Understanding Subject Headings in Library Catalogs

by
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with the research assistance of
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Acknowledgments

In this report, we describe a study of understanding subject headings in library catalogs. The OCLC Online Computer Library Center, Inc., provided support for the study through its Library and Information Science Research Grant Program. Dr. Diane Vizine-Goetz served as the OCLC Project Monitor.

We are especially grateful to Gloria Coles, Director, Flint Public Library, Barbara Wallace, Director, Bacon Memorial District Library, and Michael Deller, Director, Livonia Public Library, who welcomed the Michigan project team to their libraries where team members recruited children and adults and asked them to assign meanings to subject headings. This large-scale study of understanding subject headings was only possible because library directors and staff made us feel comfortable in their libraries and encouraged their patrons to participate in the study.

Recruiting over 250 reference and technical services librarians to formulate meanings for the subject headings in this study was a mammoth task. Several colleagues helped the Michigan project team by distributing questionnaires to professional staff in their libraries: Carol A. Mandel at Columbia University, Jennifer Younger at Ohio State University, Karen L. Horny at Southwestern Missouri State University, Bonnie A. Dede at the University of Michigan, Barbara J. Kriigel at the University of Michigan-Dearborn, Agnes Grady at the University of Tennessee, and Martha Conway at Yale University. Librarians also responded to our call for participation in this study through messages posted on several listservs. So many members of the AUTOCAT and CRISTAL-ED listservs volunteered. We thank the many reference and technical services librarians throughout North America who took part in the study.

The Michigan project team provided the principal author with invaluable assistance

throughout the project. Project consultant Susan A. Gelman, Professor, University of Michigan's Psychology Department, designed the experiment. Project consultant Bonnie A. Dede was the subject cataloging expert who supplied meanings to the 24 subject headings in the study. Project consultant and co-principal investigator Amy J. Warner assisted in the experimental design, questionnaire design and construction, and interpretation of results. Research assistant Schelle Simcox formulated six versions of questionnaires per subject heading set, distributed questionnaires to children and adults at the three Michigan libraries, secured the participation of volunteer librarians, and coded completed questionnaires. She also organized the eighteen versions of questionnaires, kept track of completed questionnaires, and recruited additional respondents to meet project goals. She shared data collection duties with Alaina Scopp who also distributed questionnaires to adults and children at participating libraries and coded completed questionnaires. Eileen Fenton assumed Schelle's duties when she joined the staff of the Internet Public Library. Eileen completed the data collection, refined the coding scheme, organized and coded completed questionnaires, and conducted the expert and inter-coder reliability studies. Despite relocating in Syracuse, New York, and beginning a business of her own, Marie Williams submitted coded data to SPSS statistical analyses and sent results to Ann Arbor via electronic mail and the World-Wide Web. Melanie Leavitt used Excel to generate many of the tables and figures in this report. The principal author is grateful to Michigan project team members for their dedication and contributions to the project.

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Published (bound and printed) copies of *Understanding Subject Headings in Library Catalogs* may be obtained from the School of Information at the following rates: (1) $14 prepaid, priority mail delivery in the United States, (2) $17 prepaid, air letter package delivery in Canada, or (3) $20 prepaid, air mail delivery outside the United

States and Canada. Please make checks payable to the University of Michigan and send them to the School of Information, University of Michigan, 304 West Hall, 550 East University Avenue, Ann Arbor, Michigan 48109–1092 USA. Only prepaid orders will be filled. The authors have submitted the report to ERIC, and, pending acceptance and processing, will be available in microfiche and hardcopy formats from ERIC.

About the Authors

Karen Markey Drabenstott is an Associate Professor in the School of
Information at the University of Michigan. The idea for research on
understanding subject headings came from a charge to the Subcommittee on
the Order of LCSH Subdivisions by the Subject Analysis Committee (SAC) of
the American Library Association (ALA) to respond to the first of six
recommendations of the LC Subject Subdivisions Conference. Karen
coordinated a pilot study on understanding subdivided subject headings to
assist the Subcommittee in its deliberations. Although pilot study findings were
interesting, limitations to the study made it difficult to generalize findings. To
overcome the limitations of the pilot study, Karen proposed a large-scale study
which was funded by OCLC's Library and Information Science Research
Grant Program. This report describes the large-scale study and makes
recommendations about subject headings in library catalogs.

Karen joined the faculty of The University of Michigan in January 1987. From
1981 to 1986, she was a research scientist in the Office of Research at OCLC.
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Schelle Simcox formulated the many different versions of questionnaires used
in the study, distributed them to children and adults at the three Michigan
libraries, secured the participation of volunteer librarians, and coded completed
questionnaires. She also organized the eighteen versions of questionnaires, kept
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Eileen G. Fenton completed the data collection, refined the coding scheme, organized and coded completed questionnaires, and conducted the inter-coder reliability study. She is currently the Production Coordinator for JSTOR, a not-for-profit organization involved in a cooperative venture with libraries and publishers to digitize the back files of scholarly journals. She hold a B.S. in English Education from Greenville College and an M.I.S. from the School of Information at the University of Michigan.

Executive Summary

A.   Project Overview

 "Understanding Subject Headings in Library Catalogs" was the first large-scale study of user understanding of subject headings. Its objectives were:

- To determine the extent to which children, adults, reference, and technical services librarians understood subdivided subject headings.

- To suggest improvements for improving understanding of subject headings.

The impetus for the study was a recommendation of the Library of Congress (LC) Subject Subdivisions Conference that suggested standardizing the order of subject subdivisions for the purpose of simplifying subject cataloging.

A total of twenty-four subdivided LC subject headings were selected for inclusion in the study. Eight subject headings were listed on questionnaires and subject headings varied in terms of context (alone, in bibliographic records, or in alphabetical lists) and order (in original order or a standardized order of subdivisions).

Children and adults at three public libraries in southeastern lower Michigan formulated meanings for listed subject headings and designated on a scale of 1 to 7 how certain they were of each meaning on questionnaires. Project staff used three approaches to recruiting professional librarians: (1) recruiting librarians at the three Michigan libraries, (2) contacting colleagues at libraries throughout the country who recruited professional staff at their libraries, and (3) recruiting volunteers directly through an announcement on various listservs.

One expert librarian with over twenty-five years experience in LC subject heading practice gave meanings to the 24 subject headings in the three contexts and two orders in this project. A reliability study demonstrated that her meanings agreed with the meanings of a second librarian with comparable experience. Project staff compared meanings formulated by children, adults, and librarians to the first expert's meanings and assigned one simple code ("Correct" or "Incorrect") per meaning. They also assigned one or two specific codes per meaning to describe why the meaning was correct or incorrect. For example, specific codes identified differences in syntax, language, leaving out or reading in one or more concepts, and just leaving meanings blank.

B.   Project Findings

An analysis of the expert's meanings demonstrated that the meaning of subject headings changed depending on the order of subdivisions and context in which subject headings resided, and that a single subject heading could have more than one meaning.

Overall percentages of correct meanings for subject headings in the original order of subdivisions were as follows: children, 32%, adults, 40%, reference 53%, and technical services librarians, 56%. Percentages were a little lower for correct meanings of subdivided subject headings in the standardized order—children, 30%, adults, 38%, reference librarians, 50%, and technical services librarians, 53%. The lowest percentages came from children and increasingly higher percentages came from adults, reference, and technical services librarians but there were notable exceptions to this regularly occurring pattern when librarians did the same or worse than children or adults.

Children, adults, reference and technical services averaged 1.24, 1.57, 2.07, and 2.19 correct meanings per questionnaire, respectively. (The upper limit on correct meanings per questionnaire was 4.0). Adults did significantly better than children in terms of giving correct meanings. There was no significant difference between reference and technical services librarians in terms of mean correct meanings.

For children and adults, mean correct meanings did not increase or decrease significantly when subject headings resided in a particular context or order. Librarians did register significantly higher mean correct meanings when subject headings resided in original order; however, significant interactions showed that the effect was dependent on several other factors.

Children, adults, reference, and technical services librarians were less certain of their incorrect meanings than their correct meanings. Certainty scores (on a scale of 1 to 7) that children gave to incorrect (4.15) and correct (5.05) meanings were the lowest of the four respondent types. Certainty scores that technical services librarians gave to incorrect (5.71) and correct (5.42) meanings were the highest of the four respondent types. The difference between certainty scores for incorrect and correct subject headings was greater for children and adults (three-quarters of a point between the two scores) than for librarians (hardly a third of a point between the two scores).

The analysis of specific *correct* codes demonstrated that reference and technical services librarians responded in the same ways to formulating meanings for subject headings. Librarians usually gave meanings with language that was different from the language the expert used. Children were more likely to give meanings with syntax that was different from the syntax the expert used. Sometimes adults' correct meanings were similar to librarians' meanings but at other times they were similar to children's meanings.

The analysis of specific *incorrect* codes was similar to the analysis of correct codes in that reference and technical services librarians responded in the same ways to formulating meanings for subject headings, children responded differently from librarians, and adults responded in ways similar to children or librarians. However, none of the four types of respondents formulated meanings that favored one or more specific incorrect meaning code. Instead, they formulated meanings that were incorrect and the specific reasons why their meanings were incorrect varied considerably across the three sets of subject headings and within each set of subject headings.

The failure analysis of subject heading meanings was unsuccessful at identifying particular properties of subject headings that were good indicators of the types of incorrect meanings that children, adults, and librarians would assign to them. About the only properties of subject headings that were likely to indicate subject headings to which respondents would have difficulty assigning correct meanings were subject headings that *changed meaning* across the various contexts and subdivision orders studied in this project.

C.   Project Conclusions

The various groups that are heavy users of the Library of Congress Subject Headings system—children, adults, and reference librarians—should be involved in the establishment of new subject headings and subdivisions to ensure that such users understand new terminology that enters the system.

The developers of new indexing systems especially systems aimed at organizing the World-Wide Web should include children, adults, librarians, and even subject-matter experts in the establishment of new terms and changes to existing ones. Perhaps there should be separate indexing systems for children, adults, librarians, and subject-matter experts. With a click of a button, users could choose the indexing system that works for them in terms of their understanding of the subject matter and the indexing system's terminology.

Statistical and failure analyses failed to demonstrate that subdivision order made a difference in terms of understanding subject headings. The researchers recommended that the order of subdivisions be standardized. Standardizing subdivision order would simplify cataloging and save money.

Future studies on understanding subject headings could examine the extent to which subdivision order and context changes the meaning of subject headings, the characteristics of subdivided subject headings that are likely to identify a difficult subject heading, and whether users of LCSH understand the subject headings in this system better or as well as indexing terms from other systems.

1 Project Objectives and Research Questions

1.1 Project Overview

According to Charles A. Cutter, one of the founding fathers of the dictionary catalog in American libraries, the most important subject cataloging principle was consideration of the best interest of the catalog user. In the preface to the fourth edition of *Rules for a dictionary catalog,* Cutter stated: "The convenience of the public is always to be set before the ease of the cataloger" (Cutter 1904, 6).

Over the ninety years that have passed since Cutter laid down this rule, the *Library of Congress Subject Headings* (LCSH), the primary tool librarians consult for subject cataloging, has grown from a single volume listing a few thousand subject headings to a four-volume set listing about two hundred thousand subject headings. In libraries throughout the country, librarians have produced tens of millions of unique cataloging records bearing subject headings drawn from this subject cataloging tool. Yet not once in those ninety years did catalogers ask library users whether they understood the subject headings assigned to cataloging records nor did they ask library users to suggest subject headings to represent the subject matter of the topics they seek.

The purpose of this research project was to study end-user understanding of subject headings. This project focused on subdivided subject headings because the vast majority of subject headings in bibliographic files are subdivided (Drabenstott and Vizine-Goetz 1994, 109).

A project study team at the University of Michigan's School of Information formulated questionnaires displaying subdivided subject headings in three contexts (i.e., single headings, headings in bibliographic records, headings in alphabetical browsing lists) and in two orders (i.e., original order of subdivisions and a revised order of subdivisions), recruited children and adults at three public libraries in southeastern lower Michigan, and reference librarians and technical services librarians across North America, and asked them to provide the meaning of subject headings. In a two-phased analysis, team members compared respondent-assigned meanings of subject headings with expert-supplied meanings to determine the extent to which respondents understood the subject headings in library catalogs. In the second phase, we conducted a failure analysis of meanings placed in "correct" and "incorrect" categories to determine the exact causes of the variance in user understanding of subdivided subject headings.

The research described in this report is the first large-scale study of end-user understanding of subject headings. This is a critical time in which librarians must think deeply about the value and future of manual subject cataloging, generally. In the next few years, administrators will be asking some important questions about the need for cataloging of library materials that are full digital texts in standardized, tagged formats. Subject cataloging could become a thing of the past as computer systems replace it with indexing and searching algorithms that feature access to the full text of digital materials. In such a future, subject cataloging could become even *more* important because it provides concise descriptions of the subject content of intellectual works to complement the detailed, specific, and complex access mechanisms that full-text algorithms will feature.

The findings of the research project gives direction for improving LCSH specifically and controlled vocabularies generally in the area of end-user understanding to help ensure their future viability. Furthermore, recommended improvements feature computer-based techniques that could be

applied to existing files of subject headings in lieu of time-consuming, manual editorial changes.

1.2 Subject Headings in Library Catalogs

1.2.1 The user and usage

According to Cutter, the most important subject cataloging principle was consideration of the best interest of the catalog user. In the preface to the fourth edition of the *Rules for a dictionary catalog*, Cutter stated: "The convenience of the public is always to be set before the ease of the cataloger" (Cutter 1904, 6).

David Judson Haykin (1951, 7), Chief of LC's Subject Cataloging Division during mid century, echoed Cutter's sentiments about the user and called this principle "the reader as a focus."

> [T]he reader is the focus in all cataloging principles and practice. All other considerations, such as convenience and the desire to arrange entries in some logical order, are secondary to the basic rule that the heading, in wording and structure, should be that which the reader will seek in the catalog, if we know or can presume what the reader will look under.

Chan (1986, 18) acknowledged that the meaning of this principle about the user was "self-evident, but how to make it operational is not. The problem is delineating the user."

In naming subjects in the catalog, Cutter and Haykin had different approaches. Cutter (1904, 69) recommended usage of the public as the guiding principle. Haykin (1951, 8) recommended "common usage or, at any rate, the usage of the class of reader for whom the material on the subject within which the heading falls is intended." In contrast to Cutter's straightforward approach, Haykin's approach gave the cataloger the freedom of naming subjects in the catalog based on the audience addressed by the material itself.

1.2.2 New subject headings in LCSH

The addition of new subject headings to LCSH is the responsibility of an editorial group composed of Library of Congress (LC) staff members from the Cataloging Policy and Support Office and interested internal observers. The editorial group reviews proposals for changes to existing headings, i.e., "additions to, alterations in, or deletions of existing headings, heading/subdivision combinations, cross references, or free-floating subdivisions" (Chan 1995, 146). The group also considers new subject headings and "deliberates on terminology (wording), cross references, notes, compatibility with descriptive headings (if applicable), and conformity to existing patterns and broad policies governing LCSH" (Chan 1995, 146).

Until very recently, proposals for new headings and changes to existing headings emanated exclusively from catalogers at the Library of Congress. The Vocabulary Improvement Project (Cochrane 1983) and an initiative sponsored by the SAC (Subject Analysis Committee) Subcommittee on New Subject Headings were pilot projects that demonstrated to LC that librarians at institutions other than LC could propose *see* references and new subject headings using the same procedures that LC librarians followed. Today, LC encourages librarians to submit new subject headings and *see* references by following the guidelines in the *Subject Cataloging Manual: Subject Headings* (SCM:SH) (Library of Congress 1991 H180–203). Despite such encouragement, very few subject heading proposals emanate from outside LC (Cooperative Subject Cataloging Project 1991).

In naming new subjects, LC catalogers face a more difficult task than their predecessors because of the diversity of today's catalog users. The decision to establish a new subject heading must take into consideration the best interest of users, the usage of the class of reader for whom the material is intended, and avoid the use of terminology that is offensive to a segment of the public. When Cutter proposed his principle of the best interest of the user, he did not have a problem knowing users and usage because library users were a homogeneous group (Miksa 1983, 74). Although we have a much more diverse user

population today than in Cutter's day, today's catalogers have tools to aid in the naming of subjects that their predecessors could not have dreamed of. They can examine an online catalog's transaction log to identify user queries that fail to produce retrievals and determine whether these queries should be represented in the controlled vocabulary as established headings or *see* references. Before online catalogs, researchers and library practitioners did not have an accurate and systematic method of determining the subjects users had difficulty finding in library catalogs.

Library catalogers do not have to obtain authorization from LC subject catalogers to create new subject headings that are a combination of subject headings printed in the *Library of Congress Subject Headings* and subdivisions printed in SCM:SH. SCM:SH gives rules, instructions, and guidelines and leaves decisions about the formulation of subdivided subject headings to the judgment and experience of library catalogers. Subdivided subject headings serve one of two purposes depending on institutional policy regarding subdivision: (1) to subarrange the library catalog when a substantial amount of material of a subject is in the collection or (2) to increase the specificity of subject headings. LC's policy with respect to subdivision is primarily to serve the latter purpose (Chan 1995).

1.2.3 End-User understanding of catalog information

Research has demonstrated that the catalog works pretty much as Cutter had intended, that is, users knowledgeable in a particular subject are as successful retrieving citations from the catalog as users without such knowledge (Bates 1977, 166). Interestingly, the most successful users are those without subject expertise but with knowledge of the structure and content of the catalog (Bates 1977, 166).

Since the introduction of online catalogs, several researchers have compared subject queries from transaction logs to the catalog's controlled vocabulary. End-user success in entering subject queries that match the catalog's controlled vocabulary could provide us with an estimation of end-user understanding of

catalog information. Unfortunately, such studies have demonstrated that users were not very successful at matching their queries for topical subjects or geographic names with the catalog's controlled vocabulary (Drabenstott and Vizine-Goetz 1994, 168, 187; Carlyle 1989, 44), and even less successful at matching subject queries for personal names, and combinations of topical subjects and names (Drabenstott and Vizine-Goetz 1994, 199–240; Lester 1989, 188).

A forty-year old study conducted by Oliver Lilly (1954) provides some insight into end-user understanding of catalog information. He supplied students with the titles and authors of six books and instructed them to write down the subject headings under which they would expect to find each book. The percentages of correct student responses ranged from 2% to 64%. In the study this report describes, the researchers supplied respondents with subject headings and asked them to write down their first impression of their meaning.

1.3   A Pilot Test of End-User Understanding

The idea for research on end-user understanding of subject headings came from a charge to the Subcommittee on the Order of LCSH Subdivisions by the Subject Analysis Committee (SAC) of the American Library Association (ALA) to respond to the first of six recommendations of the LC Subject Subdivisions Conference. This recommendation suggested standardizing the order of subject subdivisions for the purpose of simplifying subject cataloging: "If the cataloger chooses to apply subdivisions, the subdivisions should always appear in the following order: topical, geographic, chronological, form" (Conway 1992, 6). For three years beginning during the annual meeting of ALA in summer 1993, the Subcommittee was engaged in a multi-faceted study of the LCSH subject subdivisions system to ensure an informed decision regarding the future of subject subdivisions. One of this project's principals (Drabenstott) was a member of the subcommittee and supervised a pilot test of end-user understanding of subdivided subject headings (Franz et al. 1994). In fall 1993, Drabenstott and three students enrolled in her advanced cataloging

course at the University of Michigan drafted questionnaires bearing subdivided subject headings in their current order and in the order specified by the first recommendation of the LC Subject Subdivisions Conference. The students distributed questionnaires to dozens of end users — primarily friends, family, and acquaintances (who were not enrolled in library school programs or who did not work in libraries). They also recruited one cataloger and one reference librarian to formulate meanings to subject headings in the original and recommended orders of subdivisions.

The researchers placed the meanings end users gave to subject headings into a classification scheme bearing the following five major categories: (1) correct meaning, (2) omitted one or more concepts, (3) substituted one or more concepts for other concepts, (4) added one or more concepts, and (5) none of the above categories. Between 32% and 40% of end-user responses were correct meanings of subject headings. There was little difference between meanings for subject headings in the original and recommended orders of subdivisions. However, users were more likely to ascribe a correct meaning to subject headings bearing few (less than three) subdivisions and few words (less than five).

Although the findings of the pilot study were interesting, there were several limitations to the study. First, the researchers did not always agree with library-staff supplied meanings of subject headings. Second, disagreements in meaning between catalogers, reference librarians, and researchers made it impossible for the researchers to detect undesirable changes in the meaning of subdivided subject headings that were a result of the reordering of subject subdivisions. Third, the generalizability of pilot study findings was suspect because of the methods used to recruit respondents.

The large-scale study described in this report was designed to overcome these limitations. In the large-scale study, the project team enlisted an expert cataloger with many years of experience in LC subject heading assignment to determine the meaning of subject headings. We recruited a large number of respondents from public libraries in southeastern lower Michigan to ensure that

the study would not be plagued by questions about generalizability. We also had the benefit of adopting questions, format, procedures, and instructions from the pilot study and revising them based on our pilot study experience.

1.4   Research Questions and Methods

The objectives of this research project were to determine end-user understanding of subject headings and identify automatic techniques for manipulating subject headings to improve end-user understanding. The study answered five research questions:

1.   To what extent did end users understand subject headings?

2.   Did end-user understanding vary based on subject heading context?

3.   Did end-user understanding vary based on subject heading form?

4.   Were there differences in levels of understanding between the four groups of respondents (children, adults, reference librarians, technical services librarians), and in levels of understanding for the different forms or contexts of subject headings?

5.   What computer-based techniques could be applied to existing files of subject headings to produce subject headings that are more understandable to end users?

The Michigan project team called on OCLC Office of Research staff to generate lists of frequently-subdivided subject headings and of randomly-selected subdivided subject headings from the OCLC Online Union Catalog (OLUC). We used these lists as the basis for developing questionnaires for end users, catalogers, and reference librarians. Included on questionnaires were subdivided subject headings in three different contexts (single subject headings, subject headings in bibliographic records, and subject headings in alphabetical browsing lists). Subdivisions appended to main headings were arranged in their original order and in the order specified by the first recommendation of the LC Subject Subdivisions Conference (Conway 1992).

Project team members distributed three separate sets of questionnaires on which were listed a total of twenty-four subject headings to library users at three public libraries in southeastern lower Michigan: (1) Flint Public Library, (2) Bacon Memorial District Library, in Wyandotte, Michigan, and (3) Livonia Public Library, and to professional reference librarians and technical services librarians across North America. Our goal was to collect a total of eight meanings for every unique subdivided subject heading in a particular context and order from children, adults, reference librarians, and technical services librarians. We compared their meanings to the meanings supplied by a long-time expert in LC subject heading practice to determine differences between groups. A failure analysis was also carried out to shed light on the exact causes of the variance in user understanding of individual subject headings. Table 1.1 lists major project tasks and gives a schedule of project tasks. Due to circumstances unrelated to this project, co-principal investigators on the Michigan project team were unable to draft project findings into a final report during the time period stated in Table 1.1, and accomplished the task exactly one year later.

Table 1.1. Project Schedule

Tasks	Months
1. Recruit participating libraries	5/95
2. Obtain subject heading lists from OCLC	5/95
3. Research subject headings for context	5/95–6/95
4. Design questionnaire	6/95–7/95
5. Collect data in Michigan libraries	8/95–1/96
6. Analyze collected data	2/96–11/96
7. Draft project findings in final report to OCLC	12/96–4/97

References

Bates, Marcia J. 1977. "Factors affecting subject catalog search success." *Journal of the American Society for Information Science* 28, 3 (May): 161–9.

Carlyle, Allyson. 1989. "Matching *LCSH* and user vocabulary in the library catalog." *Cataloging & Classification Quarterly* 10, 1/2: 37–63.

Chan, Lois Mai. 1995. *Library of Congress Subject Headings: Principles and application.* 3rd ed. Littleton, CO: Libraries Unlimited.

Cochrane, Pauline A. 1983. *LCSH entry vocabulary project: Final report to the Council on Library Resources and to the Library of Congress.* ERIC ED 233746.

Conway, Martha O'Hara, ed. 1992. *The future of subdivisions in the Library of Congress Subject Headings system: Report from the Subject Subdivisions Conference sponsored by the Library of Congress, May 9-12, 1991.* Washington, D.C.: Library of Congress Cataloging Distribution Service.

Cooperative Subject Cataloging Project. 1991. *Cooperative subject cataloging project: summary of records processed through September 1991.* 4 pp. (Photocopy.)

Cutter, Charles A. 1904. *Rules for a dictionary catalog.* 4th ed. Washington, D.C.: U. S. Government Printing Office.

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

Franz, Lori, John Powell, Suzann Jude, and Karen M. Drabenstott. 1994. "End-user understanding of subdivided subject headings." *Library Resources & Technical Services.* 38 (3): 213–226.

Haykin, Donald Judson. 1951. *Subject headings: A practical guide.* Washington, D.C.: Library of Congress.

Lester, Marilyn Ann. 1989. *Coincidence of user vocabulary and Library of Congress Subject Headings: Experiments to improve subject access in academic library online catalogs.* Ph.D. dissertation, University of Illinois at Urbana-Champaign.

Library of Congress. 1991. *Subject cataloging manual: subject headings.* Washington, D.C.: Cataloging Distribution Service.

Lilly, Oliver L. 1954. "Evaluation of the subject catalog: criticism and a proposal." *American Documentation* 5 (April): 41–60.

Miksa, Francis. 1983. *The subject in the dictionary catalog from Cutter to the present.* Chicago: American Library Association.

2   Research Methods

2.1   Recruiting Participating Libraries

Shortly after being awarded the grant, Karen Drabenstott, the project's co-principal investigator, telephoned directors of nearby public libraries to interest them in the study. She followed up her phone calls with personal visits to the three libraries to discuss data collection procedures with library directors and interested library staff. She was accompanied by one Michigan project team member who was responsible for training data collectors and data collection at all three libraries. The three participating libraries were: (1) Flint Public Library, (2) Bacon Memorial District Library, Wyandotte, Michigan, and (3) Livonia Public Library.

Flint Public Library has been providing continuous information services to the Flint community since 1851. Currently, Flint has a staff of ninety and a collection of over half a million items including government documents, video and audio tapes, microfilms, newspapers, and magazines. The Library services an immediate population of 139,000 within the city of Flint. Since it is the largest library across three counties, patrons come from all over mid Michigan and beyond.

Besides offering traditional library services, Flint Public Library provides outreach to seniors through a variety of programs including "Take and Return Collections" in senior housing developments and "Armchair Travel," a weekly noon-time film program. The Library provides a host of services to children from cradle to adulthood, for example, "Reading Partners," a program designed to strengthen bonds between adults and children through readings,

and "Bookie Babies," for babies up to eighteen months old. Other library programs include COPE, a service for individuals looking for, choosing, or changing jobs or careers, programs on topics of interest such as managing stress, interviewing techniques, and resume writing, and an Internet Laboratory to aid patrons in learning about new electronic resources. Flint Public Library also serves as a meeting place and community forum for free and open discussion of public policy issues. Renown speakers and thinkers such as Maya Angelou and Jonathan Kozol have made presentations at the library. Special exhibits such as "Field to Factory: Afro-American Migration, 1915–1940" and "Seeds of Changes" and a concert series showcasing national and local talent have been popular library events. In 1995 alone, overall attendance to library-sponsored programs was more than 53,000.

Flint Public Library staff are constantly working to meet the community's changing needs and demands. Linkages with schools, colleges, social service agencies, and community organizations provide a context for information services and help staff reach underserved segments of the population.

Bacon Memorial District Library serves 30,938 people in Wyandotte, Michigan, south of Detroit on the Detroit River in the Downriver area. Downriver is made up of eleven old, established working-class towns, each with its own small library. Most of the population works in manufacturing, mainly in the automobile and steel industries. For the first time, the 1990 census listed over 50% of Wyandotte residents as having a high school education; fewer than 20% have a college education. Yet over 80% of residents live in single-family homes which they own. It is a very stable community where several family generations live close together. Residents use the library for school assignments, popular fiction, and general information on topics such as gardening, raising pets, and repairing their cars. The library's computers feature Internet access and have been instrumental in bringing more men into the library.

Wyandotte has had a public library since 1869. The library was renamed Bacon Memorial in 1942 when the Bacon family donated their twelve-room home to

house the library. A modern addition was added in 1962. Bacon is the oldest and largest public library in the Downriver area, with 72,000 books and 5,000 audio-visual materials (videos, books on tape, compact discs, CD-ROMs). About 40% of residents have library cards and circulation has improved about 4% annually from 95,000 in 1990 to 132,957 in 1995–1996. The public library was always part of the school district until 1994 when the state legislature eliminated property taxes for schools. At that time Bacon became an independent district library and the community passed a 1.6 mill tax to support the library. The budget is currently $677,000 which includes a materials budget of $65,000.

The Livonia Public Library has three branches and a reading room to serve Livonia, Michigan. Livonia is the eighth largest city in Michigan and has a population of 100,850. Library branches were built first, Sandburg Branch in 1961, and Noble Branch in 1967. Noble had started library service for the entire city in a storefront building in 1958. A reading room at the Civic Park Senior Center has been serving the needs of senior citizens since 1972. The main library, Livonia Civic Center Library, opened in 1988. The total collections of Livonia Public Library now exceed 250,000 items and record a circulation in excess of 800,000 annually.

In addition to two public school districts, Livonia is home to Schoolcraft College and Madonna University. Three shopping malls, including upscale Laural Park Place, and a six-square mile industrial corridor assure a strong tax base and employment for area residents. The city has managed its resources so that it can provide 1,800 acres of park land within its borders and offer a variety of recreational opportunities.

According to the 1990 census, median household income in Livonia was $44,276. About 39% of the households had income exceeding $50,000 and only 3.2% of residents were below the poverty level. In 1993, the median price of a house in Livonia was $101,500.

2.2 Selecting Subdivided Subject Headings

To assist the efforts of the Subcommittee on the Order of LCSH Subdivisions, OCLC researchers in the Office of Research generated lists of frequently-occurring subdivided subject headings and of randomly-selected subdivided subject headings from the OCLC Online Union Catalog (OLUC). The Michigan project team used these lists to select LC subject headings for inclusion on questionnaires that were distributed to children, adults, reference librarians, and technical services librarians. The former contained hundreds of subdivided subject headings for the main headings "Jews," "Art, Modern," "English poetry," and "Music." The latter contained one or more subdivided forms of 42 unique main headings.

Michigan project team members selected a total of 24 subdivided subject headings from the two lists for inclusion on questionnaires. We were deliberate in our selection of subject headings. We chose subject headings that were likely to change in meaning when their subdivisions were reordered according to the recommendation of the LC Subject Subdivisions Conference because we wanted to find out whether respondents would notice changes in meaning. We purposely chose subject headings for which no change in meaning would be discernible upon reordering of their subdivisions for a similar reason, that is, to determine whether questionnaire respondents would assign the same meanings to original and reordered forms. Team members also chose enough unique main headings so that respondents did not encounter the same main heading more than once on questionnaires.

Michigan project team members selected a total of 24 unique subdivided subject headings. Table 2.1 enumerates these headings.

Table 2.1. Selected Subdivided Subject Headings

1.	Basketball—United States—Records
2.	Jews—Michigan—Detroit—History—20th century
3.	Locomotives—Germany—History
4.	Music—500–1400—Philosophy and aesthetics
5.	Indians of North American—New Mexico—Food
6.	Spanish drama—18th century—History and criticism
7.	Education—United States—Finance
8.	Art, Modern—California—Los Angeles—20th century—Exhibitions
9.	Housing—United States—Law and legislation
10.	Handicapped—Washington (State)—Seattle metropolitan area—Transportation
11.	Jews—Germany—Berlin—Intellectual life—Congresses
12.	Organ music—17th century—Interpretation (phrasing, dynamics, etc.)
13.	World War, 1939–1945—Regimental histories—Japan
14.	English poetry—Old English, ca. 450–1100—Modernized versions
15.	Music—Washington (D.C.)—History and criticism
16.	Art, Modern—20th century—German—Berlin—Exhibitions
17.	Cattle—United States—Marketing
18.	Combined sewers—Illinois—Chicago metropolitan area—Overflows
19.	Art, Modern—20th century—Public opinion
20.	Music—Africa—History and criticism—Bibliography
21.	Jews—Egypt—Politics and government
22.	Music—Louisiana—New Orleans—History and criticism
23.	Education—California—Finance
24.	English poetry—Middle English, 1100–1500—Criticism, Textual—Congresses

2.3 Formulating Questionnaires

The Michigan project team's next step was to divide the 24 subject headings into three groups of eight unique subject headings. Library users at Flint Public Library, the first 48 volunteer reference librarians, and the first 48 volunteer technical services librarians assigned meanings to the first group of eight subject headings (headings 1–8, Table 2.1). Library users at Bacon Memorial District Library, the next 48 volunteer reference librarians, and the next 48 volunteer technical services librarians assigned meanings to the second group of eight subject headings (headings 9–16, Table 2.1). Library users at Livonia Public Library, the last 48 volunteer reference librarians, and the last 48 volunteer technical services librarians assigned meanings to the third group of eight subject headings (headings 17–24, Table 2.1). Questionnaires contained no control numbers or distinguishing marks that disclosed the identity of person who completed them other than a code that identified the particular version of the questionnaire.

There were three separate sets of questionnaires corresponding to three sets of eight subject headings (i.e., subject headings 1–8, 9–16, and 17–24). Within each set were six different questionnaires. Questionnaires within sets varied in terms of the context in which subject headings were presented (i.e., alone, in bibliographic records, or in alphabetical browsing lists). They also varied in terms of the order of subdivisions (i.e., original or recommended order) in order to minimize the order effect in data analysis. Pairs of questionnaires listed one or two subject headings with subdivisions in their *original* order followed by one or two subject headings with subdivisions in *recommended* order and so on until all eight subject heading were listed. The second member of the pair of questionnaires listed subject headings in the *opposite* order, that is, one or two subject headings with subdivisions in *recommended* order, followed by one or two subject heading with subdivisions in *original* order, and so on.

Appendixes A–F show one complete set of questionnaires for subject headings 9–16. To assist readers in identifying subject headings in original and

recommended orders, we added a code preceding each numbered subject heading to indicate whether the listed subject heading was in its original (o) or reordered (r) form. When such questionnaires were distributed to respondents, they did *not* have such codes. Another code was printed on the questionnaires in appendixes A–F. This code was helpful to Michigan project team members because it identified the particular version of questionnaire across the three sets of questionnaires. We used this code to sort completed and uncompleted questionnaires. It was printed at the top of page 2 of every questionnaire and it indicated the context and order of subdivisions. The first letter represented the order of subdivisions (a for original order and b for recommended order) for the first subject heading on the questionnaire. The second letter represented context (a for alone, b for bibliographic record, and p for alphabetical browsing list) of all the subject headings on the questionnaire. The titles of the six questionnaires in appendixes A–F cite this code.

Instructions on questionnaires asked respondents to write down the meaning of subject headings and sufficient space was provided following each listed subject heading for their response. Following the response, questionnaires asked respondents to rate the certainty of their response by writing an X on a scale of one ("not at all certain") to seven ("very certain").

Questionnaires also included questions that collected demographic information about respondents such as their age, level of schooling, gender, and frequency of library use.

2.4 Recruiting Children and Adults

To recruit children and adults at the three participating libraries, the Michigan project team instituted data collection procedures that were similar from library to library. Basically, data collection staff stood at the main entrance of the library, near a table, introduced themselves to patrons who entered the library, and asked them to take part in the study. They told patrons the name and purpose of the study, explained the voluntary nature of participation, and told them that their complete participation would take ten to fifteen minutes.

If patrons declined, staff thanked them and let them continue on their way. We supplied participating patrons with an unmarked questionnaire, pencil, eraser, and seat at the nearby table. We instructed participants to complete questionnaires at the table and place them in a box labeled "Place completed survey forms here."

Recruiting children was not always as straightforward a process as recruiting adults. If interviewers were unsure whether library patrons were eighteen years old, we asked them their age and explained that we were giving the same questionnaires to adults and children but needed to keep track of the number of each. If women entered the library with small children in tow, interviewers did not approach them to take part in the study because accompanying children might get bored, distracted, or annoyed, and cause their mothers to leave questionnaires incomplete.

Children often needed help with questionnaires. If children asked interviewers what a word meant, they would give them a simple definition. We found that it was impossible for children under age ten to complete questionnaires. When interviewers did give questionnaires to children aged ten or less, children usually returned them to us and said, "I can't do this," or "This is too hard." Some children asked their older sisters, brothers, or parents to help them read the words. Parents read hard words and, in rare cases, provided definitions for words in subject headings. When children asked interviewers for clarification on instructions, interviewers told them to try to put subject heading words together in a sentence or told them to write down what kind of book they thought the subject headings described.

Differences between libraries in data collection procedures follow. At Flint Public Library, interviewers distributed questionnaires in spring and summer 1995. The Library was so busy that interviewers needed much less time than at the other two libraries to collect the target number of questionnaires. The interviewer stood at the entrance to the library where the circulation desk resided. She wore a name tag and stood not far from a table on which sat a box of completed questionnaires. Because interviewers were so close to the entrance

and looked friendly and approachable, patrons sometimes asked them directional or reference questions. Interviewers explained why they were standing at the entrance and told patrons that they could make inquiries at the reference desk. One patron who completed a questionnaire, upon learning the purpose of the study, asked an interviewer, "Why don't you make it easier to find things on the computer?" and launched into an account of their failed online catalog search.

Figure 2.1. Explanatory note for parents

Please Take Home this Information to
Tell Your Parents about our Study:

Thank you for taking part in our study of subject headings in library catalogs. This study is being conducted by Professor Karen Drabenstott and her students at the School of Information and Library Studies at the University of Michigan. We have asked your child to complete a questionnaire that lists eight subject phrases. You or your child might have encountered subject phrases in the library's card or computer catalog. Examples are:

- *Basketball — United States — Records*
- *Spanish drama — History and criticism — 18th century*
- *Locomotives — History — Germany*

We have asked your child to write down the meaning of these subject phrases in their own words. We will use your child's responses to increase our understanding of the difficulty of using library catalogs and to improve the subject terminology used in these catalogs. If you have additional questions about our study, please contact Gloria Coles, Director, Flint Public Library.

About halfway into our data collection at Flint Public Library, the library's administration received inquiries from parents about the questionnaires that their children had completed. To minimize the number of such inquiries,

interviewers gave children a note to take home to their parents that explained the purpose of the study. Figure 2.1 contains the text of this note.

Bacon Memorial District Library had two entrances in the front and back of the library. Patrons used both entrances. The interviewer was situated at a small table near the busier entrance adjacent to the library's circulation desk. She asked patrons who approached the circulation desk to take part in the study. On occasion, patrons took the questionnaire with them because the table was too small to allow them to fill it out there. Bacon librarians collected completed questionnaires and sent them to the Michigan project team in Ann Arbor. Approximately a dozen questionnaires were returned by mail.

The Michigan project team distributed questionnaires at the Livonia Civic Center Library. The interviewer was situated at a round table near the library's only entrance which was near the reference desk and she introduced herself to patrons as they entered the library and asked them to take part in the study. Interviewers noted that refusals were more frequent at Livonia than at the other two data collection sites. The library was especially busy during lunch hours with many visits by business people. Mornings and early afternoons were characterized by visits by mothers with small children in tow. Few children came to the library unaccompanied by adults. Teenagers and local college students were heavy library users.

2.5 Recruiting Reference and Technical Services Librarians

Michigan project team members distributed the same three sets of questionnaires to professional reference librarians and technical services librarians as they gave to children and adults in Michigan libraries. Instructions on questionnaires were the same as instructions on questionnaires completed by patrons. Questionnaires contained no control numbers or distinguishing marks that would identify the identity of person who completed them other than the code that identified the particular version of the questionnaire.

We sought a total of 144 reference librarians and 144 catalogers to complete the various versions of questionnaires. We used three approaches to recruiting professional staff: (1) recruiting staff at the three participating libraries, (2) contacting colleagues at libraries throughout the country who recruited professional staff at their libraries, and (3) recruiting volunteers directly through an announcement on various listservs.

Professional staff at the three participating public libraries—Flint, Wyandotte, Livonia—completed questionnaires but we needed many more respondents. Co-principal investigator Karen Drabenstott made phone calls to library colleagues throughout the country and asked them to distribute questionnaires to professional staff in their libraries. She contacted library staff at the following libraries, described the study to them, and asked them to recruit professional staff in their libraries: (1) Columbia University, (2) Ohio State University, (3) Southwestern Missouri State University, (4) University of Michigan, (5) University of Michigan-Dearborn, (6) University of Tennessee, and (7) Yale University. Colleagues estimated the number of staff they could recruit and the Michigan project team sent them a packet with as many cover letters, questionnaires, and self-addressed, stamped envelopes as they said they needed. Colleagues gave volunteers at their libraries one self-addressed, stamped envelope containing a cover letter and one questionnaire. Volunteers were on their own to complete and return questionnaires. In appendix G, an example of cover letters sent to staff volunteers is given. Staff could also consult a page on the World-Wide Web that described the details of the project (appendix H).

The Michigan project team sent announcements to several listservs, e.g., ASIS-L, Autocat, DOCDIS, INDEXC-L, CRISTAL-ED, and COOPCAT. We received an overwhelming response to our announcements on Autocat. Announcements sent to listservs described the study and urged interested people to consult the World-Wide Web page for more information and/or send an electronic message to the project team requesting a questionnaire. In appendix I, an example of the message we posted listservs to recruit

professional library staff is given. We asked volunteers who requested a questionnaires via electronic mail to include their mailing address and the name of the school where they received their professional library degree. The Michigan project team was quite successful recruiting volunteers through personal contacts to colleagues at libraries around the country and through listserv announcements. When volunteers took a long time to return completed questionnaires, project staff sent the same version of the questionnaire to another volunteer in an effort to complete the data collection with professional staff as soon as possible. Since there were no control numbers or distinguishing marks on questionnaires, project staff could not do much more to remind volunteers to return questionnaires other than post reminders on the listservs we used to post the original announcement. Some librarians never returned questionnaires and this resulted in the collection of fewer than eight responses for a particular questionnaire version.

2.6 Determining the Meaning of Subdivided Subject Headings

2.6.1 Consulting a subject cataloging expert

The Michigan project team faced a difficult decision regarding how to determine the meaning of subdivided subject headings because these meanings would be used to judge the meanings provided by participating library patrons and professional library staff. Results from the pilot test of subject heading understanding demonstrated that professional librarians—both reference and technical services librarians—did not agree on the meaning of subdivided subject headings (Franz, Powell, Jude, and Drabenstott 1994). We wanted to use a consensus of responses from professional librarians to determine the meaning of subdivided subject headings. Unfortunately, participating library staff returned questionnaires so slowly that our funding would have been depleted long before we had collected and analyzed all library staff-completed questionnaires.

For this reason, we consulted Bonnie A. Dede, Head, Special Formats, University of Michigan Library. Ms. Dede has over twenty-five years of experience in LC subject heading practice at the University of Michigan library. Ms. Dede had read our proposal to OCLC and was familiar with the objectives of the project. She knew that she would be reviewing subject headings that were not "correct" in terms of the order of subdivisions. We gave her all eighteen versions of questionnaires and instructed her to complete questionnaires in several sittings and to resist comparing subject headings between questionnaires. Ms. Dede did not know which headings were correct or incorrect, but, on many occasions, she was able to guess which headings were correct based on her knowledge of and experience with LC subject heading practice. When she returned the questionnaires several weeks later, we noticed that she sometimes provided more than one meaning for several subdivided subject headings. We accepted her meanings without debate or discussion. If she gave more than one meaning, we checked questionnaires completed by patrons and professional staff for one of the expert-supplied meanings but did not require patrons or staff to supply more than one meaning per subject heading.

2.6.2 Comparing meanings assigned by subject cataloging experts

The Michigan project team accepted the meanings of the single subject cataloging expert for analyzing all questionnaires completed by adults, children, and librarians. We were, however, curious about the closeness of our expert's meanings to those of a second expert with a similar background and subject cataloging experience. To determine the closeness of subject cataloging experts in the assignment of meanings of subject headings, the Michigan project team consulted a second subject cataloging expert at the Library of Congress with twenty-two years of experience in LC subject heading practice. We gave the second expert six versions from two of the three sets of questionnaires and asked her to assign meanings to listed subject headings. She assigned meanings to subject headings in the two orders and three contexts. Like Ms. Dede, she was familiar with the objectives of the study and had read

the project team's proposal to OCLC. We instructed her to complete questionnaires in several sittings and to resist comparing subject headings between questionnaires.

The coder who coded the majority of questionnaires compared the meanings of the two experts. The six versions of questionnaires contained a total of 48 subject headings. These versions also enumerated subject headings in the two orders and three contexts. In every case, the second expert's responses were correct as compared to the responses of the first expert. There were differences in language and syntax but, overall, the second expert gave responses that would be considered correct responses.

