"Garbage" In, "Refuse and Refuse Disposal" Out

Making the Most of the Subject Authority File in the OPAC

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Subject access in the OPAC, as discussed in this article, is predicated on two different kinds of searching: subject (authority, alphabetic, or controlled vocabulary searching) or keyword (uncontrolled, free text, natural language vocabulary). The literature has focused on demonstrating that both approaches are needed, but very few authors address the need to integrate keyword into authority searching. The article discusses this difference and compares, with a query on the term "garbage," search results in two online catalogs, one that performs keyword searches through the authority file and one where only bibliographic records are included in keyword searches.

Early catalog use studies indicated that most searching in a catalog was for known items (Cochrane 1985; Bodoff and Kambil 1998). With the advent of computerized catalogs, subject searching came to be the predominant target for users (Drabenstott and Vizine-Goetz 1994; Hildreth 1997; Matthews 1997; Bodoff and Kambil 1998). Early OPACs provided for subject searching only by the subject heading of the bibliographic record. However, keyword searching came into use almost immediately, with most OPACs allowing for word searches in subjects, titles, and notes. A decade ago, the big question was whether keyword searching alone would suffice for subject access. The conclusion was a resounding "no!": controlled vocabulary (authorized terms) was absolutely necessary—but only if the relevant cross references were also supplied (Frost 1989; Jamieson, Dolan, and Declerck 1986; Marner 1993; Micco 1991; Smith 1991; Tillotson 1995). Users could not be expected to know the authorized subject term in order to perform subject searches. Markey (1988) suggested loading the entire Library of Congress Subject Headings (LCSH) into the OPAC to overcome this deficiency. Most libraries today, however, make do with authority records and cross references for headings actually used in the bibliographic records in their own catalogs.

Subject searching in OPACs continues to be problematic (Hildreth 1997; Matthews 1997; Yee and Layne 1998). For average users, a subject is just anything they wish to know "about." The searcher has little or no understanding of the distinction in a catalog between "keyword" searching and "subject" searching. Most catalogs use the term "keyword" to mean "free text" and "subject" to mean "controlled vocabulary" searching. Nor does the user understand that subject searches

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Manuscript received April 9, 2002; accepted May 16, 2002.

are based on left-anchored string searching, while keyword searches are generally based on words within a subject, title, or elsewhere in the bibliographic record (Yee and Layne 1998). Moreover, the average user does not understand that subject searches are based on *controlled* vocabulary used in the bibliographic record (for instance, LCSH) and represented in an authority file (Markey 1988; Cherry 1992; Drabenstott 1998; Smith 1991). Greenberg (1997) notes the failure of most OPACs even to refer to LCSH as the source of subject headings. Matthews (1997) identifies that even a keyword search of LCSH authorized headings (excluding cross references) will retrieve records only about 50% of the time.

In the typical online catalog, the distinction between keyword and controlled vocabulary subject searching, although present, is almost completely opaque to the user. Whether OPAC users actually choose "keyword" or "subject" as their search mode, the plain fact is that both end up being natural language searches in the absence of any guidance concerning the subject heading structure. If the term entered in a subject search happens to be the first word of the authorized form, then the user will likely find relevant citations. If the term entered in a subject search also happens to be the first word of a cross reference in a catalog that displays cross references, then the user will also be correctly directed. However, if the term entered in a subject search is a word *within* a subject heading or cross reference, then the user misses the authority control structure of the catalog.

How can we improve users' success in subject searching? One plan of attack would be to enrich the MARC bibliographic record, which is intellectually impoverished at best: it contains a very limited amount of conceptual and terminological variation upon which a search engine can operate (Drabenstott and Vizine-Goetz 1994). One method for enrichment would be to add more subject headings or improve subject analysis (Smith 1991; Drabenstott and Vizine-Goetz 1994), but this is not common nor often perceived as important—and would certainly be very time consuming. Nor does this approach solve the problem of user failure to understand controlled vocabulary.

