology is wreaking and will wreak in the future. So far, so very good—and the fact that the authors write in acceptable English prose is another unexpected plus.

I am a simple and prosaic soul and always approach books of this type with two simple and prosaic tests. How do the authors define information? What do you find when you look up library or libraries in the index? (The latter on the grounds that how authors treat something that I know well is a fair guide to how they treat what is less well known.) It is a sad fact that many books on information, the Information Age, and so on fail to provide any definition of information, or give *en passant* a cursory and practically useless definition. My spirits lifted when I found a discussion of the differences between knowledge and information (117–19), but not for long, because apart from the smart-sounding "knowledge usually entails a knower" (119), the discussion ends with thrown up hands. I write "smart-sounding" because the implication is that information can exist without human consciousness—an interesting philosophical question but one without practical utility. Surely, even data without a human mind is unbearably evanescent. There is a definition of sorts for information: "something that can be recorded, transcribed, digitized, and shipped in packets" (2). Apart from the leadenness of the words, the fact that they can apply to everything from a Mozart symphony

to *Citizen Kane* to a Harry Potter book to a line of Census data to a street map of Duluth makes the definition of no utility at all. The result of the second test, looking up "Libraries, digitized, 179–181"—the only such entry in an exiguous index—led to even more dispiriting words. The "conventional library, with its massive weight of paper gathering dust and resisting efficient searches, is another paper-based institution that sets fingers itching at the keyboard. The sense that the information is 'there' somewhere, but can't be found can drive anyone to digitize" (179). Seldom can there have been two sentences more choc-a-bloc with clichés, straw men, and plain drivel. It ill behooves two men bent on counteracting digital hype to claim that information can't be found in conventional libraries. If the Web and the Net had one one-hundredth of the organization and retrieval architecture of a conventional library, the world would be a happier, saner place.

This book is better than its lack of a definition of its subject and stereotyping of libraries would indicate. The authors begin with an admirably clear-eyed assessment of the overheated propaganda on behalf of technology to which we are all subject. Their central metaphor is one of tunnel vision—a concept that envisions the technological drive into the future as being narrow and exclusionary in that it ignores the human and social context of technological change. What they call the "limits to [sic] information" (vii) center on the notion that technology is a tool to be used or misused in societies and human lives but without the extreme consequences foreseen by the wilder-eyed digital pundits. The authors then move on to discuss the idea of agents, in the nauseating nomenclature of the day—knobots, chatterbots, shopbots, etc.—and their limitations, which are many in number and kind. They point to the way in which such agents are given human names (Jeeves, Sherlock, Bob, and the like) as an indication that their advocates wish to narrow the distinction between humans and software, and would seek to replace humans with agents whenever possible. One would have thought this self-evidently negative and potentially evil, but the authors believe that there are areas to be negotiated and demarcated to protect us from antisocial agents. In their words, "[w]e want ATMs that will supply us with money, but not ones that will spend it for us" (62).

In subsequent chapters, Brown and Duguid explore the isolating effects of technology on the individual and the consequences for the way in which enterprises are organized. They cast a cold eye on the discredited and antihumanistic management fads of the 1990s—downsizing, reengineering, etc., and the fatuous TQM, of which far less is heard since the Japanese economy crash-landed—and the ways in which they were "infofriendly" (117), while ignoring wider human and societal issues. Any librarian of a certain age will enjoy the authors' analysis of the myths of paperlessness. "Infoenthusiasts have thrust nothing under the hammer with quite so much enthusiasm as the paper document" (174). They go on to show how and why the paperless office, the electronic newspaper, and the digital library have all turned out to be illusory. In the chapter titled "Re-education" they address the future of universities and puncture many of the myths contained in the increasingly voluminous and silly writings on the topic. Of interest to us, the authors, unlike most academics, seem to understand that the future of the university library is far more likely to resemble its past than it will the opium dreams of futurists, information "scientists," and renegade librarians.