The coder hesitated with respect to judging of meanings that the second expert gave to six subject headings bearing the main heading "Art, Modern" and subdivision "—20th century." For example, the second expert gave the meanings "An exhibition or exhibitions of 20th century Los Angeles art" for the subdivided subject heading "Art, Modern—20th century—California—Los Angeles—Exhibitions" and "An exhibition or exhibitions of 20th century art from or produced in Berlin" for the subdivided subject heading "Art, Modern—20th century—Germany—Berlin—Exhibitions." Comparing these meanings with the first expert's meaning, the coder could have considered the second expert's meanings incorrect because they left out the "modern" concept that was present in meanings given by the first expert. The coder felt that the second expert took for granted that the phrase "—20th century" was synonymous with "modern art," and, thus, she did not consider these and other meanings bearing both main heading "Art, Modern" and subdivision "—20th century" to be incorrect because the second expert consistently omitted the term "modern" from all six meanings she gave to subject headings bearing these two elements.

2.7 Coding Completed Questionnaires

2.7.1 Introduction

When the Michigan project team received completed questionnaires, we grouped them according to questionnaire version and respondent type (i.e., adults, children, reference librarians, technical services librarians). Three team members coded questionnaires. They tried as much as possible to code questionnaires by version and respondent type to ensure coding consistency. They compared questionnaire responses with the responses provided by the expert technical services librarian (see section 2.6.1). Team members coded each questionnaire completely before coding the next questionnaire of the same version and type of respondent because they found this approach to be faster than coding single subject headings in various orders and contexts.

When coding respondent-assigned meanings of subdivided subject headings, coders first read the expert-supplied meaning paying particular attention to syntax, language and meaning. They then read the respondent-assigned meaning on the completed questionnaire and compared it to the expert-supplied meaning. Coders made several analyses per respondent-assigned meaning. They looked for similarities and differences in language or word choice, in the syntax, and in the meaning of the expert-supplied and respondent-assigned meanings. Based on their analyses, they assigned one or two codes that indicated the nature of "correctness" or "incorrectness" of the respondent-assigned meaning. Details on "correct" and "incorrect" codes follow.

2.7.2 Correct codes

All the codes discussed in this subsection were assigned to respondent-assigned meanings that were correct.

Correct (C)

If the comparison between the expert-supplied meaning and the respondent-assigned meaning revealed no differences in word choice, syntax or meaning,

coders assigned code "C" for "Correct." An example was the expert-supplied meaning "history of locomotives in Germany" and respondent-assigned meaning "a history of locomotives in Germany" for the subdivided, reordered subject heading "Locomotives—History—Germany." The coder assigned the "Correct" code because the respondent's meaning matched the expert's meaning letter-for-letter except for the initial article. A second example was the respondent-assigned meaning "United States basketball records" for the subdivided subject heading in original order "Basketball—United States—Records" which was a letter-for-letter match of the expert-supplied meaning "U. S. basketball records" except for the unabbreviated place name.

Correct Different Language (CDL)

If coders determined that the comparison between the expert-supplied meaning and the respondent-assigned meaning revealed that the respondent used different language to capture the same meaning as the expert-supplied meaning, coders assigned the "Correct, Different Language" (CDL) code. An example was the respondent-assigned meaning "records (statistics) for U. S. basketball" for the subject heading "Basketball—United States—Records." The expert-supplied meaning for this subject heading was "records of U. S. basketball." Another example was the respondent-assigned meaning "handicapped people in the Washington Seattle metropolitan area and how they get around" for the subject heading in original order "Handicapped—Washington (State)—Seattle Metropolitan Area—Transportation." The phrase "handicapped people" represented the word "handicapped" and the phrase "and how they get around" represented the word "transportation" in the expert-supplied meaning.

Correct Different Syntax (CDS)

Coders assigned the "Correct, Different Syntax" (CDS) code when their comparison between the expert-supplied meaning and the respondent-assigned meaning revealed that the respondent used the same language but different syntax to capture the same meaning as the expert-supplied meaning. An

example was the respondent-assigned meaning "20th century history of Jews in Detroit, Michigan" for the subject heading "Jews—Michigan—Detroit—History—20th century." The expert-supplied meaning for the subject heading was "20th century history of Detroit (Michigan) Jews." Another example was the respondent-assigned meaning "Washington (D. C.) music–history and criticism" for the subject heading with subdivisions in recommended order "Music—History and criticism—Washington (D.C.)." The expert-supplied meaning for this subject heading was "history and criticism of Washington (D. C.) music."

2.7.3 Correct or incorrect codes

This subsection describes two codes for reading in one or more concepts into meanings. Sometimes the added concepts did not affect the meaning of respondent-assigned meanings to the extent that they were incorrect compared to expert-supplied meanings. Sometimes the added concepts resulted in incorrect meanings.

Read in One Concept (RIC)

Coders assigned the code "Read in One Concept" (RIC) when their comparison of the respondent-assigned and expert-supplied meanings revealed that the respondent added a concept (i.e., a word or phrase). Coders added a one-letter code "C" or "I" to indicate whether the respondent's addition of a concept resulted in a correct or incorrect meaning for the subdivided subject heading. An example of a correct meaning was the respondent-assigned meaning "financial aspects of U. S. education" for the subject heading in original order "Education—United States—Finance." The expert-supplied meaning was "finance of U. S. education." The coder assigned the code "Correct, Read in One Concept" (C–RIC) because the respondent's meaning matched the expert-supplied meaning even though the former contained the concept "financial aspects" that was different from "finance" in the latter. Another example was the respondent-assigned meaning "English poetry

between 450–1000 ca. that has been updated so that it is readily understandable to the average Joe" for the reordered subject heading "English poetry—Modernized versions—Old English, ca. 450–1100." The expert-supplied meaning was "modernized versions of old English (ca. 450–1100) poetry." The coder assigned the "Correct, Read in One Concept" (C–RIC) code because the respondent's addition of the string "so that it is readily understandable to the average Joe" helped to explain the "updated" part of the meaning and did not make the respondent's meaning incorrect.

Here is an example of a meaning that the coder determined was incorrect for the "Read in One Concept" category. The expert-supplied meaning was "transportation of the handicapped in the Seattle (Washington) metropolitan area" for the subject heading "Handicapped—Washington (State)—Seattle Metropolitan Area—Transportation." The coder assigned the "Incorrect–Read in One Concept" (I–RIC) category to respondent's meaning because the respondent added the concept "public transportation." Another example was the expert-supplied meaning "exhibitions of 20th century Berlin (Germany) modern art" for the reordered subject heading "Art, Modern—Germany—Berlin—20th century—Exhibitions." The respondent gave the meaning "reprinted material from a modern art exhibit in Berlin" to this subject heading. The coder assigned the "Incorrect–Read in One Concept" code because of the addition of the concept "reprinted material." By the way, the respondent left out the concept "20th century" and the coder could have assigned the "Left out One Concept" (LOI) category; however, in the coder's judgment, the addition of a concept played a larger role in the changing meaning than the left-out concept, and, thus, the coder assigned the "Incorrect–Read in one Concept" code.

Read in More Than One Concept (RMO)

Coders assigned the code "Read in More Than One Concept" (RMO) when their comparison of the respondent-assigned and expert-supplied meanings revealed that the respondent added more than one concept (i.e., words or phrases). Coders added a one-letter code "C" or "I" to indicate whether the

respondent's addition of concepts resulted in a correct or incorrect meaning for the subdivided subject heading. An example of a respondent's correct meaning in this category was "food used (eaten, cooked, etc.) of Indians in New Mexico" for the subject heading "Indians of North America—New Mexico—Food." The expert-supplied meaning was "food of the Indians of New Mexico." The coder determined that this meaning was correct but the respondent had added more than one concept—"used," "eaten," and "cooked." Another correct example was for the subject heading in original order "Housing—United States—Law and legislation" to which the respondent gave the meaning "laws and legislative documents about housing/housing policy in the U. S." The expert-supplied meaning was "law and legislation of U. S. housing." This meaning was correct because the respondent's addition of the concepts "documents" and "housing policy" did not make the meaning incorrect in a comparison with the expert's meaning.

Incorrect examples in this category follow. The expert-supplied meaning for the reordered subject heading "Cattle—Marketing—United States" was "marketing of cattle in the U. S." A respondent gave the meaning "current or historical cases and techniques for marketing cattle and or beef products" to which the coder assigned "Incorrect–Read in More Than One Concept" because the respondent's meaning was semantically different from the expert's meaning and included more than one concept (i.e., "current or historical cases," "techniques," and "beef products"). Another example was the respondent-assigned meaning "how to finance college education" for the subject heading in original order "Education—U. S.—Finance." Missing from the expert-supplied meaning "finance of U. S. education" were the concepts "how to finance" and "college" which occurred in the respondent-assigned meaning.

2.7.4 Incorrect codes

The omission of concepts, use of incorrect syntax, and other aspects played major roles in making respondent-supplied meanings incorrect. This subsection describes several incorrect codes.

Left out One Concept (LOI)

Coders assigned the "Left out in One Concept" (LOI) code when their comparison of the respondent-assigned and expert-supplied meanings revealed that the respondent had omitted a concept. Meanings assigned this code were always incorrect because the omission resulted in an incorrect meaning. For example, the expert-supplied meaning for the subject heading "Housing—United States—Law and legislation" was "law and legislation of housing in the U. S." The respondent-assigned meaning "laws on housing in the U. S." was assigned the "Left out One Concept" code because the "legislation" concept was omitted and the omission resulted in an incorrect meaning. The coder gave the respondent-assigned meaning "legal aspects of housing in the U. S." the same code because the "legislation" concept was missing. Another example was the respondent-assigned meaning "exhibitions of 20th century German art" for the subdivided subject heading "Art, Modern—20th century—Germany—Berlin—Exhibitions." The expert-supplied meaning was "exhibitions of 20th century Berlin (Germany) modern art" which contained the "Berlin art" concept that was missing from the respondent-assigned meaning.

Left out More Than One Concept (LMO)

Coders assigned the code "Left out More Than One Concept" (LMO) when their comparison of the respondent-assigned and expert-supplied meanings revealed that the respondent had omitted more than one concept. The omission of concept(s) always changed the meaning of subject headings, thus, this was a category for incorrect meanings. Here are two examples. The expert-supplied meaning of the reordered subdivided subject heading "Music—Philosophy and aesthetics—500–1400" was "philosophy and aesthetics of music from 500–1400." A respondent gave this subject heading the meaning "examines music in that time frame." The coder assigned the "Left Out More Than One Concept" code because the respondent's meaning was missing the concepts "philosophy" and "aesthetics," and it did not specifically cite the time period. Another example was for subject heading "Art,

Modern—California—Los Angeles—20th century—Exhibitions" to which the expert gave the meaning "exhibitions of 20th century Los Angeles (California) modern art." Here are several respondent-assigned meanings missing more than one concept:

- California 20th century

- art different places

- the new art

- art in California in the 20th century

Some of these meanings referred to only one concept mentioned in the subject heading, i.e., "art," and others referred to two or more concepts, e.g., "California," "20th century," and "art."

Incorrect Different Syntax (IDS)

Coders assigned the code "Incorrect, Different Syntax" (IDS) to respondent-assigned meanings that enlisted syntax different from the syntax of expert-supplied meanings in such a way that the different syntax caused a change in meaning. An example was the respondent-assigned meaning "history in Germany of locomotives" given to the subdivided subject heading in original order "Locomotives—Germany—History." The expert-supplied meaning was "history of locomotives in Germany." In this case, the difference in syntax changed the meaning. Another example was the respondent-assigned meaning "history and criticism of 18th century Spanish drama" for the reordered subject heading "Spanish drama—History and criticism—18th century." The expert-supplied meaning was "18th century history and criticism of Spanish drama." The coder assigned the code "Incorrect, Different Syntax" to the respondent-assigned meaning because of the way in which such syntax altered the respondent's meaning.

Blank and other responses (Blank)

When respondents failed to assign meanings to questionnaires and left the response blank, the coder considered this a null response and coded it as

"Blank." Such responses were expected in the analysis of questionnaires that children completed because interviewers noted that children sometimes omitted a word from their meanings if they did not understand the vocabulary, and, if the heading looked too complex, they just did not write down a meaning and left a blank space on the questionnaire. Data collectors encountered six children who left almost three-quarters of their questionnaires blank. These children told the data collectors that they could not complete the questionnaire because they did not understand most of the listed subject headings. For these six cases, data collectors discarded the incomplete questionnaires and recruited another six children who were successful at completing most or all of the questionnaire.

If the coder was unable assign a category to the respondent-assigned meaning based on the correct and incorrect categories described above, the respondent's meaning was deemed incorrect and assigned to the "Blank" category. Such respondent-assigned meanings indicated that respondents produced a different and, sometimes, unanticipated meaning. Here were two examples. The expert-supplied meaning for the reordered subject heading "English poetry—Modernized Versions—Old English, ca. 450–1100" was "modernized versions of old English (ca. 450–1100) poetry." The respondent wrote down "basically nothing, since don't know what 'modernized versions' means." Such a meaning was only appropriate for the "Blank" category because the respondent told us why he or she couldn't supply a meaning. Another example was the phrase "what the words she chooses are about" that the respondent gave as the meaning for the subject heading "Music—500–1400—Philosophy and aesthetics." This phrase did not make sense as a meaning for this subject heading. Perhaps the respondent had asked the interviewer about this subject heading and was referring to their discussion.

2.7.5 Comparing categories assigned by coders

Three coders analyzed completed questionnaires and assigned correct and incorrect categories to respondent-assigned meanings. One coder analyzed approximately 70% of completed questionnaires, a second coder analyzed

about 25% of completed questionnaires, and a third coder analyzed about 5% of completed questionnaires. All three coders were masters-level students at the University of Michigan's School of Information of Library Studies who were in their last or next-to-last semester in a 36-credit master's degree program.

The Michigan project team determined the extent of agreement between the two coders who coded a total of 95% of completed questionnaires. We selected six completed questionnaires. These questionnaires enumerated eight different subject headings in all contexts and orders. The first coder analyzed these six questionnaires and assigned correct and incorrect codes to respondents' meanings. The first coder compared her codes to codes assigned by the second coder and figured inter-coder reliability scores for simple and specific correct and incorrect codes. The first and second coders agreed on 96% (46 of 48) of simple correct and incorrect codes. The two simple codes on which they disagreed were for the subject headings "Organ music—17th century—Interpretation (phrasing, dynamics, etc.)" and "Locomotives—Germany—History." In both cases, the first coder deemed the respondent-assigned meaning incorrect and the second coder deemed it correct. The respondent-assigned meaning for former was "everything you ever wanted to know about 17th century organ music." The presence of the phrase "everything you wanted to know" was not sufficiently specific in describing the meaning of this subject heading and was instrumental in making the first coder decide to judge this meaning incorrect. The respondent-assigned meaning for latter was "history of trains in Germany." The respondent's use of the broader term "trains" to represent heading word "locomotives" was instrumental in the first coder's decision to deem this meaning incorrect. The specific codes that the two coders assigned to the "Organ music" heading were LMO (Left out More than One Concept) and CDL (Correct, Different Language). The specific codes that the two coders assigned to the "Locomotives" heading were RIC (Read in One Concept) and CDL (Correct, Different Language).

The two coders assigned the same specific codes to 81% (39 of 48) of subject headings. Thus, they differed about the specific codes for only nine of the total

48 subject headings that they examined. Two of these cases were the two cases discussed above in which coders disagreed on simple codes, and, thus, they disagreed on the assignment of specific codes. For the remaining seven cases, coders agreed on the simple code (three correct and four incorrect meanings) but they gave respondent-assigned meanings different specific correct or incorrect categories. Here were examples of their conflicting correct and incorrect categories. Coders agreed that the respondent-assigned meaning "Food prepared or eaten by American Indians/Native Americans who live in New Mexico" for the subject heading "Indians of North America—New Mexico—Food" was correct but the first coder assigned the specific RMO (Read in More Than One Concept) code and the second coder assigned the specific RIC (Read in One Concept) coder. The terms "prepared or eaten" and "Native Americans" were the additional concepts that made the first coder assign the RMO code. Coders agreed that the respondent-assigned meaning "poetry (modern and old English)" for the reordered subject heading "English poetry—Modernized versions—Old English, ca. 450–1100" was incorrect but the first coder assigned the specific LMO (Left out More Than One Concept) category and the second coder assigned the specific IDS (Incorrect, Different Syntax) code. For the remaining two incorrect meanings on which coders disagreed, they differed with respect to whether respondents had left out one or more concepts.

Coders could assign a second specific code to describe the nature of correctness or incorrectness of respondent-assigned meanings. The second coder assigned a total of five additional codes to meanings. The first coder agreed with two of the additional codes; she did not assign an additional code to the three remaining meanings to which the second coder assigned an additional code.

Generally, the two coders who analyzed the vast majority of questionnaires demonstrated a high level of inter-coder consistency. High levels of consistency for simple codes (94%) and specific codes (81%) confirmed the reliability of coded data for respondent-assigned meanings that the Michigan project team subsequently submitted to the statistical analysis.

2.8 Summary

This chapter described the methods that the Michigan project team used in the study. One co-principal investigator secured the participation of three public libraries in southeastern lower Michigan: (1) Flint Public Library, (2) Bacon Memorial District Library, Wyandotte, Michigan, and (3) Livonia Public Library. Brief descriptions about the libraries and the populations they serve were provided (section 2.1).

Project staff selected a total of 24 subdivided subject headings (Table 2.1) from lists of frequently-occurring subdivided subject headings in the OCLC Online Union Catalog. Staff deliberately chose subject headings that were likely and not likely to change in meaning because they wanted to find out whether respondents would notice such changes. Staff divided the 24 subject headings into three groups of eight unique subject headings. For each set of eight subject headings, six versions of questionnaires were needed to list subject headings in the three contexts and two orders. Section 2.3 gives details on questionnaire formulation.

The six versions of questionnaires for the set of subject headings 1–8 were distributed to children and adults at Flint Public Library. Bacon Memorial Library users gave meanings to the second set of subject headings 9–16 and Livonia Public Library users gave meanings to the third set of subject headings 17–24. Michigan project team members traveled to these libraries and asked children and adults who were entering the library to take part in the study by completing a questionnaire. Although data collection procedures at the three Michigan libraries were similar from library to library, section 2.4 describes a few differences between libraries. Professional reference librarians and technical services librarians were given the same three sets of questionnaires that were distributed to children and adults in Michigan libraries (section 2.5). We used three approaches to recruiting professional staff: (1) recruiting staff at the three participating libraries, (2) contacting colleagues at libraries throughout the country who recruited professional staff at their libraries, and (3) recruiting volunteers directly through an announcement on various listservs. For every

version of the questionnaires, we sought eight children, eight adults, eight reference, and eight technical services librarians to give meanings to subject headings.

A single librarian with over 25 years experience in LC subject heading practice gave meanings to the 24 subject headings in the three contexts and two orders (section 2.6.1). Project staff compared this expert's meanings to the meanings of a second expert with comparable job responsibilities and cataloging experience (section 2.6.2). In every case, the second expert's responses were correct as compared to the responses of the first expert. There were differences in language and syntax but, overall, the second expert gave responses that would be considered correct responses.

A team of three coders compared respondent-assigned meanings to expert-supplied meanings and chose between two simple codes ("Correct" or "Incorrect") and several specific codes that described correct and incorrect meanings (section 2.7). Specific codes for correct meanings were "Correct" (C), "Correct, Different Language" (CDL), "Correct, Different Syntax" (CDS), "Read in One Concept" (RIC), "Read in More Than One Concept" (RMO), and combinations of two specific correct codes. Specific codes for incorrect meanings were "Incorrect, Different Syntax" (IDS), "Left out One Concept" (LOI), "Left out More Than One Concept" (LMO), "Read in One Concept" (RIC), "Read in More Than One Concept" (RMO), Blank, and combinations of two specific incorrect codes. An inter-coder reliability test demonstrated a high level of inter-coder consistency (section 2.7.5). High levels of consistency for simple codes (94%) and specific codes (81%) confirmed the reliability of coded data for respondent-assigned meanings that the Michigan project team subsequently submitted to the statistical analysis.

3 Participants and Expert-supplied Meanings in the Study

3.1 Data Collection Goals

At each of the three participating libraries, data collection goals were to recruit eight children and eight adults to provide meanings for the eight subject headings listed on each version of questionnaires (section 2.4). Since six versions of the questionnaire were required to display the eight subject headings in three contexts and two orders, we needed to recruit 48 children and 48 adults per participating library. Interviewers were successful in their recruitment efforts.

The Michigan project team enlisted several strategies to recruit reference and technical services librarians (section 2.5). Goals for recruiting librarians were the same as the goals for recruiting children and adults. We needed to recruit eight reference librarians and eight technical services librarians to provide meanings for the eight subject headings listed on each version of questionnaires. Since six versions of the questionnaire were required to display the eight subject headings in three contexts and two orders, we needed to recruit 48 reference and 48 technical services librarians for each of the three sets of questionnaires. Overall, we needed a total of 144 reference librarians and 144 technical services librarians. Unfortunately, we fell a little short of these numbers and recruited 137 reference librarians and 135 technical services librarians.

3.2 Characteristics of Participating Patrons

Table 3.1 shows the percentages of males and females who completed questionnaires at the three participating public libraries. (Totals in this table and

in other tables in section 3.2 did not add to 48 or 96 because some patrons did
not fill in the particular question on their questionnaires.)

Table 3.1. Library Patrons' Gender

Gender	Flint		Wyandotte		Livonia		Total	
	No.	%	No.	%	No.	%	No.	%
Female	62	65.	57	59.	74	78.	193	67.
Male	33	35.	39	41.	21	22.	93	33.
Total	95	100.	96	100.	95	100.	286	100.

Overall, the majority (67%) of participating library patrons were female. The
largest percentage of participating males came from Wyandotte where 41% of
respondents were male.

Table 3.2. Adults' Ages

Age	Flint		Wyandotte		Livonia		Total	
	No.	%	No.	%	No.	%	No.	%
18–20	8	17.	5	10.	3	7.	16	12.
21–30	6	13.	9	19.	2	4.	17	12.
31–40	10	22.	14	29.	7	15.	31	22.
41–50	14	30.	14	29.	9	20.	37	26.
51–60	4	9.	4	9.	10	22.	18	13.
Over 60	4	9.	2	4.	15	32.	21	15.
Total	46	100.	48	100.	46	100.	140	100.

Table 3.2 shows ages reported by adult library patrons. At Flint and
Wyandotte, about half of adults were eighteen to 40 years old. At Livonia,
only 26% were in this age range. Over half of Livonia's library patrons were
fifty years old or older. At Flint and Wyandotte, only 18% and 13% of adults
were in this age range.

Table 3.3. Children's Ages

Age	Flint		Wyandotte		Livonia		Total	
	No.	%	No.	%	No.	%	No.	%
Less than 12	7	15.	6	13.	3	6.	16	11.
12	10	21.	2	4.	7	15.	19	13.
13	7	15.	11	23.	9	19.	27	19.
14	6	12.	2	4.	4	8.	12	8.
15	4	9.	4	8.	13	27.	21	15.
16	9	19.	10	21.	5	10.	24	17.
17	4	9.	13	27.	7	15.	24	17.
Total	47	100.	48	100.	48	100.	143	100.

Table 3.3 shows children's ages. At Flint, a little over a third of children were aged twelve years or less. At Wyandotte and Livonia, 17% and 21% of children were aged twelve years or less, respectively. About half of Wyandotte children were sixteen or seventeen years old. Overall, all but one age category (14 years old) registered double-digit percentages.

Table 3.4. Amount of Education Reported by Adults

Amount of Education	Flint		Wyandotte		Livonia		Total	
	No.	%	No.	%	No.	%	No.	%
Junior high	2	4.	0	0.	0	0.	2	1.
Senior high	6	12.	12	25.	2	4.	20	14.
Some college	19	40.	14	29.	14	29.	47	33.
College degree	21	44.	22	46.	32	67.	75	52.
Total	48	100.	48	100.	48	100.	144	100.

Table 3.4 shows the amount of education reported by adult library patrons. Overall, small percentages (1% and 14%) of adults patrons had completed only junior high school or senior high school. About one-third of respondents

had completed some college. Overall the majority of respondents held college degrees. The largest percentage (67%) of adult library patrons who had a college degree came from Livonia.

Table 3.5. Amount of Education Reported by Children

Amount of Education	Flint		Wyandotte		Livonia		Total	
	No.	%	No.	%	No.	%	No.	%
Elementary	21	46.	13	30.	17	37.	51	38.
Junior high	25	54.	25	58.	27	59.	77	57.
Senior high	0	0.	5	12.	1	2.	6	4.
Some college	0	0.	0	0.	1	2.	1	1.
Total	46	100.	43	100.	46	100.	135	100.

Table 3.5 shows the amount of education reported by children. Overall, 38% of children had completed elementary school and 57% had completed junior high school. Very small percentages of respondents had completed senior high school (4%) or had had some college (1%).

Questionnaires allowed library patrons to write down a word or phrase that described their profession. Table 3.6 consolidates their descriptions into broad categories such as art professions, business professions, tradespersons, and sales.

Table 3.6. Library Patrons' Professions

Jobs, professions, etc.	No.	%
Students	124	43.
Not reported	46	16.
Retired	21	7.
Education, e.g., teachers, counselors, teacher-aides, professors, social scientists	21	7.
Homemakers	14	5.
Science, technology, and computer fields, e.g., computer programmers, engineers, scientists, systems analysts	11	4.

Tradespersons, e.g., autoworkers, electricians, maintenance workers, cooks	10	4.
Health, e.g., caregivers, nurses, pharmacists, occupational therapists	8	3.
Art and literature, e.g., artists, designers, curators, writers	8	3.
Sales	7	2.
Secretaries or clerks	6	2.
Business, e.g., accountants, human resource managers, marketing, service manager	6	2.
Other, e.g., ministers, supervisors, postal workers, self-employed, city government	6	2.
Total	288	100.

Library patrons used over 50 words and phrases to describe their job or profession. Table 3.6 consolidates jobs and professions into about a dozen categories. The largest percentage (43%) of library patrons were students. Exactly 16% of respondents did not write down their profession. A little over seven percent were retired. Another seven percent were involved in education. Each of the remaining categories accounted for less than five percent of library patrons.

Table 3.7. Frequency of Library Use

Library Use	Flint		Wyandotte		Livonia		Total	
	No.	%	No.	%	No.	%	No.	%
Daily	9	9.	5	5.	4	4.	18	6.
Weekly	32	33.	39	41.	40	42.	111	39.
Monthly	37	39.	37	39.	37	39.	111	39.
2 to 3 times/yr.	15	16.	13	13.	11	11.	39	13.
< 2 times/yr.	3	3.	2	2.	4	4.	9	3.
Total	96	100.	96	100.	96	100.	288	100.

Table 3.7 shows the frequency of library use by both adults and children. At all three libraries, patrons visited the library on a weekly or monthly basis.

3.3 Characteristics of Participating Librarians

The Michigan project team used three approaches to recruiting professional staff: (1) recruiting staff at the three participating libraries, (2) contacting colleagues at libraries throughout the country who recruited professional staff at their libraries, and (3) recruiting volunteers directly through an announcement on various listservs. Since we did not mark questionnaires with control numbers, we could not determine the identity of participating librarians. Our announcements stressed our desire to limit respondents to holders of degrees from accredited library schools. All respondents who responded to listserv announcements and contacted us through electronic mail messages volunteered the names of their library schools and the dates that they graduated. We did not keep track of individual responses but instead used this information as a check to make sure that librarians had received degrees from institutions with library and information studies schools. Respondents recruited through personal contacts were instructed to distribute questionnaires to their professional library staff.

Postmarks on returned envelopes bearing completed questionnaires came from libraries throughout the United States, Canada, and from libraries at American military and foreign services posts around the world. We also had large returns from libraries at the Ohio State University, University of Michigan (Ann Arbor and Dearborn), Columbia University, Southwest Missouri State University, University of Tennessee, and Yale University where our colleagues volunteered to distribute questionnaires to their professional reference and technical services staff. Table 3.8 shows that over three-quarters of recruited reference and technical services librarians were female.

Table 3.9 shows the ages of participating librarians. About 85% of participating librarians were 31 to 60 years old. Percentages in each age category were about the same for reference and technical services librarians. (Totals in Table 3.9 did

not add to 137 and 135 in columns for responses by reference and technical services librarians because a few librarians did not fill in the particular question on their questionnaires.)

Table 3.8. Gender of Participating Librarians

Gender	Reference		Technical services		Total	
	No.	%	No.	%	No.	%
Female	107	78.	106	78.	213	78.
Male	30	22.	29	22.	59	22.
Total	137	100.	135	100.	272	100.

Table 3.9. Ages of Participating Librarians

Ages	Reference		Technical services		Total	
	No.	%	No.	%	No.	%
21–30	16	12.	11	8.	27	10.
31–40	35	26.	40	30.	75	28.
41–50	48	36.	49	36.	97	36.
51–60	31	23.	29	22.	60	23.
over 60	4	3.	5	4.	9	3.
Total	134	100.	134	100.	268	100.

3.4 Characteristics of Expert-supplied Meanings

One technical services librarian with many years of experience in subject cataloging assigned meanings to the 24 subject headings in the study (section 2.6.1). The Michigan project team used the meanings supplied by this single subject cataloging expert to analyze all questionnaires completed by adults, children, reference and technical services librarians. The meanings supplied by this expert were not always the same for the two orders of subdivisions and the three contexts of subject headings. In fact, the meanings for only five of the 24 subject headings were the same across the two orders and three contexts. Table

3.10 lists subject headings in original and recommended orders and the expert-supplied meanings of the subject headings.

Table 3.10. Subject Headings and Meanings (no meaning change)

Subject headings	Expert-supplied meanings
4. Music—Philosophy and aesthetics—500–1400 (original); Music—500–1400 Philosophy and aesthetics (recommended)	philosophy and aesthetics of music for the time period 500–1400
14. English poetry—Old English, ca. 450–1100—Modernized versions (original); English poetry—Modernized versions—Old English, ca. 450–1100 (recommended)	modernized versions of old English (ca. 450–1100) poetry
17. Cattle—United States—Marketing (original); Cattle—Marketing—United States (recommended)	marketing of cattle in the United States
18. Combined sewers—Illinois—Chicago metropolitan area—Overflows (original); Combined sewers—Overflows—Illinois—Chicago metropolitan area (recommended)	overflows of combined sewers in the Chicago (Ill.) metropolitan area
23. Education—California—Finance (original order); Education—Finance—California (recommended)	finance of education in California

The meanings for only four of the 24 subject headings were different for the two orders and the same for the three representations. Table 3.11 lists the two subject headings in original and recommended orders and expert-supplied meanings.

Meanings for nine subject headings varied across the two orders and one or more of the three contexts of subject headings. This meant that meanings could be the same for the two orders of subject headings and different for one or more contexts of subject headings or visa versa. Table 3.12 gives an example of such a subject heading.

Table 3.11. Subject Headings and Meanings

(meaning change for the two different orders of subdivisions)

Subject headings	Order of Subdivisions	Expert-supplied meanings
2. Jews—Michigan—Detroit—History—20th century	Original	20th century history of Detroit (Mich.) Jews
2. Jews—History—Michigan—Detroit—20th century	Recommended	history of 20th century Detroit (Mich.) Jews
7. Education—United States—Finance	Original	finance of U. S. education
7. Education—Finance—United States	Recommended	finance of education in the U. S.
12. Organ music—17th century—Interpretation (phrasing, dynamics, etc.)	Original	interpretation (phrasing, dynamics, etc.) of 17th century organ music
12. Organ music—Interpretation (phrasing, dynamics, etc.)—17th century	Recommended	17th century interpretation (phrasing, dynamics, etc.) of organ music
19. Art, Modern—20th century—Public opinion	Original	public opinion of 20th century modern art
19. Art, Modern—Public opinion—20th century	Recommended	20th century opinion of modern art

Table 3.12. Different Meanings for Orders and Contexts

(subject heading #5)

Subject headings	Context	Expert-supplied meanings
Indians of North America—Food—New Mexico (original order)	alone, bibliographic record, alphabetical list	foods of Indians of New Mexico
Indians of North America—New Mexico—Food (recommended order)	alone	foods of Indians of New Mexico
Indians of North America—New Mexico—Food (recommended	bibliographic record, alphabetical	New Mexican food of the Indians of North America

order)	list	

In this case, the meanings for the subject heading in its original order were the same, i.e., "foods of Indians of New Mexico." Two meanings were possible for this heading in the recommended order of subdivisions depending upon the particular context of the subject heading. The meanings of the nine subject headings that differed based on context or order of subdivisions are listed in Appendix J.

Meanings for the remaining six subject headings not only varied across the two orders of subdivisions and one or more of the three contexts of subject headings, but there were two meanings for one particular order and context of the subject heading. Table 3.13 lists one such subject heading.

Table 3.13. Multiple Meanings for Orders and Contexts

(subject heading #3)

Subject headings	Representation	Expert-supplied meanings
Locomotives—Germany—History (original order)	alone, bibliographic record	history of locomotives in Germany
Locomotives—History—Germany (original order)	alphabetical list	German history of locomotives
Locomotives—Germany—History (recommended order)	alone	history of locomotives in Germany
Locomotives—Germany—History (recommended order)	bibliographic record, alphabetical list	German history of locomotives, or history of locomotives where histories are held in German repositories

There were a total of three meanings for the "Locomotives" subject heading. Two meanings were possible for this subject heading in its original order of subdivisions and the two meanings depended on the context in which the heading resided. Three meanings were possible for this subject heading in the recommended order of subdivisions. Again, meaning depended on the context in which the subject heading resided. For one order (recommended) and two contexts (bibliographic record and alphabetical list), two meanings were

possible. The meanings of the six subject headings that differed based on order of subdivisions, context, and featured more than one meaning per order and context are listed in Appendix K.

This analysis of the 24 subject headings in the study demonstrated that the meanings of subject headings changed. Meaning changed depending on the order of subdivisions and context in which subject headings resided. One characteristic that indicated subject headings that were likely to change meaning was the order of subdivisions. Of the 72 different orders and contexts for the 24 subject headings in the study, 40 (56%) resulted in a change of meaning. Another characteristic that indicated subject headings that were likely to change meaning was the occurrence of geographical subdivisions in the string. Eighteen of the 24 subject headings in the study featured one or more geographical subdivisions. Of the 54 different orders and contexts for these eighteen headings, 31 (57%) resulted in a change of meaning. Thus, order of subdivisions and presence of geographical subdivisions were likely to be factors that contributed to changes in subject heading meaning. We must caution readers about using these percentages to make conclusions about subdivided subject headings and meaning changes. We deliberately sought subject headings for which a change in meaning was likely because we wanted to determine whether study participants' meanings would also reflect such changes (section 2.2). Only by choosing a random sample of subject headings bearing two or more subdivisions could one determine the extent to which subdivided subject headings change meaning and the role that subdivision order, geographical subdivision, and other features play in meaning changes.

Additionally, subject headings might have more than one meaning. Five subject headings featured multiple meanings and the subdivisions of four of the five headings had been reordered. All but one of the five subject headings featured a geographical element that elicited a second meaning from the subject cataloging expert. This second meaning referred to the disposition of the result of the activity or event described in the subject heading in a

repository or in a collection in the place named by the geographical element. The meanings and subject headings were:

- "Basketball records (kept physically in the U. S.)" for the reordered subject heading "Basketball—Records—United States"

- "History of locomotives—this history held in German repositories" for the reordered subject heading "Locomotives—History—Germany"

- "Regimental histories of World War, 1939–1945, in repositories in Japan" for the subject heading in original order "World War, 1939–1945—Regimental histories—Japan"

- "History and criticism of music in Washington, D. C., repositories" for the reordered subject heading "Music—History and criticism—Washington (D.C.)

3.5   Summary

The Michigan project team met their goal of recruiting 144 children and 144 adults at the three participating libraries (section 3.1). The team fell a little short of these numbers and recruited 137 reference librarians and 135 technical services librarians throughout North America.

Sections 3.2 and 3.3 discussed demographic characteristics about the library patrons and librarians who participated in the study. The majority (67%) of participating library patrons were female. The largest percentage (41%) of males came from Wyandotte. Adults ranged in age from eighteen to over 60 years old. At Flint and Wyandotte, about half of adults were eighteen to 40 years old. At Livonia, over half of adults were 51 to over 60 years old. Over half of adults had a college degree. Children ranged in age from about ten to seventeen years old. Overall, all but one age category for children registered double-digit percentages. Most (95%) children had completed junior high school. A dozen categories described library patrons' professions. Examples were art professions, business professions, tradespersons, and sales. Across the three libraries, patrons visited the library on a weekly or monthly basis. The

majority (78%) of participating librarians were female. About 85% of librarians were 31 to 60 years old.

Section 3.4 discussed expert-supplied meanings for the 24 subject headings. Meanings supplied by the subject cataloging expert were not always the same for the two orders of subdivisions and three contexts of subject headings. In fact, there were several possibilities:

- Meanings were the same across the two orders and three contexts (5 subject headings in the study)

- Meanings were different for the two orders and the same for the three contexts (4 subject headings in the study)

- Meanings were different across the two orders and one or more of the three contexts of subject headings (9 subject headings in the study)

- Meanings were different across the two orders and one or more of the three contexts and there were two meanings for one particular order and context of subject heading (6 subject headings in the study)

The analysis of expert-supplied meanings for the 24 subject headings in the study demonstrated that the meanings of subject headings changed. Meaning changed depending on the order of subdivisions and the context in which subject headings resided. Two characteristics that indicated subject headings that were likely to change meaning were the order of subdivisions and the presence of geographical subdivisions in subject heading strings. The extent to which these characteristics affected the meaning of subject headings could not be determined from the analysis of the subject headings and expert-supplied meanings in this study. We deliberately sought subject headings for which a change in meaning was likely because we wanted to find out whether study participants' meanings would also reflect such changes. Only by choosing a random sample of subject headings bearing two or more subdivisions could one determine the extent to which subdivided subject headings change meaning and the role that subdivision order, geographical subdivision, and other features play in meaning changes.

4 Descriptive and Statistical Analyses of the Meanings Respondents Assign to Subject Headings

4.1 Introduction

In this chapter, we present findings about the correct and incorrect meanings that study participants gave to subdivided subject headings. Descriptive and statistical analyses in this chapter enabled us to draw conclusions about the impact that subdivision order, context, and type of respondent had on meanings of subject headings. Although we collected meanings from adults and children at three libraries in southeastern lower Michigan, we cannot draw conclusions about differences between the library patrons at the three libraries because we gave them different sets of subject headings. We were deliberate about giving different sets of subject headings to library patrons. Only by giving different sets of subject headings to library patrons at the three Michigan libraries could we have included as many subject headings (24) as we did. We could have distributed questionnaires bearing the same eight subject headings to library patrons at the three participating libraries but we did not want to limit the entire study to an analysis of eight subject headings and we did not have the resources to distribute more questionnaires at the three participating libraries.

4.2 A Descriptive Analysis of Correct and Incorrect Meanings

4.2.1 Correct and incorrect Meanings

Figure 4.1 shows the percentages of correct and incorrect meanings for children, adults, reference, and technical services librarians across the three sets of subject headings.

Figure 4.1. Correct and incorrect meanings

across the three subject heading sets
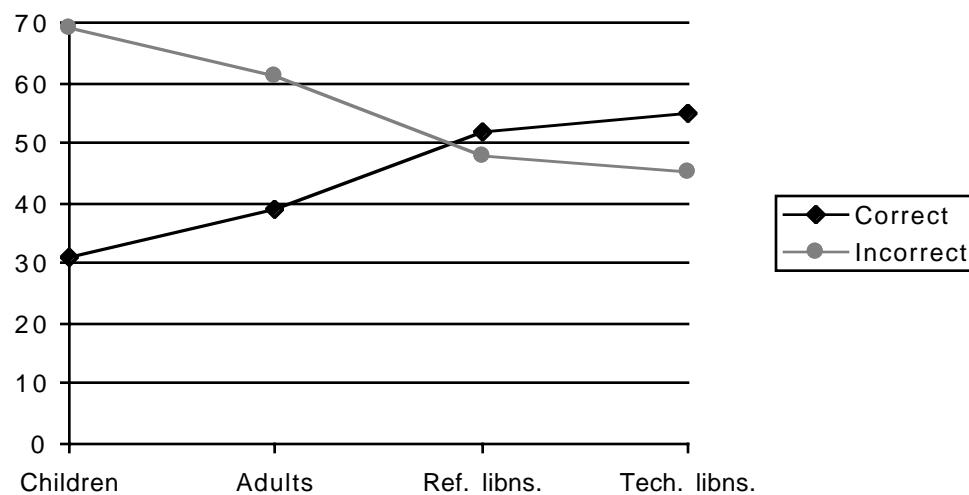
Figure 4.1 shows that percentages of correct meanings were quite different for each of the respondent types. A little under a third of children's meanings were correct. Adults responded to about two-fifths of subject headings with correct meanings. About half of the meanings reference librarians offered were correct. Technical services librarians did the best—a little over than half of the meanings they gave were correct.

Figure 4.2 shows the percentages of correct meanings for the four respondent types and for each of the three sets of subject headings.

Figure 4.2. Correct and incorrect meanings

for each of three subject heading sets
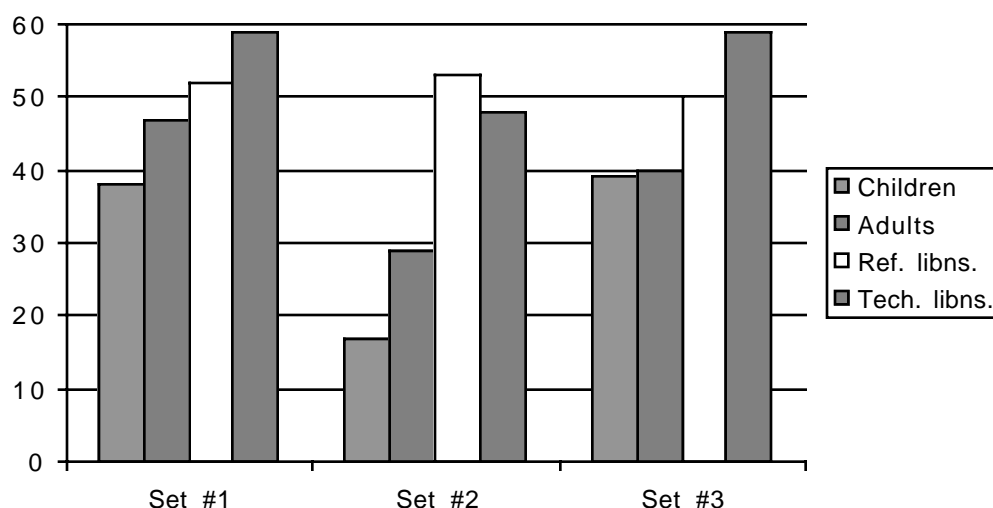
Subject heading set #1 maintained the pattern of lowest percentage of correct meanings for children, and increasingly higher percentages of correct meanings for adults, reference librarians, and technical services librarians. The pattern was not much different for subject heading set #2 except for reference librarians who had a higher percentage of correct meanings than technical services librarians. Figure 4.2 reports low percentages of correct meanings for children and adults for the second set of subject headings—these percentages did not exceed 30%. Perhaps the eight subject headings in set #2 were just harder than the eight subject headings in sets #1 and #3. Set #3 also reflected the pattern of set #1 in which the highest percentage of correct meanings was for technical services librarians, and increasingly lower percentages of correct meanings were for reference librarians, adults, and children; yet, percentages of correct meanings were about the same for children and adults.

4.2.2 Meanings and subdivision order

Figure 4.3 shows percentages of correct meanings for subject headings 1–8 that were given by children and adults at Flint Public Library and by reference and technical services librarians at libraries across North America. The figure

involves two separate sets of percentages for subdivisions in original and recommended orders.

Figure 4.3. Correct meanings for subject headings 1–8
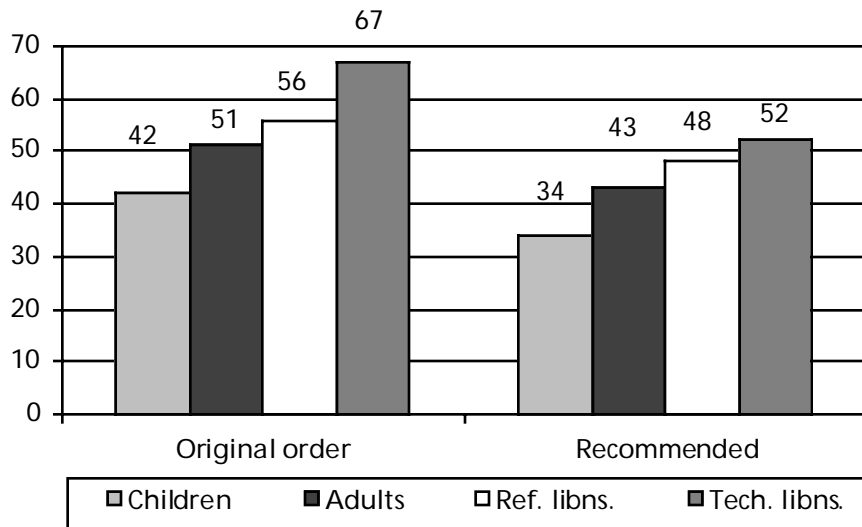
Two things are immediately apparent from a visual check of figure 4.3. First, there were marked differences between the percentages of correct meanings given by the four different types of respondents, that is, the percentages for children were lower than percentages for adults, and percentages for both children and adults were lower than percentages for reference librarians, and percentages for children, adults, and reference librarians were lower than percentages for technical services librarians. Second, there were marked differences between the percentages of correct meanings for headings for the two order of subdivisions. Generally percentages of correct meanings were higher for subject headings in the original than in the recommended order.