Another method of enrichment would be adding tables of contents to the bibliographic record—in effect adding more keywords (Bodoff and Kambil 1998). But this method does not direct the user toward controlled vocabulary. One way around this lack would be to add keywords as cross references in the authority record (Micco 1991; Rada et al. 1988). However, since most catalogs do not use the authority record in keyword searches, this strategy would be of help only in a subject phrase search. Greenberg (1997, 112) notes, "Despite the popularity of [keyword searching], there has been little effort to link keyword searching to OPAC reference structures."

Users are frequently taught in online instruction classes to try a word search first; locate a relevant citation; examine the subject headings associated with the item; and then either do a new search with the relevant subject or, if the catalog allows it, request a further search by related items (Marner 1993; Greenberg 1997; Aanonson 1987). Many librarians also use this approach. However, the average user of keyword searching rarely has the patience to wade through the retrieval set to actually perform the second, relevant search. Hildreth notes that users do not understand why keyword searches fail; we either need to train users better or improve our retrieval systems. The latter approach is preferable because "there will always be fewer systems to improve than users to instruct" (1997, 61). Borgman (1996, 501) concludes, "Most end users of online catalogs are perpetual novices who lack the requisite conceptual knowledge for searching. They need assistance in the translation process, whether provided by the system itself, by instruction in using the system, or by a search intermediary."

Hildreth's second approach to improving users' success would be to enhance systems rather than enrich records. Drabenstott and Weller (1995; 1996) have suggested a solution: use search trees to improve retrieval by subject. One of the suggestions includes "requiring the system to check whether keyword searches on user-entered queries that match cross references retrieve additional titles and enable/disable the 'expand search' option based on this system check" (1996, 535). Although this method uses the cross references in a keyword search, it is unclear if the intent is to search cross references as free text or as phrase searches. Micco suggests a system that "takes uncontrolled terms from wherever possible in the MARC record . . . and links these terms to the controlled vocabulary of the primary LCSH heading assigned to that work" (Basista, Micco, Rambler 1991, 89). It appears that this approach would use the established heading but not make use of cross references.

Libraries have long recognized the necessity of an online authority file, containing not only the authorized term but cross references directing the user to the correct term. Libraries are committing substantial staff time and dollars to maintaining and improving authority files. Meanwhile, these very authority files and the benefits they provide are often lost to the users of keyword searching. Because, for the most part, keyword searches are based on terms found in the bibliographic record only, these searches completely miss the cross references built into the authority file. It is worth repeating that the two methods of subject searching—subject term and keyword—are only joined together through the bibliographic record. The authority file is missed in the keyword search completely and the subject phrase search is only useful if the term used is the first word of the cross reference or the authorized form. What if keyword searches searched

cross references (4xx fields) in the authority record first and returned the related bibliographic records?

Demonstration of Keyword Searching through the Authority File

Method

For the purposes of demonstration, I sought a cross-reference term in LCSH that did not contain any of the words that were part of the authorized term (in order to avoid search results based on the occurrence of the word in the authorized subject heading). The term "garbage," which is a cross reference to the term "refuse and refuse disposal" (and also "organic wastes"), turned out to be an excellent example.

I performed the test searches in two large Geac ADVANCE catalog systems: University at Albany, State University of New York (UAlbany) and New York University (NYU). At the time of this investigation, the two libraries had chosen different options in the Geac ADVANCE indexing structure. At UAlbany, keyword searches were automatically submitted to the authority file, returning not only words within a bibliographic record but also words within a cross reference. NYU had chosen the most common keyword indexing option, namely one that does not send keyword queries to the cross-reference structure.

Figure 1 shows how the Library of Congress Subject Authority record for "refuse and refuse disposal," is displayed in the UAlbany catalog. The term searched, "garbage," which is a MARC tag 450 or cross reference in the authority record, is bold-faced.

The UAlbany system permits separate keyword searches by title, author, subject, series, notes, and words in all fields. For this study, I searched by both subject word and keyword (all fields). A subject-word query searches the authority file, not only finding the term as the first element of an authorized form or cross reference, but also as a term within an authorized form or a cross reference. A keyword (all fields) query not only searches the authority file in the same manner, but also searches each bibliographic record by title, author, series, and notes.