In sum, this book offers a good analysis of the blinkered nature of most prognostications on technology and "information," and of the way those prognostications ignore the social and human context of communities, organizations, and institutions. The authors do not claim to offer solutions to the intellectual mess we are in, but they do offer a way of looking at that mess that may well lead to solutions.—*Michael Gorman (michaelg@csufresno.edu), Henry Madden Library, California State University, Fresno*

Instructions for Authors

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Manuscripts of articles should be sent to the editor, John Budd, University of Missouri, 221M Townsend Hall, Columbia, MO 65211; (573) 882-3258; fax: (573) 884-4944; e-mail: buddj@missouri.edu.

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LRTS follows *The Chicago Manual of Style*, 14th ed. (1993). Please include the following information in the review:

Header: complete bibliographic citation of the book, in the following format:

> *Advances in Library Automation and Networking*, Vol. 5 (1994). Ed. Joe A. Hewitt and Charles W. Bailey, Jr. Greenwich, Conn.: JAI Pr., 1994. 282p. $73.25 (ISBN 1-55938-510-3).

Quotations: give page numbers in parentheses (36) (vii) immediately following the quote.

Quotation marks around chapter or section heads: be sure these reflect the exact language used in the book.

Author(s), title, place, and date of publication of all works cited: a complete bibliographic citation should be included at the end of the text. Use the author-date system of references, as described in *The Chicago Manual of Style*, chapter 16. Please verify all citations carefully.

Reviewer's name, e-mail address, and affiliation immediately following the text: if unaffiliated, give city of residence.

Do not use end notes for reasons other than the citation of other works.

Use first name or initial of each person cited for the first time.

Avoid library jargon because it may become dated (e.g., online catalog, not OPAC).

In quotations, identify acronyms and initialisms (e.g., ALA, ALCTS, ASIS, etc.) with the full name at their first use: "Library of Congress (LC) policy is." Use the acronym for subsequent references to the same entity.

For good advice and helpful reminders on writing and style, check the following compendium, which includes a link to the 1918 edition of Strunk's *The Elements of Style:* http://andromeda.rutgers.edu/~jlynch/Writing.

Format

Reviews submitted in machine-readable form are greatly appreciated. To facilitate editing, please observe these additional formatting instructions:

- double-space all text, including headers;
- do not indent paragraphs, but use two carriage returns between paragraphs;
- do not use carriage returns at line ends (use your word processor's word-wrap capability);
- keep the right margin ragged (do not use full justification) and do not hyphenate words at the line breaks;
- do not use your word processor's automatic endnoting capability;
- treat the endnotes as the final paragraph of your review;
- include at least 1" margins on all sides.

Submitting the Review

If possible, please send your review as an e-mail attachment, preferably a Microsoft Word Document. If e-mail is not possible, send the review on a 3.5" disk.

And . . . A Few More Suggestions, Especially for Novice Reviewers

Allow enough time to read the book, think about it, draft your review, and rewrite. Don't base your review on a careful reading of the book's introduction and conclusion or—heaven forbid—the book jacket and other reviews. It is often helpful to ask a colleague to read your review and comment. If you would like to send a draft for comment before preparing the final version, feel free to do so, well in advance of the deadline.

A review is not an abstract of the book. To characterize the book's content, a synthesis or a description of its highlights is preferable to a chapter-by-chapter summary. This is especially important, and also a difficult task if you are reviewing a compilation. Careful attention to this part of the review usually will help you focus on evaluating the book.

A review is an opinion piece, not a book report. State opinions clearly—be fair and specific with both praise and criticism. Understand the author's purpose in writing the book and evaluate the success in meeting stated objectives. Are the objectives

worthwhile? How does the book compare to others of similar content and purpose? What is unique or especially valuable about the book? Is the book controversial? To what audience will it be most interesting and useful? Are there any significant errors or omissions?

And One Suggestion for Everyone . . .

Clear your mind, especially at the rewrite stage, by taking another look at Strunk and White. Your editor does!

Thank you for reviewing a book for *LRTS*. If you have questions about review style or about submitting your review, please contact me: Margaret Rohdy, Head of Research, Training & Quality Management, University of Pennsylvania Libraries, 3420 Walnut St., Philadelphia, PA 19104-6206; phone: (215) 898-0314; fax: (215) 573-9610; e-mail: rohdy@pobox.upenn.edu.