Let's take a look at figure 4.4 to see if the same pattern emerged for the second set of subject headings (headings 9–16), that is, differences between types of respondents and for the two orders of subdivisions. Meanings for subject headings 9–16 were given by children and adults at Bacon Memorial District Library and by reference and technical services librarians across North America.

Figure 4.4. Correct meanings for subject headings 9–16
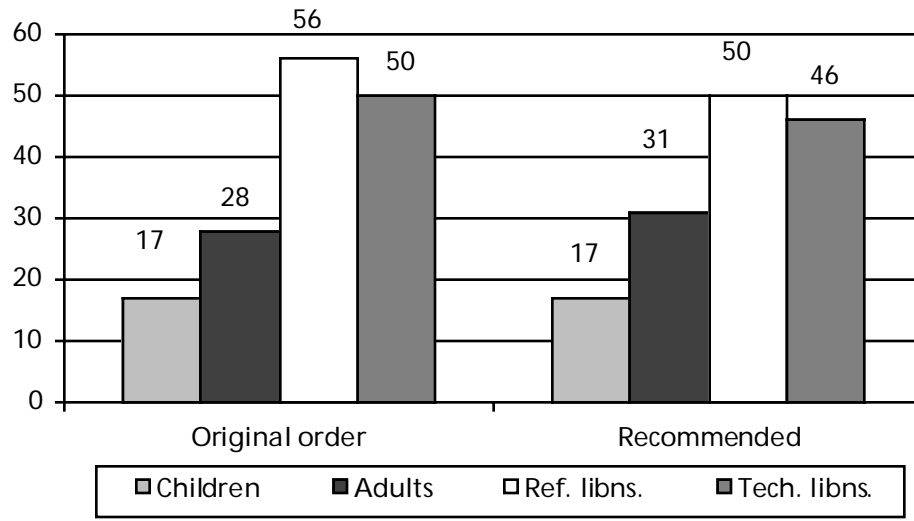
Figure 4.2 presents us with a mixed picture regarding the orders of subdivisions. Percentages were the same (children), they were higher for the recommended order than for the original order (adults), and they were higher for original order than for recommended order (reference and technical services librarians).

Let's now compare the percentages of correct meanings between the two sets of subject headings, i.e., headings 1–8 and headings 9–16. For children, correct responses for the first set of subject headings (1–8) were higher by as many as 17 to 25 percentage points. For adults, correct responses for the first set of subject headings (1–8) were higher by as many as 12 to 23 percentage points. Since these figures came from adults and children who gave meanings to different sets of subject headings, we cannot attribute differences to subject headings or libraries. Reference librarians did quite well in terms of giving correct meanings to both sets of subject headings in their original form; for subject heading sets #1 and #2, 56% of their meanings were correct for subject headings in original and recommended orders. About two-thirds of technical services librarians' meanings were correct for the first set of subject headings in original order. This proportion dropped to half for the second set of subject headings in original order. Technical services librarians did about the same with

respect to formulating correct meanings for the first and second sets of subject headings in recommended order.

Figure 4.5 shows percentages of correct meanings for subject headings 17–24 that were given by children and adults at Livonia Public Library and by reference and technical services librarians across North America.

Figure 4.5. Correct meanings for subject headings 17–24
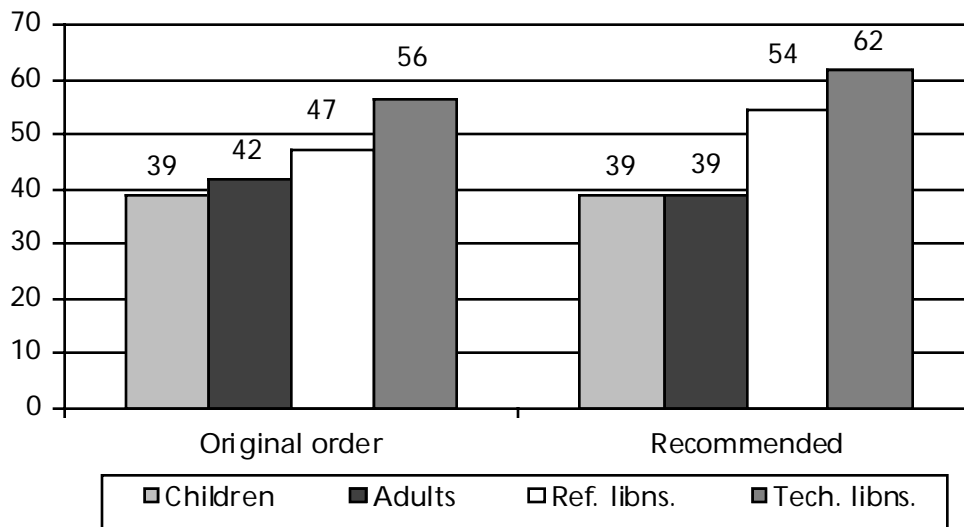
Figure 4.5 presents us with a picture that was similar to figure 4.3 for headings 1–8. Percentages of correct meanings for both children and adults were lower than percentages for reference and technical services librarians, and percentages for reference librarians were lower than percentages for technical services librarians. However, there were differences between the two figures. Children and adults gave about the same percentages of correct meanings for subject headings in both orders of subdivisions. Also, both reference and technical services librarians gave lower percentages of correct meanings for subdivisions in the original order than in the recommended order.

Across the three sets of subject headings, a few patterns were evident with a few exceptions. First, percentages of correct meanings for children were lower than percentages for adults. Second, percentages of correct meanings for both children and adults were lower than percentages for reference and technical

services librarians. Another pattern was evident but it did not occur across the board—percentages for reference librarians were lower than percentages for technical services librarians. One pattern we expected did not occur across the board. Percentages of correct meanings for subject headings in their original order were not always greater than or about equal to the percentages of correct meanings for subject headings in the recommended order.

4.2.3 Meanings and contexts of subject headings

So far, the analysis has only taken into account the different respondent types (children, adults, reference librarians, technical services librarians) and the orders of subdivided subject headings (original and recommended orders). This section adds contexts of subject headings into the mix.

Findings about subject heading contexts were rather consistently inconsistent across the three sets of subject headings. First, we might have expected a pattern to emerge in which adults did better than children in terms of percentages of correct meanings and in which both reference and technical services librarians did better than adults and children. There were seven times when percentages of correct meanings followed such a pattern (alone, set #1, original and recommended orders; alone, set #2, original and recommended orders; bibliographic records, set #2, original order only; alphabetical, set #2, original and recommended orders). At times, one particular type of respondent did much better than expected. Children did better than adults five times (alphabetical, set #1, original order only; alone, set #3, original and recommended orders; bibliographic record, set #3, original and recommended orders). Adults did better than reference librarians four times (bibliographic record, set #1, original and recommended orders; alphabetical, set #3, original and recommended orders). Only once did technical services librarians do worse than children, adults, and reference librarians (alphabetical, set #1, recommended order only).

Second, we might have expected that percentages of correct meanings for subject headings in original order would have been higher than such

percentages in the recommended order. In fact, of the 36 possible comparisons with respect to the three subject heading sets, four respondent types, and three contexts, percentages of correct meanings for subject headings in original order were higher than percentages for subject headings in recommended order in 24 instances (or about two-thirds of instances). There were instances when percentages of correct meanings for subject headings in the recommended order towered above percentages for subject headings in original order. Yet, for the first set of subject headings, all percentages of correct meanings for subject headings in original order were higher or roughly equivalent to the percentages for reordered subject headings. Such a mixed picture made it difficult for us to draw hard-and-fast conclusions about the impact of subject heading context on respondents' ability to formulate correct meanings for subdivided subject headings.

Third, we might have expected that percentages of correct meanings would have been highest for the alone context and lower for the bibliographic record and alphabetical list contexts because respondents would not have been distracted by or likely to read in information from the context in which the heading occurred. For the first set of subject headings, respondents seemed to favor the alone context in terms of giving the highest percentages of correct meanings across the three contexts. For the second and third set of subject headings, a mixed picture emerged in which respondents had both high and low percentages of correct meanings for each of the three contexts.

4.3 A Statistical Analysis of Correct Meanings

4.3.1 Children and adults

To compare the performance of children and adults in terms of assigning correct meanings to subject headings, we submitted collected data to a 4-way analysis of variance (ANOVA) with Library, Type of Respondent, and Context as between-subject factors and with Subdivision Order as a within-subject factor. Table 4.1 summarizes the result of the analysis for main effects. The upper limit for means reported in Table 4.1 was 4.0 because individual

respondents gave meanings to four subject headings in original order and to four subject headings in the recommended order of subdivisions per questionnaire.

Table 4.1. Results of 4-way ANOVA for Correct Meanings

(children vs. adults)

Results for Type of Respondent:		
Children	Mean = 1.24	Standard deviation = 1.18
Adults	Mean = 1.57	Standard deviation = 1.13
H_o: Type of Respondent effect — $F_{(1, 270)}$ = 10.36 — Significance = .001*		
Results for Library:		
Flint	Mean = 1.69	Standard deviation = 1.15
Wyandotte	Mean = 0.95	Standard deviation = 1.06
Livonia	Mean = 1.57	Standard deviation = 1.13
H_o: Library effect — $F_{(2, 270)}$ = 19.82 — Significance = .000*		
Results for Context:		
Alone	Mean = 1.43	Standard deviation = 1.18
Bibliographic record	Mean = 1.27	Standard deviation = 1.17
Alphabetical list	Mean = 1.51	Standard deviation = 1.12
H_o: No Context effect — $F_{(2, 270)}$ = 1.90 — Significance = .152		
Results for Subdivision Order:		
Original order	Mean = 1.45	Standard deviation = 1.19
Recommended order	Mean = 1.36	Standard deviation = 1.13
H_o: No Subdivision Order effect — $F_{(1, 270)}$ = 1.43 — Significance = .234		

Table 4.1 shows two significant main effects: (1) Type of Respondent, and (2) Library. With respect to Type of Respondent, Table 4.1 cites means for children (1.24) and adults (1.57) that varied by a third of a point. The number of correct meanings given by children was significantly lower than the number for adults. The Type of Respondent effect was significant at the .001 level.

With respect to Library, Table 4.1 cites means for respondents at Flint (1.69) and at Livonia (1.57) that were about the same; however, the mean of correct meanings for respondents at Wyandotte (0.95) was about two-thirds of a point lower than the means for respondents at Flint and at Livonia. Since respondents at the three participating libraries examined different sets of subject headings, it was impossible to attribute the effect to the different libraries or the different subject headings enumerated on questionnaires. Thus, no conclusions could be drawn about the significant Library effect because of confounding factors.

Table 4.1 reports no significant effect for Context. This means that Context had no effect on respondents' ability to assign correct meanings. Means for the three contexts were a little different—respondents did best (mean = 1.51) when they assigned meanings to subject headings embedded in alphabetical browsing lists and they did worst (mean = 1.27) when they assigned meanings to subject headings embedded in bibliographic records.

Table 4.1 reports no significant effect for Subdivision Order. Less than a tenth of a point separated the two means of correct meanings for subject headings in the original (1.45) and recommended orders (1.36). Thus, children and adults performed about as well in terms of assigning correct meanings whether they examined subject headings in original order or in the recommended order of subdivisions.

There were no other main effects or interactions that were significant at the .05 level.

4.3.2 Reference and technical services librarians

To compare the performance of reference and technical services librarians in terms of assigning correct meanings to subject headings, we submitted collected data to a 4-way ANOVA with Library, Type of Respondent, and Context as between-subject factors and with Subdivision Order as a within-subject factor.

Table 4.2. Results of 4-way ANOVA for Correct Meanings

(reference vs. technical services librarians)

Results for Type of Respondent:		
Reference	Mean = 2.07	Standard deviation = 1.08
Technical services	Mean = 2.19	Standard deviation = 1.15
H_o: No Type of Respondent effect — $F_{(1, 262)}$ = 1.43 — Significance = .232		
Results for Subject Heading Set:		
Set 1 (headings 1–8)	Mean = 2.23	Standard deviation = 1.13
Set 2 (headings 9–16)	Mean = 2.02	Standard deviation = 1.04
Set 3 (headings 16–24)	Mean = 2.19	Standard deviation = 1.14
H_o: No Subject Heading Set effect — $F_{(2, 262)}$ = 1.51 — Significance = .222		
Results for Context:		
Alone	Mean = 2.28	Standard deviation = 1.10
Bibliographic record	Mean = 1.96	Standard deviation = 1.15
Alphabetical list	Mean = 2.17	Standard deviation = 1.08
H_o: No Context effect — $F_{(2, 262)}$ = 2.99 — Significance = .052		
Results for Subdivision Order:		
Original order	Mean = 2.23	Standard deviation = 1.14
Recommended order	Mean = 2.05	Standard deviation = 1.08
H_o: Subdivision Order effect — $F_{(1, 262)}$ = 5.19 — Significance = .023*		
Results for Subject Heading Set by Subdivision Order:		
Set 1, original	Mean = 2.51	Standard deviation = 1.06
Set 1, recommended	Mean = 1.94	Standard deviation = 1.21
Set 2, original	Mean = 2.11	Standard deviation = 1.04
Set 2, recommended	Mean = 1.92	Standard deviation = 1.05
Set 3, original	Mean = 2.07	Standard deviation = 1.03
Set 3, recommended	Mean = 2.31	Standard deviation = 1.25
H_o: Subdvn. Order by Set interaction — $F_{(2, 262)}$ = 9.62 — Significance = .000*		

Table 4.2 summarizes the result of the analysis for main effects. It also includes statistics for one significant 2-way interaction. The upper limit for means reported in Table 4.2 was 4.0 because individual respondents gave meanings to four subject headings in original order and to four subject headings in the recommended order of subdivisions per questionnaire.

Table 4.2 shows one significant main effect for Subdivision Order, and one significant interaction for Subject Heading Set by Subdivision Order. Let's discuss significant and non-significant effects and interactions in the order in which Table 4.2 presents them.

There was no significant effect for Type of Respondent. Table 4.2 cites means that were a little higher for technical services librarians (2.19) than for reference librarians (2.07) but the difference between the two means was not significant. Table 4.2 cites means for Subject Heading Set. These Sets corresponded to Library in Table 4.1 for the analysis of children and adults. Since we recruited reference and technical services librarians from libraries across North America and sent them questionnaires on a random basis, we could look for an effect called "Subject Heading Set" in the statistical analysis of librarian data. Means did vary for the three subject heading sets with librarians doing worst (2.02) assigning meanings to set 2; however, there was no significant effect for Subject Heading Set. In the data analysis for children and adults (Table 4.1), respondents also scored lowest when assigning meanings to the second set of subject headings.

Table 4.2 reports no significant effect for Context. This meant that Context had no effect on respondents' ability to assign correct meanings. Means for the three contexts were a little different — respondents did best (2.28) when they assigned meanings to subject headings alone and they did worst (1.96) when they assigned meanings to subject heading embedded in bibliographic records. In the data analysis for children and adults (Table 4.1), respondents also scored lowest (1.27) when assigning meanings to subject headings embedded in bibliographic records.

Table 4.2 reports a significant effect for Subdivision Order at the .023 level. Means for correct meanings were 2.23 and 2.05 for subject headings in original and recommended orders, respectively. However, the one significant 2-way interaction involved Order. Figure 4.6 graphs this interaction. It shows means that were higher for subdivisions in original order than for subdivisions in recommended order for two of the three subject heading sets and the opposite for the third subject heading set.

Figure 4.6. Interaction effect for

subdivision order and subject heading set
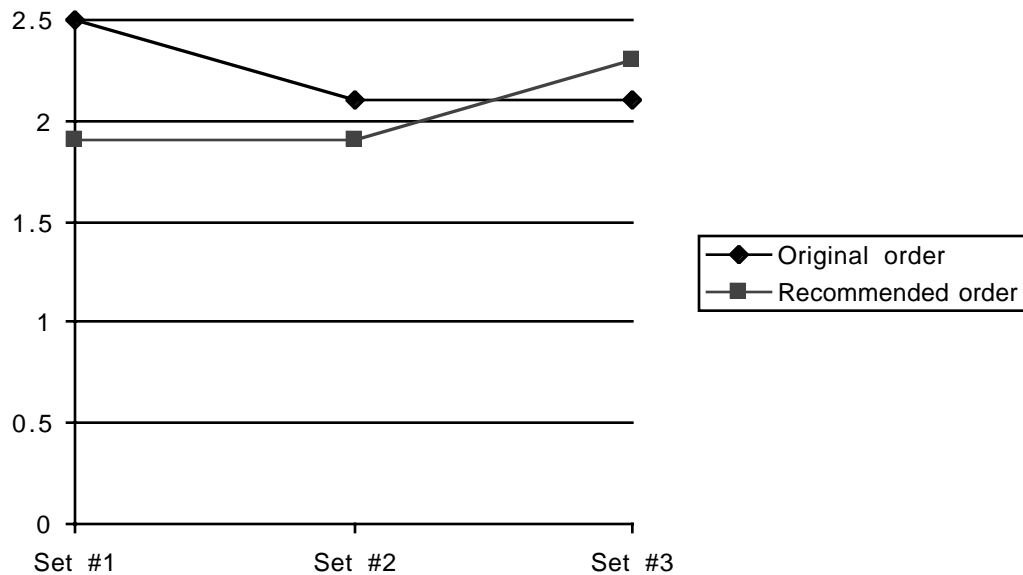
There were two other significant interactions and both involved Subdivision Order: (1) a 3-way interaction for Subject Heading Set by Context by Subdivision Order, and (2) a 4-way interaction for Library by Context by Type of Respondent by Subdivision Order. The three significant interactions involving Subdivision Order clouded the effect of the main effect for Subdivision Order and demonstrated that Subdivision Order depended on certain combinations of Contexts, Type of Respondents, and Subject Heading Sets.

4.4   A Descriptive Analysis of Certainty Scores

4.4.1 Introduction

On questionnaires, respondents wrote down the meaning of eight subject headings. Following each subject heading was the question "How certain are you of the meaning you have given to this phrase?" This question was accompanied by a scale from 1 (not at all certain) to 7 (very certain) where respondents put an "X" or some other mark to designate their certainty about the meanings they gave to subject headings. This section uses descriptive statistics to compare the certainty scores that respondents gave to correct and incorrect meanings.

4.4.2 Children and adults

Children gave certainty scores that averaged 5.05 for *correct* meanings across the three libraries. They gave certainty scores that averaged 4.15 for *incorrect* meanings across the three libraries. Their average certainty score for correct meanings was higher than their average certainty score for incorrect meanings and a little less than one point separated the two scores.

Figure 4.7 shows average certainty scores that children gave to correct and incorrect meanings of subject headings across the three libraries.

Children's certainty scores for correct meanings were higher than their certainty scores for incorrect meanings for the subject headings sets distributed at the three libraries. The difference between certainty scores for correct and incorrect meanings varied by as little as about a half point (Livonia) and as much as about one point (Flint and Wyandotte). Lowest certainty scores were for both correct and incorrect subject headings at Wyandotte. The statistical analysis of correct meanings (Tables 4.1 and 4.2) showed that in addition to children, the three other respondent types had difficulties assigning correct meanings to the subject headings that children were given at Wyandotte. Perhaps the subject headings in this second set were rather difficult subject headings to which to assign meanings.

Figure 4.7. Children's certainty scores
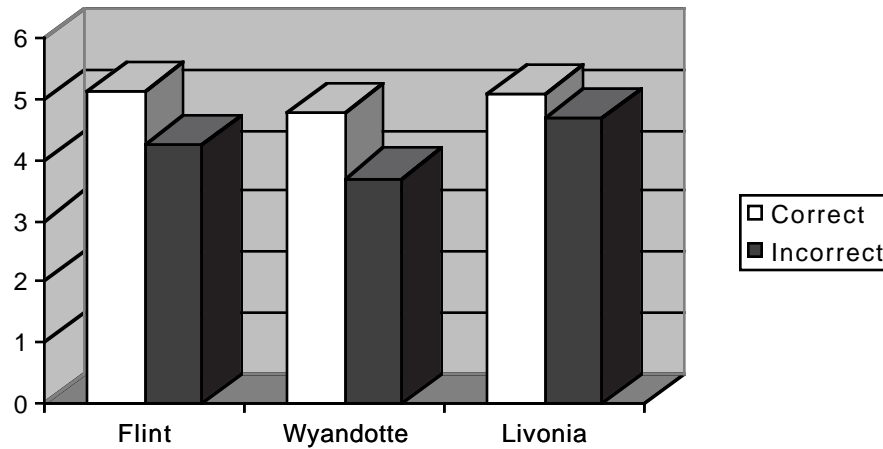
Showing additional figures that graphed certainty scores for the two orders of subdivisions or three contexts of subject headings would reflect the general trend of the certainty scores for correct meanings that were greater than such scores for incorrect meanings. This was not true across the board for certain contexts and orders of subdivisions. For example, there were two instances for subject heading set #2 in which certainty scores of incorrect meanings were greater than the scores of correct meanings. These instances were for subject headings in the alone context and original order of subdivisions, and for subject headings in the alphabetical list context and the recommended order of subdivisions. Across the three subject heading sets, two orders of subdivisions, and three contexts, average certainty scores tied or flip-flopped five times. So, in thirteen of the eighteen instances, average certainty scores for correct meanings exceeded such scores for incorrect meanings.

Adults gave certainty scores that averaged 5.70 for *correct* meanings across the three libraries. They gave certainty scores that averaged 5.08 for *incorrect* meanings across the three libraries. For adults, the average certainty score for correct meanings was higher than the average certainty score for incorrect meanings and about two-thirds of a point separated the two scores. The average certainty scores that adults gave to correct and incorrect meanings were

three-quarters of a point to almost one point higher than the average certainty scores that children gave to correct and incorrect meanings.

Figure 4.8 shows average certainty scores that adults gave to correct and incorrect meanings of subject headings across the three libraries.

Figure 4.8. Adults' certainty scores
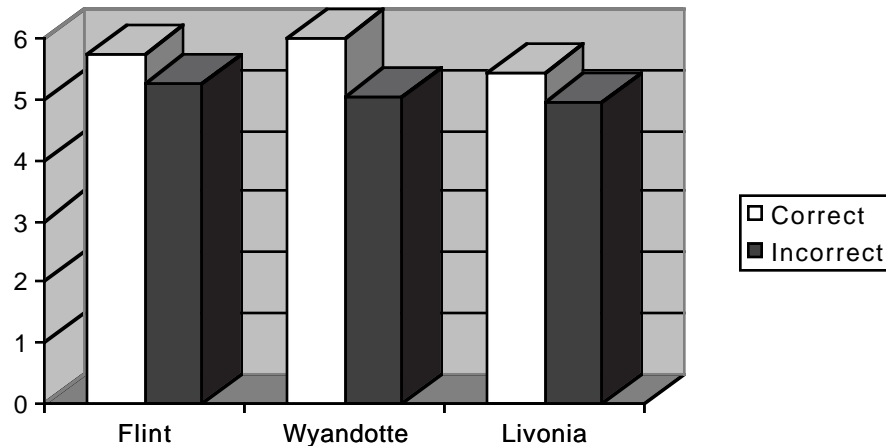
Adults' certainty scores for correct meanings were higher than their certainty scores for incorrect meanings for the subject headings sets distributed at the three libraries. The difference between certainty scores for correct and incorrect meanings varied by as little as about a half point (Flint and Livonia) and as much as about one point (Wyandotte).

Showing additional figures that graph certainty scores for the two orders or three contexts would demonstrate the exact same trend as figure 4.8, that is, average certainty scores for correct meanings were always greater than such scores for incorrect meanings. Sometimes the difference between two scores was very low (thirteen hundredths of a point between certainty scores for subject headings embedded in bibliographic records and in the original order of subdivisions for subject heading set #3). At other times the difference between the two scores exceeded one point (for subject headings embedded in alphabetical browsing lists and in the original order of subdivisions for subject heading set #2).

In the analysis of library patron data, unusually high or low certainty scores were not associated with a particular specific *correct* meaning code. Unusually low certainty scores were almost always associated with *incorrect* LOI ("Left out One Concept") codes and LMO ("Left out More Than One Concept") codes. This is an important finding to keep in mind but the discussion of this finding is featured in the failure analysis (chapter 5) because of the many examples of LOI and LMO meanings given there.

4.4.3 Reference and Technical Services Librarians

Reference librarians gave certainty scores that averaged 5.55 for *correct* meanings across the three sets of subject headings. They gave certainty scores that averaged 5.25 for *incorrect* meanings across the three sets of subject headings. Although the average certainty score for correct meanings was higher than the average certainty score for incorrect meanings, less than a third of a point separated the two scores.

Figure 4.9 shows average certainty scores that reference librarians gave to correct and incorrect meanings of subject headings for the three sets of subject headings.

Figure 4.9. Reference librarians' certainty scores
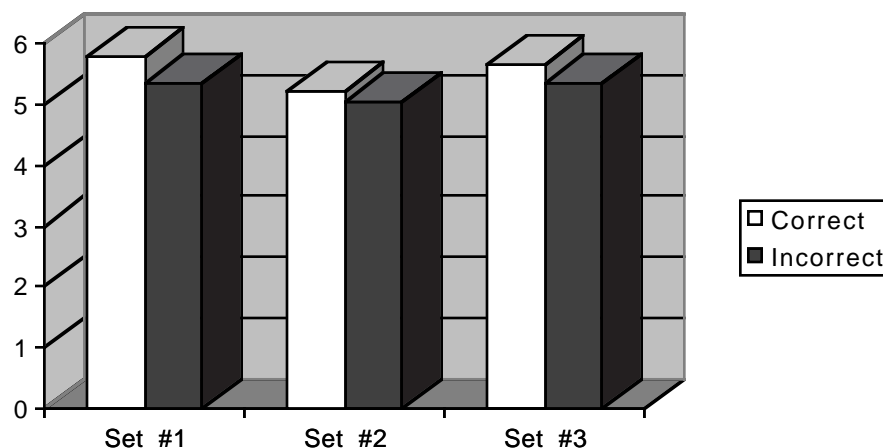
Reference librarians' certainty scores for correct meanings were higher than their certainty scores for incorrect meanings across the subject headings sets. The difference between certainty scores for correct and incorrect meanings was not that great. In fact, less than two-tenths of a point separated certainty scores for the second set of subject headings. Also, reference librarians gave the lowest certainty scores to the second set of subject headings. The statistical analysis (Tables 4.1 and 4.2) showed that in addition to reference librarians, the three other types of respondents had difficulties assigning meanings to the second set of subject headings. Perhaps the subject headings in this second set were rather difficult subject headings to which to assign meanings.

Within the three subject heading sets, the general trend of higher certainty scores for correct meanings and lower certainty scores for incorrect meanings was maintained across the two orders of subdivisions. There was one exception. When reference librarians gave meanings to subject headings in the original order of subdivisions for the second set of subject headings, their certainty scores for incorrect meanings exceeded their certainty scores for correct meanings. The difference between the two average certainty scores, however, was very small (less than one-tenth of a point). Within the three subject heading sets, the general trend of higher certainty scores for correct meanings and lower certainty scores for incorrect meanings was maintained across the three contexts of subdivisions. The few times that certainty scores flip-flopped involved the bibliographic record and alphabetical list contexts. In general, the analysis of reference librarians' certainty scores showed higher certainty scores for correct meanings and lower certainty scores for incorrect meanings and the difference between correct and incorrect scores rarely exceeded one point.

Technical services librarians gave certainty scores that averaged 5.71 for *correct* meanings across the three sets of subject headings. They gave certainty scores that averaged 5.42 for *incorrect* meanings across the three sets of subject headings. The average certainty scores that technical services librarians gave to correct and incorrect meanings were hardly fifteen hundredths of a point higher than the average certainty scores that reference librarians gave to correct

and incorrect meanings. Like reference librarians, technical services librarians gave certainty scores for correct and incorrect meanings for which the difference was less than a third of a point. The average certainty scores that technical services librarians gave to correct and incorrect meanings were about sixteen hundredths of a point higher than the average certainty scores that reference librarians gave to correct and incorrect meanings. Although the difference between certainty scores for the two librarian types was minuscule, technical services librarians' certainty scores were generally higher than reference librarians' certainty scores.

Figure 4.10 shows average certainty scores that technical services librarians gave to correct and incorrect meanings of subject headings for each of the three sets of subject headings.

Figure 4.10. Technical services librarians' certainty scores
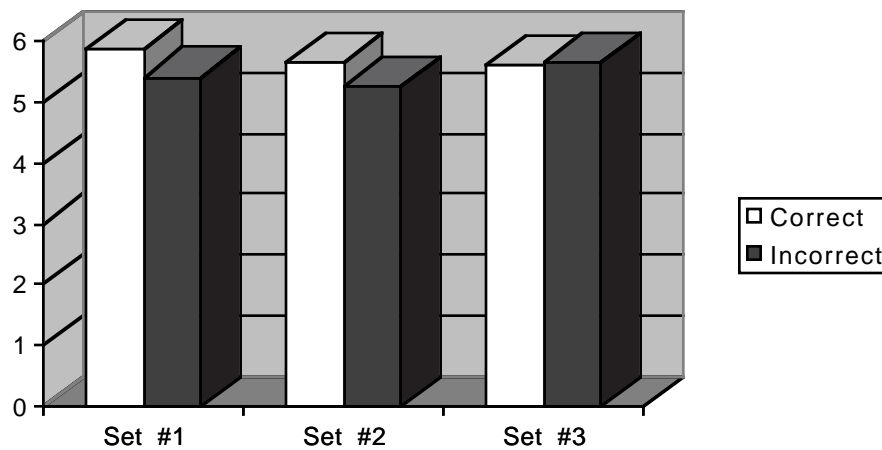
Except for the third set of subject headings, technical services librarians' certainty scores for correct meanings were higher than their certainty scores for incorrect meanings. The difference between certainty scores for correct and incorrect meanings was not that great. In fact, less than a half point separated certainty scores for the first and second set of subject headings. The lowest certainty scores for incorrect meanings were for the second set of subject headings. We have mentioned this second set several times in this chapter.

Since low certainty scores and low percentages of correct meanings were connected with this set, it may now be safe to conclude that this set probably included especially difficult subject headings to which respondents assigned meanings. Technical services librarians gave certainty scores to the third set of subject headings that were about the same for correct and incorrect meanings.

For subject heading sets #1 and #2, separating certainty scores for the various contexts and orders of subdivisions maintained the pattern of higher certainty scores for correct meanings and lower certainty scores for correct meanings. The analysis of certainty scores for subject heading set #3 gave a much different picture. Average certainty scores for incorrect meanings were always higher than such scores for correct meanings for subject headings in the original order. Average certainty scores for correct meanings were always higher than such scores for correct meanings for subject headings in the recommended order. This was a interesting result but it did not occur across the other subject heading sets for any other respondent type.

In the analysis of librarian data, unusually high or low certainty scores were not associated with a particular specific correct or incorrect meaning code. For each subject heading set to which reference or technical services librarians responded, one particular specific incorrect meaning code almost always had an unusually low certainty score but low certainty scores were not associated with the one code across two or more subject heading sets.

4.5   A Statistical Analysis of Certainty Scores

4.5.1 Children and adults

To compare the performance of children and adults in terms of rating the certainty of the meanings they assigned to subject headings, we submitted collected data to a 4-way ANOVA with Library, Type of Respondent, and Context as between-subject factors and with Subdivision Order as a within-subject factor. Table 4.3 summarizes the result of the analysis for main effects. Means could range from one to seven in Table 4.3 because individual

respondents rated the certainty of their meanings on a scale from 1 (not at all certain) to 7 (very certain).

The means cited in Table 4.3 are not comparable to average certainty scores for children and adults reported in section 4.4 because the means in Table 4.3 *combined* certainty scores that adults and children gave to both correct and incorrect meanings. Certainty scores discussed in section 4.4 separated certainty scores into average certainty scores for *correct* meanings and average certainty scores for *incorrect* meanings.

Table 4.3. Results of 4-way ANOVA for Certainty

(main effects for children vs. adults)

Results for Type of Respondent:		
Children	Mean = 4.40	Standard deviation = 1.27
Adults	Mean = 5.30	Standard deviation = 1.04
H_o: Type of Respondent effect — $F_{(1, 269)}$ = 46.79 — Significance = .000*		
Results for Library:		
Flint	Mean = 4.91	Standard deviation = 1.28
Wyandotte	Mean = 4.60	Standard deviation = 1.39
Livonia	Mean = 5.04	Standard deviation = 0.99
H_o: Library effect — $F_{(2, 269)}$ = 3.77 — Significance = .024*		
Results for Context:		
Alone	Mean = 4.77	Standard deviation = 1.26
Bibliographic record	Mean = 4.89	Standard deviation = 1.34
Alphabetical list	Mean = 4.88	Standard deviation = 1.13
H_o: No Context effect — $F_{(2, 269)}$ = 0.45 — Significance = .637		
Results for Subdivision Order:		
Original order	Mean = 4.82	Standard deviation = 1.31
Recommended order	Mean = 4.87	Standard deviation = 1.33
H_o: No Subdivision Order effect — $F_{(1, 269)}$ = 0.72 — Significance = .396		

Table 4.3 shows two significant main effects—Type of Respondent and Library. Children (4.40) gave certainty scores that averaged almost one whole point below adults (5.30). The difference between the two certainty scores was significant, in fact, the Type of Respondent effect was significant beyond the .001 level.

With respect to Library, Table 4.3 cites mean certainty scores for respondents at Flint (4.91) and at Livonia (5.04) that were not much different. Respondents at Wyandotte were less certain about their meanings and gave a certainty score (4.60) that was a little more than a third of a point lower than certainty scores given by Flint and Livonia respondents. Here was more evidence in favor of the idea that the second set of subject headings included especially difficult subject headings.

Table 4.3 reports no significant effect for Context. This meant that Context had no effect on respondents' certainty of their meanings. Means for the three contexts were a little different—respondents were most certain (4.89 and 4.88) when they assigned meanings to subject headings embedded in bibliographic records or alphabetical lists. They were least certain (4.77) when they assigned meanings to subject headings alone. These results were somewhat baffling because respondents did not do well in terms of assigning correct meanings to subject headings when such headings were embedded in bibliographic records (see Table 4.1) and low certainty scores would have been expected for the bibliographic record context. Instead, low scores came from the alone context.

Table 4.3 reports no significant effect for Subdivision Order. In fact, the two mean certainty scores differed by five hundredths of a point. Thus, children and adults were as certain about the meanings they assigned to subject headings in original order as they were about the meanings they assigned to headings in the recommended order of subdivisions.

Table 4.4 reports two interactions that were significant at or beyond the .05 level for the analysis of certainty scores for children and adults. Both significant interactions involved Type of Respondent. The first interaction showed that

adults' mean certainty scores for alone and bibliographic record contexts varied by one and a half points and one points from children's mean certainty scores for alone and bibliographic record contexts, respectively. For the alphabetical list context, the difference between certainty scores for adults and children was much less dramatic—less than a half point. Children were much more certain about the meanings they gave to subject headings in the alphabetical context than in the alone and bibliographic record contexts. In contrast, adults were less certain about the meanings they gave to subject headings in the alphabetical context than in the alone and bibliographic record contexts.

Table 4.4. Results of 4-way ANOVA for Certainty

(significant interactions for children vs. adults)

Results for Type of Respondent by Context:		
Adults, alone	Mean = 5.44	Standard deviation = 0.97
Children, alone	Mean = 4.09	Standard deviation = 1.15
Adults, bib. rec.	Mean = 5.38	Standard deviation = 0.99
Children, bib. rec.	Mean = 4.40	Standard deviation = 1.47
Adults, alpha. list	Mean = 5.07	Standard deviation = 1.12
Children, alpha. list	Mean = 4.69	Standard deviation = 1.11
H_o: Respondent by Context interaction — $F_{(2, 269)}$ = 4.76 — Significance = .009*		
Results for Type of Respondent by Library:		
Adults, Flint	Mean = 5.35	Standard deviation = 1.18
Children, Flint	Mean = 4.46	Standard deviation = 1.24
Adults, Wyandotte	Mean = 5.33	Standard deviation = 1.08
Children, Wyandotte	Mean = 3.87	Standard deviation = 1.29
Adults, Livonia	Mean = 5.22	Standard deviation = 0.83
Children, Livonia	Mean = 4.85	Standard deviation = 1.10
H_o: Respondent by Library interaction — $F_{(2, 269)}$ = 5.29 — Significance = .006*		

The second interaction showed that adults' mean certainty scores did not change very much—they ranged from a low of 5.22 at Wyandotte to a high of

5.35 at Flint. Children's mean certainty scores did show some variation. They were highest at Livonia (4.85) and, as usual, lowest at Wyandotte (3.87).

4.5.2 Reference and technical services librarians

To compare the performance of reference and technical services librarians in terms of rating the certainty of their meanings, we submitted collected data to a 4-way ANOVA with Library, Type of Respondent, and Context as between-subject factors and with Subdivision Order as a within-subject factor.

Table 4.5. Results of 4-way ANOVA for Certainty

(main effects for reference vs. tech. servs. librarians)

Results for Type of Respondent:		
Reference librarians	Mean = 5.43	Standard deviation = 0.93
Tech. servs. librarians	Mean = 5.59	Standard deviation = 0.86
H_o: No Type of Respondent effect — $F_{(1, 254)} = 3.20$ — Significance = .075		
Results for Subject Heading Set:		
Set 1 (headings 1–8)	Mean = 5.59	Standard deviation = 0.94
Set 2 (headings 9–16)	Mean = 5.30	Standard deviation = 0.88
Set 3 (headings 17–24)	Mean = 5.65	Standard deviation = 0.86
H_o: Library effect — $F_{(2, 254)} = 4.53$ — Significance = .012*		
Results for Context:		
Alone	Mean = 5.32	Standard deviation = 0.87
Bibliographic record	Mean = 5.49	Standard deviation = 0.92
Alphabetical list	Mean = 5.74	Standard deviation = 0.87
H_o: Context effect — $F_{(2, 254)} = 5.62$ — Significance = .004*		
Results for Subdivision Order:		
Original order	Mean = 5.62	Standard deviation = 0.98
Recommended order	Mean = 5.40	Standard deviation = 0.93
H_o: Subdivision Order effect — $F_{(1, 254)} = 18.52$ — Significance = .000*		

Table 4.5 summarizes the result of the analysis for main effects and significant interactions. Means could range from one to seven in Table 4.5 because individual respondents rated the certainty of their meanings on a scale from 1 (not at all certain) to 7 (very certain).

The means cited in Table 4.5 are not comparable to average certainty scores for reference and technical services librarians reported in section 4.4 because the means in Table 4.5 *combined* certainty scores that reference and technical services librarians gave to both correct and incorrect meanings. Certainty scores discussed in section 4.4 separated certainty scores into average certainty scores for *correct* meanings and average certainty scores for *incorrect* meanings.

Table 4.5 shows three significant main effects—Subject Heading Set, Context, and Subdivision Order. With respect to the three subject heading sets, Table 4.5 reports higher certainty scores (5.59 and 5.65) for subject heading sets #1 and #3, respectively, and a lower certainty score (5.30) for the second subject heading set. Since the statistical analysis of librarian data did not have the confounding factors of different libraries and sets of subject headings, we have confidence that the low certainty score for the subject heading set #2 gives additional evidence about the difficulty of the subject headings in this set.

Means for the three contexts were a little different—respondents were most certain (5.74) when they assigned meanings to subject headings embedded in alphabetical lists, a little less certain (5.49) when they assigned meanings to subject headings embedded in bibliographic records, and least certain (5.32) when they assigned meanings to subject headings alone. These results were somewhat baffling because librarians did best assigning meanings to subject headings alone (see Table 4.2).

Certainty scores averaged about a quarter of a point higher for correct subject headings in original order than for correct subject headings in the recommended order of subdivisions. The difference between the two certainty scores was significant, in fact, the Subdivision Order effect was significant

beyond the .001 level. However, the one significant interaction that occurred in the analysis involved Subdivision Order.

The only non-significant main effect in Table 4.5 was for Type of Respondent. The difference between mean certainty scores for reference (5.43) and technical services librarians (5.59) was less than two-tenths of a point and it was not significant.

The one significant interaction involved mean certainty scores for the alone and alphabetical contexts that differed by one quarter to one third of a point with the higher scores being certainty scores for subject headings in the original order of subdivisions (Table 4.6).

Table 4.6. Results of 4-way ANOVA for Certainty
(significant interaction for reference vs. tech. servs. librarians)

Results for Context by Subdivision Order:		
alone, original order	Mean = 5.50	Standard deviation = 0.95
alone, rec. order	Mean = 5.14	Standard deviation = 0.97
bib., original order	Mean = 5.50	Standard deviation = 1.02
bib., rec. order	Mean = 5.47	Standard deviation = 0.96
alpha., original order	Mean = 5.87	Standard deviation = 0.85
alpha., rec. order	Mean = 5.61	Standard deviation = 1.04
H_o: Context by Subdivision Order interaction — $F_{(2, 254)} = 3.96$ Significance = .020*		

Mean certainty scores for meanings that respondents gave to subject headings in the bibliographic context were still higher for subject headings in the original than in the recommended order of subdivisions but such scores differed by a mere three hundredths of a point. This analysis demonstrated that respondents were more certain about their meanings for subject headings in the original order of subdivisions than they were for subject headings in the recommended order of subdivisions; however, their certainty was about the same when they

assessed the meanings they gave to subject headings in bibliographic records for the two subdivision orders.

4.6   Summary

Chapter 4 presented findings about the correct and incorrect meanings that study participants gave to subdivided subject headings. A descriptive analysis focused on the percentage of correct and incorrect meanings that respondents gave to subdivided subject headings. A statistical analysis focused on mean correct meanings that respondents gave to the subject headings they saw on questionnaires. Since respondents noted how certain they were about the meanings they gave to subject headings, we also conducted a descriptive analysis of average certainty scores that respondents gave to correct and incorrect meanings and a statistical analysis of the mean certainty scores that respondents gave to correct and incorrect meanings.

The four respondent types varied in terms of the correct meanings they gave to subdivided subject headings (figure 4.1). A little under a third of children's meanings were correct. Adults responded to about two-fifths of subject headings with correct meanings. About half of the meanings reference librarians offered were correct. Technical services librarians did the best—a little over half of the meanings they gave were correct.

Generally, there was a pattern of lowest percentage of correct meanings for children, and increasingly higher percentages for adults, reference librarians, and technical services librarians (figure 4.2). This pattern occurred over and over across the various contexts, subdivision orders, and subject heading sets (sections 4.2.2 and 4.2.3), but, there were notable exceptions. For example, technical services librarians once did worse than children, adults, and reference librarians (alphabetical context, set #1, recommended order only).

A statistical analysis of the correct meanings adults and children assigned to subdivided subject headings resulted in two significant main effects for Type of Respondent and Library (Table 4.1). The mean of correct meanings given

by children (1.40) was significantly lower than the mean for adults (1.57). With respect to the Library effect, the mean for correct meanings for respondents at Wyandotte (0.95) was about two-thirds of a point lower than such means for respondents at Flint (1.69) and at Livonia (1.57). Since respondents at the three participating libraries examined different sets of subject headings, it was impossible to attribute the effect to the different libraries or the different subject headings enumerated on questionnaires. Thus, no conclusions could be drawn about the significant Library effect because of confounding factors.

Significant main effects for Context and Subdivision Order were not found. This meant neither Context nor Subdivision Order had an effect on respondents' ability to assign correct meanings to subject headings. There were no significant interactions as a result of the analysis of library patron data.

A statistical analysis of the correct meanings reference and technical services librarians assigned to subdivided subject headings resulted in one significant main effect for Subdivision Order (Table 4.2). Means for correct meanings were 2.23 and 2.05 for subject headings in original and recommended orders, respectively. However, the three significant interactions involving Subdivision Order clouded the effect of the main effect for Subdivision Order and demonstrated that Subdivision Order depended on certain combinations of Contexts, Type of Respondents, and Subject Heading Sets.