Three different searches on "garbage" made up this study: subject, subject word, and keyword. The subject query (s=garbage) is a left-anchored phrase search, accessing the bibliographic records through the authority file. The subject-word query (sw=garbage) searches the authority file for the term within an authorized heading or a cross reference. The keyword query (w=garbage) searches the authority file in the same manner as the subject word query and in addition searches bibliographic records for the term within other fields, including title and notes. In most OPACs, these last two queries would only search the bibliographic record; in UAlbany's OPAC, the word search is sent to the authority file for words in headings or cross references.

008			990830i| anannbab| |b ana |||
010	BB	a	sh 85112316
040	BB	a	DLC
		c	DLC
		d	DLC
053	B0	a	HD4482
		b	HD4485
		c	Economics
053	B0	a	TD785
		b	TD812.5
		c	Engineering
150	BB	a	Refuse and refuse disposal
360	BB	i	subdivision
		a	Waste disposal
		i	under types of industries, industrial processes, facilities and institutions, e.g.
		a	Construction industry—Waste disposal; Metals—Finishing—Waste disposal; Universities and colleges—Waste disposal
450	BB	a	Discarded materials
450	BB	a	Disposal of refuse
450	**BB**	**a**	**Garbage**
450	BB	a	Household waste
450	BB	a	Household wastes
450	BB	a	Rubbish
450	BB	a	Solid waste management
450	BB	a	Trash
450	BB	a	Waste disposal
450	BB	a	Waste management
450	BB	a	Wastes, Household
550	BB	a	Sanitation
550	BB	a	Factory and trade waste
550	BB	a	Pollution
550	BB	a	Pollution control industry
550	BB	a	Salvage (Waste, etc.)
550	BB	a	Street cleaning
550	BB	a	Waste products
670	BB	a	LC database, May 7, 1999
		b	(household waste; household wastes)

[Note: The Geac system uses "B" to represent a blank, does not display delimiters, and places subfields on separate line]

Figure 1. Authority Record for Refuse and Refuse Disposal

Results

A subject search in Geac (s=garbage) is a *phrase* search. The results are presented to the user as a subject index screen, alphabetically, from the authority file with bibliographic records attached. (Geac ADVANCE requires an authority record for each bibliographic heading.) Figures 2A and 2B present similar results in the public OPAC view

for the same subject search (s=garbage) at UAlbany and NYU. The NYU search presents additional information to the user by presenting all LC authorized headings and cross references alphabetically near "garbage," even if there are no bibliographic records in the NYU catalog (for instance, "Garbage [see Organic wastes] LCSH [0]). In both OPACs, the user who enters "garbage" as a subject search will be directed to use "organic wastes" or "refuse and refuse disposal" (as well as other terms starting with "refuse").

Of 51 records for "refuse and refuse disposal" at UAlbany (figure 2A), only one title, *Garbage as you like it*, had the word "garbage" in the bibliographic record. Of the 17 records for "refuse as fuel," one record for "organic wastes," and two records for "refuse collection", none had the word "garbage" in the bibliographic record. This means that in the most common keyword search (that is, one that does not send the keyword to the cross-reference structure), only one of these 71 records would be returned.

Of 41 records for "refuse and refuse disposal" in the NYU catalog (figure 2B), only two had "garbage" in the bibliographic record. Of eight records for "refuse as fuel", two records for "refuse collection," and one record for "rag pickers," none had the word "garbage" in the bibliographic record. This means that in an ordinary keyword search, only two of these 52 records would be returned.

I next searched "garbage" as a subject word in both catalogs. In most catalogs, including NYU, this search will only look for the word within a subject heading used in a bibliographic record. But at UAlbany, this search also looks for the word *within* an authorized heading *or* cross reference.

Figure 3A (UAlbany), shows an authority index screen from the public OPAC, similar to that produced by the subject search, but including only entries with "garbage" as a word (i.e., it does not present the authority file in the alphabetical neighborhood of "garbage" as the first word). This search returns the same records as the first for those headings and cross references beginning with "garbage," but additionally returns the cross reference "medical garbage *see* medical wastes," because "garbage" is a term within this cross reference, and also returns the cross reference for "University at Arizona Garbage Project." The "medical wastes" bibliographic records did not contain the term "garbage" anywhere. If this query had searched the bibliographic record only, then only the "garbage collection (Computer science)" and "Garbage Project (University of Arizona)" records would have been returned, because these are the only records with "garbage" in a subject heading.