Significant main effects for Type of Respondent, Context, and Subject Heading Set were not found in the analysis of librarian data. The mean for correct meanings given by reference librarians (2.07) was a little lower than the mean for technical services librarians (2.19) but the difference was not significant. Neither Context nor Subdivision Order had an effect on respondents' ability to assign correct meanings to subject headings. The mean for correct meanings (2.02) was lower for subject heading set #2 than for sets #1 (2.23) and #3 (2.19) and this made us wonder whether the subject headings in set #2 were especially difficult to which to assign meanings.

The descriptive analysis of respondents' certainty scores demonstrated that they were less certain of their incorrect meanings than their correct meanings. This finding was evident across the three subject heading sets, two orders of subdivisions, and three contexts. There were a few instances when respondents' certainty scores for incorrect meanings exceeded their scores for correct meanings. When this happened, the difference between the two scores was a fraction of a point.

Children, adults, reference, and technical services librarians were less certain of their incorrect meanings than their correct meanings. Certainty scores that children gave to incorrect (4.15) and correct (5.05) meanings were the lowest of the four respondent types. Certainty scores that technical services librarians gave to incorrect (5.71) and correct (5.42) meanings were the highest of the four respondent types. The difference between certainty scores for incorrect and correct subject headings was greater for children and adults (three-quarters of a point between the two scores) than for librarians (hardly a third of a point between the two scores).

A statistical analysis of the certainty scores adults and children assigned to subdivided subject headings resulted in two significant main effects for Type of Respondent and Library (Table 4.3). Adults (5.30) gave certainty scores that exceeded such scores for children (4.40) by almost one whole point and the difference between the two scores was significant. With respect to Library, the mean certainty score for library patrons at Wyandotte (4.60) was a little more than a third of a point lower than mean certainty scores for library patrons at Flint (4.91) and at Livonia (5.04). Again, the difficulty of the subject headings in set #2 might have been a factor in the low certainty score for Wyandotte patrons. Findings regarding the significant main effects were tempered by two significant interactions which involved Type of Respondent, Library, and Context (Table 4.4). No significant effect was found for context or subdivision order.

A statistical analysis of the certainty scores reference and technical services librarians assigned to subdivided subject headings resulted in three significant

main effects for Subject Heading Set, Context, and Subdivision Order (Table 4.5). Technical services librarians (5.59) gave certainty scores that exceeded such scores for reference librarians (5.43) by hardly sixteen hundredths of a point and the difference between the two scores was not significant. Significant main effects for Context and Subdivision Order were tempered by a significant interaction involving these two factors (Table 4.6).

Librarians gave higher certainty scores (5.59 and 5.65) for subject heading sets #1 and #3, respectively, and a lower certainty score (5.30) for the second subject heading set. Since the statistical analysis of librarian data did not have the confounding factors of different libraries and sets of subject headings, we decided it was now safe to conclude that set #2 probably included especially difficult subject headings. Lower mean correct meanings and certainty scores for both library patrons and librarians could be attributed to the difficulty of the subject headings in set #2.

5 A Failure Analysis of Subject Heading Meanings

5.1 Introduction

So far, analyses have considered only whether respondent-assigned meanings were correct or incorrect. Michigan project team members assigned codes to these meanings to designate not only whether meanings were simply correct or incorrect, but to specify the specific reason or reasons why meanings were correct or incorrect. Section 2.7 described the five specific correct codes and six specific incorrect codes the team members assigned to respondent-assigned meanings. A brief review of correct and incorrect codes is given here.

Five codes were used to describe correct meanings. The "Correct" (C) code was assigned to meanings that were virtually letter-for-letter transcriptions of expert-supplied meanings. If respondents used terminology or syntax that was different from the terminology or syntax that the expert used, team members assigned codes for "Correct, Different Language" (CDL) or "Correct, Different Syntax" (CDS), respectively. If respondents' meanings featured additional concepts, coders assigned the "Read in One Concept" (RIC) or "Read in More Than One Concept" (RMO) code. When the one or more read-in concepts did not change meaning, RIC and RMO were codes for *correct* meanings. Sometimes team members used more than one correct code to describe the nature of respondents' correct meanings.

Coders had at hand six codes to describe incorrect meanings. If respondents used syntax that was different from the syntax of expert-supplied meanings and such syntax resulted in incorrect meanings, team members assigned the

code for "Incorrect, Different Syntax" (IDS). If respondents' meanings featured additional concepts, coders assigned the "Read in One Concept" (RIC) or "Read in More Than One Concept" (RMO) code. When the one or more read-in concepts changed meaning, RIC and RMO were codes for *incorrect* meanings. Coders assigned the "Left out One Concept" (LOI) or "Left out More Than One Concept" (LMO) code when their comparison of the respondent-assigned and expert-supplied meanings revealed that the respondent had omitted one or more concepts. If the coder was unable assign a category to the respondent-supplied meaning using the correct and incorrect categories described above, the respondent's meaning was deemed incorrect and assigned to the "Blank" code. When respondents did not assign meanings to subject headings, coders also assigned the Blank code.

This chapter provides an analysis of the several specific correct and incorrect codes that coders gave to respondent-assigned meanings. In an attempt to find characteristics of subject headings and the particular problems they gave respondents, it gives an account of an in-depth failure analysis of all 24 subject headings in the study.

5.2 Codes for Correct Meanings

Figure 5.1 shows percentages of correct codes for the first set of eight subject headings (1–8). Meanings for these headings were given by children and adults at Flint Public Library and reference and technical services librarians across North America.

Figure 5.1. Codes for correct meanings

for subject headings 1–8

Figure 5.1 does not show striking differences amongst the four response patterns. Codes for "Correct" (C) meanings were higher for adults and children than they were for reference and technical services librarians. Percentages of codes for "Correct, Different Language" (CDL) fell for children and adults but rose for reference and technical services librarians. In fact, percentages for CDL codes were the highest percentages of all the codes for the two librarian types. Codes for "Correct, Different Syntax" (CDS) were higher for children and lower for the three other respondent types. Percentages of the two read-in codes (RIC and RMO) were rather low across the board in comparison to C, CDL, and CDS codes. Very few combinations of codes occurred. Generally, we see a picture of high percentages for three codes, C, CDL, and CDS, with librarians favoring CDL meanings and library patrons favoring C and CDS meanings.

Table 5.1 shows these same data in tabular form for readers interested in exact percentages. Totals for correct codes varied from column to column because totals for incorrect codes were not included in this analysis (see section 5.3).

Table 5.1. Codes for Correct Meanings

for Subject Headings 1–8

Codes	Children		Adults		Ref. libns.		Tech. libns.	
	No.	%	No.	%	No.	%	No.	%
C	39	27.	61	34.	39	20.	49	27.
CDL	37	25.	41	23.	82	41.	73	39.
CDS	66	45.	47	26.	50	25.	44	24.
RIC	1	1.	17	9.	25	13.	13	7.
RMO	1	1.	8	4.	3	1.	6	3.
Combs.	1	1.	7	4.	0	–	0	–
Total	145	100.	181	100.	199	100.	185	100.

Figure 5.2 shows percentages of correct codes for the second set of eight subject headings (9–16). Meanings for these headings were given by children and adults at Bacon Memorial District Library and reference and technical services librarians across North America.

Figure 5.2. Codes for correct meanings

for subject headings 9–16
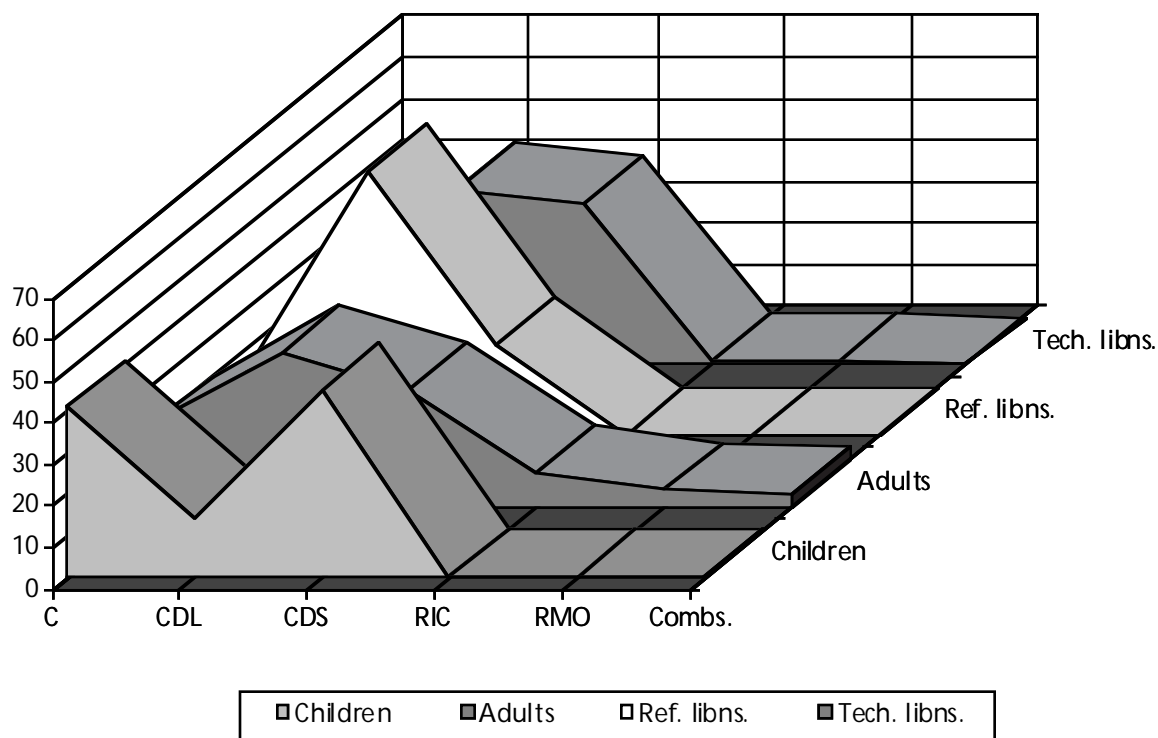
Figure 5.2 shows striking differences amongst the four types of respondents in terms of the three most common correct codes, C, CDL, and CDS. Percentages of codes for C and CDS meanings were especially high for children; in fact, this pattern for children's meanings was quite similar to the pattern for children's meanings for headings 1–8 (figure 5.1). Adults, technical services librarians, and especially reference librarians gave high percentages of CDL meanings, that is, they used different language in their meanings. The percentage of codes for CDS meanings was rather high for technical services librarians. Percentages of the two read-in codes (RIC and RMO) were very low, occurring hardly at all except for adults. Of the four Types of respondents, only adults gave meanings that required combinations of correct codes.

There were some similarities between figures 5.1 and 5.2. Percentages of CDS codes for children were high. Reference and technical services librarians responded with high percentages of CDL codes for the two sets of subject headings. There were also differences. For headings 1–8, the response pattern of adults was similar to the pattern for children. In contrast, for headings 9–16, the response pattern of adults was similar to the pattern for reference and technical services librarians. There were also higher percentages of RIC meanings for headings 1–8 than for headings 9–16; in fact, for headings 9–16, only adults gave meanings that coders judged as RIC meanings.

For readers interested in exact percentages, Table 5.2 shows correct codes for the second set of subject headings (9–16). Totals for correct codes varied from column to column because totals for incorrect codes were not included in this analysis (see section 5.3).

Table 5.2. Codes for Correct Meanings

for Subject Headings 9–16

Codes	Children		Adults		Ref. libns.		Tech. libns.	
	No.	%	No.	%	No.	%	No.	%
C	27	41.	22	20.	28	14.	32	17.
CDL	9	14.	41	37.	126	64.	77	42
CDS	29	45.	31	28.	44	22.	71	39.
RIC	0	–	9	8.	0	–	2	1.
RMO	0	–	5	4.	0	–	2	1.
Combs.	0	–	4	3.	0	–	0	–
Total	65	100.	112	100.	198	100.	184	100.

Figure 5.3 shows percentages of correct codes for the third set of eight subject headings (headings 17–24). Meanings for these headings were given by children and adults at Livonia Public Library and reference and technical services librarians across North America.

Figure 5.3. Codes for correct meanings

for subject headings 17–24
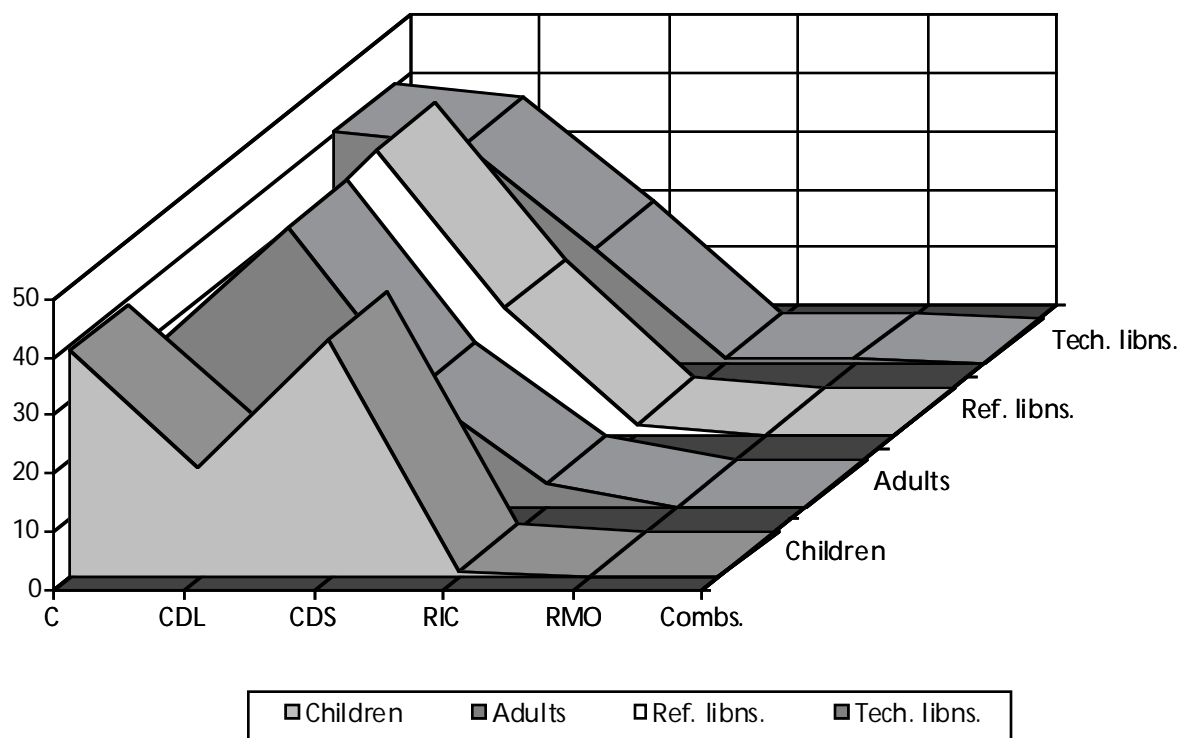
What is immediately apparent in figure 5.3 was the similarity in response patterns between Livonia adults and reference librarians. The response pattern of technical services librarians was somewhat similar to the response pattern of adults and reference librarians but technical services librarians gave meanings that resulted in a high percentage of "Correct" meanings. The response pattern of children was similar to their respective patterns for subject headings 1–8 and 9–16, that is, there were high percentages of both C and CDS meanings. Very few read-in meanings occurred and no combination codes occurred at all.

For readers interested in exact percentages, Table 5.3 shows correct codes for the third set of subject headings (headings 17–24). Totals for correct codes varied from column to column because totals for incorrect codes were not included in this analysis (see section 5.3).

Table 5.3. Codes for Correct Meanings

for Subject Headings 17–24

	Children		Adults		Ref. libns.		Tech. libns.	
Codes	No.	%	No.	%	No.	%	No.	%
C	58	39.	43	28.	46	27.	91	40.
CDL	28	19.	74	48.	82	49.	86	38.
CDS	62	41.	32	20.	37	22.	46	20.
RIC	2	1.	6	4.	4	2.	1	1.
RMO	0	–	0	–	0	–	1	1.
Combs.	0	–	0	–	0	–	0	–
Total	150	100.	155	100.	169	100.	225	100.

Children gave "Correct" meanings that were letter-for-letter matches of expert-supplied meanings or they gave correct meanings that were correct but used different syntax than expert-supplied meanings (CDS meanings). In fact, all three figures 5.1 to 5.3 showed peaks for C and CDS meanings and valleys for CDL meanings and read-in meanings. For the first set of subject headings, Adults responded in the same way as children did.

The response patterns of reference librarians were rather similar across the three sets of subject headings. They had high percentages of CDL meanings, lower percentages of C meanings, and even lower percentages of CDS meanings. Percentages of CDL meanings were always the highest, leading us to conclude that reference librarians were likely to use their own language to describe the correct meanings of subdivided subject headings. With respect to the second and third sets of subject headings, the response patterns of adults were more similar to reference librarians than they were to children, that is, with high percentages of CDL meanings and somewhat lower percentages of C and CDS meanings. Only adults were likely to read in concepts when providing correct meanings of subdivided subject headings but percentages of read-in codes were very low, even for the third set of subject headings where they accounted for only 8% of the total meanings.

The response patterns of technical services librarians for the three sets of subject headings were somewhat different from one another. If there was a similarity, it was the high percentages of CDL meanings across the three subject heading sets. But a large percentage of "Correct" meanings occurred (third heading set) and a large percentage of CDS meanings also occurred (second heading set). Like the other three types of respondents, technical services librarians gave few correct meanings for which coders assigned read-in or combination codes. Response patterns of technical services librarians were not at all like the response patterns of children. Their response patterns were comparable to reference librarians (headings 1–8) or adults (headings 9–16) but they were also different from the three other types of respondents (headings 17–24).

5.3 Codes for Incorrect Meanings

Figure 5.4 shows percentages of incorrect codes for the first set of eight subject headings (1–8). Meanings for these headings were given by children and adults at Flint Public Library and reference and technical services librarians across North America.

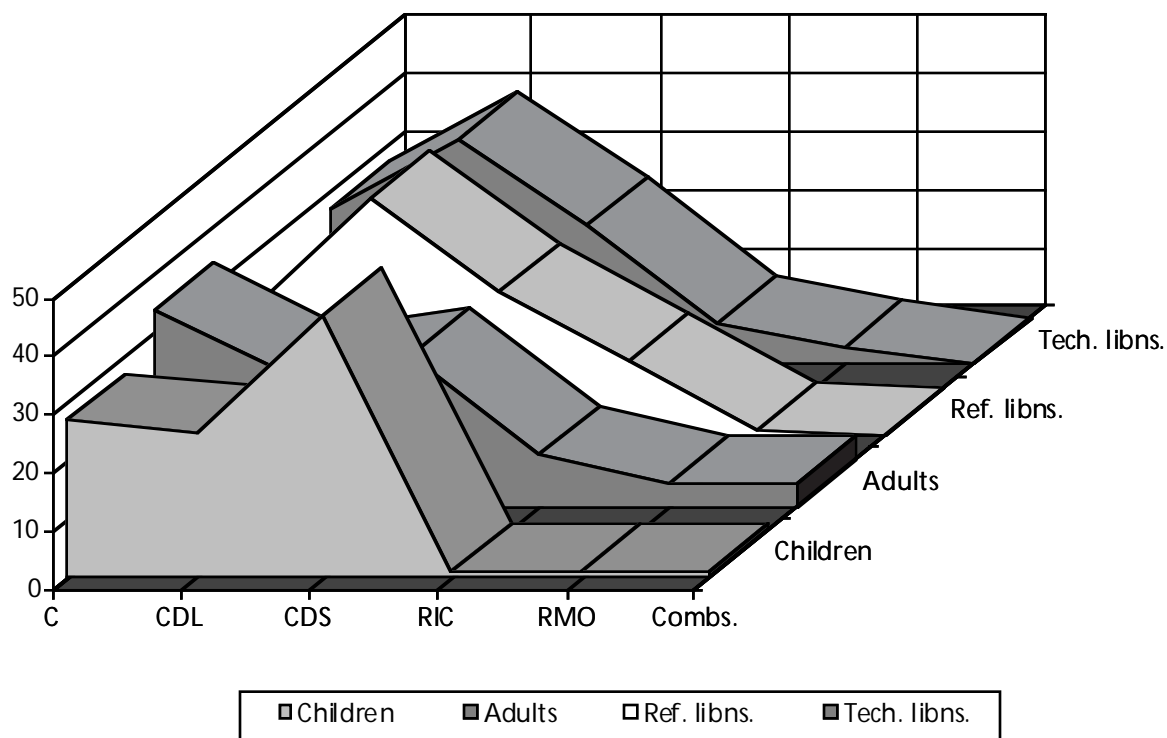Figure 5.4. Codes for incorrect meanings

for subject headings 1–8
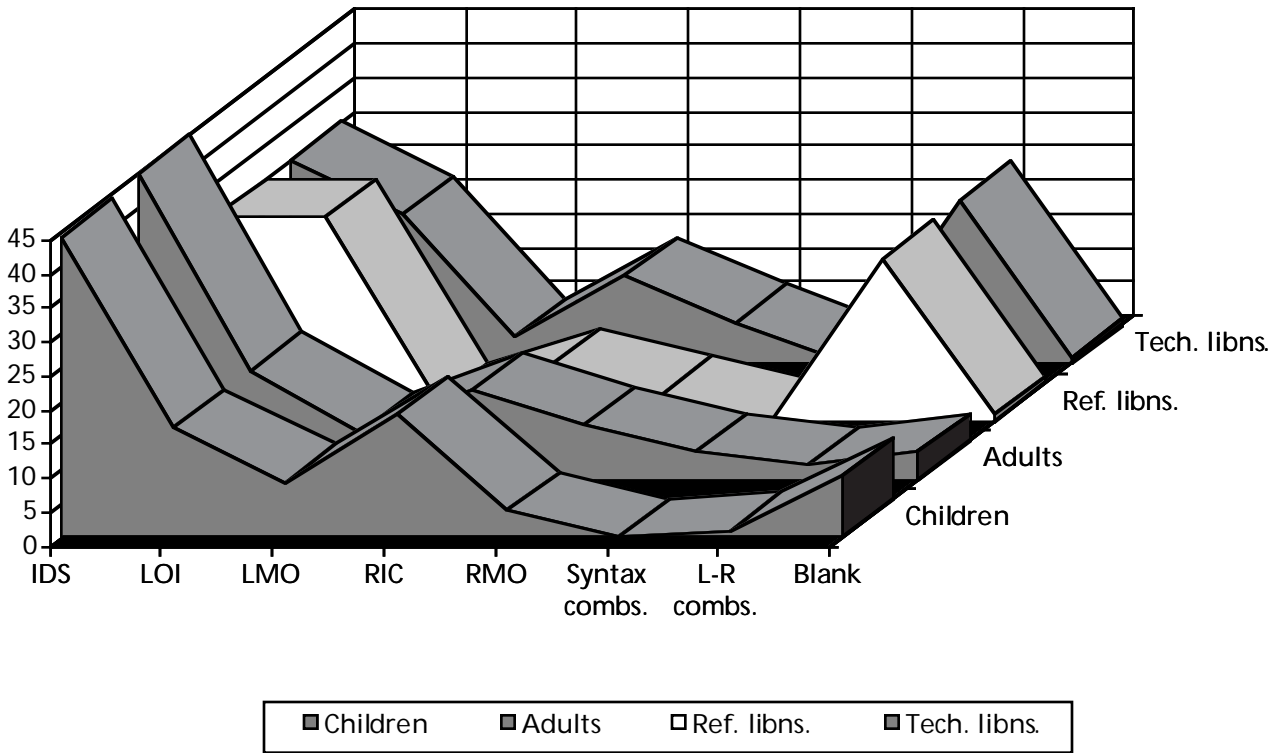
The figure shows two response patterns, one for children and adults, and a second for reference and technical services librarians. Both children and adults gave meanings that reached the highest percentages for IDS codes (about 45%) and lower percentages for the two left out codes (LOI and LMO). Percentages increased to the teens for RIC codes and dropped for incorrect syntax combinations and combinations involving codes for leaving out (LOI or LMO) or reading in (RIC or RMO) one or more concepts. About the only marked difference between the response pattern of children and adults was the greater percentage (9% vs. 4%) of Blanks for children.

Response patterns for reference and technical services librarians had similarities. Percentages of IDS codes were high at 30%. Percentages of incorrect codes for reading in or leaving out one or more than one concept (LMO or RMO) were

rather low—they failed to rise above 6%. What was particularly striking were the high percentages of combinations for reading in and leaving out concepts ("L–R combs." in figure 5.4). In fact, such percentages accounted for almost a quarter of incorrect codes for reference and technical services librarians. There were also differences between the two librarian types. For example, the percentage of LOI codes was 30% for reference librarians and 22% for technical services librarians.

For readers interested in exact percentages, Table 5.4 shows incorrect codes for the first set of subject headings (1–8). Totals for incorrect codes varied from column to column because totals for correct codes were not included in this analysis (see section 5.2).

Table 5.4. Codes for Incorrect Meanings

for Subject Headings 1–8

Codes	Children		Adults		Ref. libns.		Tech. libns.	
	No.	%	No.	%	No.	%	No.	%
IDS	106	44.	91	45.	55	30.	38	30.
LOI	39	16.	33	16.	55	30.	28	22.
LMO	19	8.	15	7.	5	3.	6	4.
RIC	42	18.	27	13.	16	8.	17	13.
RMO	9	4.	17	8.	7	4.	7	6.
Syntax combs.	0	–	9	4.	0	–	0	–
L-R combs.	2	1.	5	3.	44	24.	30	24.
No response	22	9.	7	4.	3	1.	1	1.
Total	239	100.	204	100.	185	100.	127	100.

Figure 5.5 shows percentages of incorrect codes for the second set of eight subject headings (9–16). Meanings for these headings were given by children

and adults at Bacon Memorial District Library and reference and technical services librarians across North America.

Figure 5.5. Codes for incorrect meanings

for subject headings 9–16
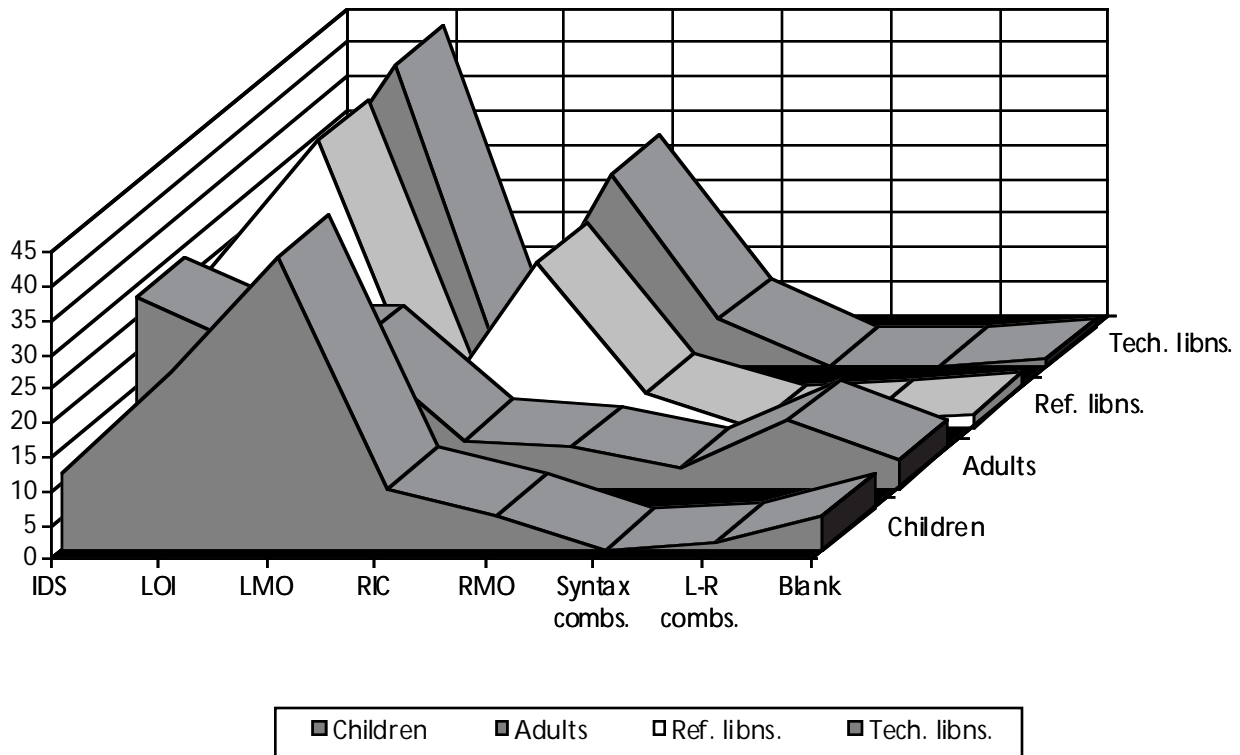
Three different response patterns were evident in figure 5.5: children, adults, and librarians. First, children's responses showed high percentages of the two left out codes (LOI and LMO). Children gave meanings to which other incorrect codes were assigned, e.g., IDS, RIC, RMO, and Blanks, but the percentages of responses for these codes did not go much above 10%. The second response pattern was for adults and it showed moderately high percentages for IDS, LOI, and LMO codes (percentages in the 20s) and low percentages (under 10%) for the several other incorrect codes. The third response pattern was for reference and technical services librarians. Their

patterns were almost mirror images of each other with the highest percentages for LOI codes and moderately high percentages for IDS and RIC codes. Percentages for leaving out or reading in more than one concept (LMO or RMO) were very low to nil for the two librarian types.

Comparing figures 5.4 and 5.5 for the two different sets of subject headings demonstrated rather marked differences. Meanings provided by children and adults to the first set of eight subject headings showed high percentages (a little over 40%) of IDS meanings. While adults had a high percentage of IDS meanings for the second set of subject headings, children were much more likely to leave out concepts from their meanings, in fact, percentages for LOI and LMO meanings accounted for over two-thirds of the meanings that children gave to the second set of subject headings. Both types of librarians responded to the first set of eight subject headings with high percentages of incorrect meanings that were assigned IDS, LOI, or combinations of codes involving leaving out and reading in concepts. High percentages of IDS and LOI codes also characterized librarians' responses to the second set of subject headings but combinations involving leaving out and reading in concepts did not occur. Instead, moderately high percentages of RIC codes were typical of the incorrect meanings that librarians gave to the second set of subject headings.

For readers interested in exact percentages, Table 5.5 shows incorrect codes for the second set of subject headings (9–16). Totals for incorrect codes varied from column to column because totals for correct codes were not included in this analysis (see section 5.2).

Table 5.5. Codes for Incorrect Meanings

for Subject Headings 9–16

Codes	Children		Adults		Ref. libns.		Tech. libns.	
	No.	%	No.	%	No.	%	No.	%
IDS	34	11.	76	28.	40	23.	40	20.
LOI	84	26.	56	21.	77	43.	87	44.
LMO	138	43.	57	21.	3	2.	0	–
RIC	28	9.	19	7.	43	24.	55	28.
RMO	17	5.	16	6.	9	5.	15	7.
Syntax combs.	0	–	9	3.	0	–	0	–
L-R combs.	1	1.	27	10.	2	1.	0	–
No response	17	5.	12	4.	4	2.	3	1.
Total	319	100.	272	100.	178	100.	200	100.

Before drawing conclusions about incorrect meanings, let's take a look at incorrect codes for the third set of eight subject headings (headings 17–24) in figure 5.6. Meanings for these headings were given by children and adults at Livonia Public Library and reference and technical services librarians across North America.

Figure 5.6 depicts two—maybe three different response patterns—children, adults, and librarians. Once again, reference and technical services librarians responded similarly. Rather high percentages of RIC meanings occurred. LOI meanings were also typical. Librarians gave low percentages of LMO, RMO, combinations of codes, and Blanks.

Figure 5.6. Codes for incorrect meanings

for subject headings 17–24
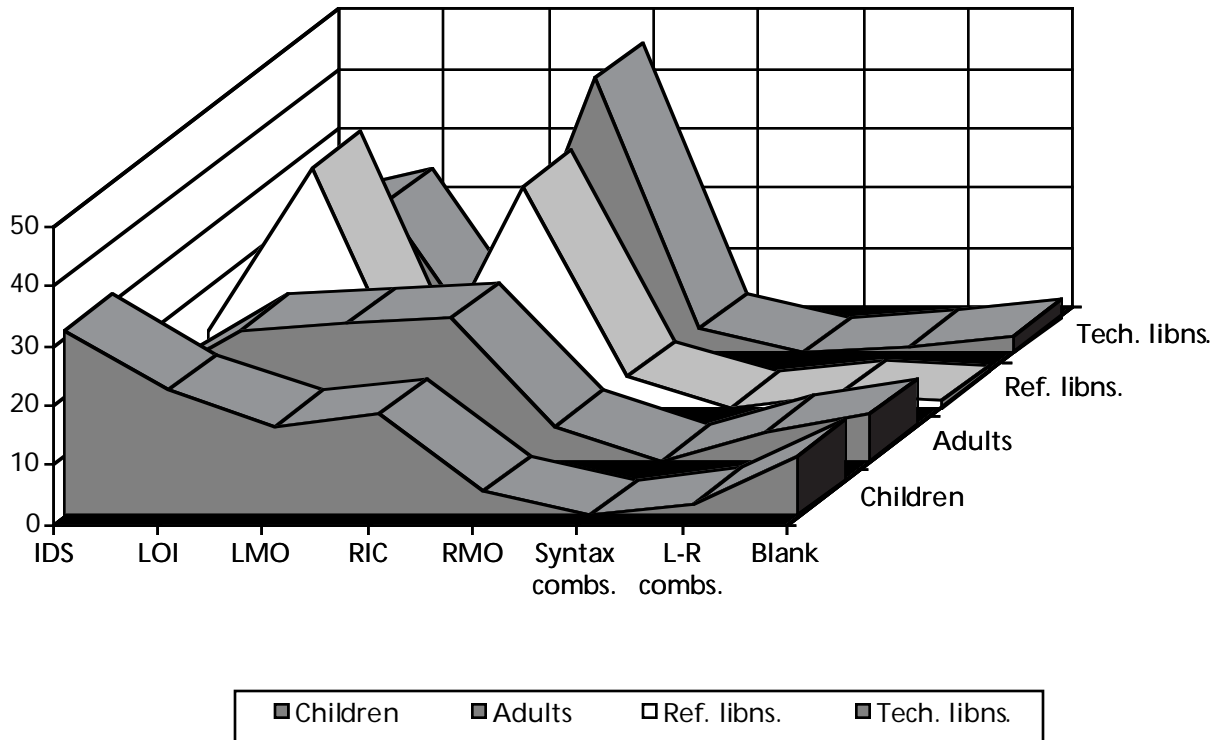
The response patterns for children and adults were similar except for IDS meanings. The high percentage (31%) IDS meanings that characterized children's responses did not occur for adults. In fact, this percentage was somewhat low at 12%. The response patterns for children and adults for the other incorrect codes were similar with adults scoring higher percentages than children to make up for the lower percentage of IDS meanings. Both children and adults had moderately high percentages of LOI, LMO, and RIC meanings. They had low percentages of RMO codes, combination codes, and Blanks.

For readers interested in exact percentages, Table 5.6 shows correct codes for the third set of subject headings (17–24). Totals for incorrect codes varied

from column to column because totals for correct codes were not included in this analysis (see section 5.2).

Table 5.6. Codes for Incorrect Meanings

for Subject Headings 17–24

Codes	Children		Adults		Ref. libns.		Tech. libns.	
	No.	%	No.	%	No.	%	No.	%
IDS	72	31.	27	12.	22	13.	33	21.
LOI	49	21.	51	22.	66	40.	39	25.
LMO	35	15.	52	23.	4	2.	0	–
RIC	39	17.	55	24.	61	37.	74	46.
RMO	9	4.	14	6.	8	5.	7	4.
Syntax combs.	0	–	0	–	0	–	0	–
L-R combs.	5	2.	11	5.	4	2.	1	1.
No response	25	10.	19	8.	2	1.	5	3.
Total	234	100.	229	100.	167	100.	159	100.

Response patterns for incorrect codes showed similar response patterns for reference and technical services librarians across the three different sets of subject headings. However, high and moderately high percentages of codes were different for each of the three subject heading sets. Librarians' responses for the first subject heading set (1–8) were heavy on IDS, LOI, and incorrect combinations for leaving out and reading in concepts. Their responses for the second subject heading set (9–16) were very high for LOI codes and moderately high for RIC codes. Combinations involving leaving out and reading in concepts were not even a factor in the analysis of the second set of subject headings. Incorrect codes for the third subject heading set were the reverse of such codes for the second set, that is, responses were very high for

RIC codes and moderately high for LOI codes, and again, combinations involving leaving out and reading in concepts were not a factor in the analysis.

Response patterns for children and adults were similar (headings set #1), different (headings set #2), and both similar and different (headings set #3). For the first subject heading set, response patterns for children and adults were almost mirror images of one another. Very high percentages of meanings were incorrect due to differences in syntax, and moderately low percentages of meanings were incorrect because children and adults left out or read in concepts. Children responded to the second set of subject headings by leaving out one or more concepts. Adults were more likely to give incorrect meanings due to different syntax. Children responded to the third set of subject headings by giving meanings with syntax that was different from expert-supplied meanings. Adults were not likely to give meanings with different syntax but their response pattern for the other incorrect codes for headings set #3 mirrored the response pattern of children with a little higher percentages for each code to make up for the low percentages of IDS meanings.

The analysis of *correct* codes demonstrated that reference and technical services librarians responded in the same ways to formulating meanings for subject headings. Librarians favored CDL meanings, and, to a lesser degree C and CDS meanings. Children favored C and CDS meanings. Adults sometimes responded in ways similar to librarians, that is, favoring CDL meanings; adults also responded in ways similar to children, that is favoring C and CDS meanings. The analysis of *incorrect* codes was similar to the analysis of correct codes in that reference and technical services librarians responded in the same ways to formulating meanings for subject headings, children responded differently from librarians, and adults responded in ways similar to children or librarians. However, none of the four types of respondents formulated meanings that favored one or more specific incorrect meaning code. Instead, librarians, children, and adults formulated meanings that were incorrect and the specific reasons why their meanings were incorrect varied considerably across the three sets of subject headings.

5.4 Correct Meanings for Subject Headings in the Study

5.4.1 Introduction

Because we were unable to identify one or more particular incorrect code that librarians, children, and adults favored, we examined each of the 24 subject headings in the study and the meanings respondents gave to them. We sought groups of subject headings that were similar in terms of the correct or incorrect meanings that respondents gave to them. Perhaps this failure analysis would result in the identification of certain characteristics of individual subject headings that made study participants respond in particular ways to them.

Section 5.4 examines *correct* meanings that respondents gave to subject headings. It is divided into subsections 5.4.2 to 5.4.5 that discuss one or two groups of subject headings at a time. Grouped subject headings were alike in terms of the response patterns of library patrons (adults and children) and librarians (reference and technical services librarians). Since reference and technical services librarians almost always gave meanings with similar response patterns (see figures 5.1 to 5.6), we were comfortable combining their meanings into a single response pattern entitled "Librarians" in the figures that follow. We were less comfortable combining the responses of adults and children into a single response pattern entitled "Patrons" in the figures that follow because their responses sometimes differed; however, the numbers of meanings for children or adults alone would not have been enough to discern a particular response pattern so we combined them in the failure analysis of correct and incorrect meanings (sections 5.4 and 5.5).

Library patrons and librarians did not always give a sufficient number of correct responses to warrant an in-depth analysis; consequently, this section on correct meanings only discusses subject headings to which one-third or more of the meanings given by library patrons or librarians were correct. Omitted were discussions of four subject headings (#8, #9, #12, and #16) to which more than two-thirds of the meanings given by *both* library patrons *and* librarians were

incorrect, and discussions of seven subject headings (#10, #11, #13, #15, #20, #22, and #24) to which more than two-thirds of the meanings given by *either* library patrons *or* librarians were incorrect.

Respondents' meanings were not limited to correct meanings for the subject headings included in this section. Interesting findings about the incorrect meanings that respondents gave these headings are discussed in section 5.5. The individual subject headings within particular groups were different in sections 5.4 and 5.5 because no one incorrect *and* incorrect response pattern was evident across the small groups of subject headings featured in each section.

Sections 5.4 and 5.5 give many examples of user-assigned meanings. Since we were more concerned about subject heading meanings than the forms of words in such meanings, we eliminated much of the variation in meanings with respect to capitalization and abbreviation. Except for state names and numbers of centuries, we wrote out all words in meanings. We abbreviated state names using abbreviations in an appendix of *Anglo-American Cataloging Rules.* The only capitalized words in user-assigned meanings were proper nouns and adjectives. We made no other changes to user-assigned meanings.

5.4.2 C (Correct) meanings

This subsection discusses subject headings to which respondents assigned lots of correct (C) meanings that were letter-for-letter matches of expert-supplied meanings and fewer other correct meanings, that is, meanings that used different language (CDL) or syntax (CDS). It features two groups of subject headings that had different response patterns involving large percentages of Correct (C) meanings.

There was one group of four subject headings to which respondents assigned lots of correct (C) meanings that were letter-for-letter matches of expert-supplied meanings, fewer correct meanings that used different language (CDL), and even fewer correct meanings that used different syntax (CDS) than expert-supplied meanings. The subject headings were:

- #3: Locomotives—Germany—History (library patrons and librarians)

- #17: Cattle—United States—Marketing (library patrons and librarians)

- #19: Art, Modern—20th century—Public opinion (librarians only)

- #21: Jews—Egypt—Politics and government (library patrons only)

These were rather simple subject headings in which main headings and subdivisions added to three to six words. Subdivisions ran the gamut in terms of the three specific subject subdivisions, i.e., topical, geographical, and period. Figure 5.7 shows the response pattern for these subject headings.

Figure 5.7. Response pattern (many C and fewer CDL meanings)
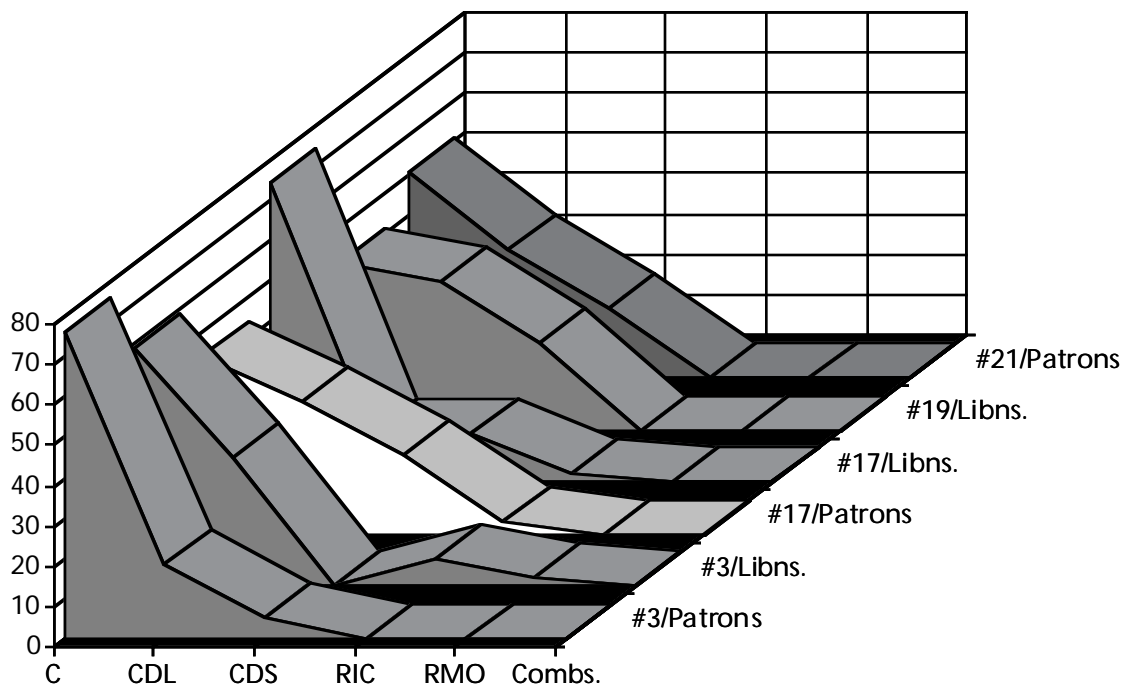
The response pattern for the subject headings in this group had high percentages of correct (C) meanings (between 40% and 80%), lower percentages of CDL meanings, and even lower percentages of CDS meanings.

Respondents hardly ever gave correct meanings that read in one or more concepts and combination codes did not occur at all.

Listed below were the one or two correct meanings for the subject headings in this group. Since C meanings were almost letter-for-letter transcriptions of expert-supplied meanings, it would have been redundant to include respondent-supplied meanings here.

- #3: history of locomotives in Germany, or German history of locomotives

- #17: marketing of cattle in the U. S.

- #19: public opinion of 20th century modern art, or 20th century public opinion of modern art

- #21: politics and government of Jews in Egypt, or politics and government of Egyptian Jews

Table 5.7. CDL Meanings–1

Expert-supplied meanings	Respondents' meanings
history of locomotives in Germany	locomotives had a history in Germany
	about the history of trains, specifically the locomotive car, in Germany
	history of train engines in Germany
marketing of cattle in the United States	how cattle are marketed in the U. S.
	the use of marketing for the sale of cattle in the U. S.
	cattle, marketing methods in the U. S.
public opinion of 20th century modern art	the public's view of 20th century modern art
	popular views on modern art in this century
	attitudes of the general public towards 20th century modern art

CDS meanings were especially plentiful for the subject headings in this group. Table 5.7 lists examples of CDL meanings along with the expert-supplied

meanings for these subject headings. CDS meanings for these subject headings were not especially plentiful or interesting so they are not included here.

There was a second group of three subject headings to which respondents assigned lots of correct (C) meanings that were letter-for-letter matches of expert-supplied meanings, fewer correct meanings that used different syntax (CDS), and even fewer correct meanings that used language that was different (CDL) from the language of expert-supplied meanings. The subject headings were:

- #4: Music—Philosophy and aesthetics—500–1400 (library patrons)

- #6: Spanish drama—History and criticism—18th century (library patrons)

- #19: Art, Modern—20th century—Public opinion (library patrons)

These were rather simple subject headings in which main headings and subdivisions averaged about six words. Subdivisions ran the gamut in terms of three specific subject subdivisions, i.e., topical, geographical, and period. Figure 5.8 shows the response pattern for these subject headings.

All the subject headings in this group had high percentages of correct (C) meanings (between 45% and 60%), lower percentages of CDS meanings, and even lower percentages of CDL meanings. Respondents hardly ever gave correct meanings that read in one or more concepts or meanings that required a combination of correct codes to these six subject headings.

Figure 5.8. Response pattern (many C and fewer CDS meanings)
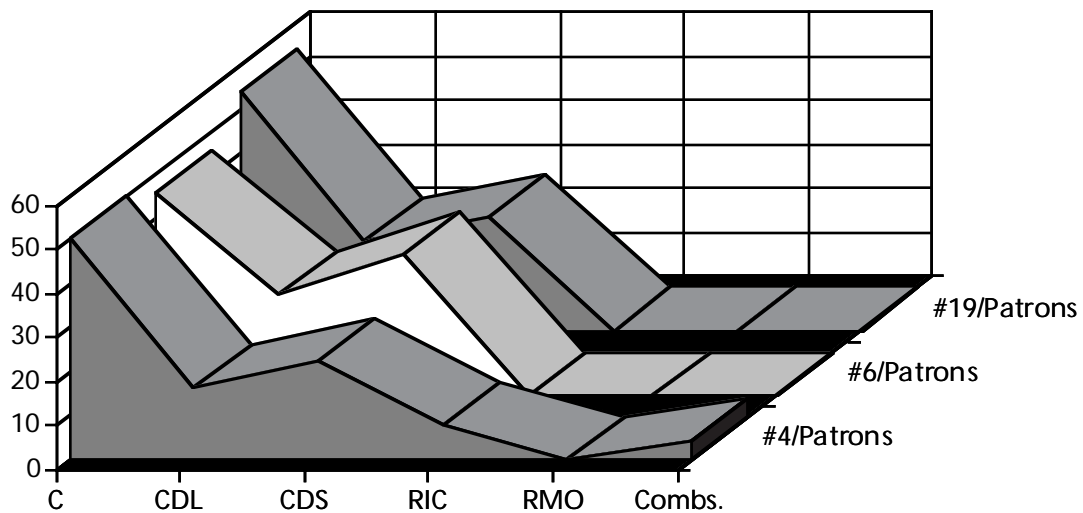
Listed below were the one or two correct meanings for the subject headings in this group. Since C meanings were almost letter-for-letter transcriptions of expert-supplied meanings, it would have been redundant to include respondent-supplied meanings here.

- #3: history of locomotives in Germany, or German history of locomotives

- #6: history and criticism of 18th century Spanish drama, or 18th century history and criticism of Spanish drama.

- #19: public opinion of 20th century modern art, or 20th century public opinion of modern art

CDS meanings were especially plentiful for the subject headings in this group. Table 5.8 lists examples of CDS meanings along with the expert-supplied meanings for these subject headings.

Table 5.8. CDS Meanings–1

Expert-supplied meanings	Respondents' meanings
philosophy and aesthetics of music from 500–1400	(Most meanings designated the time period differently, for example:) … between 500–1400 AD … between the years 500–1400 … in 500–1400
history and criticism of 18th century Spanish drama	for history and criticism of Spanish drama in the 18th century 18th century Spanish drama, the history and criticism
public opinion of 20th century modern art	20th century modern art public opinion 20th century modern art in public opinion public opinion on modern art of the 20th century

5.4.3 CDL (Correct, Different Language) meanings

This subsection discusses two groups of subject headings to which respondents assigned large percentages of correct meanings that enlisted language that was different (CDL) from the language of expert-supplied meanings.

The first group involved five subject headings. Respondents assigned large percentages of CDL meanings, smaller percentages of C meanings, and even smaller percentages of CDS meanings. The subject headings in this group were:

- #4: Music—Philosophy and aesthetics—500–1400 (librarians only)

- #14: English poetry—Old English, ca. 450–1100—Modernized versions (librarians only)

- #21: Jews—Egypt—Politics and government (librarians only)

- #23: Education—California—Finance (library patrons and librarians)

- #24: English poetry—Middle English, 1100–1500—Criticism, Textual—Congresses (librarians only)

All five subject headings featured a one-word or two-word main heading. All were appended by two subdivisions. Two subject headings (#21 and #23) were quite simple consisting of a one-word main heading and averaging four words. The three other subject headings (#4, #14, #24) were more complex. They averaged eight words. They featured period subdivisions of which two of the subdivisions consisted of both date range and explanatory text. Figure 5.9 shows the response pattern for these subject headings.

Figure 5.9. Response pattern (many CDL and fewer C meanings)
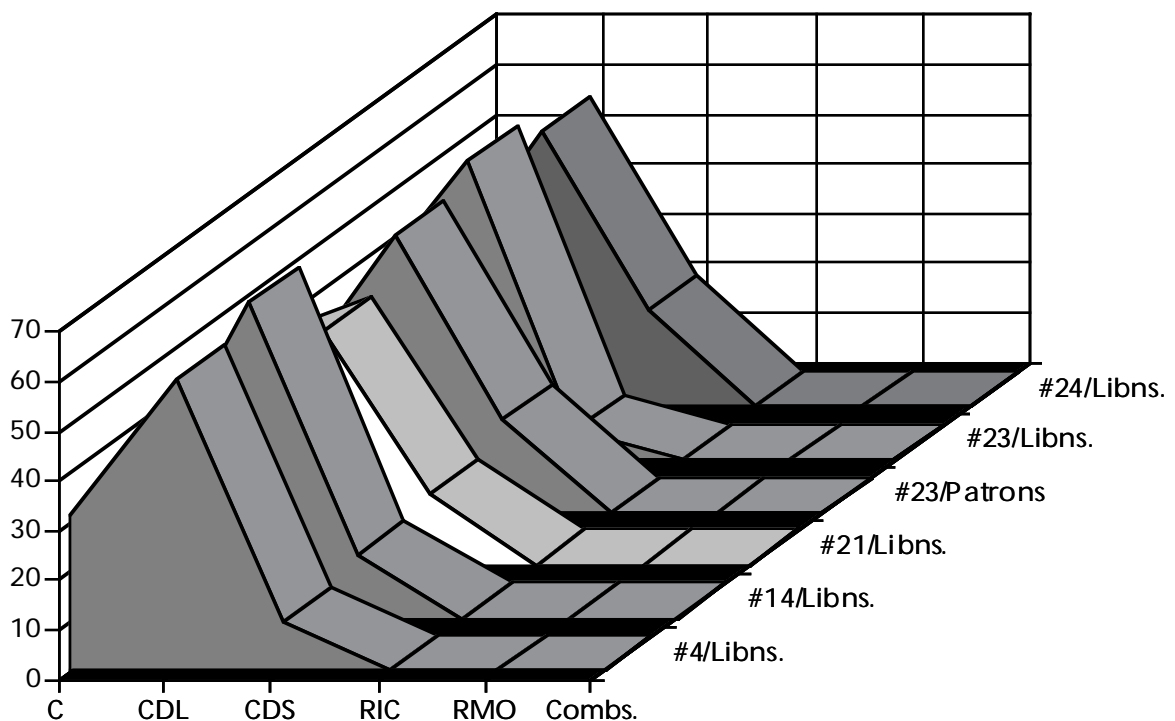
The response pattern for these subject headings showed very high percentages of CDL meanings (between 45% and 65%), lower percentages of C meanings,

and even lower percentages of CDS meanings. Respondents gave no meanings that read in concepts or were combinations of two correct codes.

Table 5.9. CDL Meanings–2

Expert-supplied meanings	Respondents' meanings
philosophy and aesthetics of music from 500–1400	(Most meanings used different language to express "philosophy and aesthetics," for example:) philosophical and aesthetical aspects of… aspects of the philosophy and aesthetics of… philosophy and beauty of…
modernized versions of old English (ca. 450–1100) poetry	translation into modern English of an old English poem or poems a modernized version of some old English poetry updated/translated versions of poems written in old English from 450–1100 old English poetry translated into a modernized version
politics and government of Jews in Egypt	Jews in Egypt involved with politics and government Jewish people in politics and government of Egypt politics and government of Jews living in Egypt information on Jews' contributions to Egyptian politics and government
congresses of textual criticism of middle English poetry	(Most meanings used different language to express "congresses," for example:) meeting (papers, conference, etc.) on… a conference on middle English poetry where papers concentrated on… report of a meeting on… collection of papers on… proceedings of a conference on…

Table 5.9 lists examples of CDL meanings along with the expert-supplied meanings for these subject headings.

Let's turn to a second group of eight subject headings. Respondents assigned lots of CDL meanings, fewer CDS meanings, and even fewer C meanings to these eight subjects:

- #1: Basketball—United States—Records (librarians only)

- #5: Indians of North America—Food—New Mexico (patrons only)

- #7: Education—United States—Finance (librarians only)

- #10: Handicapped—Washington (State)—Seattle metropolitan area—Transportation (librarians only)

- #11: Jews—Germany—Berlin—Intellectual life—Congresses (librarians only)

- #13: World War, 1939–1945—Regimental histories—Japan (librarians only)

- #15: Music—Washington (D.C.)—History and criticism (librarians only)

- #18: Combined sewers—Illinois—Chicago metropolitan area—Overflows (librarians only)

These subject headings were more complex than the subject headings we have examined so far. Three subjects consisted of more than two subdivisions (#10, #11, and #18). Only one subject heading (#7) was rather simple in that it was made up of a one-word main heading and two one- to two-word subdivisions. Since CDL meanings characterized librarians' correct meanings (section 5.2), it was not surprising that librarians gave correct meanings to almost all the subject headings in this group. Figure 5.10 shows the response pattern for these subjects.

Figure 5.10. Response pattern (many CDL and fewer CDS meanings)
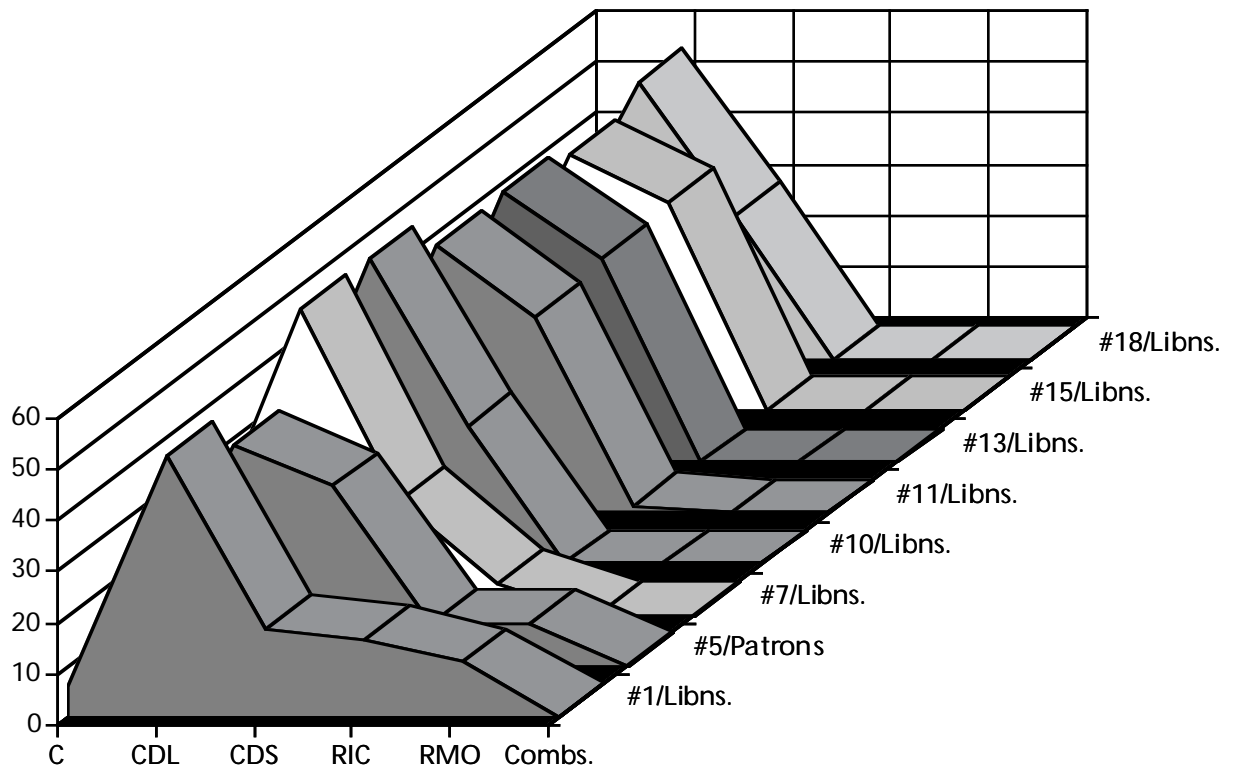
All the subject headings had low percentages of C meanings (between 5% and 17%) and much higher percentages of CDL meanings (between 43% and 60%). Percentages of CDS meanings were sometimes as high as the highest CDL meanings (about 40%, headings #5, #11, #13, and #15) and they were sometimes rather low (about 25% or lower, headings #1 and #7). There were occurrences of correct meanings for read-in concepts (headings #1, #5, #7 and #11). Respondents gave no meanings that were combinations of two correct codes.

Table 5.10 lists examples of CDL meanings along with the expert-supplied meanings for these subject headings.

Table 5.10. CDL Meanings–3

Expert-supplied meanings	Respondents' meanings
foods of Indians of New Mexico	Indians of North America, mainly New Mexico and their food
	types of food that North American Indians in New Mexico eat
	food of Indians of North America in New Mexico
finance of U. S. education	how education is financed in the U. S.
	discussion of financing U. S. education
	how education is funded in the U. S.
	educational finance in the U. S.
transportation of handicapped in the Seattle (Wash.) metropolitan area	transportation for handicapped people in the Seattle area
	transportation of disabled people in the Seattle, Wash., area
	ways and means for handicapped people to get around the Seattle area
congresses of the intellectual life of Berlin (Germany) Jews	Most meanings used different language to express "congresses," for example:)
	reports of meetings discussing…
	organized meetings about…
	…presented as papers to a congress
	group meetings about…
	proceedings of a conference on…
overflows of combined sewers in the Chicago metropolitan area	overflows involved with combined sewers in the Chicago area
	some type of overflow problem that exists in a certain type of sewer system that they have in the Chicago, Ill., area
	concerning overflows from the combined sewers in the Chicago metropolitan area
	discussion of the overflow of water from combined sewer systems in the greater Chicago area

5.4.4 CDS (Correct, Different Syntax) meanings

This section features one group of five subject headings to which respondents assigned lots of CDS meanings, fewer CDL meanings, and even fewer C meanings. The subject headings were:

- #1: Basketball—United States—Records (library patrons only)

- #2: Jews—Michigan—Detroit—History—20th century (library patrons and librarians)

- #18: Combined sewers—Illinois—Chicago metropolitan area—Overflows (library patrons only)

- #20: Music—Africa—History and criticism—Bibliography (librarians only)

- #22: Music—Louisiana—New Orleans—History and criticism (library patrons only)

These five subject headings had more dissimilarities than similarities. All five featured a one-word or two-word main heading. All were appended by at least one geographical subdivision. Only subject heading #1 was quite simple consisting of a one-word main heading, two one- to two-word subdivisions, and numbering four words. The four other subject headings featured three to four subdivisions, subdivisions ranging from one to three words, and averaged 6.5 words. Library patrons gave meanings to all but one of the subject headings in this group. This was not surprising because patrons, especially children, favored CDS meanings (see section 5.2). Figure 5.11 shows the response pattern for these subject headings.

Figure 5.11. Response pattern (many CDS and fewer CDL meanings)
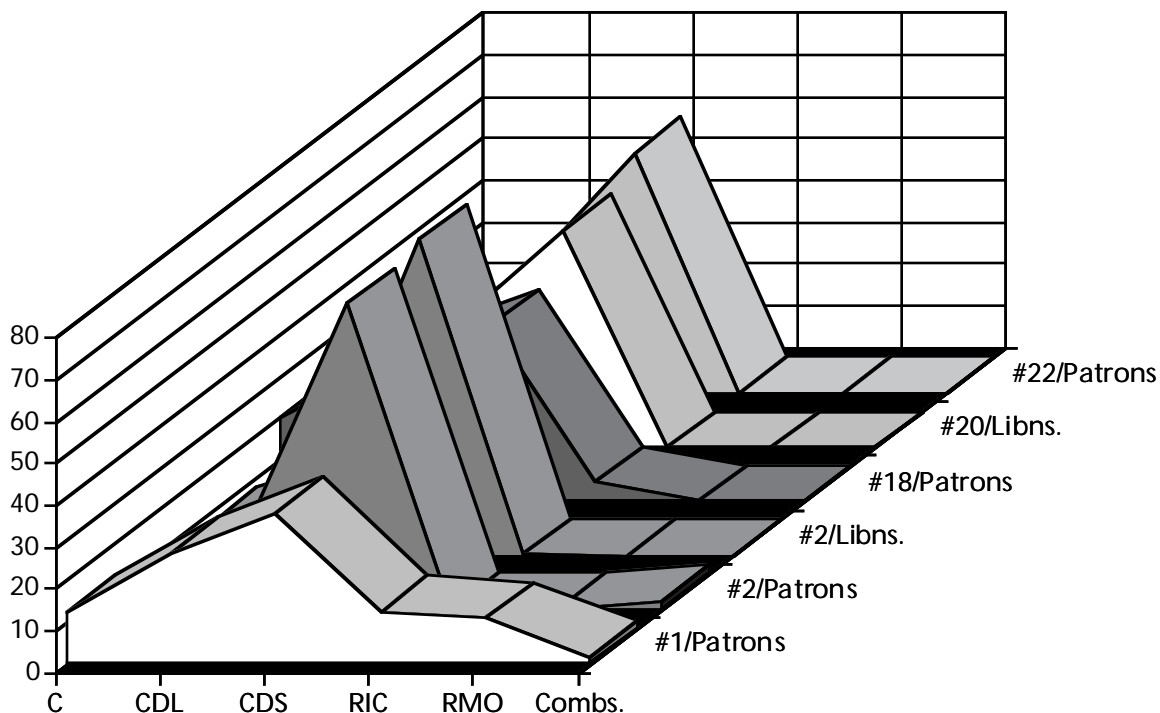
The subject headings in this group had very high percentages of CDS meanings. Sometimes these percentages accounted for between 50% and 75% of meanings (headings #2, #20, and #22). Percentages of CDS meanings were high for headings #1 and #18 but they were not a lot higher than the percentages of CDL meanings (between 15% and 34%). All the subject headings in this group had low percentages of C meanings (between 7% and 20%). There were occurrences of correct meanings for read-in concepts (headings #1 and #18). Respondents gave very few meanings that were combinations of two correct codes.

Table 5.11 lists examples of CDS meanings along with the expert-supplied meanings for these subject headings.

Table 5.11. CDS Meanings–2

Expert-supplied meanings	Respondents' meanings
records of U. S. basketball	U. S. basketball records records for basketball in the U. S. U. S. records–basketball the records of basketball in the U. S.
history of Detroit (Mich.) Jews in the 20th century	history of Jews Detroit, Mich., 20th century history of the Jews in Detroit, Mich., in the 20th century history of Michigan's Jews from Detroit in the 20th century (1900s) Jews history in the 20th century in Detroit, Mich.
overflows of combined sewers in the Chicago (Ill.) metropolitan area	Ill. Chicago metropolitan area overflows in combined sewers combined sewer overflow of the Chicago, Ill., metropolitan area Ill. Chicago area combined sewer overflows it means that there are combined sewers and overflows in Ill. Chicago and metropolitan area

5.4.5 Two or more correct meaning codes equally high

This section discusses one group of three subject headings to which respondents responded with lots of correct meanings for two or more correct codes. The subject headings were:

- #5: Indians of North America—Food—New Mexico (librarians only)

- #6: Spanish drama—History and criticism—18th century (librarians only)

- #7: Education—United States—Finance (library patrons only)

- #14: English poetry—Old English, ca. 450–1100—Modernized versions (library patrons only)

All four subject headings consisted of one main heading and two subdivisions. The number of words in main headings ranged from one (heading #7) to four (heading #5). Subject heading #14 was rather complicated in that it consisted of nine words, one two-word topical subdivision, and one five-word period subdivision bearing both date range and explanatory text. The complexity of subject heading #5 centered on two elements—main heading and subdivision—that named geographical places. Figure 5.12 shows percentages of correct meaning codes that respondents assigned to the subject headings in this group.

Figure 5.12. Response pattern
(many meanings for two or more correct codes)
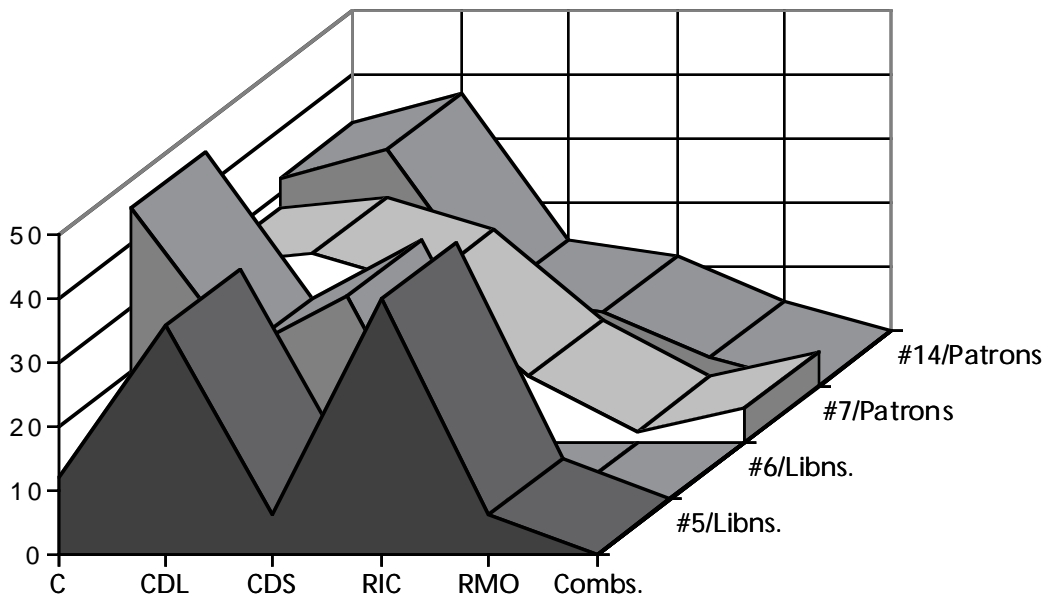
Figure 5.12 shows not one but four different response patterns. Subject heading #5 was marked by a large percentage of read-in concepts. Here were a few examples of meanings with one or more read-in concepts when the correct

meaning for this subject heading was "food of Indians [of/from/in] New
Mexico" or "food of New Mexico Indians:"

- what Indians in New Mexico grow and/or eat

- foods used by native Americans of New Mexico

- what the food was and other aspects of food (like where it came from,
  etc.) of Indians of North America in what is now New Mexico

- food prepared/eaten by native Americans in the New Mexico area

- food used (eaten, cooked, etc.) of Indians in New Mexico

Correct (C) codes for meanings that were letter-for-letter matches of expert-
supplied meanings and that used different syntax from user-supplied meanings
(CDS) characterized responses to subject heading #6. Most of the differences
in language (CDL) were connected with using different terminology for the
"history and criticism" element in one of this subject heading's subdivisions.
Examples were:

- history and evaluations of…

- history and critical opinion of…

- history of/literary criticism of…

- history and critical works regarding…

- a history/analysis of…

Percentages of C, CDL, and CDS codes were about the same (around 25% to
30%) for subject heading #7. When the meaning of this heading was "finance
of education in the U. S.," examples of each meaning were:

- the finance of education in the U. S. (C)

- education in the U. S. and its finance (CDL)

- money finances for the education in the U. S. (CDL)

- how education is paid for in the U. S. (CDL)

- education is financed in the U. S. (CDS)

Percentages of C and CDL codes were about the same (around 32% to 37%) for subject heading #14. The meaning of this heading was "modernized versions of old English (ca. 450–1100) poetry" and most respondents used their own terminology to express the "modernized versions" phrase of this subject heading. Examples were:

- modernized interpretations of…

- modernized adaptions [sic] of…

- reworks of…

- updated versions of…

5.4.6 Correct meanings summary

Section 5.4 discussed several groups of three to eight subject headings that shared similarities in terms of the specific correct meaning codes that were assigned to them. There were groups of subject headings with the following characteristics:

- Two groups with high percentages of Correct (C) meanings and: (1) lower CDL meanings and even lower CDS meanings, or (2) lower CDS meanings and even lower CDL meanings

- Two groups with high percentages of CDL meanings and: (1) lower C meanings and even lower CDS meanings, or (2) lower CDS meanings, and even lower C meanings

- One group with high percentages of CDS meanings, lower CDL meanings, and even lower C meanings

- One group with moderately high percentages of two or more correct codes, e.g., CDL and RIC, or C, CDL, and CDS

Only four subject headings occurred in the same group for both library patrons and librarians. This meant that library patrons and librarians gave correct meanings to the same groups of subject headings but the characteristics of their correct meanings, e.g., language, syntax, read-in concepts, were different.

Unfortunately, grouped subject headings did not exhibit any particular properties that would single them out. Grouped subject headings were usually a mixture of simple subject headings consisting of a one- to two-word main heading and two one-to two-word subdivisions, and more complex subject headings consisting of a two- or four-word main heading and three or four subdivisions.

One group was missing from the groups of subject headings discussed in this section. This group was made up of the eleven subject headings to which more than two-thirds of the meanings given by *both* library patrons *and* librarians were incorrect, and to which more than two-thirds of the meanings given by *either* library patrons *or* librarians were incorrect. The missing group averaged 7.0 words per subject heading and 4.0 subdivisions per subject heading. The several groups discussed in this section averaged 5.6 words per subject heading and 3.2 subdivisions per subject heading. Subject headings to which respondents gave high percentages of correct meanings were little less wordy (5.6 versus 7.0 words) and consisted of fewer subdivisions (3.2 versus 4.0 subdivisions) than subject headings to which respondents gave high percentages of incorrect meanings.

5.5 Incorrect Meanings for Subject Headings in the Study

5.5.1 Introduction

Section 5.5 is a continuation of our failure analysis of the meanings respondents gave to subject headings. It examines the *incorrect* meanings that respondents gave to subject headings. It is divided into subsections 5.5.2 to 5.5.7 that discuss one to four groups of subject headings at a time. Grouped subject headings were alike in terms of the response patterns of library patrons (adults and children) and librarians (reference and technical services).

Library patrons and librarians did not always give a sufficient number of incorrect responses to warrant an in-depth analysis; consequently, this section on incorrect meanings only discusses subject headings to which one-third or

more of the meanings given by library patrons or librarians were incorrect. Omitted are discussions of eight subject headings (#3, #7, #10, #11, #13, #14, #17, and #23) to which more than two-thirds of the meanings given by *either* library patrons *or* librarians were correct.

5.5.2 Lots of syntax problems

This subsection focuses on three groups of subject headings that were plagued by IDS problems.

There was one group of five subject headings to which respondents assigned high percentages of IDS meanings, lower percentages of incorrect meanings that left out one concept (LOI), and even lower percentages of incorrect meanings that left out more than one concept (LMO). The subject headings in this group were:

- #2: Jews—Michigan—Detroit—History—20th century (library patrons only)

- #6: Spanish drama—History and criticism—18th century (library patrons and librarians)

- #8: Art, Modern—California—Los Angeles—20th century—Exhibitions (library patrons and librarians)

- #16: Art, Modern—20th century—Germany—Berlin—Exhibitions (librarians only)

- #19: Art, Modern—20th century—Public opinion (library patrons and librarians)

Main subject headings consisted of one or two words. In fact, three of the five subject headings were the same main heading "Art, Modern" subdivided by the period subdivision "—20th century," and one or more other subdivisions. Except for headings #6 and #19, subject headings featured four subdivisions. Period subdivisions occurred in all five subject headings. Figure 5.13 shows the response pattern for this group of subject headings.

Figure 5.13. Response pattern

(many IDS meanings and fewer LOI meanings)
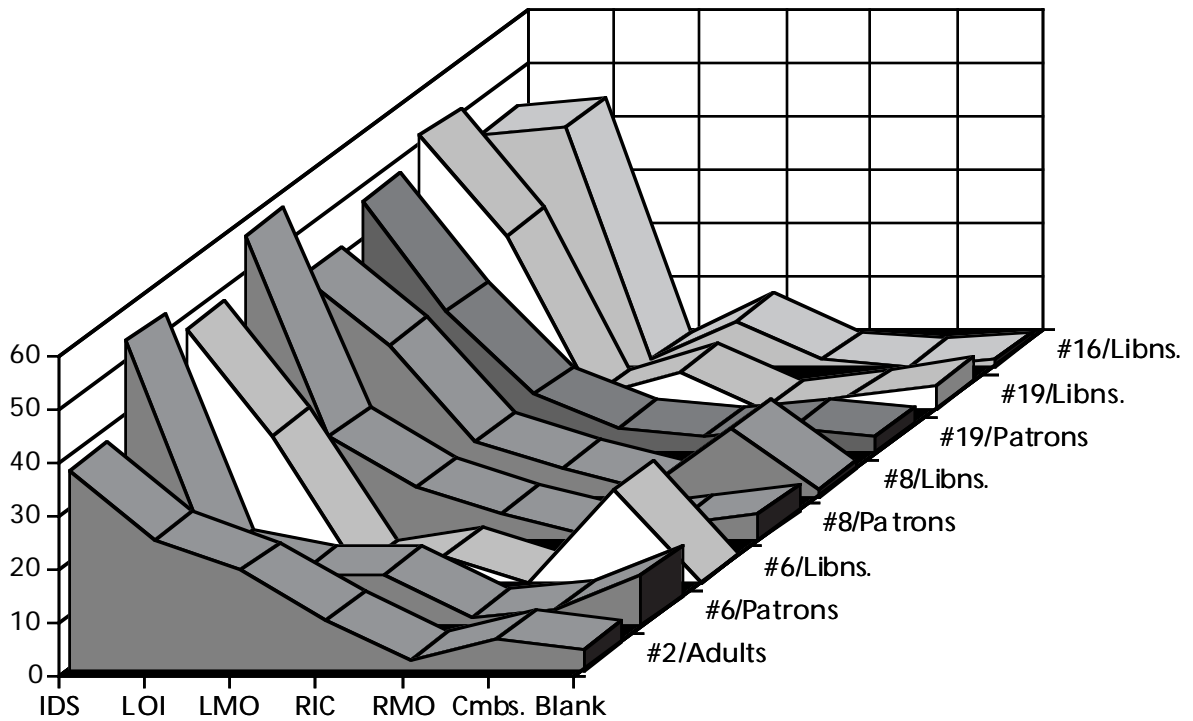
There was basically one response pattern for the five subject headings in this group. Respondents assigned high percentages (between 37% and 57%) of IDS meanings. Percentages of LOI meanings were lower than percentages of IDS meanings except for subject heading #16 for which the percentage of LOI meanings was about the same as the high percentage of IDS meanings. Percentages of LMO meanings were even lower than LOI meanings. Some respondents gave RIC meanings to subject headings. Other respondents gave meanings that warranted the assignment of combinations of incorrect codes (#6/librarians, and #8/librarians). Table 5.12 lists IDS meanings that respondents gave to some of these subject headings.

Table 5.12. IDS Meanings–1

Expert-supplied meanings	Respondents' meanings
history and criticism of 18th century Spanish drama	18th century history and criticism of Spanish drama
18th century history and criticism of Spanish drama	history and criticism of 18th century Spanish drama 18th century Spanish drama, a history and criticism of
exhibitions of 20th century modern art from Los Angeles, Calif.	modern art exhibitions of 20th century in Los Angeles, Calif. 20th century Los Angeles, Calif., exhibitions in modern art modern art in the 20th century in Los Angeles, Calif.
exhibitions of 20th century Los Angeles (Calif.) modern art	exhibitions of modern art in Los Angeles during the 20th century 20th century exhibitions in Los Angeles, Calif., about modern art
20th century public opinion of modern art	public opinion of 20th century modern art public opinion about 20th century (modern) art what the public thinks about 20th century modern art how the general public feels about modern art in the 20th century
public opinion of 20th century modern art	20th century public opinion of modern art

Table 5.12 lists two different meanings for three subject headings. One of the two meanings applied to one of the two orders of the subject heading. Respondents assigned meanings to subject headings that would have been judged correct (that is, C, CDL, or CDS) for the other order of the subject heading. For example, experts supplied the two meanings "public opinion of 20th century modern art" and "20th century public opinion of modern art" for the subject headings "Art, Modern—20th century—Public opinion" and "Art, Modern—Public opinion—20th century," respectively. IDS meanings respondents gave to the former heading would have been judged correct meanings had they assigned them to the latter heading and visa versa.

The subject heading "Art, Modern—20th century—Germany—Berlin—Exhibitions" gave respondents entirely different problems in terms of syntax. One of the two expert-supplied meanings for this subject heading was "exhibitions of 20th century Berlin art." Some respondent-assigned meanings described exhibitions that were held "in Berlin." Examples were:

- 20th century modern art exhibitions in Berlin

- exhibitions of 20th century modern art in Berlin

- exhibitions of modern art (20th century) that are held in Berlin, Germany

- displays of modern art in Berlin during the 20th century

Other respondent-assigned meanings described exhibitions that were held "in 20th century Berlin." Examples were:

- exhibitions of modern art in 20th century Berlin

- exhibition of modern art in 20th century Berlin, Germany

None of these respondent-assigned meanings referred to exhibitions of "Berlin art," a concept that was present in the expert-supplied meaning. Instead, respondent-assigned meanings introduced entirely new meanings for this reordered subject heading.

The five subject headings in this group were not only plagued by IDS problems, respondents also were likely to leave out one or more concepts from their meanings. Thus, coders used LOI and LMO codes to indicate why respondents' meanings were incorrect. Table 5.13 lists such meanings.

Let's turn to a second group of five subject headings. Respondents assigned the subject headings in this group high percentages of IDS meaning and lower percentages of codes for read-in concepts. The subject headings were:

- #3: Locomotives—Germany—History (library patrons only)

- #5: Indians of North America—Food—New Mexico (library patrons only)

Table 5.13. LOI and LMO Meanings

Expert-supplied meanings	Respondents' meanings
20th century history of Detroit (Mich.) Jews History of Detroit (Mich.) Jews in the 20th century	(Left-out elements were usually "20th century" or "Detroit" elements) the history of Jews in Michigan the Jews in the 20th century history of Jews in the 20th century Michigan centuries ago (religion)
history and criticism of 18th century Spanish drama	Spanish drama 18th century about Spanish the history of Spanish drama history of Spanish drama and what critics have to say about it
exhibitions of 20th century Los Angeles (Calif.) modern art exhibitions of 20th century modern art from Los Angeles, Calif.	exhibitions of modern art in Los Angeles, Calif. 20th century art/Calif. 20th century Los Angeles art exhibitions California 20th century modern 20th century art, Los Angeles, Calif. Los Angeles shows featuring modern art
public opinion of 20th century modern art	(Most respondents left out the "modern art" element) public views of 20th century art what people think of 20th century art public opinion about 20th century art the public's opinion on recent art art (paintings in the 20th century) study of modern art from the public's viewpoint–20th century seems a bit redundant

- #7: Education—United States—Finance (library patrons only)

- #12: Organ music—17th century—Interpretation (phrasing, dynamics, etc.) (librarians only)

- #23: Education—California—Finance (library patrons only)

This list had some simple headings ("Locomotives" and the two "Education" headings) bearing one-word main headings and two one- to two-word subdivisions. It also included subject headings with multiple-word main headings and subdivisions. Let's take a look at the response pattern for these subject headings in figure 5.14.

Figure 5.14. Response pattern

(many IDS meanings and fewer read-in meanings)
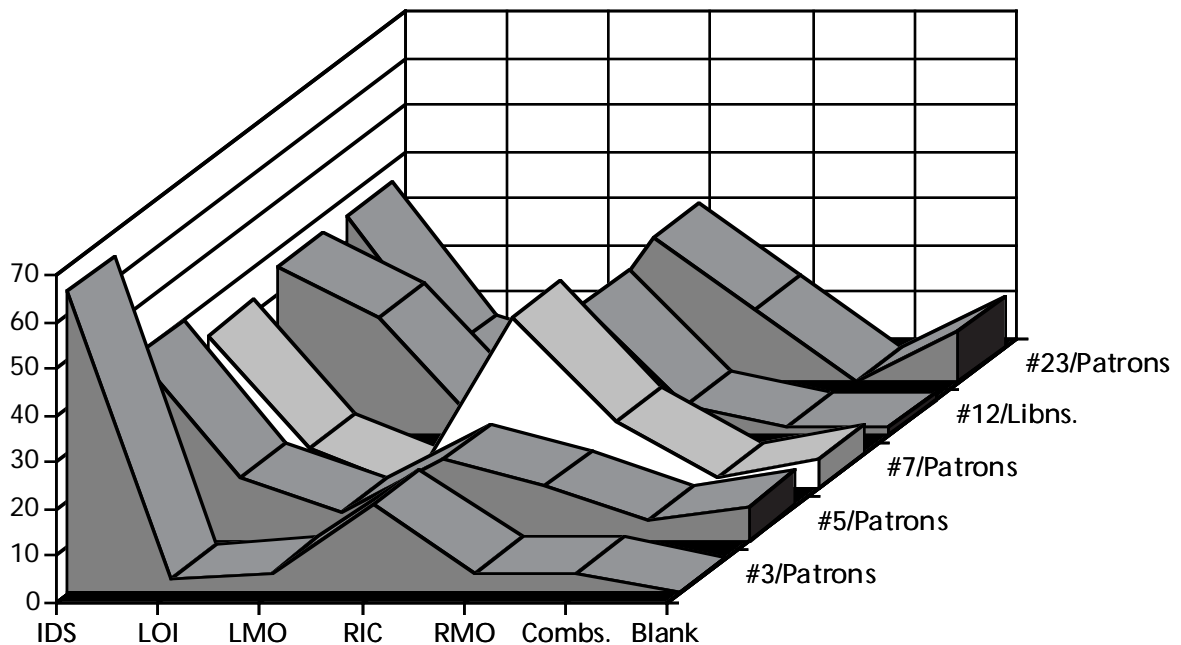
In all five cases, percentages of IDS meanings were high (between 32% and 65%). Percentages of RIC and RMO meanings were also high, in fact, the combined total of these two read-in codes amounted to between 23% and

51%. Percentages of LOI meanings for subject heading #12 were also high at 25%.

Let's take a look at the IDS meanings for the subject headings in this group. Table 5.14 features meanings for two subject headings.

Table 5.14. IDS Meanings–2

Expert-supplied meanings	Respondents' meanings
history of locomotives in Germany	history of German locomotives German locomotives, history of
German history of locomotives	history of locomotives in Germany history of German trains history of German locomotives
17th century interpretation… of organ music	(Meanings below were the same as the meaning change which was "interpretation… of 17th century organ music") the interpretation of organ music [from the, written in the] 17th century organ music of the 17th century with interpretations of the phrasing, dynamics
interpretation… of 17th century organ music	(Respondents gave no meanings assigned IDS codes.)

Two meanings were possible for the "Locomotives" subject heading in the original and recommended orders. Meanings that coders assigned IDS codes would have been judged correct (C, CDL, or CDS) for one of the two orders of headings but not to the order of heading to which the respondent assigned the meaning. For the other order, respondents gave entirely different meanings that the expert did not assign to either of the two orders. The same thing happened to "Organ music." When the meaning of the subject heading was "17th century interpretation… of organ music," respondents gave meanings that would have been judged correct for the other form of heading with respect to subdivision order. When the meaning was "interpretation… of 17th century organ music," they gave no meanings that would have been judged correct for

the other form of heading; they also did not introduce other meanings that were incorrect due to syntax.

Table 5.15 gives more IDS meanings for the subject headings in this group. The meanings that respondents gave to these headings did not flip-flop as they did in Tables 5.12 and 5.14. Instead, respondents issued meanings with interpretations that were entirely different from the one or more meanings of the subject headings. For example, several meanings for the two "Education" subject headings placed more or the same amount of emphasis on "finance" as on "education" which resulted in meanings involving "finance education in the U. S." and "finance in the U. S."

Table 5.15. IDS Meanings–3

Expert-supplied meanings	Respondents' meanings
New Mexican food of the Indians of North America	food of the Indians of North America in New Mexico food of New Mexican Indians food common to the North American Indians of New Mexico
finance of U. S. education	U. S. education in finance finance education in the U. S. U. S. finance education education and finance in the U. S.
finance of education in the U. S.	education of finance in the U. S. the education and finance of the U. S. the U. S. education finance education and finance as they pertain to the U. S.
finance of education in California	education and finance in California California's education and finance

Respondents were also likely to read one or more concepts into the subject headings in this group. Table 5.16 lists some examples.

A few read-in concepts referred to elements cited in the bibliographic records that users saw along with certain subject headings. (Only one-third of the respondents in the study were given questionnaires bearing subject headings in bibliographic records; the other two-thirds received questionnaires bearing subject headings alone or subject headings in alphabetical lists.) For example, respondents mentioned "steam engines" for the "Locomotives" heading. The title of the bibliographic record in which the "Locomotives" subject heading was enumerated referred to steam engines and this might have prompted respondents to include this element in their meanings. Meanings for the "Education" heading referred to "schools." When formulating their meanings for this subject heading, respondents might have been paraphrasing from the title *Financing Education in the Public Schools* which occurred in the bibliographic record in questionnaires that some respondents completed.

Table 5.16. Read-in Meanings

Expert-supplied meanings	Respondents' meanings
interpretation… of 17th century organ music 17th century interpretation… of organ music	explanation of 17th century music scores interpretation, phrasing, dynamics, expression, tempo, character, etc., of 17th century pipe organ music literature works on aspects of performance or transcriptions of organ music relating to the 17th century technical-analytical examination of emotional responses to organ music composition in the 1600s
finance of education in California	cost of education in California California shcool [sic] budget how California wastes its money in education California schools need more money to finance the education of schools
history of locomotives in Germany German history of locomotives	a reflection of the steam engine in Germany and an account of the impact made on German railways after it [sic] discontinuance a history of the use, development, and economic impact of locomotives in Germany

	history of German rail's steam engines
	history says that locomotives were invented in Germany

5.5.3 Lots of left-out concepts

This section takes a close look at four groups of subject headings for which respondents gave high percentages of incorrect meanings that left out one or more concepts. The first group of four subject headings was marked by high percentages of LOI meanings and much lower percentages of the several other incorrect meaning codes. The subject headings were:

- #2: Jews—Michigan—Detroit—History—20th century (librarians only)

- #9: Housing—United States—Law and legislation (librarians only)

- #18: Combined sewers—Illinois—Chicago metropolitan area—Overflows (librarians only)

- #24: English poetry—Middle English, 1100–1500—Criticism, Textual—Congresses (librarians only)

These four subject headings were somewhat complex consisting of one main heading, two to four subdivisions, and ranging from six to nine words. All the respondents to the subject headings in this group were librarians. Figure 5.15 gives the response pattern for these headings.

Figure 5.15 shows high percentages (between 51% and 64%) of LOI meanings. Percentages of IDS meanings were much lower across the board and ranged from 12% to 20% except for heading #18 for which no IDS meanings occurred. There were other individual differences between the subject headings in this group. For subject headings #2 and #18, about 20% of responses were incorrect meanings for reading in one or more concepts.