Figure 3B (NYU) represents a traditional subject-word query, which searches for a keyword within the subject headings of the bibliographic record only (i.e., *not* incorporating the authority file or its cross references). The user is presented with a browse screen of titles, all of which have "garbage" in a subject heading. Of these six, three are for "garbage can models of decision making," one is for "Garbage Project (University of Arizona)," one is for "garbage collection (Computer science)," and one is for "Memphis (Tenn.)—Garbage strike 1968." In addition to retrieving far fewer records than the UAlbany "sw=garbage" search, this query yields what might fairly be called low precision as well.

Finally, I searched the term "garbage" as a keyword, resulting in 113 records at UAlbany and 74 records at NYU. The browse screen for both results is an undifferentiated list of bibliographic records with no indication of where the term appeared. The word search at UAlbany implicitly searches the authority file with its cross references and also the bibliographic file; the same search at NYU searches only bibliographic records.

In figure 4A (UAlbany), all of the records in the first two searches (subject and subject word) are returned in this search, as well as all records with "garbage" somewhere in the bibliographic record *beyond the subject fields*. Because there is no indication that cross references are being searched, users may be confused as to why they actually retrieved some of the records in response to the search. As noted above, in discussion of the subject search and subject-word search, 71 of the 113 records do not have the term "garbage" anywhere in the record. Of the remaining

Browsing Subjects: S=garbage

Subject Heading		No. of Titles
1. Garaudy, R. (Roger)		
2. [See] Garaudy, Roger	(Subject)	5
3. Garaudy, Roger	(Subject)	5
4. Garay, Eugenio Alejandrino, 1874–1937	(Subject)	1
5. Garay, Juan de, 1528?–1583	(Subject)	1
>>>		
6. Garbage		
7. [See] Organic wastes	**(Subject)**	**1**
8. Garbage		
9. [See] Refuse and refuse disposal	**(Subject)**	**51**
10. Garbage as fee —Law and legislation —United States	(Subject)	1
11. Garbage as fuel		

Subject Heading		No. of Titles
Garbage as fuel	**(continued)**	
1. [See] Refuse as fuel	**(Subject)**	**17**
2. Garbage collection		
3. [See] Refuse collection	**(Subject)**	**2**
4. Garbage collection (Computer science)	(Subject)	1
5. Garbage Project (University of Arizona)	(Subject)	1
6. Garbarz, Moshe	(Subject)	1
7. Garbett, Cyril Forster, Abp. of York, 1875–1955	(Subject)	1

Figure 2A. (UAlbany) Online Catalog—Heading Browse

Browsing Subjects: S=garbage

Subject Heading		No. of Titles
1. Garawi		
2. [See] Sudan grass	(LCSH)	0
3. Garay, Juan de, 1528?–1583	(LCSH)	1
4. Garay, Martin de, 1760–1825	(LCSH)	1
5. Garay, Sindo	(LCSH)	1
6. Garba, Joseph Nanven, 1943–	(LCSH)	1
>>>		
7. Garbage		
8. [See] Organic wastes	**(LCSH)**	**0**
9. [See] Refuse and refuse disposal	**(LCSH)**	**41**
10. Garbage Analysis Programme	(LCSH)	0
11. Garbage as feed	(LCSH)	0
12. Garbage as fuel		
13. [See] Refuse as fuel	**(LCSH)**	**8**

Browsing Subjects: S=garbage

Subject Heading		No. of Titles
1. Garbage can models of decision making	(LCSH)	2
2. Garbage can models of decision making—Congresses	(LCSH)	1
3. Garbage collection		
4. [See] Refuse collection	**(LCSH)**	**2**
5. Garbage collection (Computer science)	(LCSH)	1
6. Garbage collectors		
7. [See] Sanitation workers	(LCSH)	0
8. Garbage pickers		
9. [See] Ragpickers	**(LCSH)**	**1**
10. Garbage Project (University of Arizona)	(LCSH)	1
11. Garbage trucks		
12. [See] Refuse collection vehicles	(LCSH)	0
13. Garbagemen		
14. [See] Refuse collectors	(LCSH)	0