Figure 5.15. Response pattern

(many LOI meanings)
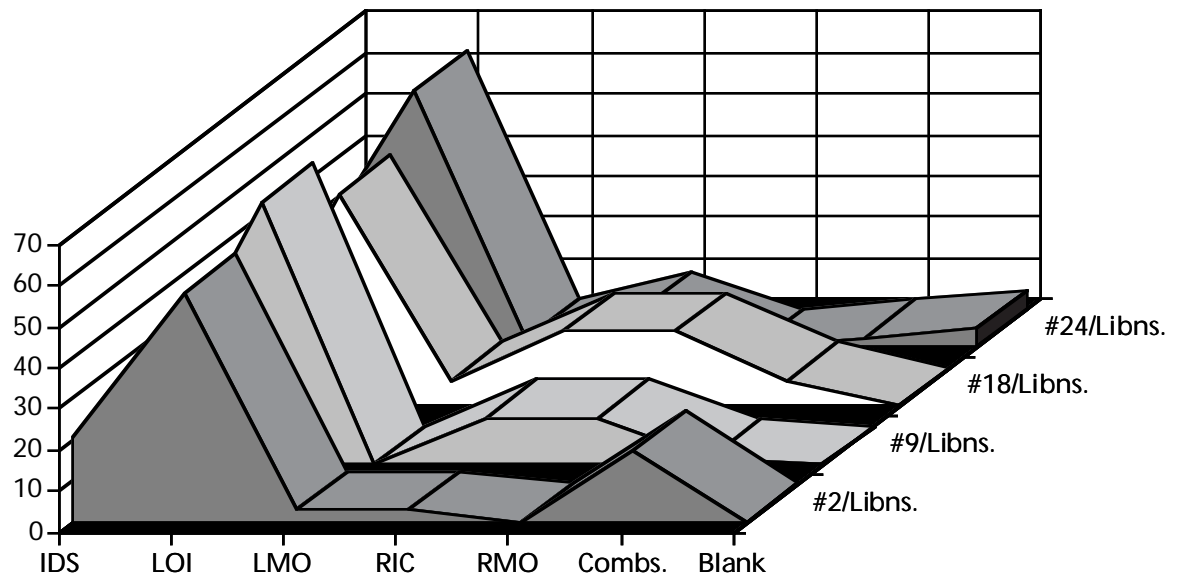
Table 5.17 lists several examples of left-out meanings for the subject headings in this group. For two of the subject headings, respondents were likely to leave out the same elements, and, perhaps, they did not understand these elements in the context of the subject heading. In fact, one respondent said as much in the meaning she gave for this subject heading—"overflows of sewers in the Chicago area (not sure what 'combined' means)."

Table 5.17. LOI Meanings

Expert-supplied meanings	Respondents' meanings
20th century history of Detroit (Mich.) Jews history of Detroit (Mich.) Jews in the 20th century	history of Jews in Michigan in the 20th century recent history of Jews in Detroit
overflows of combined sewers in the Chicago metropolitan area	(Respondents usually omitted "combined" element, for example:) problems of overflows of sewers in Chicago metropolitan area overflows of sewers in the Chicago area (not sure what "combined" means) sewer overflows in Chicago area
congresses of textual criticism of middle English (1100–1500) poetry	(Respondents usually omitted "textual" or "textual criticism" element, for example:) a conference about medieval English poetry meeting discussing middle English poetry scholarly congress on middle English poetry criticism of middle English poetry recorded (in print) at a symposium, conference, etc.
law and legislation of U. S. housing law and legislation of housing in the U. S.	(Most respondents omitted the "legislation" element, for example:) U. S. laws about housing laws in the U. S. about housing laws about housing (where people live) in the U. S. U. S. housing laws

The second group of five subject headings featured high percentages of meanings for leaving out one or more concepts. The subject headings were:

- #4: Music—Philosophy and aesthetics—500–1400 (library patrons only)

- #9: Housing—United States—Law and legislation (library patrons only)

- #13: World War, 1939–1945—Regimental histories—Japan (library patrons only)

- #15: Music—Washington (D. C.)— History and criticism (library patrons only)

- #18: Combined sewers—Illinois—Chicago metropolitan area—Overflows (library patrons only)

Figure 5.16. Response pattern

(many LOI and LMO meanings)
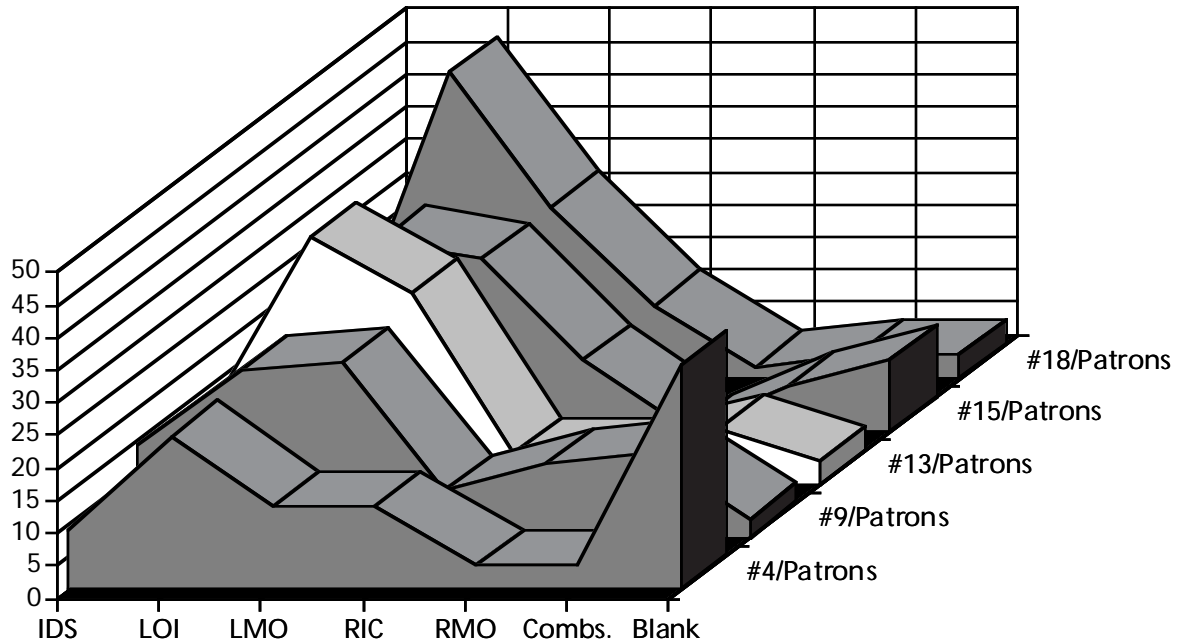
These subject headings contained six or seven words. Most featured two multiple-word subdivisions. One heading featured three subdivisions. Geographical subdivisions occurred in all but one subject heading. All the respondents for this subject heading group were library patrons. Figure 5.16 gives the response pattern for these headings.

Percentages of LOI and LMO meanings ranged from 25% to 47% and 26% to 30%, respectively. Overall, over 50% of respondent-assigned meanings left out one or more concepts and this percentage was as high as 74% for subject heading #8. Meanings for other incorrect codes did not amount to very much except for the whopping 35% of Blank responses for subject heading #4. (Subsection 5.5.7 focuses specifically on high percentages of Blank responses for this and other subject headings.)

Table 5.18. LMO Meanings–1

Expert-supplied meanings	Respondents' meanings
law and legislation of U. S. housing	types of housing congress housing in the U. S. government the laws for a house (rental or own) law and legislation
Japanese regimental histories of World War (1939–1945) regimental histories of World War (1939–1945) located in Japan	WW II–concerning Japan boundries [sic] war related history of military things that went on in WWII wars the war against Japan Japan and the world wars
history and criticism of Washington (D. C.) music	music reflecting history music peculiar [sic] to Washington, D. C. congress history of music
overflows of combined sewers in the Chicago (Ill.) metropolitan area	where there is a "problem" with overflow of sewers information on the sewers of Chicago, Ill. sewer flow in Chicago the unique sewer problems of the Chicago area

Table 5.18 features the many meanings missing *more than one* concept. Most of the examples in Table 5.18 came from questionnaires completed by children.

Respondents consistently missed the "combined" element in the "Combined sewers" subject heading. They usually glossed over this concept by referring to "sewer problems" or "information on sewers" in their meanings. The "regimental histories" element was consistently missing from the examples for the "Japanese regimental histories" heading. Some respondents also left out the "Japanese" element. Respondents did not consistently omit certain topics from their meanings for the other two subject headings. For example, meanings for "Housing" left out one or more of the four concepts in this subject heading, i.e., "housing," "law," "legislation," and "U. S."

Let's turn to the third group of three subject headings. The response pattern was similar to the pattern for the previous group of four subject headings to which respondents assigned lots of LOI and LMO meanings. The main difference between the two groups was that respondents gave a sizable number of IDS meanings to subject headings in the third group. The subject headings were:

- #11: Jews—Germany—Berlin—Intellectual life—Congresses (library patrons only)

- #14: English poetry—Old English, ca. 450–1100—Modernized versions (library patrons only)

- #16: Art, Modern—20th century—Germany—Berlin—Exhibitions (library patrons only)

These subject headings were all different. Main headings consisted of one or two words. Two of the headings featured four subdivisions. The one subject heading bearing only two subdivisions featured subdivisions with several words. The four types of subdivisions occurred in these subject headings, i.e., topical,

form, period, and geographical subdivisions. Figure 5.17 shows the response pattern for these subject headings.

Figure 5.17. Response pattern

(many LMO and LOI meanings, many IDS meanings)
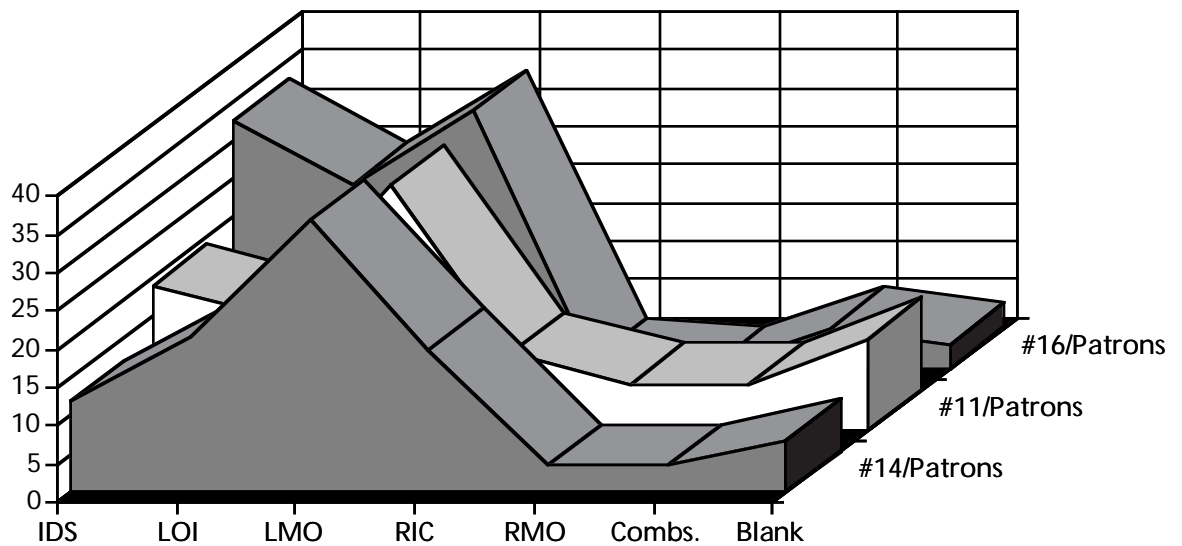
Percentages of LMO meanings were especially high and accounted for about one-third of responses or higher. Percentages of LOI meanings ranged from 15% to 25%. There was a lot of variation for IDS meanings. Meanings for other incorrect codes did not amount to very much except for the moderately high percentage (12%) of Blank responses for subject heading #11. (Subsection 5.5.7 specifically focuses on Blank responses.)

Table 5.19 features the many meanings missing *more than one* concept. Most of the examples in Table 5.19 came from questionnaires completed by children.

Table 5.19. LMO Meanings–2

Expert-supplied meanings	Respondents' meanings
congresses on the intellectual life of Jews in Berlin, Germany	religion about different kinds of people a Jews life about Germany how Jewish people live their life
modernized versions of old English (ca. 450–1100) poetry	about poetry poetry–old and new versions of English poetry poetry in English at different times old poetry
exhibitions of 20th century Berlin (Germany) modern art exhibitions of 20th century modern art in Berlin, Germany	art about art museums art in museums art in different countries modern art of Germany

Some LMO meanings captured two or more of the concepts in subject headings, e.g., "modern art of Germany" or "versions of English poetry." Other meanings attempted to summarize the subject heading's meaning in one or two broad terms, e.g., "art," "museums," "religion," "about poetry," and "art in museums." Perhaps the valiant attempts to express the meanings of the subject headings in this and the previous group were indicative of children's lack of knowledge on the topics described in the subject headings.

IDS meanings were especially plentiful for two of the subject headings in this group. For the "Jews" heading, respondents seemed to have difficulty expressing the "congresses" element of this heading and the results were meanings to which coders gave IDS codes. When the meaning of this heading

was "congresses of the intellectual life of Berlin (Germany) Jews," examples of IDS meanings were:

- intellectual life in congres [sic] for Jews, Germany, Berlin

- a study/history of intellectual Jewish congresses in Berlin, Germany

- intellectual life of the Jews with the congress in Berlin, Germany

- the Jews in Berlin congressed into intellectual life

For most representations of the "Art, Modern" heading, the expert-supplied meaning was "exhibitions of 20th century Berlin (Germany) modern art." Respondents typically offered meanings that described this subject heading's second meaning, i.e., "exhibitions of 20th century modern art in Berlin, Germany" when the first meaning was in effect. Coders judged such meanings incorrect due to syntax (IDS). Examples were:

- exhibitions of 20th century modern art (exhibited) in Berlin, Germany

- 20th century modern art in Berlin, Germany, specifically relating to exhibitions

- exhibitions of modern art during the 20th century in Berlin, Germany

At other times, respondents expressed their meanings using syntax that was incorrect but resulted in still more meanings for this subject heading. Examples were:

- modern art exhibitions in 20th century Berlin

- exhibits of A [sic] in Berlin in the 20th century

- modern art exhibitions in 20th century Germany and Berlin

When the meaning of this subject heading was "exhibitions of 20th century modern art in Berlin, Germany," respondents gave so few IDS meanings that they were not worthy of discussion here.

Let's take a look at a last group of two subject headings which had high percentages of LOI and RIC meanings. Librarians gave meanings to the two

subjects in this group, "Music—Washington (D.C.)—History and criticism" and "Jews—Egypt—Politics and government." Both subject headings had a one-word main heading, two subdivisions, and numbered five or six words. Figure 5.18 shows the response pattern for these subject headings.

Figure 5.18. Response pattern

(many LOI and RIC meanings)
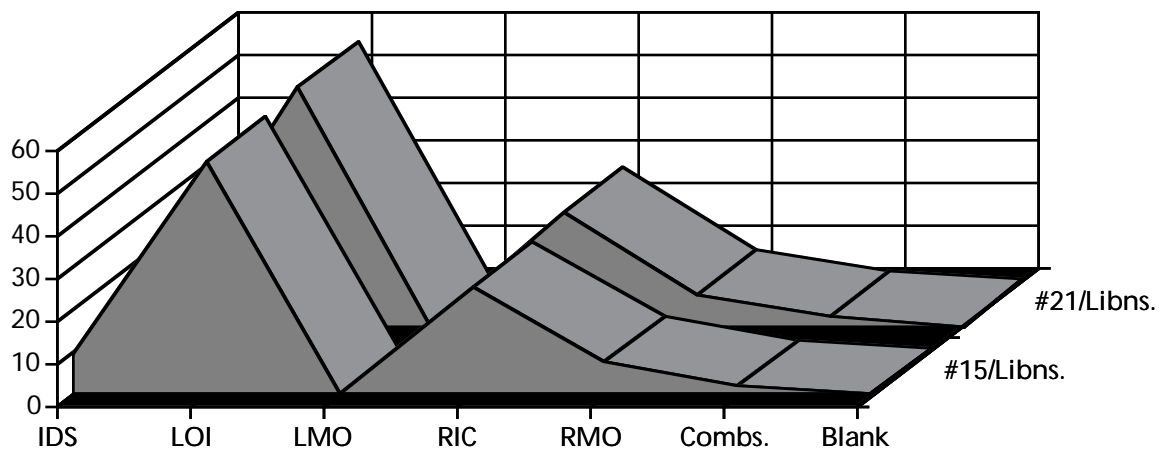
Response patterns were almost mirror images of one another: high percentages (around 55%) of LOI meanings, no LMO meanings, moderately high (about 25%) percentages of RIC meanings, and much lower percentages of RMO (about 8%) meanings. Left-out concepts were somewhat predictable in that respondents usually omitted one of the two elements in subdivisions. Examples of respondent-assigned meanings follow in which the "criticism" element in the subdivision "—History and criticism" or the "government" or "politics" element in the subdivision "—Politics and government" was missing.

- history of music in Washington, D. C.

- a history of music associated with Washington, D. C.

- history of music in the District of Columbia

- politics of Jews in Egypt

- Jews in Egyptian government

- the role of Jews in Egyptian politics

5.5.4 Lots of read-in concepts

There was only one group of two subject headings to which respondents assigned large percentages of RIC meanings and smaller percentages of the other incorrect meanings. The two subject headings in this group shared the same main heading "Music." The headings were:

- #20: Music—Africa—History and criticism—Bibliography (library patrons and librarians)

- #22: Music—Louisiana—New Orleans—History and criticism (library patrons and librarians)

For both subject headings, almost three-quarters of meanings made by librarians were RIC meanings. Between about 37% and 40% of library patrons assigned RIC meanings to these subject headings. They also assigned LOI meanings about 20% of the time and most of these LOI meanings were missing the "history" or "criticism" element in the subdivision "—History and criticism." About 20% of library patrons assigned LMO meanings to the "Music—Africa" subject heading. Sometimes, their LMO meanings left out both elements in the subdivision "—History and criticism;" other times, they used broad terms to characterize the heading's meaning, e.g., "music has history," "history of Africa," "African music (history)."

Let's now focus on read-in meanings. With respect to the first music heading above, the meaning was "bibliography of the history and criticism of music from Africa." Since most respondent-assigned meanings used the phrase

"African music" instead of "music in Africa," coders judged such meanings as "read in one concept" because "music in Africa" in the expert-supplied meaning referred to music from Africa but the music could be French, German, Polish, American, etc. The phrase "African music" in respondent-supplied meanings limited meanings to music indigenous to Africa.

The problem with the second subject heading was similar. There were three correct meanings for this subject heading depending upon the particular representation at hand. These meanings were:

- history and criticism of New Orleans (La.) music; that is, music originating in New Orleans

- History and criticism of music [from, in] New Orleans, La.; that is, music performed in New Orleans but the music need not have originated there

- New Orleans (La.) history and criticism of music; that is, criticism made in New Orleans about any kind of music

Most library patrons responded with meanings that were the same as the first two meanings above but they flip-flopped their meanings, that is, assigning the incorrect meaning for the particular representation at hand.

5.5.5 Lots of combination codes

Three subject headings were singled out because respondents gave meanings to which coders assigned more than one incorrect code. The three subject headings were:

- #1: Basketball—United States—Records (librarians only)

- #4: Music—Philosophy and aesthetics—500–1400 (librarians only)

- #5: Indians of North America—Food—New Mexico (librarians only)

Two of these subject headings consisted of a one-word main heading and two subdivisions, and one consisted of a four-word main heading and two

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subdivisions. The words in these subject headings ranged from four to seven. Figure 5.19 shows the response pattern for these subject headings.

Figure 5.19. Response pattern (many combination meanings)
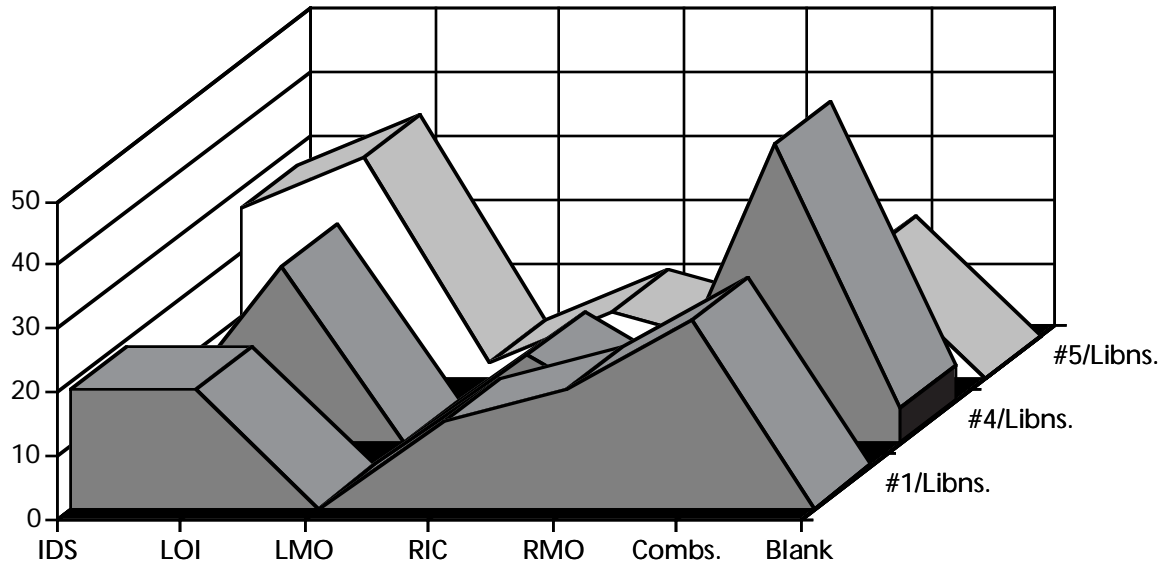
Let's discuss each subject heading individually. Combination meanings predominated for subject heading #1. All these combination meanings involved codes for leaving out and reading in concepts. When the correct meaning was "records of U. S. basketball," examples of combination meanings were:

- statistics on aspects/persons of the pro basketball game played in the U. S.

- a history of basketball or facts about basketball in the U. S.

- basketball team/player statistics

- a history of basketball or facts

- exceptional performance by basketball teams or players in the U. S.

Each meaning left out or read in one or more concepts. For example, the third-listed meaning omitted the concept "records" and added the concepts "history" and "facts." Also typical were LOI meanings for this subject heading. In all cases, respondents omitted the "United States" concept. Examples were:

- basketball records

- records of games, scores

- unique basketball statistics

- records held in basketball

Percentages of combination codes accounted for almost 50% of meanings for subject heading #4. Again, all these combination meanings involved leaving out and reading in concepts. When the correct meaning was "philosophy and aesthetics of music from 500–1400," examples of combination meanings were:

- what people thought of the theory and appreciation of music in the middle ages

- use and theory of music from the years 500–1400 CE"

- philosophical discussion of music created between 500–1400

- what music was thought of between 500–1400

- examines the music in this time frame–what it was attempting to do

Most incorrect combination meanings included the concepts "music" and an appropriate time period. They left out the "philosophy" and "aesthetics" elements from the subdivision "—Philosophy and aesthetics" and added concepts such as "what people thought" and "use and theory." LOI meanings were also typical of the respondent-assigned meanings for this subject heading; most of the time, respondents omitted one element from the "—Philosophy and aesthetics" subdivision.

Subject heading #5 featured moderately high percentages for three incorrect meanings—LOI, IDS, and incorrect combinations. About 20% were incorrect

combination meanings. When the meaning was "New Mexican food of the Indians of North America," here were some combination meanings for this subject heading:

- food in the lives of New Mexican Indians

- concerns food eaten by New Mexican Indians

- New Mexican Indians food situation–where?

- Dietary patterns of Indians in New Mexico

Instead of referring to "Indians of North America," these meanings referred to "New Mexican Indians" or "Indians of New Mexico." None of them mentioned "North America" and the last-listed meaning added the concept "dietary patterns."

5.5.6 No one code predominated

This subsection discusses six subject headings for which no one incorrect code predominated. Usually two or three codes amounted to between 50% and 60% of responses for these subject headings. The subject headings were:

- #1: Basketball—United States—Records (library patrons only)

- #10: Handicapped—Washington (State)—Seattle metropolitan area—Transportation (library patrons only)

- #12: Organ music—17th century—Interpretation (phrasing, dynamics, etc.) (library patrons only)

- #17: Cattle—United States—Marketing (library patrons only)

- #21: Jews—Egypt—Politics and government (library patrons only)

- #24: English poetry—Middle English, 1100–1500—Criticism, Textual—Congresses (library patrons only)

Main headings consisted of one or two words and were appended by two or three subdivisions. The number of words in these subject headings ranged from four to nine words. Since no one incorrect code predominated, it did not make

sense to graph response patterns. Instead, we will discuss each subject heading individually.

For the subject heading "Basketball," the percentages of each IDS, LOI, and RIC meaning ranged from 21% to 27% of responses and together they amounted to a little over of 75% of incorrect meanings. The correct meaning of this subdivided subject heading was "records of U. S. basketball" which limited this heading to describing U. S. basketball. Frequently-occurring IDS meanings were "basketball records in the U. S." or "records made in basketball in the U. S." These incorrect meanings limited the heading's meaning to records made in the U. S. but such records could be made by teams from countries other than the U. S. Almost all LOI meanings for this subject heading left out the "U. S." concept. Finally, respondents were likely to read in several different concepts which probably reflected their own personal knowledge of and experience with this subject. Some of the examples below might have been inspired by the bibliographic record's title (*Basketball statistics: Top players and teams by game, season, and career)* because they mentioned basketball players, teams, and the NBA:

• the records of the basketball players in the U. S.

• athletic record holders in basketball

• I would find facts relating to basketball records made or broken in the U. S.

• NBA player and team statistics

For the subject heading "Handicapped," each IDS, LOI, and LMO meaning ranged from 17% to 26% of responses and together they amounted to about two-thirds of the incorrect meanings for this subject. The correct meaning of one representation of this subdivided subject heading was "transportation of Seattle (Wash.) metropolitan area handicapped." When respondents were asked to give meanings to the several representations of this subdivided subject heading for which "transportation of handicapped in the Seattle (Wash.) metropolitan area" was the correct meaning, they gave IDS meanings that

matched the other correct meaning of this subdivided subject heading. The opposite did not happen. Instead, respondents gave IDS meanings with entirely new interpretations. Examples were:

- transportation in Washington for the handicapped in the Seattle metropolitan area

- transportation for the handicapped through the metropolitan area of Seattle

- provisions for handicapped persons on transportation in Washington State, especially in Seattle metropolitan area

- transportation for the handicapped in the Seattle and Washington State area

With respect to LOI meanings, children were likely to mention the state of "Washington" and leave out "Seattle." Adults were more prone to omitting any mention of place. There were lots of examples of LMO meanings. Most such meanings left out any mention of place or summarized the subject in broad terms. Examples were:

- veterans

- the people who are not that aple [sic] to do things

- handicapped

- the way handicapped people get to where they are going

- transportation of the handicapped

For the subject heading "Organ music," the percentages of each IDS, LOI, and LMO meaning were about 28% and together they amounted to exactly 84% of responses. This subject heading featured two meanings depending on the particular representation at hand: (1) "interpretation… of 17th century organ music," and (2) "17th century interpretation… of organ music." When the first meaning was applicable, respondents sometimes gave IDS meanings that described the second meaning. Examples were:

- 17th century organ interpretation

- 17th century interpretation of organ music

When the second meaning was applicable, respondents sometimes gave IDS meanings that described the first meaning. Examples were:

- interpretation of 17th century organ music

- interpretation of organ music composed in the 17th century

- how organ music from the 17th century is interpreted today

In addition, respondents gave IDS meanings that described neither the first nor second meaning above but introduced entirely new meanings for this subject.

Both adults and children gave meanings that left-out concepts. Children were more likely to leave out more than one concept and to restate the subject in broad terms. Examples were:

- operas

- oldies music

- organ

- about music

- instruments in an orchestra

Adults also restated meanings for this topic but examples of such meanings were less plentiful than those given by children. Such examples of adults' meanings were:

- organ music (history of)

- story behind the music

- old organ music

Yet, some adults and children offered LOI and LMO meanings that captured one or two concepts of this multifaceted subject heading. Examples for the second meaning of this subject heading were:

- music and 17th century

- perspectives dealing with organ music of the 17th century

- organ music style: interpretation, phrasing, etc.

- the study of 17th century organ music

For the subject heading "Cattle," the percentages of each LOI and RIC meaning were about 24%, the percentage of IDS meanings were 18%, and together they amounted to about two-thirds of responses. LOI meanings usually omitted the "U. S." or "cattle" concepts of the subject. This subject heading had only one meaning, namely, "marketing of cattle in the United States." Examples of LOI meanings were:

- marketing of cattle

- trading cattle

- information on marketing cattle

- U. S. marketing

- marketing in the U. S.

Since RMO meanings accounted to only about 10% of responses, we'll include such meanings in a single list of RIC and RMO meanings below:

- making money–dealing in cattle/U. S.

- how to market cattle profitably in U. S. by knowing cattle cycles

- law and legislation regarding cattle marketing in U. S.

- how the USDA goes about market [sic] cattle

The title of the bibliographic record *(Cattle cycles: How to profit from them)* could have inspired the first two meanings listed above. Respondents who formulated the last two titles above did not see the subject heading in a bibliographic record. They must have added the phrases "law and legislation" and "USDA" from their own experiences and knowledge.

For the subject heading "Jews," the only incorrect codes receiving more than one-quarter of responses was RIC (28%). IDS, LOI, and RMO meanings reached double-digit percentages but only IDS meanings reached the high teens (19%). This subject heading featured two meanings depending on the particular representation at hand: (1) "politics and government of Jews in Egypt," and (2) "politics of Egyptian Jews." When the first meaning was in effect, respondents sometimes gave IDS meanings that described the second meaning. Examples were:

- politics and government of Egyptian Jews

- Egyptian Jews politics and government

- Egyptian Jews on politics and government

The reverse did not happen, that is, when the second meaning was applicable, respondents did not give IDS meanings that described the first meaning; however, there was only one representation for which the second meaning was in effect and respondents gave no IDS meanings for this particular representation.

Let's take a look a read-in concepts. Added to the list below are RMO meanings because they achieved double-digit percentages. Examples were:

- Jews involvement is politics and government in Egypt

- the political influence of Jews on or in Egypt

- Jews in public service in Egypt

- Jews are a large part of the politics/government of Egypt

- the relation between Jews, Egypt vs. government and politics

- the Jews of Egypt, 1920–1970: in the midst of Zionism, anti-Semetism [sic], and the Middle East conflict, including politics and government

It is obvious that the title of the bibliographic record *(The Jews of Egypt, 1920–1970: In the midst of Zionism, anti-Semitism, and the Middle East conflict)* inspired the last listed meaning because the respondent cited the title verbatim.

The title did not play a role in the other meanings because they focused on the concepts "politics" and "government" which were cited in the subject heading but not in the title of the bibliographic record.

"English poetry" is our final subject heading for discussion in this subsection. It received high percentages of LMO (37%) and IDS (22%) meanings. LOI meanings achieved a double-digit percentage (14%). Together these three meanings accounted for 73% of responses. This subject heading featured two meanings depending on the particular representation at hand: (1) "congresses of textual criticism of middle English (1100–1500) poetry," and (2) "congresses of middle English (1100–1500) textual criticism of English poetry." Regardless which meaning was in effect, respondents gave new meanings to describe this subject; some of the phrases in these meanings were comparable to the phrases in one or both correct meanings. Although children gave most of the IDS meanings, a few examples below came from adults:

- middle English (1100–1500) criticism of English poetry and textual congresses

- criticism, textual–congresses on middle English poetry of middle English poetry

- there is textual and criticism on the congress, English poetry and middle English, 1100–1500

- the textual criticism of middle English (1100–1500) congresses of English poetry

- textual criticism by congresses of English poetry in mid-English from 1100–1500

LOI and LMO meanings came from both adults and children. Some such meanings cite phrases in the subject heading:

- criticism of middle English poetry

- middle English poetry

- criticism of English poetry composed 1100–1500

- English poetry in 1100–1500

- the criticism and middle English poetry?

Some LMO meanings from both adults and children restated the topic in broad terms that they knew or were familiar to them. Examples were:

- midevil [sic]

- poetry in England

- the congresses

- poetry in U. S.

- how the congresses feel about middle English poetry

At first glance, the RMO meaning "poetry in U. S." was baffling because nothing in the bibliographic record or alphabetical lists referred to the United States. However, the last-listed meaning "how the congresses feel about middle English poetry" gave the clue that unlocked the mystery. Respondents were probably not familiar with the meaning of the word "congresses" when used to mean a gathering of scholars but they were familiar with the U. S. Congress. Possibly, respondents thought of the U. S. when they read the word "congresses" and made up a meaning that included "U. S." along with "poetry."

5.5.7 Blank responses

The seven subject headings that are discussed in this section have been covered in previous sections on incorrect meanings (sections 5.5.2 to 5.5.6). We singled out these seven subject headings for additional discussion because more than 10% of the responses were Blank. Since we have about one hundred meanings per subject heading from library patrons and one hundred meanings per subject heading from librarians, this means that we are talking about subject headings for which ten patrons or ten librarians failed to provide meanings. In every case, the respondents were library patrons. (The highest percentage of Blank responses for librarians was 6% for the subject heading "Music—Philosophy and aesthetics—500–1400.") The seven subject headings for which more than

10% of library patrons failed to give meanings are listed in Table 5.20 along with the percentages of Blank responses and the number of meanings for the six representations of the subject heading.

Table 5.20. Subject Headings and Blank Responses

Subject heading	(%) Blank	(#) Mngs.
#4: Music—Philosophy and aesthetics—500–1400	35.	1
#24: English poetry—Middle English, 1100–1500—Criticism, Textual—Congresses	22.	2
#21: Jews—Egypt—Politics and government	13.	2
#11: Jews—Germany—Berlin—Intellectual life—Congresses	12.	2
#23: Education—California—Finance	11.	1
#15: Music—Washington (D. C.)—History and criticism	11.	3
#22: Music—Louisiana—New Orleans—History and criticism	10.	3

Most percentages of Blank responses were around 12% but there were two percentages that accounted for much more. Two of the seven subject headings featured only one meaning while another two featured as many as three meanings. We would have included certainty scores for the subject headings listed in Table 5.20 but most respondents left the certainty scale blank also.

Figure 5.20 shows the response pattern for these seven subject headings.

Figure 5.20. Response pattern (many Blanks)
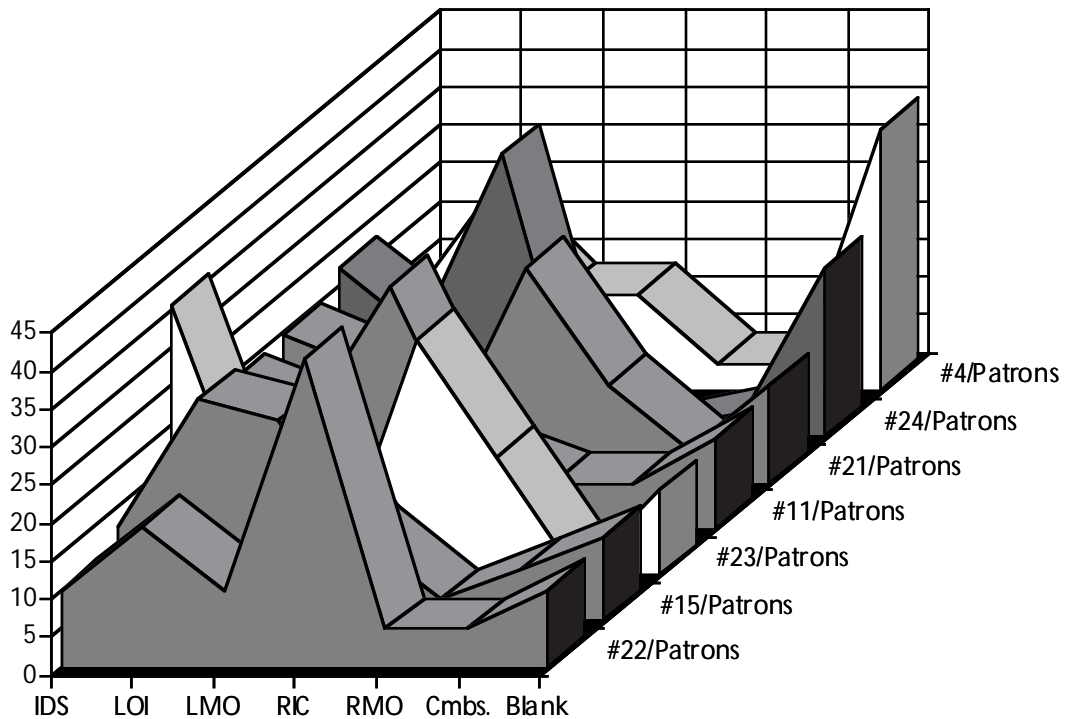
Figure 5.20 shows as many response patterns as there were subject headings in this group. Double-digit percentages of Blank responses occurred in response patterns with just about every other frequent response pattern type, e.g., IDS and LMO, LOI and LMO, RIC and RMO. About the only similarity besides double-digit percentages of Blank responses were high or moderately high percentages of LOI and/or LMO responses *or* high or moderately high percentages of RIC and/or RMO responses. Thus, in addition to double-digit percentages of Blank responses, respondents assigned high percentages of incorrect meanings that either left out *or* read in one or more concepts. Previous subsections provided several examples of such meanings. Let's repeat here some LMO meanings for the subject heading "Jews—Germany—Berlin—Intellectual life—Congresses" that expressed this heading in broad terms. Although such meanings often came from children, adults made them also. Meanings made by children were:

- religion

- about different kinds of people

- a Jews life

- about Germany

- how Jewish people live their life

High percentages of RIC and RMO meanings also co-occurred with double-digit percentages of Blank responses. Previous subsections provided several examples of such meanings but, for the sake of example, a few RIC and RMO meanings for the subject heading "Education—California—Finance" are listed below with the reminder that title and other information in bibliographic records might have inspired respondents to read in terms for "school" and "budget."

- cost of education in California

- California shcool [sic] budget

- how much they waste money on education in California

- how to finance your education in California

- education on young kids and teens (in California)

5.5.8 Incorrect meanings summary

Section 5.5 discussed groups of two to six subject headings that shared similarities in terms of the specific incorrect meaning codes assigned to them. There were groups of subject headings with the following characteristics:

- Two groups with high percentages of IDS meanings and: (1) lower percentages of LOI meanings and even lower LMO meanings, or (2) lower percentages of read-in (RIC and RMO) meanings

- Four groups with high percentages of LOI meanings and: (1) lower percentages of the several other incorrect meaning codes with no one such code predominating, (2) lower percentages of codes for leaving

out more than one concept (LMO), (3) lower percentages of IDS and LMO meanings, or (4) lower percentages RIC meanings

- One group with high percentages of RIC meanings and lower percentages of the several other incorrect meaning codes with no one such code predominating

- One group with high percentages of a combination of two incorrect codes

- One group in which no one incorrect meaning code predominated

Most groups of subject headings featured a mixture of incorrect meanings by both library patrons and librarians. Yet there were a few groups which were given entirely to the incorrect meanings of one of the two types of respondents. For example, librarians were responsible for the response pattern that featured high percentages of LOI meanings and lower percentages of the several other incorrect meaning codes with no one such code predominating and library patrons were responsible for the response pattern that featured high percentages of LOI and LMO meanings.

There were only five instances when the response patterns for both library patrons and librarians were the same for the same subject heading. This was an important finding. It meant that the syntactic and semantic qualities of the incorrect meanings that library patrons and librarians gave to the same subject headings were quite different.

There were interesting findings about each incorrect meaning code. Let's start with IDS codes (section 5.5.2). Some subject headings featured two meanings depending on the particular subject heading representation at hand. When the first of two meanings was in effect, respondents sometimes gave IDS meanings that described the second meaning and visa versa. Other IDS meanings gave additional interpretations for the subject headings at hand that were not amongst the correct meaning(s) supplied by the subject cataloging expert.

Library patrons and librarians offered incorrect meanings that left out concepts (section 5.5.3). Generally librarians were likely to leave out one concept (LOI)

but they did not very often leave out more than one concept (LMO). LMO meanings were much more characteristic of library patrons. In fact, children typically offered two types of LMO meanings: (1) LMO meanings that reiterated one or more concepts in subject headings but left out more than one concept, or (2) LMO meanings that restated subject headings in rather broad terms. "17th century organ music" and "17th century music of the organ" were two examples of children's LMO meanings that cited the "organ music" and "17th century" concepts in the expert-supplied meaning "Interpretation (phrasing, dynamics, etc.) of 17th century organ music" for the subject heading in original order "Organ music—17th century—Interpretation (phrasing, dynamics, etc.)," but they left out the "interpretation," "phrasing," and "dynamics" elements. The meanings "church," "oldies music," "about music," "when it was played" were examples of children's LMO meanings that characterized the subject in very broad terms. When adults and children rated the certainty of their meanings, unusually low certainty scores were almost always associated with *incorrect* LOI ("Left out One Concept") codes and LMO ("Left out More Than One Concept") codes (section 4.4.2). So they knew in advance that their meanings in this regard were likely to be incorrect.

Codes for reading in one or more concepts were not very plentiful. They described only one group of subject headings and there were only two subject headings in the group. When respondents gave meanings to subject headings in the bibliographic record context, we expected to encounter read-in meanings. We thought that respondents would add concepts to their meanings for the concepts present in bibliographic records. However, this did not happen very often. Sections 5.5.2 and 5.5.6 cite a few examples.

Respondents gave meanings to one group of three subject headings to which coders assigned more than one incorrect code (section 5.5.5). High percentages of combination codes were for combinations of codes for leaving out or reading in one or more concepts. Other combinations were possible, for example, combinations of codes for syntax problems and leaving out one or

more concepts or for syntax problems and reading in one or more concepts, but such combinations seldom occurred.

Double-digit percentages (10% and higher) of Blank responses characterized library patrons' incorrect responses to seven subject headings. The one subject heading for which library patrons scored the highest percentage (35%) of Blank responses was for "Music—Philosophy and aesthetics—500–1400." Except for a high percentage of Blank and a moderately high percentage of LOI meanings, no other incorrect code characterized patron responses to this heading. A few patrons restated it in broad terms, e.g., ""music history of it" or "about music and philosophy." Perhaps patrons chose to leave the meaning blank rather than hazard a guess at the meaning. The highest percentage of Blank responses for librarians was in the single digits at 6% for the same subject heading.

Grouped subject headings did not exhibit any particular characteristics that would single them out. Grouped subject headings were often a mixture of simple subject headings consisting of a one- to two-word main heading and two one-to two-word subdivisions, and more complex subject headings consisting of a two- or four-word main heading and three or four subdivisions.

One group was missing from the groups of subject headings discussed in this section. This group was made up of the eight subject headings to which more than two-thirds of the meanings given by *either* library patrons *or* librarians were correct. The missing group averaged 5.4 words per subject heading and 3.4 subdivisions per subject heading. The several subject heading groups discussed in this section averaged 6.6 words per subject heading and 3.6 subdivisions per subject heading. Subject headings to which respondents gave high percentages of incorrect meanings were little more wordy (6.6 versus 5.4 words); however, they consisted of almost the same number of subdivisions (3.6 versus 3.4 subdivisions).

5.6 Meaning Changes and Correct Meanings

So far, statistical and failure analyses of subdivided subject headings and the meanings respondents assigned to them have revealed little in terms of the particular characteristics of subject headings that identify them as being especially difficult for respondents to understand.

In our efforts to find characteristics that made certain subject headings difficult in terms of assigning meanings, we wondered whether subject headings which changed meaning due to subdivision order, context, or a combination of the two, were just more difficult than subject headings that did not change meaning. To determine whether there was any truth behind this hypothesis, we distributed subject headings into separate categories for "Change" and "No change" in meaning. Subject headings in the "Change" category were pairs of subject headings in original and recommended orders to which the subject cataloging expert gave two or more meanings. Subject headings in the "No Change" category were pairs of subject headings in original and recommended orders to which the subject cataloging expert gave one and only one meaning. Then we tallied the numbers and percentages of correct meanings that respondents gave to these subject heading pairs in "Change" and "No Change" categories. Figure 5.21 shows the results for adults and children across the three participating Michigan libraries.

Figure 5.21. Correct meanings for subject headings that
changed and did not change meaning (adults and children)
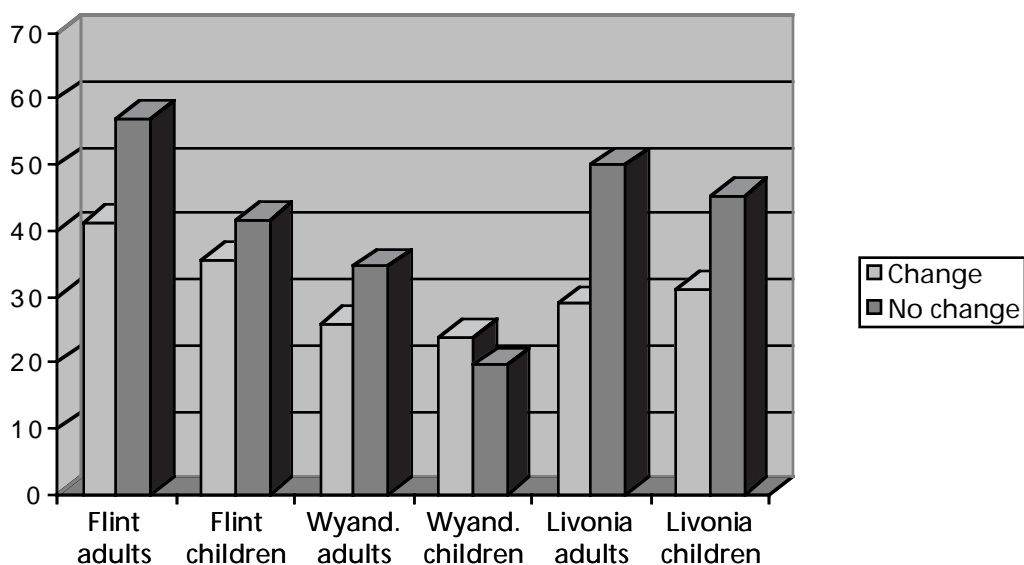
In almost every case, the percentages of correct meanings were greater for subject headings that did not change meaning, and sometimes substantially greater, than the percentages of correct meanings for subject headings that changed meaning. As few as six percentage points separated one pair of "Change" and "No Change" percentages (Flint, children) and as many as 21 percentage points separated another pair of "Change" and "No Change" percentages (Livonia, adults). The only percentages that flip-flopped were for Wyandotte children; 24% of correct meanings were for subject headings that changed meaning and 20% of correct meanings were for subject headings that did *not* change meaning.

Figure 5.22 shows the results for reference and technical services librarians for the three sets of subject headings.

Figure 5.22. Correct meanings for subject headings that
changed and did not change meaning (librarians)
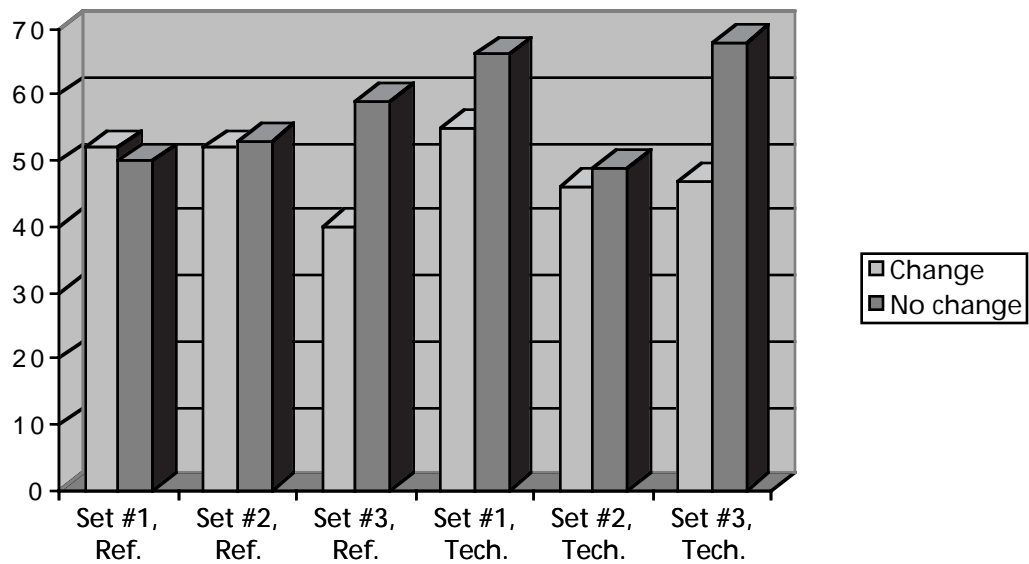
In almost every case, the percentages of correct meanings were about the same or greater for subject headings that did not change meaning than the percentages of correct meanings for subject headings that changed meaning. As few as one percentage point separated one pair of "Change" and "No Change" percentages (Set #2, reference librarians) and as many as twenty percentage points separated another pair of "Change" and "No Change" percentages (set #3, technical services librarians). The only percentages that flip-flopped were for reference librarians who examined set #1 for which 52% of correct meanings were for subject headings that changed meaning and 50% of correct meanings were for subject headings that did not change meaning.

Comparisons of percentages for meanings in "Change" and "No Change" categories showed that, with few exceptions, respondents had more problems assigning meanings to subject headings that changed meaning than they did assigning meanings to subject headings that did not change meaning. This analysis demonstrated that respondents were more likely to have difficulty assigning meanings to subject headings that changed meaning.

6 Major Project Findings and Conclusions

6.1 Background

The idea for this research on understanding subject headings came from a charge to the Subcommittee on the Order of LCSH (Library of Congress Subject Headings) Subdivisions by the Subject Analysis Committee (SAC) of the American Library Association (ALA) to respond to the first of six recommendations of the Library of Congress (LC) Subject Subdivisions Conference. This recommendation suggested standardizing the order of subject subdivisions for the purpose of simplifying subject cataloging. Ultimately, enforcement of a standardized order of subdivisions could reduce time spent training and reviewing the work of new cataloging staff, and time spent assigning subdivided subject headings. It would also enable computer-based systems to automatically verify subdivided subject headings.

Before implementing the recommendation, librarians wanted to determine whether reordering subject subdivisions would have a negative effect on end users' understanding of subdivided subject headings. Some librarians expected that end users would have more problems understanding the meaning of subject headings in the recommended order than in the original order. Perhaps children would have even more problems than adults in terms of understanding reordered subject headings. This research project put these and other hypotheses to the test. It assessed the impact of reordered subdivisions when they were displayed to users in typical subject heading contexts—alone, embedded in bibliographic records, and embedded in alphabetical browsing lists—and determined whether respondents were likely to read in concepts mentioned in bibliographic records. It also generated additional hypotheses

such as the effect that meaning changes had on respondents' ability to formulate correct meanings to subject headings.

6.2 Objectives and Research Questions

The objectives of this research project were to determine end-user understanding of subject headings and identify automatic techniques for manipulating subject headings to improve end-user understanding. The study answered five research questions:

1.   To what extent did end users understand subject headings?

2.   Did end-user understanding vary based on subject heading context?

3.   Did end-user understanding vary based on subject heading form?

4.   Were there differences in levels of understanding between the four groups of respondents (children, adults, reference librarians, technical services librarians), and in levels of understanding for the different forms or contexts of subject headings?

5.   What computer-based techniques could be applied to existing files of subject headings to produce subject headings that are more understandable to end users?

6.3 Methods Overview

The Michigan project team selected a total of 24 LC subject headings (Table 2.1) for inclusion in the study from lists of frequently-occurring and randomly-selected subject headings from the OCLC Online Union Catalog (section 2.2). Team members deliberately chose subject headings that were likely to change in meaning when their subdivisions were reordered according to the recommendation of the LC Subject Subdivisions Conference to determine whether respondents would notice changes in meaning.

The Michigan project team constructed three separate sets of questionnaires corresponding to three sets of eight subject headings (i.e., subject headings 1–8,

9–16, and 17–24). Within each set were six different questionnaires. Questionnaires within sets varied in terms of the context in which subject headings were presented (i.e., alone, in bibliographic records, or in alphabetical browsing lists). They also varied in terms of the order of subdivisions (i.e., original or recommended order) in order to minimize the order effect in data collection. Questionnaires also included five questions that collected demographic information about respondents. Our goal was to collect eight meanings per subject heading from each of the respondent types—children, adults, reference librarians, and technical services librarians.

The Michigan project team recruited children and adults from three public libraries in southeastern lower Michigan—Flint Public Library, Bacon Memorial District Library, Wyandotte, Michigan, and Livonia Public Library—to complete questionnaires (section 2.1). Team members used three approaches to recruiting professional reference and technical services librarians (section 2.5): (1) recruiting librarians at the three participating libraries, (2) contacting colleagues at libraries throughout the country who recruited professional librarians at their libraries, and (3) recruiting volunteers directly through an announcement on various listservs.

Library users at Flint Public Library, the first 48 volunteer reference librarians, and the first 48 volunteer technical services librarians assigned meanings to the first group of eight subject headings. Library users at Bacon Memorial District Library, the next 48 volunteer reference librarians, and the next 48 volunteer technical services librarians assigned meanings to the second group of eight subject headings. Library users at Livonia Public Library, the last 48 volunteer reference librarians, and the last 48 volunteer technical services librarians assigned meanings to the third group of eight subject headings. We were successful recruiting 48 children and 48 adults at each of the three participating libraries. Overall we needed a total of 144 reference librarians and 144 technical services librarians. Unfortunately, we fell a little short of these numbers and recruited 137 reference librarians and 135 technical services librarians.

One subject cataloging expert at the University of Michigan with over twenty-five years of experience in Library of Congress subject heading practice supplied meanings for the 24 subject headings in the three contexts and two subdivision orders (section 2.6.1). Michigan project team members undertook a reliability study to ensure that two experts with similar experience would agree on correct meanings (section 2.6.2).

The Michigan project team members assigned the following codes to respondents' correct meanings (section 2.7):

- C (Correct)

- CDL (Correct, Different Language)

- CDS (Correct, Different Syntax)

- C–RIC (Correct, Read in One Concept)

- C–RMO (Correct, Read in More Than One Concept)

- Combinations of two correct codes

They assigned the following codes to incorrect meanings:

- IDS (Incorrect, Different Syntax)

- LOI (Left out One Concept)

- LMO (Left out More Than One Concept)

- I–RIC (Incorrect, Read in One Concept)

- I–RMO (Incorrect, Read in More Than One Concept)

- Combinations of two incorrect codes

Coded data were submitted to an inter-coder reliability study to make sure that coders agreed with each other (section 2.7.5). Coded data were then submitted to descriptive, statistical, and failure analyses.

6.4 Study Participants

Overall, the majority (67%) of participating library patrons were female (Table 3.1). The largest percentage of participating males came from Wyandotte where 41% of respondents were male. Adults ranged in age from eighteen to over 60 years old (Table 3.2). Overall, 99% of the adults in the study had completed high school and 52% had a college degree (Table 3.4). Children aged ten years old and younger typically returned questionnaires to interviewers telling them that they were unable to complete them. Children in this study were about eleven to seventeen years old (Table 3.3). Overall, 95% of the children in the study had completed junior high school (table 3.5). Children and adults in the study were frequent library users—over three-quarters of them used the library on a weekly or monthly basis (Table 3.7).

Over three-quarters of recruited reference and technical services librarians were female (Table 3.8). Almost 90% of participating librarians were 31 to 60 years old (Table 3.9).

6.5 Characteristics of Expert-supplied Meanings

One subject cataloging expert with over twenty-five years of subject cataloging experience supplied meanings for the 24 subject headings in the study. Her meanings were not always the same for the two orders of subdivisions and three contexts of subject headings (section 3.4). In fact, there were several possibilities:

- Meanings were the same across the two orders and three contexts (5 subject headings in the study)

- Meanings were different for the two orders and the same for the three contexts (4 subject headings in the study)

- Meanings were different across the two orders and one or more of the three contexts of subject headings (9 subject headings in the study)

- Meanings were different across the two orders and one or more of the three contexts and there were two meanings for one particular order and context of subject heading (6 subject headings in the study)

The analysis of expert-supplied meanings for the 24 subject headings in the study demonstrated that the meanings of subject headings changed. Meaning changed depending on the order of subdivisions and context in which subject headings resided. Two characteristics that indicated subject headings that were likely to change meaning were the order of subdivisions and the presence of geographical subdivisions in subject heading strings. The extent to which these characteristics affected the meaning of subject headings could not be determined from the analysis of the subject headings and expert-supplied meanings in this study. We deliberately sought subject headings for which a change in meaning was likely because we wanted to find out whether study participants' meanings would also reflect such changes.

Researchers would have to choose a random sample of subject headings bearing two or more subdivisions to determine the extent to which subdivided subject headings change meaning and the role that subdivision order, geographical subdivision, and other features play in meaning changes.

6.6 Results of Descriptive and Statistical Analyses on Correct and Incorrect Meanings

6.6.1 Overall percentages of correct meanings

Overall percentages of correct meanings for subject headings in the original order of subdivisions were as follows: children, 32%, adults, 40%, reference 53%, and technical services librarians, 56%. Overall percentages were a little lower for correct meanings of subdivided subject headings in the recommended order—children, 30%, adults, 38%, reference librarians, 50%, and technical services librarians, 53%. The lowest percentages came from children and increasingly higher percentages came from adults, reference, and technical services librarians (section 4.2.1). There were notable exceptions to this regularly occurring pattern (sections 4.2.2 to 4.2.3). For example, technical

services librarians once did worse than children, adults, and reference librarians (alphabetical context, set #1, recommended order only). The statistical analysis demonstrated whether differences in the number of correct meanings between children and adults, and between reference and technical services librarians were significant.

6.6.2 Statistical analysis of correct meanings for children and adults

To compare the performance of children and adults, we submitted coded correct meanings to a 4-way analysis of variance (ANOVA) with Library, Type of Respondent, and Context as between-subject factors and with Subdivision Order as a within-subject factor (section 4.3.1).

There were two main effects—Type of Respondent and Library. Children and adults averaged 1.24 and 1.57 correct meanings per questionnaire, respectively. (The upper limit on mean correct meanings per questionnaire was 4.0.) The difference between the two means was significant. Mean correct meanings were about the same at Flint (1.69) and at Livonia (1.57). At Wyandotte (0.95), the mean was about two-thirds of a point lower and the significant main effect for Library underlined the difference between the means. Since there were the confounding factors of different libraries and different subject headings in this analysis, no conclusions could be drawn about this significant main effect for Library. Differences in the three means for correct responses which corresponded to the three Michigan libraries could have been attributed to differences between the Libraries or to the sets of subject headings that respondents were given in the three libraries and it was impossible to separate the two factors in the analysis of this main effect. However, subsequent analyses demonstrated that librarians did not do as well on the same set of subject headings that were distributed to Wyandotte library patrons as they did on assigning meanings to subject headings in sets #1 and #3. Since librarian data were not affected by confounding factors, we concluded that the second set of subject headings were especially difficult to which to assign meanings.

There were no other main effects or interactions that were significant at the .05 level. Since statistical tests involving Subdivision Order and Context were not significant, we concluded that these variables had little impact on the ability of children and adults to formulate correct meanings for subdivided subject headings.

6.6.3 Statistical analysis of correct meanings for reference and technical services librarians

To compare the performance of reference and technical services librarians, we submitted collected data to a 4-way analysis of variance (ANOVA) with Library, Type of Respondent, and Context as between-subject factors and with Subdivision Order as a within-subject factor (section 4.3.2).

There was one significant main effect for Subdivision Order and three significant interactions involving Subdivision Order. Reference librarians assigned 2.07 correct meanings and technical services librarians assigned 2.19 correct meanings per questionnaire. (The upper limit on mean correct meanings per questionnaire was 4.0.) Although technical services librarians scored higher than reference librarians, the difference between the two means was not significant. This meant that reference librarians did about as well as technical services librarians in terms of formulating correct meanings and visa versa.

Mean correct meanings for subject heading sets #1 and #3 were about the same at 2.2.3 and 2.19, respectively. The mean of correct meanings for subject heading set #2 was a little lower at 2.02 but there was no significant difference between the three means. Yet librarians had more difficulty assigning correct meanings to the second set of subject headings than to the first and second sets, and this finding helped to support the idea that the subject headings in the second set were more difficult than the subject headings in sets #1 and #3 to which to assign meanings.

There was no significant main effect for Context but librarians did better assigning correct meanings to the alone (2.28) and alphabetical list (2.17) contexts than to the bibliographic record (1.96) context.

Mean correct meanings for subject headings in original and recommended orders were 2.23 and 2.05. Although the difference between the two means was significant, there were three significant interactions that involved Subdivision Order. These interactions clouded the effect of the main effect for Subdivision Order and demonstrated that Subdivision Order depended on certain combinations of Contexts, Type of Respondents, and Subject Heading Sets.

6.7 Results of Descriptive and Statistical Analyses on Certainty Scores

The descriptive analysis of certainty scores for children, adults, reference, and technical services librarians demonstrated that each respondent type was *less certain* of their *incorrect* meanings than their correct meanings (section 4.4). This finding was evident across the three subject heading sets, two orders of subdivisions, and three contexts. There were a few instances when respondents' certainty scores for incorrect meanings exceeded their scores for correct meanings (sections 4.4.2 and 4.4.3). When this happened, the difference between the two scores was a fraction of a point.

Children, adults, reference, and technical services librarians were less certain of their incorrect meanings than their correct meanings. Certainty scores that children gave to incorrect (4.15) and correct (5.05) meanings were the lowest of the four respondent types. Certainty scores that technical services librarians gave to incorrect (5.71) and correct (5.42) meanings were the highest of the four respondent types. The difference between certainty scores for incorrect and correct subject headings was greater for children and adults (three-quarters of a point between the two scores) than for librarians (hardly a third of a point).

A statistical analysis of the certainty scores adults and children assigned to subdivided subject headings resulted in two significant main effects for Type of Respondent and Library (Table 4.3). Adults (5.30) gave certainty scores that exceeded such scores for children (4.40) by almost one whole point and the difference between the two scores was significant. With respect to Library, the mean certainty score for library patrons at Wyandotte (4.60) was a little more

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than a third of a point lower than mean certainty scores for library patrons at Flint (4.91) and at Livonia (5.04). Again, the difficulty of the subject headings in set #2 was probably the key factor in the significantly lower certainty score for Wyandotte patrons. Findings regarding significant main effects were tempered by two significant interactions which involved Type of Respondent, Library, and Context (Table 4.4). No significant main effect was found for Context or Subdivision Order.

A statistical analysis of the certainty scores reference and technical services librarians assigned to subdivided subject headings resulted in three significant main effects for Subject Heading Set, Context, and Subdivision Order (Table 4.5). Technical services librarians (5.59) gave certainty scores that exceeded such scores for reference librarians (5.43) by hardly sixteen hundredths of a point and the difference between the two scores was not significant. Significant main effects for Context and Subdivision Order were tempered by a significant interaction involving these two factors (Table 4.6).

Librarians gave higher certainty scores (5.59 and 5.65) for subject heading sets #1 and #3, respectively, and a lower certainty score (5.30) for the second subject heading set. Since the statistical analysis of librarian data did not have the confounding factors of different libraries and different subject headings, the conclusion that set #2 included especially difficult subject headings was warranted. Thus, lower mean correct meanings and certainty scores for both library patrons and librarians could be attributed to the difficulty of the subject headings in set #2.

6.8 Results of the Failure Analysis of Patrons' and Librarians' Meanings

6.8.1 Within-sets analysis of correct and incorrect meanings

The within-sets failure analysis examined correct and incorrect meanings to determine whether one or two correct and incorrect meaning codes consistently described the reasons why the meanings were correct or incorrect (sections 5.2 and 5.3). The analysis of *correct* codes demonstrated that

reference and technical services librarians responded in the same ways to formulating meanings for subject headings. Librarians favored CDL meanings, and, to a lesser degree C and CDS meanings. Children favored C and CDS meanings. Adults sometimes responded in ways similar to librarians, that is, favoring CDL meanings; adults also responded in ways similar to children, that is favoring C and CDS meanings. The analysis of *incorrect* codes was similar to the analysis of correct codes in that reference and technical services librarians responded in similar ways to formulating meanings for subject headings, children responded differently from librarians, and adults responded in ways similar to children or librarians. However, none of the four types of respondents formulated meanings that favored one or more specific incorrect meaning code. Instead, librarians, children, and adults formulated meanings that were incorrect and the specific reasons why their meanings were incorrect varied considerably across the three sets of subject headings.

6.8.2 Across-sets analysis of correct meanings

Mixed results for the within-sets analysis of correct and incorrect meanings encouraged the Michigan project team to examine respondent meanings across the three subject heading sets (sections 5.4 and 5.5). We examined each of the 24 subject headings in the study and the meanings respondents gave to them. We grouped subject headings together that were alike in terms of the response patterns of library patrons (adults and children) and librarians (reference and technical services librarians).

For correct meanings, there were groups of subject headings with the following characteristics (section 5.4):

- Two groups with high percentages of Correct (C) meanings and: (1) lower CDL meanings and even lower CDS meanings, or (2) lower CDS meanings and even lower CDL meanings

- Two groups with high percentages of CDL meanings and: (1) lower C meanings and even lower CDS meanings, or (2) lower CDS meanings, and even lower C meanings

- One group with high percentages of CDS meanings, lower CDL meanings, and even lower C meanings

- One group with moderately high percentages of two or more correct codes, e.g., CDL and RIC, or C, CDL, and CDS

Only four subject headings occurred in the same group for both library patrons and librarians. This was an important finding. It meant that library patrons and librarians gave correct meanings to the same groups of subject headings but the characteristics of their correct meanings, e.g., language, syntax, read-in concepts, were different. Grouped subject headings did not exhibit any particular properties that would single them out. This meant that the particular properties of subject headings—the number of words in main headings, the number of subdivisions, the order of subdivisions, the number of words per subdivision, the number of subdivisions—were not good indicators of the types of correct meanings that library patrons or librarians would assign to them.

6.8.3 Across-sets analysis of incorrect meanings

For incorrect meanings, there were groups of subject headings with the following characteristics (section 5.5):

- Two groups with high percentages of IDS meanings and: (1) lower percentages of LOI meanings and even lower LMO meanings, or (2) lower percentages of read-in (RIC and RMO) meanings

- Four groups with high percentages of LOI meanings and: (1) lower percentages of the several other incorrect meaning codes with no one such code predominating, (2) lower percentages of codes for leaving out more than one concept (LMO), (3) lower percentages of IDS and LMO meanings, or (4) lower percentages RIC meanings

- One group with high percentages of RIC meanings and lower percentages of the several other incorrect meaning codes with no one such code predominating

- One group with high percentages of a combination of two incorrect codes

- One group in which no one incorrect meaning code predominated

Most groups of subject headings did not describe the incorrect meanings that both library patrons and librarians gave to the same subject heading. There were only *five* instances when the response patterns for both library patrons and librarians were the same for the same subject heading. This again was an important finding. It meant that library patrons and librarians gave incorrect meanings to the same groups of subject headings but the characteristics of their incorrect meanings, e.g., language, syntax, read-in concepts, were different.

Like findings for correct meanings, grouped subject headings did not exhibit any particular properties that would single them out. This meant that the particular properties of subject headings—the number of words in main headings, the number of subdivisions, the order of subdivisions, the number of words per subdivision, the number of subdivisions—were not good indicators of the types of incorrect meanings that library patrons or librarians would assign to them.

6.8.4 Interesting findings about incorrect meanings

There were interesting findings about the six incorrect meaning codes. Let's start with IDS codes (section 5.5.2). Some subject headings featured two meanings depending on the particular subject heading representation at hand. When the first of two meanings was in effect, respondents sometimes gave IDS meanings that described the second meaning and visa versa. Other IDS meanings gave additional interpretations for the subject headings at hand that were not amongst the correct meaning(s) supplied by the subject cataloging expert.

Library patrons and librarians offered incorrect meanings that left out concepts (section 5.5.3). Generally *librarians* were likely to leave out one concept (LOI) but they did not very often leave out more than one concept (LMO). LMO meanings were much more characteristic of library patrons. In fact, *children*

typically offered two types of LMO meanings: (1) LMO meanings that reiterated one or more concepts in subject headings but left out more than one concept, or (2) LMO meanings that restated subject headings in rather broad terms. "17th century organ music" and "17th century music of the organ" were two examples of children's LMO meanings that cited the "organ music" and "17th century" concepts in the expert-supplied meaning "Interpretation (phrasing, dynamics, etc.) of 17th century organ music" for the subject heading in original order "Organ music—17th century—Interpretation (phrasing, dynamics, etc.)." Both meanings left out the "interpretation," "phrasing," and "dynamics" elements. The meanings "church," "oldies music," "about music," "when it was played" were examples of children's LMO meanings that characterized the subject in very broad terms. When adults and children rated the certainty of their meanings, unusually low certainty scores were almost always associated with *incorrect* LOI ("Left out One Concept") codes and LMO ("Left out More Than One Concept") codes (section 4.4.2). So children and adults knew in advance that their meanings in this regard were likely to be incorrect.

Codes for reading in one or more concepts were not very plentiful (section 5.5.4). They described only one group of subject headings and there were only two subject headings in the group. In fact, we expected to encounter read-in meanings when respondents gave meanings to subject headings in the bibliographic record representation. We thought that respondents would add concepts to their meanings for the concepts present in the bibliographic records in which subject headings were embedded. However, this did not happen very often. Sections 5.5.2 and 5.5.6 cited a few examples.

Double-digit percentages (10% and higher) of Blank responses characterized library patrons' incorrect responses to seven subject headings (section 5.5.7). The one subject heading for which library patrons scored the highest percentage (35%) of Blank responses was for "Music—Philosophy and aesthetics—500–1400." Except for a high percentage of Blank and a moderately high percentage of LOI meanings, no other incorrect code

characterized patron responses to this heading. A few patrons restated it in broad terms, e.g., ""music history of it" or "about music and philosophy." Perhaps patrons chose to leave the meaning blank rather than hazard a guess at the meaning. The highest percentage of Blank responses for librarians was in the single digits at 6% for the same subject heading.

6.9   The Effects of Meaning Changes

Quite frankly, we were surprised at the magnitude of meaning changes (section 3.4). Not only did subdivision order result in meaning changes but context resulted in meaning changes. Furthermore, there were some subject headings for which more than one meaning was in effect for a particular order of subdivisions and context. Since statistical and failure analyses failed to identify certain characteristics that made subject headings difficult in terms of assigning meanings, we wondered whether subject headings that changed meaning due to subdivision order, context, or a combination of the two, were just more difficult to which to assign meanings (section 5.6). To determine whether there was any truth behind this hypothesis, we distributed subject headings into separate categories for "Change" and "No change" in meaning. Subject headings in the "Change" category were pairs of subject headings in original and recommended orders to which the subject cataloging expert gave two or more meanings. Subject headings in the "No Change" category were pairs of subject headings in original and recommended orders to which the subject cataloging expert gave one and only one meaning.

With respect to the results for adults and children across the three participating Michigan libraries, the percentages of correct meanings were greater for subject headings that did not change meaning, and sometimes substantially greater, than the percentages of correct meanings for subject headings that changed meaning (figure 5.21). As few as six percentage points separated one pair of "Change" and "No Change" percentages (Flint, children) and as many as 21 percentage points separated another pair of "Change" and "No Change" percentages (Livonia, adults). The only percentages that flip-flopped were for

Wyandotte children; 24% of correct meanings were for subject headings that changed meaning and 20% of correct meanings were for subject headings that did not change meaning and the four percentage points difference between the two percentages was not that great.

The results for reference and technical services librarians for the three sets of subject headings were not much different (figure 5.22). The percentages of correct meanings were about the same or greater for subject headings that changed meaning than the percentages of correct meanings for subject headings that did not change meaning. As few as one percentage point separated one pair of "Change" and "No Change" percentages (Set #2, reference librarians) and as many as twenty percentage points separated another pair of "Change" and "No Change" percentages (set #3, technical services librarians). The only percentages that flip-flopped were for reference librarians who examined set #1 for which 52% of correct meanings were for subject headings that changed meaning and 50% of correct meanings were for subject headings that did *not* change meaning and the two percentage points difference between the two percentages was not that great.

Comparisons of percentages for meanings in "Change" and "No Change" categories showed that, with few exceptions, respondents had more problems assigning meanings to subject headings that changed meaning than they did assigning meanings to subject headings that did not change meaning.

6.10 Conclusions

6.10.1 Wholesale changes to the existing LCSH system

For each questionnaire, children, adults, reference and technical services librarians gave meanings to a total of four subject headings in the same context and order of subdivisions. Children, adults, reference and technical services averaged 1.24, 1.57, 2.07, and 2.19 correct meanings per questionnaire, respectively. Statistical tests confirmed what most readers would conclude from a cursory glance at these means. Children had considerable difficulty

understanding subject headings. So did adults. Despite the surprising evidence from the analysis of certainty scores that adults and children knew that some of their meanings were likely to be incorrect, the researchers of this study are concerned that readers will ignore findings about certainty scores, focus on low percentages of correct meanings, and conclude that library users did not do very well—about every one to two meanings in four meanings that they gave to subject headings was incorrect.

Yet day in and day out, children, adults, and librarians search online and printed catalogs for library materials using subject headings in subject or keyword searches, cull call numbers from retrieved items, search bookshelves for materials of interest, and use these materials to complete homework assignments, write term papers, conduct experiments, make decisions, write journal articles and books, and even fix the family car. Is there any reason to believe that given such tangible results of catalog searches involving subject headings that the existing system of subject headings should change based on the lack of understanding and difficulty with subject headings?

In two words, probably not. Why? There are the obvious reasons for keeping the existing system. Changes would require great expense in terms of personnel to refine the existing system and to make changes to the huge bibliographic databases where subject headings reside. The less obvious reasons for keeping the existing system are cited in the previous paragraph. Subject headings form part of a much more complex system of catalog access that results in the retrieval of library materials. Catalog users really do not find useful library materials based on identifying one or more subject headings that describe their information needs. They use keyword searching with implicit Boolean operators to match the individual words in their queries. Keyword search retrievals might match words in two or more subject headings, titles, and/or the other subject information in bibliographic records. When catalog users do perform subject heading searches, they do not base their selections on the subject headings alone, they glance at the titles and other subject information on bibliographic records before writing down call numbers and searching

library bookshelves. Whether they are successful fetching the book from the bookshelves or not (for books in circulation), catalog users almost always search nearby bookshelves to find additional material. In fact, there is evidence that the vast majority of the library materials that library patrons select are the result of bookshelf browsing (Hancock 1987).

We do not, however, recommend wholesale changes to the existing system. We do recommend involving the various groups that are heavy users of the system—children, adults, and reference librarians—in the establishment of new subject headings and subdivisions in the Library of Congress Subject Headings system. Involvement could take on several different forms. For example, LC could sponsor clubs, committees, working groups, etc., of children and adults who would serve in an advisory capacity to the Cataloging Policy and Support Office which is the editorial board for LCSH. Members could be recruited from nearby high schools or public libraries, they could be frequent public users that LC's reference librarians have come to know, or they could be volunteers who participate in editorial reviews with the staff of the Cataloging Policy and Support Office via electronic mail or other collaboration technologies. Also members of the Cataloging Policy and Support Office could review published material on a subject across several different intended audiences to find language shared by audiences to express the subject. Certainly staff of the Library of Congress would be quick to make suggestions about how they could recruit children and adults to review proposals for new subject headings and subdivisions and changes to existing ones. What is important is that children, adults, and reference librarians are included in the process.

6.10.2   Tampering with the existing LCSH system

Since we do not make suggest making wholesale changes to the existing LCSH system, what small changes might make subtle improvements to the system as a whole? First and foremost is subdivision order. Statistical and failure analyses failed to demonstrate that subdivision order made a difference in terms of understanding subject headings. Should the order of subdivisions be standardized?

In a word, yes. Standardizing subdivision order would simplify cataloging and save money. Library schools and technical services departments would no longer spend time training people how to order the subdivisions in subject heading strings. Cataloging staff would no longer spend time determining the order of subject subdivisions. They would build strings based on a standardized order of subdivided elements. Library systems staff could introduce computer-based techniques to automatically verify the order of subdivisions in existing strings and in newly-assigned strings. Such techniques would reduce the errors that occur in subdivided subject headings due to subdivision order (Drabenstott and Vizine-Goetz 1994, 113–20).

If the library community is still skeptical about the recommendation involving subdivision order, researchers could undertake one more study on subdivision order. They could study the subdivided subject headings used in this project or select an entirely new set of subject headings. (In the case of the latter, they would need to find experts to assign meanings to the two orders of these subject headings.) They could then search library catalogs under the original forms of these subject headings to determine whether the library material assigned these subject headings describes the subject heading in its original or recommended order. If such material describes the subject heading in both orders, then the question of standardizing the order of subdivisions in subject heading strings would be a moot point. The researchers who conducted this study do not feel that one more study is necessary. Standardize the order of subdivisions today!

We could make recommendations about introducing certain indicators to subject headings that would reduce the problems library patrons have understanding subject headings due to syntax. Unfortunately, librarians would have to explain how such indicators worked. Librarians would never be able to reach all patrons to explain the system, and those patrons they did reach would probably forget the explanation rather quickly.

We could tamper with the punctuation between subject heading elements. Most catalogs combine such elements using two hyphens (--) or an m-dash

(—). What would happen if we used colons (:), slashes (/), or tildes (~) between elements? The researchers who conducted this study have much experience explaining the LCSH system to students or to colleagues in related fields and have anecdotal evidence that suggests that students and colleagues think that the individual elements in subdivided subject headings are ordered in a hierarchical relationship. Although the empirical evidence in this study suggests otherwise, this notion about hierarchical ordering usually emerges when new library school students or colleagues in related fields offer an explanation of how subject headings work, not when they assign meanings to subject headings. Perhaps researchers would consider undertaking studies that introduce different punctuation between subject heading elements to determine what effect such elements have on subject heading understanding.

6.10.3 Establishing new indexing systems

A few years ago, the idea of establishing new systems of indexing written materials was not conceivable. With the popularity of the World-Wide Web, new systems are possible on a weekly basis. Several World-Wide Web browsing services are available—a2z Lycos, Argus Clearinghouse, Excite Reviews, Internet Public Library, and Yahoo!. Before wholesale changes to these systems are no longer possible because of the investment made in these systems in terms of their depth and the large numbers of web sites to which they are assigned, the developers of these systems should include children, adults, librarians, and even subject-matter experts in the establishment of new terms and changes to existing ones. Perhaps there should be separate indexing systems for children, adults, librarians, and subject-matter experts. With a click of a button, users could choose the indexing system that works for them in terms of their understanding of the subject matter and the terminology of the indexing system.

6.10.4 Defending the existing LCSH system

Some readers might be tempted to review the findings about subject heading understanding in this report and conclude that the entire LCSH system ought

to be thrown out because library patrons understand less than half the subdivided subject headings they encounter. To be honest, we researchers do not know how to interpret this finding because there are no other studies of subject heading understanding with which to compare. So let's try to interpret findings about subject heading understanding by examining the individual tasks that subject headings are asked to do. They sum up the subject contents of the items to which they are assigned in a single statement. They give catalog searchers hooks for matching the terms in their queries with the subjects of library materials. They index the subject contents of a library's collection and subdivide highly posted subjects through the use of the subdivisions system. They also standardize the subject terminology so that catalog users can expect all the material on a particular subject to be found under one subject heading. Furthermore, with the assistance of the catalog's syndetic structure, subject headings are part of a system of cross-references that suggest related terminology to catalog users for an encyclopedic array of subjects.

This study examined just one of the many tasks that subject headings are asked to do, that is, sum up the subject contents of library materials in a single statement. This report makes some recommendations about how the existing LCSH can redress some mistakes of the past by including end users of the system on editorial panels and working groups that establish new subject headings and subdivisions and make changes to existing ones. Throwing out the entire system would leave catalog users without an index to the library's collection or systematic methods of navigating the terminology that describes the written knowledge of our culture.

6.10.5 Additional studies of end-user understanding

Quite frankly, the researchers in this study were surprised that subdivision order and context changed meanings of subject headings and that some subject headings had more than one meaning. This study could not examine the extent to which subdivision order and context changed the meanings of subject headings. Researchers would have to choose a random sample of subject headings bearing two or more subdivisions to determine the extent to which

subdivided subject headings changed meaning and the role that subdivision order, geographical subdivision, and other features played in meaning changes.

Most statistical and failure analyses of subdivided subject headings and the meanings respondents assigned to them revealed little in terms of the particular characteristics of subject headings that identified them as being especially difficult for respondents to understand. However, two comparisons were promising. One comparison figured percentages for meanings in "Change" and "No Change" categories and showed that, with few exceptions, respondents had more problems assigning meanings to subject headings that changed meaning than they did assigning meanings to subject headings that did not change meaning. The second comparison figured the average number of words and subdivisions for groups of subject headings to which respondents assigned high percentages of incorrect or correct meanings. The results showed that the average number of words and subdivisions per subject heading were higher for groups of subject headings to which respondents assigned high percentages of incorrect meanings. However, the difference between the average number of subdivisions for the two groups was very small (0.2). Since this study's findings about the characteristics of subdivided subject headings that were likely to identify a difficult subject heading were inconclusive, it remains for future researchers to continue searching for such characteristics.

Since this was the first large-scale study of subject heading understanding, it was difficult to interpret findings about percentages of correct meanings for the four types of respondents in the study. Future studies might consider investigating end-user understanding of other subject headings systems such as Sears Subject Headings, Medical Subject Headings, Yahoo! subject headings, Art & Architecture Thesaurus terms, and comparable systems. We would like to suggest that researchers adopt the correct and incorrect codes used in this study to examine other systems so that comparisons between different systems can be made. Would researchers find higher percentages of correct meanings for children, adults, and librarians? Would children score about the same or even better using Sears Subject Headings? Would subject-matter experts be

more likely to understand subject headings or index terms from specialized vocabularies such as Medical Subject Headings or the Art & Architecture Thesaurus? Just how do users of the Library of Congress Subject Heading system fare in comparison to users of other subject heading schemes? Such questions can only be answered through additional studies of end-user understanding of subject headings.

References

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

Hancock, Micheline . 1987. "Subject searching behaviour at the library catalogue and at the shelves: Implications for online interactive catalogues." *Journal of Documentation* 43, 4 (December): 303–21.

Appendix A. Questionnaire Version 2aa

(Headings 9–16, alone, order of subdivisions begins with original order)

University of Michigan
School of Information and Library Studies

Library Survey on Subject Phrases

Instructions. On pages 2 and 3 of this survey, eight subject phrases are listed. Please read each phrase and write down your first impression of the phrase's meaning. Then, rate on a scale from 1 to 7 how certain you feel about the meaning of the subject phrase. On the last page of this survey are listed five questions. Please answer these questions that ask about yourself and your use of libraries. A completed example follows.

For example:

• **Televisions — History**

a. The phrase in **bold** print means:

A history of televisions

b. How certain are you of the meaning you have given to this phrase?

```
|-----------------------------|--------------------X--------|
1                             4                           7
not at all certain      somewhat certain        very certain
```

Please turn the page to begin.

•1o   **Housing — United States — Law and legislation**

1a.   The phrase in **bold** print means:

1b.   How certain are you of the meaning you have given to this phrase?

```
        |----------------------------|----------------------------|
        1                            4                            7
   not at all certain        somewhat certain         very certain
```


•2o   **Handicapped —Washington (State) — Seattle Metropolitan Area — Transportation**

2a.   The phrase in **bold** print means:

2b.   How certain are you of the meaning you have given to this phrase?

```
        |----------------------------|----------------------------|
        1                            4                            7
   not at all certain        somewhat certain         very certain
```


•3r   **Jews — Intellectual Life — Germany — Berlin — Congresses**

3a.   The phrase in **bold** print means:

3b.   How certain are you of the meaning you have given to this phrase?

```
        |----------------------------|----------------------------|
        1                            4                            7
   not at all certain        somewhat certain         very certain
```
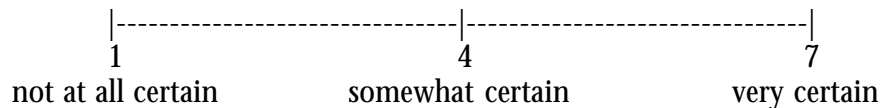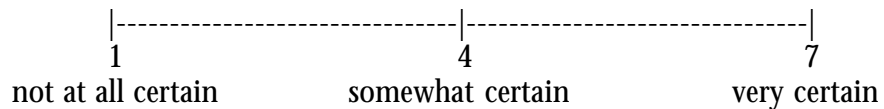

•4o   **Organ music — 17th century — Interpretation (phrasing, dynamics, etc.)**

4a.   The phrase in **bold** print means:

4b.   How certain are you of the meaning you have given to this phrase?

```
        |----------------------------|----------------------------|
        1                            4                            7
   not at all certain        somewhat certain         very certain
```
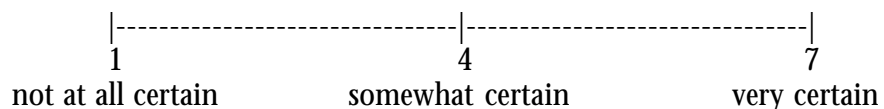
•5r   **World War, 1939-1945 — Japan — Regimental histories**

5a.   The phrase in **bold** print means:

5b.   How certain are you of the meaning you have given to this phrase?

```
        |----------------------------|----------------------------|
        1                            4                            7
   not at all certain        somewhat certain          very certain
```

•6r   **English poetry — Modernized versions — Old English, ca. 450–1100**

6a.   The phrase in **bold** print means:

6b.   How certain are you of the meaning you have given to this phrase?

```
        |----------------------------|----------------------------|
        1                            4                            7
   not at all certain        somewhat certain          very certain
```

•7o   **Music — Washington (D.C.) — History and criticism**

7a.   The phrase in **bold** print means:

7b.   How certain are you of the meaning you have given to this phrase?

```
        |----------------------------|----------------------------|
        1                            4                            7
   not at all certain        somewhat certain          very certain
```

•8r   **Art, Modern — Germany — Berlin — 20th century — Exhibitions**

8a.   The phrase in **bold** print means:

8b.   How certain are you of the meaning you have given to this phrase?

```
        |----------------------------|----------------------------|
        1                            4                            7
   not at all certain        somewhat certain          very certain
```

I am

        1. Female
        2. Male

Age: _____

I use a library:

        1. Daily
        2. Weekly
        3. Monthly
        4. 2 – 3 times a year
        5. Never

I have completed:

        1. Elementary school
        2. Junior high school
        3. Senior high school
        4. Some college or university
        5. College or university graduate

Profession: _____

Thank you for assisting our University of Michigan research team
in this study of subject phrases. Your responses will help libraries improve library catalogs
and subject searching for library materials.

Appendix B. Questionnaire Version 2ab

(Headings 9–16, alone, order of subdivisions begins with recommended order)

University of Michigan
School of Information and Library Studies

Library Survey on Subject Phrases

Instructions. On pages 2 and 3 of this survey, eight subject phrases are listed. Please read each phrase and write down your first impression of the phrase's meaning. Then, rate on a scale from 1 to 7 how certain you feel about the meaning of the subject phrase. On the last page of this survey are listed five questions. Please answer these questions that ask about yourself and your use of libraries. A completed example follows.

For example:

•   **Televisions — History**

a.   The phrase in **bold** print means:

A history of televisions

b.   How certain are you of the meaning you have given to this phrase?

```
|-----------------------------|--------------------X---------|
1                             4                             7
not at all certain      somewhat certain        very certain
```

Please turn the page to begin.