Figure 2B. (NYU) Online Catalog—Heading Browse

Your Search: SW=Garbage

Subject Heading		No. of Titles
1. Garbage		
2. [See] Organic wastes	(Subject)	1
3. Garbage		
4. [See] Refuse and refuse disposal	(Subject)	51
5. Garbage as feed—Law and legislation—United States	(Subject)	1
6. Garbage as fuel		
7. [See] Refuse as fuel	(Subject)	17
8. Garbage collection		
9. [See] Refuse collection	(Subject)	2
10. Garbage collection (Computer science)	(Subject)	1
11. Garbage Project (University of Arizona)	(Subject)	1
12. Medical garbage		
13. [See] Medical wastes	(Subject)	3
14. University of Arizona—Garbage Project		
15. [See] Garbage Project (University of Arizona)	(Subject)	1

Figure 3A. (UAlbany)

Online Catalogue—Title Summary
Your Search: SW=GARBAGE

Author/Title	Year
1. Ambiguity and command: organizational perspectives on military decision making	1986
2. Lentz, Richard Sixty-five days in Memphis : a study of culture, symbols, and the press	1986
3. Rathje, William L. Rubbish! : the archaeology of garbage	1992
4. The logic of organizational disorder	1996
5. Jones, Richard, 1954– Garbage collection : algorithms for automatic dynamic memory management	1996
6. Organizing political institutions : essays for Johan P. Olsen	1999

6 titles in list

Figure 3B. (NYU)

42 records returned, 14 have "refuse and refuse disposal—<subdivision>" as a subject heading and seven have what could be considered related headings of "marine waste" or "environmental engineering." Therefore, if this search had operated as a bibliographic keyword search, only 42 titles would have been returned, 21 having nothing to do with waste management at all. Literary titles, song titles, and descriptive notes make up the remainder of the results of this search.

In figure 4B (NYU), there is a return that appears similar to the UAlbany search, but does not include titles that would have been returned from cross references. Of 74 titles returned, only 19 had "refuse and refuse disposal—<subdivision>" as a subject heading; seven had a related environmental heading; six were the same as in the subject word search. This left 42 titles (more than 50%) that were totally unrelated to waste products. NYU has a much larger collection of popular song recordings than UAlbany, resulting in a higher number of unrelated titles. Certainly a user presented with these results would be hard put to find an appropriate record, find the correct subject heading, and then resume the search.

Summary and Conclusions

Subject searching in most OPACs remains problematic because users rarely know the difference between "keyword" and "subject" searching. They have little conception of controlled vocabulary except when stumbling over a cross reference in a phrase search. Hence, most OPAC queries turn out to be no better than keyword searches. Unlike the UAlbany catalog, most OPACs do not even take advantage of the authority file in keyword searches. That is,

Your Search: W=Garbage

Author/Title/Volume	Year
1. Lee, James A., 1922– The gold and the garbage in management theories and prescriptions	1980
2. Savas, E. S. The organization and efficiency of solid waste collection	1977
3. Young, Dennis R., 1943– How shall we collect the garbage? A study in economic organization.	1972
4. Fairfield, Roy P. Humanizing the workplace	1974
5. Rist, Ray C. The pornography controversy : changing moral standards in American life	1974
6. Hsu, Vivian Ling Born of the same roots : stories of modern Chinese women	1981
7. Dos Passos, John, 1896–1970 The garbage man : a parade with shouting	1929
8. Herbert, Brian Sidney's comet : being an account of the remarkable events which occurred during the approach of the Great Garbage...	1983
9. Platt, Charles Garbage world	1967
10. Darlington, Arnold Ecology of refuse tips	1969
11. Leckie, James O., 1939– Other homes and garbage : designs for self-sufficient living	1975

[An additional 102 records are presented to the user in a similar manner]

Figure 4A. (UAlbany)

Your Search: W=Garbage

Author/Title/Volume	Year
1. McQuade, Walter, comp. Cities fit to live in and how we can make them happen; recent articles on the urban environment.	1971
2. Other homes and garbage : designs for self-sufficient living	1975
3. Fanning, Buckner. Throw away the garbage	1976
4. Lee, James A., 1922– The gold and the garbage in management theories and prescriptions	1980
5. Melosi, Martin V., 1947– Garbage in the cities : refuse, reform, and the environment : 1880–1980	1981
6. Xavier, Ismail Norberto. Allegories of underdevelopment [microform] : from the "aesthetics of hunger" to the "aesthetics of garbage"	1982
7. Young, Dennis, 1943– How shall we collect the garbage? A study in economic organization.	1972
8. Perls, Frederick S. In and out the garbage pail	1969
9. Erganian, George K. Effects of community-wide installation of household garbage-grinders on environmental sanitation	
10. Kelly, Katie. Garbage; the history and future of garbage in America.	1973
11. Born of the same roots : stories of modern Chinese women	1981
12. Neal, Homer A. Solid waste management and the environment : the mounting garbage and trash crisis	1987
13. Ambiguity and command: organizational perspectives on military decision making	1986
14. Lentz, Richard. Sixty-five days in Memphis : a study of culture, symbols, and the press	1986
15. Hershkowitz, Allen. Garbage burning : lessons from Europe: consensus and controversy in four European states	1986
16. Fassbinder, Rainer Werner, 1946- Plays. English. Selections Plays	1985
17. Hershkowitz, Allen. Garbage management in Japan : leading the way	1987
18. Kirshner, Dan. To burn or not to burn : the economic advantages of recycling over garbage incineration for New York City.	1985
19. Dixon, Stephen, 1936– Garbage : a novel	1988
20. Rush to burn : solving America's garbage crisis?	1989

[An additional 54 records are presented to the user in a similar manner]

Figure 4B. (NYU)

they do not return bibliographic records having the search term in any of the fields, nor do they return cross references having the search term in any portion of the cross reference.

This investigation has revealed at least some strategies libraries can adopt to help solve this problem. For example:

1. A keyword query should be sent to the authority file first, returning authorized headings and cross references that inform the searcher of the authorized/controlled vocabulary headings. The sample search "sw=garbage" in the UAlbany OPAC returned the authority index screen, suggesting the appropriate subject headings through cross references and also finding the term within a cross reference.
2. If keyword searches are sent to the authority file, then the user should be presented with the authorized headings first (i.e., index screen with cross references), with an option to continue the search to bibliographic records only. Presenting users with an undifferentiated list of records is not helpful (as in the returns for "w=garbage"). Greenberg (1997, 112) notes that "Perhaps intelligent access to reference structures could even help to resolve a number of the retrieval overload problems associated with keyword searching." A searcher may have no idea why records for "refuse and refuse disposal" are retrieved, for example, when the word searched ("garbage") does not appear in the bibliographic record.

3. If a keyword search were sent to the authority file first, then adding common terms to the authority file as cross references would increase chances of returning more relevant records. Following a suggestion by Micco (1991), we might use a work's table of contents as a guide to terms that might usefully be added to the authority record as cross references. If, for instance, the keyword "rubbish" were in the table of contents, but not a cross reference on the authority record for the corresponding subject heading, adding it as a cross reference would improve retrieval.

These results raise the question of how much preemptive control OPAC designers should exercise over users' choices when they select a particular search type. For instance, in most OPACs, the default condition for a keyword search is "keyword anywhere." However, the default condition for a subject search is most often a left-anchored phrase search. Even a subject keyword search typically will not access the authority file. Hence, one kind of strategy consistent with the findings of this paper would be to redefine a keyword search as a *subject* keyword search including access to the authority file. The user does not need to know this; this approach, in most cases, will improve both precision and recall.

In an era of patron empowerment, this may not be a popular move, but at least for the naive user, it may initially provide the most useful results. Experienced users can always opt for more advanced techniques.

Increasingly sophisticated search and retrieval software, together with complex bibliographic record structures, offer the possibility of significant improvement in the performance of subject searches in online library catalogs. But this will not happen unless we take an innovative approach to exploiting the controlled indexing and searching capabilities of the next generation of integrated library systems. We already know what some of these strategies might look like. We may not be able to reduce the incidence of garbage in, but we can certainly reduce the incidence of garbage out.

Works Cited

Aanonson, John. 1987. A comparison of keyword subject searching on six British university OPACs. *Online Review* 11, no. 5: 303–13.

Basista, Thomas, H. Mary Micco, and Linda Rambler. 1991. Designing the OPAC user interface to improve access and retrieval. *Microcomputers for Information Management* 8, no. 2: 87–103.

Bodoff, David, and Ajit Kambil. 1998. Partial coordination I: The best of pre-coordination and post-coordination. *Journal of the American Society for Information Science* 49, no. 14: 1,254–69.

Borgman, Christine L. 1996. Why are online catalogs *still* hard to use? *Journal of the American Society for Information Science* 47, no. 7: 493–503.

Cherry, Joan M. 1992. Improving subject access in OPACs: An exploratory study of conversion of users' queries. *Journal of Academic Librarianship* 18, no. 2: 95–99.

Cochrane, Pauline A. 1985. *Redesign of catalogs and indexes for improved online subject access: Selected papers of Pauline A. Cochrane.* Phoenix, Ariz.: Oryx.

Drabenstott, Karen M. 1998. *Understanding subject headings in library catalogs*. Ann Arbor: School of Information, University of Michigan.

Drabenstott, Karen M., and Diane Vizine-Goetz. 1994. *Using subject headings for online retrieval: Theory, practice, and potential.* San Diego: Academic.

Drabenstott, Karen M., and Marjorie S. Weller. 1996. Failure analysis of subject searches in a test of a new design for subject access to online catalogs. *Journal of the American Society for Information Science* 47, no. 7: 519–37.

———. 1995. *Testing a new design for subject access to online catalogs*. Ann Arbor: School of Information and Library Studies, University of Michigan.

Frost, Carolyn O. 1989. Title words as entry vocabulary to LCSH: Correlation between assigned LCSH terms and derived terms from titles in bibliographic records with implications for subject access in online catalogs. *Cataloging and Classification Quarterly* 10, no. 1/2: 165–79.

Greenberg, Jane. 1997. Reference structures: Stagnation, progress, and future challenges. *Information Technology and Libraries* 16, no. 3: 108–19.

Hildreth, Charles R. 1997. The use and understanding of keyword searching in a university online catalog. *Information Technology and Libraries* 16, no. 2: 52–62.

Jamieson, Alexis J., Elizabeth Dolan, and Luc Declerck. 1986. Keyword searching vs. authority control in an online catalog. *Journal of Academic Librarianship* 12, no. 5: 277–83.

Markey, Karen. 1988. Integrating the machine-readable LCSH into online catalogs. *Information Technology and Libraries* 7, no. 3: 299–312.

Marner, Jonathan C. 1993. Measuring the success of keyword search strategy in an online catalog. *Technical Services Quarterly* 11, no. 2: 1–11.

Matthews, Joseph R. 1997. Time for new OPAC initiatives: An overview of landmarks in the literature and introduction to WordFocus. *Library Hi Tech* 15, no. 1/2: 111–22.

Micco, Mary. 1991. The next generation of online public access catalogs: A new look at subject access using hypermedia. *Cataloging and Classification Quarterly* 13, no. 3/4: 103–32.

Rada, Roy, et al. 1988. Creating and evaluating entry terms. *Journal of Documentation* 44, no. 1: 19–41.

Smith, Elizabeth H. 1991. Enhancing subject accessibility to the online catalog. *Library Resources and Technical Services* 35, no. 1: 109–13.

Tillotson, Joy. 1995. Is keyword searching the answer? *College and Research Libraries* 56, no. 3: 199–206.

Yee, Martha M., and Sara Shatford Layne. 1998. *Improving online public access catalogs*. Chicago: ALA.