•1r   **Housing — Law and legislation — United States**

1a.   The phrase in **bold** print means:

1b.   How certain are you of the meaning you have given to this phrase?

```
        |----------------------------|----------------------------|
        1                            4                            7
   not at all certain        somewhat certain           very certain
```
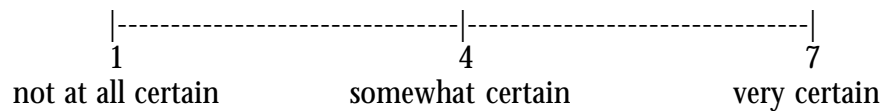

•2r   **Handicapped — Transportation —Washington (State) — Seattle Metropolitan Area**

2a.   The phrase in **bold** print means:

2b.   How certain are you of the meaning you have given to this phrase?

```
        |----------------------------|----------------------------|
        1                            4                            7
   not at all certain        somewhat certain           very certain
```


•3o   **Jews — Germany — Berlin — Intellectual Life — Congresses**

3a.   The phrase in **bold** print means:

3b.   How certain are you of the meaning you have given to this phrase?

```
        |----------------------------|----------------------------|
        1                            4                            7
   not at all certain        somewhat certain           very certain
```
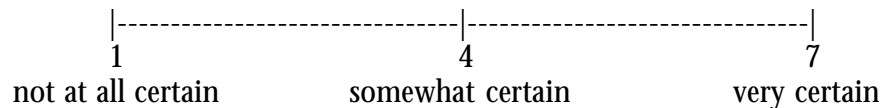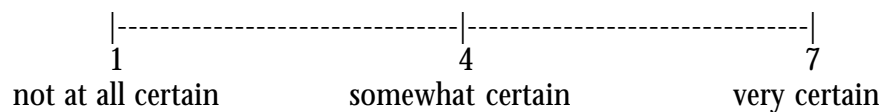

•4r   **Organ music — Interpretation (phrasing, dynamics, etc.) — 17th century**

4a.   The phrase in **bold** print means:

4b.   How certain are you of the meaning you have given to this phrase?

```
        |----------------------------|----------------------------|
        1                            4                            7
   not at all certain        somewhat certain           very certain
```
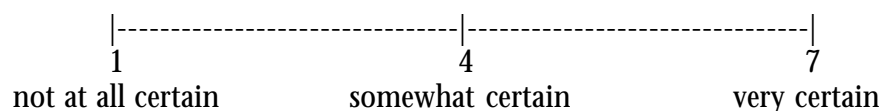
•5o   **World War, 1939-1945 — Regimental histories — Japan**

5a.   The phrase in **bold** print means:

5b.   How certain are you of the meaning you have given to this phrase?

```
        |-----------------------------|-----------------------------|
        1                             4                             7
   not at all certain          somewhat certain            very certain
```
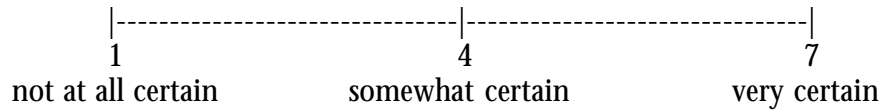

•6o   **English poetry — Old English, ca. 450–1100 — Modernized versions**

6a.   The phrase in **bold** print means:

6b.   How certain are you of the meaning you have given to this phrase?

```
        |-----------------------------|-----------------------------|
        1                             4                             7
   not at all certain          somewhat certain            very certain
```
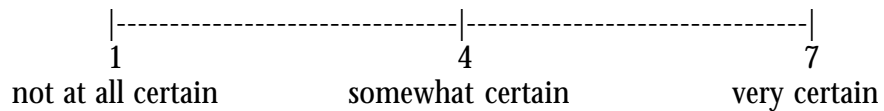

•7r   **Music — History and criticism — Washington (D.C.)**

7a.   The phrase in **bold** print means:

7b.   How certain are you of the meaning you have given to this phrase?

```
        |-----------------------------|-----------------------------|
        1                             4                             7
   not at all certain          somewhat certain            very certain
```


•8o   **Art, Modern — 20th century — Germany — Berlin — Exhibitions**

8a.   The phrase in **bold** print means:

8b.   How certain are you of the meaning you have given to this phrase?

```
        |-----------------------------|-----------------------------|
        1                             4                             7
   not at all certain          somewhat certain            very certain
```

I am
        1. Female
        2. Male

Age: _____

I use a library:
        1. Daily
        2. Weekly
        3. Monthly
        4. 2 – 3 times a year
        5. Never

I have completed:
        1. Elementary school
        2. Junior high school
        3. Senior high school
        4. Some college or university
        5. College or university graduate

Profession: _____

Thank you for assisting our University of Michigan research team
in this study of subject phrases. Your responses will help libraries improve library catalogs
and subject searching for library materials.

Appendix C. Questionnaire Version 2ba

(Headings 9–16, bibliographic record, order of subdivisions begins with original order)

University of Michigan
School of Information and Library Studies

Library Survey on Subject Phrases

Instructions. On pages 2 to 5 of this survey, eight subject phrases are listed. Please read each phrase and write down your first impression of the phrase's meaning. Then, rate on a scale from 1 to 7 how certain you feel about the meaning of the subject phrase. On the last page of this survey are listed five questions. Please answer these questions that ask about yourself and your use of libraries. A completed example follows.
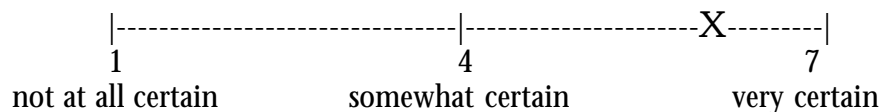
For example:

Title:	On the screen: a history of television in America
Subject:	1. **Televisions — History**
Author:	Miller, Jerry, 1951–.
Publisher:	New York: Crown Publishers, 1991

a.   The phrase in **bold** print means:

   A history of televisions

b.   How certain are you of the meaning you have given to this phrase?

```
        |------------------------------|---------------------X---------|
        1                              4                       7
   not at all certain          somewhat certain          very certain
```
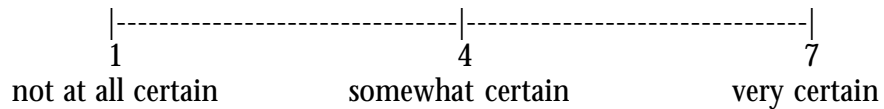
Please turn the page to begin.

•1o

Title:	Basic laws and authorities on housing and urban development.
Subject:	1. **Housing — United States — Law and legislation** 2. City planning and redevelopment law — United States
Author:	United States Department of Housing and Urban Development.
Publisher:	Washington, D.C. : U. S. Govt. Print. Off., 1990.

1a.   The phrase in **bold** print means:

1b.   How certain are you of the meaning you have given to this phrase?

```
      |------------------------------|------------------------------|
      1                              4                              7
   not at all certain        somewhat certain           very certain
```
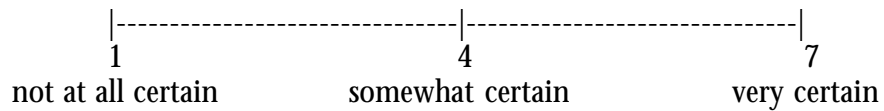
•2o

Title:	Transportation needs of the disabled and the elderly.
Subject:	1. **Handicapped — Washington (State) — Seattle metropolitan area —Transportation.** 2. Local-transit — Washington (State) — Seattle metropolitan area.
Author:	Feiss, Caroline L.
Publisher:	Seattle : Elderly/Handicapped Transportation Study, 1976.

2a.   The phrase in **bold** print means:

2b.   How certain are you of the meaning you have given to this phrase?

```
      |------------------------------|------------------------------|
      1                              4                              7
   not at all certain        somewhat certain           very certain
```

•3r

Title:	Image and self-image of Berlin Jews between the Enlightenment and Romanticism : contributions to a conference.
Subject:	1. Jews — History— Germany — Berlin — Congresses. **2. Jews — Intellectual life — Germany — Berlin — Congresses.** 3. Berlin (Germany) — Ethnic relations — Congresses. 4. Berlin (Germany) — Intellectual life — Congresses.
Publisher:	Berlin : Colloquium Verlag, 1992.

3a.   The phrase in **bold** print means:

3b.   How certain are you of the meaning you have given to this phrase?

```
        |------------------------------|------------------------------|
        1                              4                              7
   not at all certain           somewhat certain              very certain
```

•4o

Title:	Introduction to organ playing in the 17th and 18th century style.
Subject:	1. Organ — Methods. **2. Organ music — 17th century — Interpretation (phrasing, dynamics, etc.)** 3. Organ music — 18th century — Interpretation (phrasing, dynamics, etc.)
Author:	Brock, John.
Publisher:	[United States] : W. Leupold Editions ; Boston, Mass. : Sole selling agent, ECS Publishing, c1991.

4a.   The phrase in **bold** print means:

4b.   How certain are you of the meaning you have given to this phrase?

```
        |------------------------------|------------------------------|
        1                              4                              7
   not at all certain           somewhat certain              very certain
```

•5r

Title:	Japanese naval aces and fighter units in World War II.
Subject:	1. Japan. Kaigun. Kokutai — History. 2. **World War, 1939–1945 — Japan — Regimental histories.** 3. World War, 1939–1945 — Aerial operations, Japanese.
Author:	Hata, Ikuhiko, 1932–.
Publisher:	Annapolis, Md. : Naval Institute Press, c1989.

5a.   The phrase in **bold** print means:

5b.   How certain are you of the meaning you have given to this phrase?

```
        |------------------------------|------------------------------|
        1                              4                              7
   not at all certain          somewhat certain             very certain
```

•6r

Title:	An anthology of Old English poetry.
Subject:	1. **English poetry — Modernized versions — Old English, ca. 450–1100.** 2. English poetry — Translations from Old English.
Author:	Kennedy, Charles W. (Charles William), 1882–1969, ed. and tr.
Publisher:	New York : Oxford University Press, 1960.

6a.   The phrase in **bold** print means:

6b.   How certain are you of the meaning you have given to this phrase?

```
        |------------------------------|------------------------------|
        1                              4                              7
   not at all certain          somewhat certain             very certain
```

•7o

Title:	Music at the White House : a history of the American spirit.
Subject:	1. White House (Washington, D. C.). 2. **Music — Washington (D. C.) — History and criticism.** 3. Concerts — Washington (D. C.). 4. Music — United States — History and criticism.
Author:	Kirk, Elise K. (Elise Kuhl), 1932–.
Publisher:	Urbana : University of Illinois Press, c1986.

7a.   The phrase in **bold** print means:

7b.   How certain are you of the meaning you have given to this phrase?

```
        |-----------------------------|-----------------------------|
        1                             4                             7
   not at all certain         somewhat certain            very certain
```

•8r

Title:	Interface : Berlin art in the nineties.
Subject:	1. Art, German — Germany — Berlin — Exhibitions. 2. **Art, Modern — Germany — Berlin — 20th century — Exhibitions.**
Publisher:	Washington, D. C.: German-American Cultural Fund ; [Berlin] : Museumspadagogischer Dienst Berlin, 1992.

8a.   The phrase in **bold** print means:

8b.   How certain are you of the meaning you have given to this phrase?

```
        |-----------------------------|-----------------------------|
        1                             4                             7
   not at all certain         somewhat certain            very certain
```

I am
        1. Female
        2. Male

Age: _____

I use a library:
        1. Daily
        2. Weekly
        3. Monthly
        4. 2 – 3 times a year
        5. Never

I have completed:
        1. Elementary school
        2. Junior high school
        3. Senior high school
        4. Some college or university
        5. College or university graduate

Profession: _____

Thank you for assisting our University of Michigan research team
in this study of subject phrases. Your responses will help libraries improve library catalogs
and subject searching for library materials.

Appendix D. Questionnaire Version 2bb

(Headings 9–16, bibliographic record, order of subdivisions begins with recommended order)

University of Michigan
School of Information and Library Studies

Library Survey on Subject Phrases

Instructions. On pages 2 to 5 of this survey, eight subject phrases are listed. Please read each phrase and write down your first impression of the phrase's meaning. Then, rate on a scale from 1 to 7 how certain you feel about the meaning of the subject phrase. On the last page of this survey are listed five questions. Please answer these questions that ask about yourself and your use of libraries. A completed example follows.

For example:

Title:	On the screen: a history of television in America
Subject:	1. **Televisions — History**
Author:	Miller, Jerry, 1951–.
Publisher:	New York: Crown Publishers, 1991

a.   The phrase in **bold** print means:

   A history of televisions

b.   How certain are you of the meaning you have given to this phrase?

```
        |------------------------------|--------------------X---------|
        1                              4                             7
   not at all certain          somewhat certain              very certain
```

Please turn the page to begin.

•1r

Title:	Basic laws and authorities on housing and urban development.
Subject:	1. **Housing — Law and legislation — United States.** 2. City planning and redevelopment law — United States
Author:	United States Department of Housing and Urban Development.
Publisher:	Washington, D.C. : U. S. Govt. Print. Off., 1990.

1a.   The phrase in **bold** print means:

1b.   How certain are you of the meaning you have given to this phrase?

```
    |----------------------------|----------------------------|
    1                            4                            7
not at all certain        somewhat certain          very certain
```

•2r

Title:	Transportation needs of the disabled and the elderly.
Subject:	1. **Handicapped —Transportation — Washington (State) — Seattle metropolitan area.** 2. Local-transit — Washington (State) — Seattle metropolitan area.
Author:	Feiss, Caroline L.
Publisher:	Seattle : Elderly/Handicapped Transportation Study, 1976.

2a.   The phrase in **bold** print means:

2b.   How certain are you of the meaning you have given to this phrase?

```
    |----------------------------|----------------------------|
    1                            4                            7
not at all certain        somewhat certain          very certain
```

•3o

Title:	Image and self-image of Berlin Jews between the Enlightenment and Romanticism : contributions to a conference.
Subject:	1. Jews — History— Germany — Berlin — Congresses. **2. Jews — Germany — Berlin — Intellectual life — Congresses.** 3. Berlin (Germany) — Ethnic relations — Congresses. 4. Berlin (Germany) — Intellectual life — Congresses.
Publisher:	Berlin : Colloquium Verlag, 1992.

3a. The phrase in **bold** print means:

3b. How certain are you of the meaning you have given to this phrase?

```
       |------------------------------|------------------------------|
       1                              4                              7
  not at all certain          somewhat certain             very certain
```
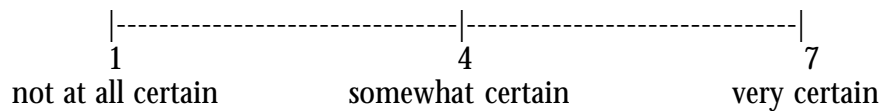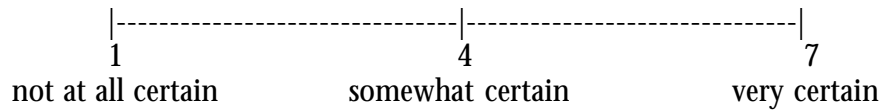
•4r

Title:	Introduction to organ playing in the 17th and 18th century style.
Subject:	1. Organ — Methods. **2. Organ music — Interpretation (phrasing, dynamics, etc.) — 17th century.** 3. Organ music — 18th century — Interpretation (phrasing, dynamics, etc.)
Author:	Brock, John.
Publisher:	[United States] : W. Leupold Editions ; Boston, Mass. : Sole selling agent, ECS Publishing, c1991.

4a. The phrase in **bold** print means:

4b. How certain are you of the meaning you have given to this phrase?

```
       |------------------------------|------------------------------|
       1                              4                              7
  not at all certain          somewhat certain             very certain
```
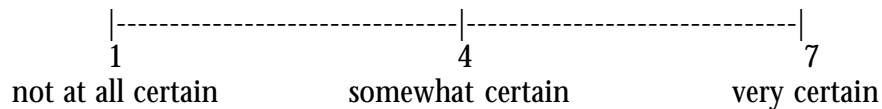
Title:	Japanese naval aces and fighter units in World War II.
Subject:	1. Japan. Kaigun. Kokutai — History. 2. **World War, 1939–1945 — Regimental histories — Japan.** 3. World War, 1939–1945 — Aerial operations, Japanese.
Author:	Hata, Ikuhiko, 1932–.
Publisher:	Annapolis, Md. : Naval Institute Press, c1989.

5a.   The phrase in **bold** print means:

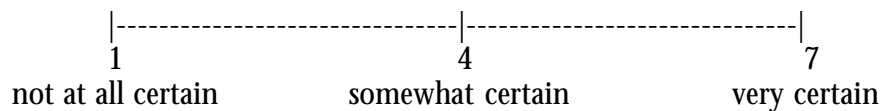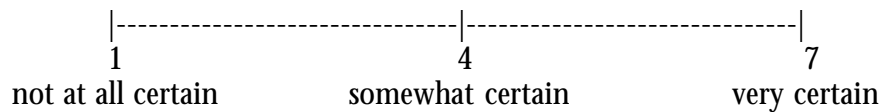5b.   How certain are you of the meaning you have given to this phrase?

```
        |------------------------------|------------------------------|
        1                              4                              7
    not at all certain          somewhat certain            very certain
```
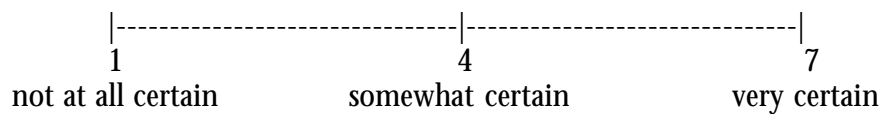
Title:	An anthology of Old English poetry.
Subject:	1. **English poetry — Old English, ca. 450–1100 — Modernized versions.** 2. English poetry — Translations from Old English.
Author:	Kennedy, Charles W. (Charles William), 1882–1969, ed. and tr.
Publisher:	New York : Oxford University Press, 1960.

6a.   The phrase in **bold** print means:

6b.   How certain are you of the meaning you have given to this phrase?

```
        |------------------------------|------------------------------|
        1                              4                              7
    not at all certain          somewhat certain            very certain
```

•7r

Title:	Music at the White House : a history of the American spirit.
Subject:	1. White House (Washington, D. C.). 2. **Music — History and criticism — Washington (D. C.).** 3. Concerts — Washington (D. C.). 4. Music — United States — History and criticism.
Author:	Kirk, Elise K. (Elise Kuhl), 1932–.
Publisher:	Urbana : University of Illinois Press, c1986.

7a.   The phrase in **bold** print means:

7b.   How certain are you of the meaning you have given to this phrase?

```
       |-----------------------------|-----------------------------|
       1                             4                             7
   not at all certain        somewhat certain            very certain
```
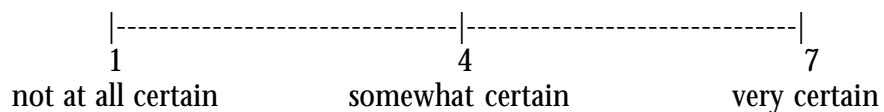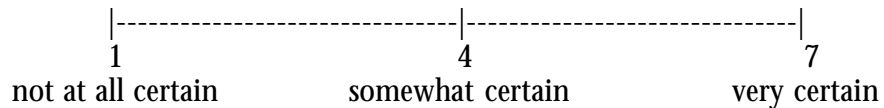
•8o

Title:	Interface : Berlin art in the nineties.
Subject:	1. Art, German — Germany — Berlin — Exhibitions. 2. **Art, Modern — 20th century — Germany — Berlin — Exhibitions.**
Publisher:	Washington, D. C.: German-American Cultural Fund ; [Berlin] : Museumspadagogischer Dienst Berlin, 1992.

8a.   The phrase in **bold** print means:

8b.   How certain are you of the meaning you have given to this phrase?

```
       |-----------------------------|-----------------------------|
       1                             4                             7
   not at all certain        somewhat certain            very certain
```
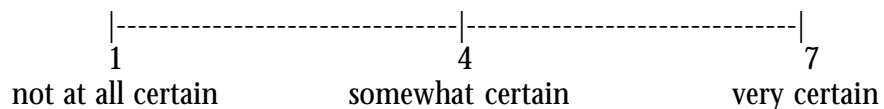
I am
              1. Female
              2. Male

Age: _____

I use a library:
              1. Daily
              2. Weekly
              3. Monthly
              4. 2 – 3 times a year
              5. Never

I have completed:
              1. Elementary school
              2. Junior high school
              3. Senior high school
              4. Some college or university
              5. College or university graduate

Profession: _____

Thank you for assisting our University of Michigan research team
in this study of subject phrases. Your responses will help libraries improve library catalogs
and subject searching for library materials.

Appendix E. Questionnaire Version 2ap

(Headings 9–16, alphabetical list, order of subdivisions begins with original order)

University of Michigan
School of Information and Library Studies

Library Survey on Subject Phrases

Instructions. On pages 2 to 5 of this survey, eight subject phrases are listed. Please read each phrase and write down your first impression of the phrase's meaning. Then, rate on a scale from 1 to 7 how certain you feel about the meaning of the subject phrase. On the last page of this survey are listed five questions. Please answer these questions that ask about yourself and your use of libraries. A completed example follows.

For example:

- Televisions — Bibliography
  Televisions — Bibliography — Catalogs
  Televisions — California
  Televisions — History
  Televisions — Information services
  Televisions — Periodicals
  Televisions — Statistics

a. The phrase in **bold** print means:

   A history of televisions

b. How certain are you of the meaning you have given to this phrase?

```
|-----------------------------|--------------------X--------|
1                            4                            7
not at all certain     somewhat certain          very certain
```

Please turn the page to begin.

•1o   Housing — United States — Information services — Bibliography — Catalogs
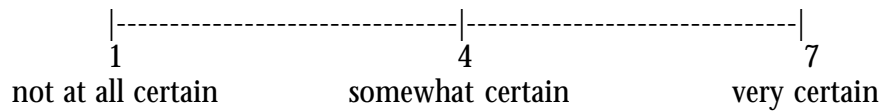   Housing — United States — Inspection — Handbooks, manuals, etc.
       Housing — United States — Inventories
       Housing — United States — Law and legislation
       Housing — United States — Maintenance and repair
       Housing — United States — Maps
       Housing — United States — Mathematical models
       Housing — United States — Periodicals

1a.   The phrase in **bold** print means:

1b.   How certain are you of the meaning you have given to this phrase?

```
|------------------------------|------------------------------|
1                              4                              7
not at all certain      somewhat certain        very certain
```

•2o   Handicapped — United States — Transportation
       Handicapped — Washington (State) — Vocational education
       Handicapped — Washington (State) — Seattle metropolitan area — Directories
       Handicapped — Washington (State) — Seattle metropolitan area — Transportation
       Handicapped — Washington (State) — Vocational guidance
       Handicapped and the arts
       Handicapped and the arts — Great Britain
       Handicapped and the arts — United States

2a.   The phrase in **bold** print means:

2b.   How certain are you of the meaning you have given to this phrase?

```
|------------------------------|------------------------------|
1                              4                              7
not at all certain      somewhat certain        very certain
```
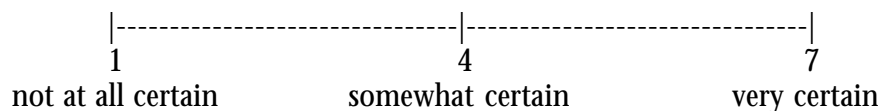
•3r   Jews — Intellectual Life — Europe, Eastern
Jews — Intellectual Life — France
Jews — Intellectual Life — Germany
Jews — Intellectual Life — Germany — Berlin — Congresses
Jews — Intellectual Life — Germany — Congresses
Jews — Intellectual Life — Germany — Exhibitions
Jews — Intellectual Life — Germany — History
Jews — Intellectual Life — Germany — History — 16th century

3a.   The phrase in **bold** print means:

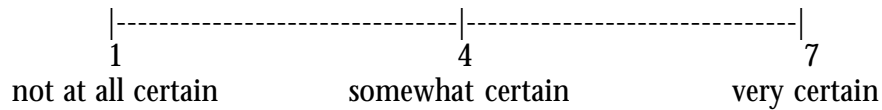3b.   How certain are you of the meaning you have given to this phrase?

```
|------------------------------|------------------------------|
1                              4                              7
not at all certain        somewhat certain          very certain
```
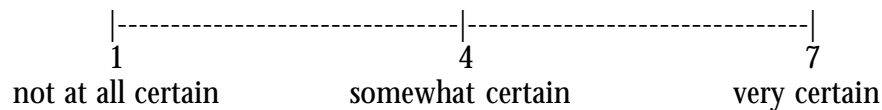
•4o   Organ music — 16th century
Organ music — 17th century
Organ music — 17th century — History and criticism
Organ music — 17th century — Interpretation (phrasing, dynamics, etc.)
Organ music — 18th century
Organ music — 18th century — History and criticism
Organ music — 18th century — Interpretation (phrasing, dynamics, etc.)
Organ music — 19th century

4a.   The phrase in **bold** print means:

4b.   How certain are you of the meaning you have given to this phrase?

```
|------------------------------|------------------------------|
1                              4                              7
not at all certain        somewhat certain          very certain
```
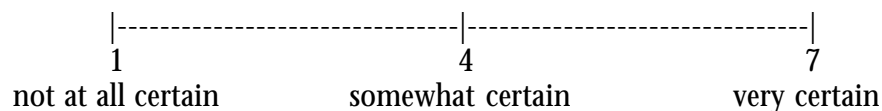
•5r   World War, 1939–1945 — Japan — Pictorial works
         World War, 1939–1945 — Japan — Poetry
         World War, 1939–1945 — Japan — Propaganda
         World War, 1939–1945 — Japan — Regimental histories
         World War, 1939–1945 — Japan — Regimental histories — Bibliography
         World War, 1939–1945 — Japan — Reparation
         World War, 1939–1945 — Japan — Ryukyu Islands
         World War, 1939–1945 — Japan — Sources

5a.   The phrase in **bold** print means:

5b.   How certain are you of the meaning you have given to this phrase?

         |------------------------------|------------------------------|
         1   4   7
         not at all certain   somewhat certain   very certain
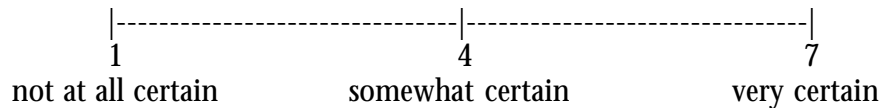
•6r   English poetry — Manuscripts — Middle English, 1100–1500
         English poetry — Manuscripts — Old English, ca. 450–1100 — Bibliography
         English poetry — Modernized versions — Middle English, 11001500
         English poetry — Modernized versions — Old English, ca. 450–1100
         English poetry — Musical settings
         English poetry — Musical settings — Bibliography
         English poetry — Translations into English — Old English, ca. 450–1100
         English poetry — Translations into French — Old English, ca. 450–1100

6a.   The phrase in **bold** print means:

6b.   How certain are you of the meaning you have given to this phrase?

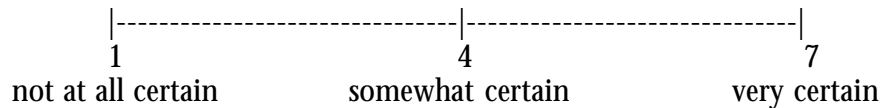 |------------------------------|------------------------------|
         1   4   7
         not at all certain   somewhat certain   very certain
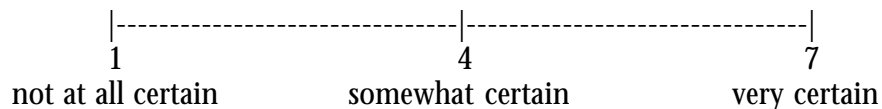
•7o   Music — United States — History and criticism
        Music — Washington — Seattle — History and criticism
        Music — Washington (D. C.)
        Music — Washington (D C.) — History and criticism
        Music — Washington (D. C.) — Library Resources
        Music — Wisconsin — Milwaukee
        Music — Wyoming
        Music — Yugoslavia — History and criticism

7a.   The phrase in **bold** print means:

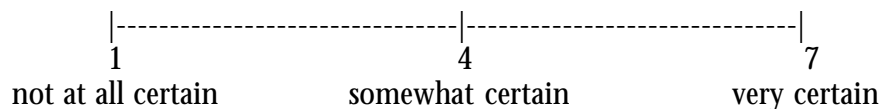7b.   How certain are you of the meaning you have given to this phrase?

```
        |------------------------------|------------------------------|
        1                              4                              7
        not at all certain     somewhat certain         very certain
```
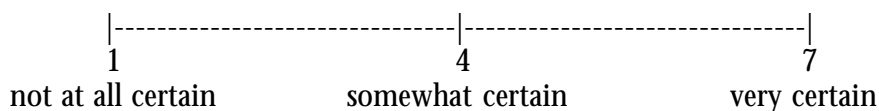

•8r   Art, Modern — Germany — Berlin — 19th century
        Art, Modern — Germany — Berlin — 19th century — Exhibitions
        Art, Modern — Germany — Berlin — 20th century
        Art, Modern — Germany — Berlin — 20th century — Exhibitions
        Art, Modern — Germany — Darmstadt — 20th century — Catalogs
        Art, Modern — Germany — Dresden — 20th century — Exhibitions
        Art, Modern — Germany — History
        Art, Modern — Germany — Munich — 19th century

8a.   The phrase in **bold** print means:

8b.   How certain are you of the meaning you have given to this phrase?

```
        |------------------------------|------------------------------|
        1                              4                              7
        not at all certain     somewhat certain         very certain
```

I am
        1. Female
        2. Male

Age: _____

I use a library:
        1. Daily
        2. Weekly
        3. Monthly
        4. 2 – 3 times a year
        5. Never

I have completed:
        1. Elementary school
        2. Junior high school
        3. Senior high school
        4. Some college or university
        5. College or university graduate

Profession: _____

Thank you for assisting our University of Michigan research team
in this study of subject phrases. Your responses will help libraries improve library catalogs
and subject searching for library materials.

Appendix F. Questionnaire Version 2bp

(Headings 9–16, alphabetical list, order of subdivisions begins with recommended order)

University of Michigan
School of Information and Library Studies

Library Survey on Subject Phrases

Instructions. On pages 2 to 5 of this survey, eight subject phrases are listed. Please read each phrase and write down your first impression of the phrase's meaning. Then, rate on a scale from 1 to 7 how certain you feel about the meaning of the subject phrase. On the last page of this survey are listed five questions. Please answer these questions that ask about yourself and your use of libraries. A completed example follows.
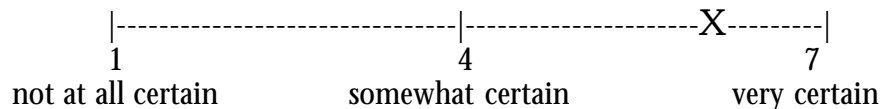
For example:

•   Televisions — Bibliography
        Televisions — Bibliography — Catalogs
        Televisions — California
        Televisions — History
        Televisions — Information services
        Televisions — Periodicals
        Televisions — Statistics

a.   The phrase in **bold** print means:

A history of televisions

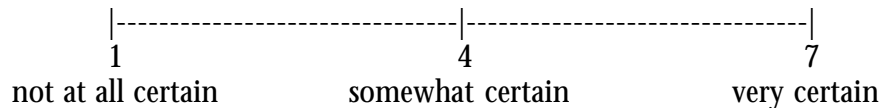b.   How certain are you of the meaning you have given to this phrase?

```
|-----------------------------|--------------------X--------|
1                             4                            7
not at all certain      somewhat certain           very certain
```

Please turn the page to begin.

•1r   Housing — Law and legislation — North Carolina
Housing — Law and legislation — Poland
Housing — Law and legislation — Sweden
Housing — Law and legislation — United States
Housing — Law and legislation — United States — Periodicals
Housing — Law and legislation — United States — Statistics
Housing — Law and legislation — Washington (D. C.)
Housing — Law and legislation — Yugoslavia

1a.   The phrase in **bold** print means:

1b.   How certain are you of the meaning you have given to this phrase?

```
|------------------------------|------------------------------|
1                              4                              7
not at all certain       somewhat certain          very certain
```

•2r   Handicapped —Transportation — New York (State)
Handicapped —Transportation — Michigan, Southeastern
Handicapped —Transportation — United States
Handicapped — Transportation — Washington (State) — Seattle metropolitan area
Handicapped — Travel
Handicapped — Travel — Bibliography
Handicapped — Travel — Congresses
Handicapped — Travel — Directories

2a.   The phrase in **bold** print means:

2b.   How certain are you of the meaning you have given to this phrase?

```
|------------------------------|------------------------------|
1                              4                              7
not at all certain       somewhat certain          very certain
```

•3o   Jews — Germany — Berlin — History — 20th century
Jews — Germany — Berlin — History — Genealogy
Jews —Germany — Berlin — Sources
Jews — Germany — Berlin — Congresses — Intellectual Life
Jews —Germany — Berlin — Bibliography
Jews — Germany — Bibliography
Jews — Germany — Bremen

3a.   The phrase in **bold** print means:

3b.   How certain are you of the meaning you have given to this phrase?

```
       |------------------------------|------------------------------|
       1                              4                              7
    not at all certain          somewhat certain            very certain
```


•4r   Organ music — History and criticism
Organ music — History and criticism — 17th century
Organ music — History and criticism — 18th century
Organ music — Interpretation (phrasing, dynamics, etc.) — 17th century
Organ music — Interpretation (phrasing, dynamics, etc.) — 18th century
Organ music — Italy
Organ music — Italy — 18th century
Organ music — Periodicals

4a.   The phrase in **bold** print means:

4b.   How certain are you of the meaning you have given to this phrase?

```
       |------------------------------|------------------------------|
       1                              4                              7
    not at all certain          somewhat certain            very certain
```

•5o   World War, 1939–1945 — Regimental histories — India
World War, 1939–1945 — Regimental histories — Indonesia
World War, 1939–1945 — Regimental histories — Italy
World War, 1939–1945 — Regimental histories — Japan
World War, 1939–1945 — Regimental histories — Bibliography — Japan
World War, 1939–1945 — Regimental histories — Japan — Kantogun
World War, 1939–1945 — Regimental histories — Japan — Tokyo
World War, 1939–1945 — Regimental histories — New Zealand

5a.   The phrase in **bold** print means:

5b.   How certain are you of the meaning you have given to this phrase?

```
|-----------------------------|-----------------------------|
1                             4                             7
not at all certain      somewhat certain          very certain
```

•6o   English poetry — Old English, ca. 450–1100 — History and criticism — Sources
English poetry — Old English, ca. 450–1100 — History and criticism — Theory, etc.
English poetry — Old English, ca. 450–1100 — Manuscripts — Bibliography
English poetry — Old English, ca. 450–1100 — Modernized versions
English poetry — Old English, ca. 450–1100 — Translations into English
English poetry — Old English, ca. 450–1100 — Translations into French
English poetry — Old English, ca. 450–1100 — Translations into Italian
English poetry — Old English, ca. 450–1100 — Translations into Spanish

6a.   The phrase in **bold** print means:

6b.   How certain are you of the meaning you have given to this phrase?

```
|-----------------------------|-----------------------------|
1                             4                             7
not at all certain      somewhat certain          very certain
```

•7r   Music — History and criticism — Turkey
Music — History and criticism — United States
Music — History and criticism — Washington — Seattle
Music — History and criticism — Washington (D C.)
Music — History and criticism — Venezuela
Music — History and criticism — Yugoslavia
Music — History and criticism — Zimbabwe
Music — History and criticism — 16th century

7a.   The phrase in **bold** print means:

7b.   How certain are you of the meaning you have given to this phrase?

```
|-----------------------------|-----------------------------|
1                             4                             7
```
not at all certain   somewhat certain   very certain

•8o   Art, Modern — 20th century — France
Art, Modern — 20th century — Germany
Art, Modern — 20th century — Germany — Berlin
Art, Modern — 20th century — Germany — Berlin— Exhibitions
Art, Modern — 20th century — Germany— Bibliography
Art, Modern — 20th century — Germany— Catalogs
Art, Modern — 20th century — Germany — Darmstadt— Catalogs
Art, Modern — 20th century — Germany — Dresden — Exhibitions

8a.   The phrase in **bold** print means:

8b.   How certain are you of the meaning you have given to this phrase?

```
|-----------------------------|-----------------------------|
1                             4                             7
```
not at all certain   somewhat certain   very certain

I am

        1. Female
        2. Male

Age: _____

I use a library:

        1. Daily
        2. Weekly
        3. Monthly
        4. 2 – 3 times a year
        5. Never

I have completed:

        1. Elementary school
        2. Junior high school
        3. Senior high school
        4. Some college or university
        5. College or university graduate

Profession: _____

Thank you for assisting our University of Michigan research team
in this study of subject phrases. Your responses will help libraries improve library catalogs
and subject searching for library materials.

Appendix G. Cover Letter to Professional Library Staff

[Insert date]

Thank you for taking part in the first large-scale study of user understanding of subject headings. Study objectives are to determine user understanding of subject headings and to identify computer-based techniques for manipulating subject headings to improve user understanding. Study findings will give direction for improving LCSH in the area of end-user understanding to help ensure its future viability. Also, recommended improvements will feature computer-based techniques that could be applied to existing files of subject headings in lieu of time-consuming, manual editorial changes.

Please return your completed questionnaire to us in the enclosed self-addressed, stamped envelope by *[date].* If you have any questions, please message project team members Karen M. Drabenstott (karen.drabenstott@umich.edu) or Eileen Fenton (egfenton@sils.umich.edu).

We expect that the data analysis will take several months. We hope to complete a final report by late summer 1996. We will place compressed and Postscript files of our final report on our school's FTP Server and announce the availability of report files on our project's World-Wide Web presentation, on relevant listservs, and message participants directly who have contacted us through electronic mail.

Many thanks for your participation in our study. We are looking forward to receiving your completed questionnaire.

Sincerely,

Karen M. Drabenstott
Project Director

Enclosure

Appendix H. World-Wide Web Page Describing the Study

User Understanding of Subdivided Subject Headings

A Brief Project Overview

"User Understanding of Subdivided Subject Headings" is the first large-scale study of user understanding of subject headings. Our objectives are:

- To determine the extent to which users understand subdivided subject headings.

- To identify computer-based techniques for manipulating subject headings to improve user understanding.

Study team members have distributed questionnaires to library patrons -- from children to seniors -- at three Michigan public libraries that asked them to use their own words to describe the meaning of subdivided subject headings. We are now expanding the study to include public and technical services librarians. We would like volunteers to complete the same questionnaires as we distributed to end users. We will compare the responses of end users and librarians to determine whether there are differences in levels of understanding between the three groups of respondents (end users, reference librarians, technical services librarians). We will also conduct a linguistic analysis of responses to identify computer-based techniques for manipulating subject headings to improve user understanding.

Background to the Study

The impetus for this study was a recommendation of the Library of Congress (LC) Subject Subdivisions Conference that suggested standardizing the order of subject subdivisions for the purpose of simplifying subject cataloging. A subcommittee of the American Library Association's Subject Analysis Committee (SAC) undertook a multi-faceted study of the subdivision in the LCSH (Library of Congress Subject Headings) system to ensure an informed decision regarding the future of subject subdivisions. This multi-faceted study included a pilot test of end-user understanding of subdivided subject headings in their current order and standardized order.

Professor Karen M. Drabenstott supervised the pilot test which was conducted by three students enrolled in her advanced cataloging course (Lori Franz, John Powell, and Suzann Jude). The results of the pilot study were published in *Library Resources & Technical Services* (see Franz et al., "End-user understanding of subdivided subject headings," v. 38, no. 3, 1994, pp. 213-226).

The findings of the pilot study were interesting but the study had several limitations. We sought funding from OCLC's Library and Information Science Research Grant Program to expand on the pilot test and overcome the limitations of the pilot test. OCLC responded by awarding a Study Team at the University of Michigan a grant to conduct the first large-scale study of user understanding of subject headings.

Study Team Members

Co-principal investigators — Karen M. Drabenstott and Amy J. Warner — Associate Professors, School of Information and Library Studies (SILS), University of Michigan (UM).

Data-collecting team — Schelle Simcox and Alaina Scopp — Masters-level students, SILS, UM.

Data-analysis team — Schelle Simcox and Marie Williams — Masters-level students, SILS, UM.

Project consultants — Susan A. Gelman — Professor, Psychology Department, UM -- Bonnie A. Dede — Head, Special Formats, Harlan Hatcher Graduate Library, UM.

Participating Michigan libraries — Flint Public Library (Gloria M. Coles, Director) — Livonia Public Library (Michael Deller, Director) — Wyandotte Public Library (Barbara Wallace, Director).

Study Objectives and Research Questions

The objectives of this large-scale study of user understanding of subject headings are to determine user understanding of subject headings and identify computer-based techniques for manipulating subject headings to improve user understanding. The study will answer five research questions:

1. To what extent do the various users of library catalogs understand subject headings?

2. Does user understanding vary based on subject heading context?

3. Does user understanding vary based on subject heading form?

4. Are there differences in levels of understanding between the three groups of respondents (end users, catalogers, reference librarians), and in levels of understanding for different forms or contexts of subject headings?

5. What computer-based techniques could be applied to existing files of subject headings to produce subject headings that are more understandable to users?

Our Progress to Date

Study staff have formulated questionnaires that list frequently-occurring, subdivided subject headings in OCLC bibliographic records. Subject headings are listed singly and in different contexts. We have distributed questionnaires

to almost three hundred library users at three public libraries in southeastern lower Michigan.

Our next step is to collect data to answer this study's fourth research question regarding differences in levels of understanding between end users, public services librarians, and technical services librarians. We are looking for public services and technical services librarians to volunteer to use their own words to describe the meaning of subdivided subject headings in different orders and contexts.

We Need Your Help

We need technical and public services librarians to participate in our study. Please help us out by requesting a questionnaire. We will send you a questionnaire and a self-addressed, stamped envelope in which to return the questionnaire. We would like participants to have a masters degree in library science and experience in public and/or technical services librarianship.

Guidelines for Participation

We would like participants with the following qualifications:

• A masters degree in library science.

• Experience in public and/or technical services librarianship

How to Obtain a Questionnaire

Please send an electronic mail message to ssimcox@umich.edu:

1. Your name.

2. Your library's mailing address.

3. Your job title.

4. The name of your library school.

5. Your electronic mail address.

6. Your phone number at work.

We will send you a questionnaire and self-addressed, stamped envelope and request that you return the completed questionnaire in the enclosed envelope by February 29, 1996.

Deadline for Completed Questionnaires

Please return the completed questionnaire in the enclosed self-addressed, stamped envelope by February 29, 1996.

Availability of the Study's Final Report

The Study Team will use the same classification developed in the pilot test to analyze end-user and librarian responses to subject headings. This will enable us to determine whether there are differences in levels of understanding between the three groups of respondents, and in levels of understanding for different forms or contexts of subject headings. We will also conduct a failure analysis to shed light on the exact causes of the variance in user understanding of individual subject headings.

The analysis will take several months. We hope to complete a final report by late spring 1996. We will place compressed and Postscript files of our final report on our school's FTP Server. We will announce the availability of report files on this World-Wide Web presentation, on relevant listservs, and message participants who include their electronic mail address on completed, returned questionnaires.

Whom to Contact with Your Questions

Please contact Schelle Simcox at the following electronic mail address: ssimcox@umich.edu. We thank you for your interest and hope you will consider participation in this large-scale study of user understanding of subject headings.

Appendix I. Announcement Sent to Listservs to Recruit Librarians

PLEASE PARTICIPATE IN OUR STUDY

Karen Markey Drabenstott and graduate students at the School of Information and Library Studies at the University of Michigan are conducting a study to determine how well library catalog users understand subject headings. This study is supported by OCLC's Library and Information Science Research Grant Program.

We are now expanding the study to include public and technical services librarians, and we need your help. We would like you to volunteer to complete a questionnaire that asks you to write down the meaning of listed subject headings. We will compare responses to determine the extent to which there are differences in levels of understanding between three groups of library catalog users (patrons, public services librarians, and technical services librarians).

HOW TO REQUEST A QUESTIONNAIRE

Please help us out by requesting a questionnaire. We will send you a questionnaire and a self-addressed, stamped envelope in which to return your completed questionnaire. We would like volunteers to have a masters degree in library science and experience in public and/or technical services librarianship.

Please send an electronic mail message to ssimcox@umich.edu and include in your message the following information: (1) your name, (2) your library's mailing address, (3) your job title, (4) the name of the library school from

which you graduated, (5) your electronic mail address, and (6) your phone number at work.

We will then send you a questionnaire and self-addressed, stamped envelope and request that you return the completed questionnaire in the enclosed envelope by *[date].*

OBJECTIVES OF THE STUDY

The objectives of this large-scale study of user understanding of subject headings are to determine user understanding of subject headings and identify computer-based techniques for manipulating subject headings to improve user understanding. The study will answer five research questions:

1.   To what extent do the various users of library catalogs understand subject headings?

2.   Does user understanding vary based on subject heading context?

3.   Does user understanding vary based on subject heading form?

4.   Are there differences in levels of understanding between the three groups of respondents (patrons, technical services librarians, public services librarians), and in levels of understanding for different forms or contexts of subject headings?

5.   What computer-based techniques could be applied to existing files of subject headings to produce subject headings that are more understandable to users?

FURTHER INFORMATION

For further information about the study, please consult our web page at the following URL: http://www.umich.edu/~ssimcox/oclcpg.html.

We thank you for your interest and hope you will consider participation in this large-scale study of user understanding of subject headings. Again, please contact ssimcox@umich.edu if you have any questions.

Appendix J. Different Meanings for Different Orders and Contexts

Table F1. Subject Heading #5

Subject headings	Representation	Expert-supplied meanings
Indians of North America—Food—New Mexico (original order)	alone, bibliographic record, alphabetical list	Foods of Indians of New Mexico
Indians of North America—New Mexico—Food (revised order)	alone	Foods of Indians of New Mexico
Indians of North America—New Mexico—Food (revised order)	bibl. record, alphabetical list	New Mexican food of the Indians of North America

Table F2. Subject Heading #6

Subject headings	Representation	Expert-supplied meanings
Spanish drama—History and criticism—18th century (original order)	alone, bibliographic record, alphabetical list	History and criticism of 18th century Spanish drama
Spanish drama—18th century—History and	alone, alphabetical list	18th century history of criticism of Spanish drama

Subject headings	Representation	Expert-supplied meanings
criticism (revised order)		
Spanish drama—18th century—History and criticism (revised order)	bibliographic record	History and criticism of 18th century Spanish drama

Table F3. Subject Heading #8

Subject headings	Representation	Expert-supplied meanings
Art, Modern—California—Los Angeles—20th century—Exhibitions (original order)	alone, bibliographic record, alphabetical list	Exhibitions of 20th century Los Angeles (Calif.) modern art
Art, Modern—20th century—California—Los Angeles—Exhibitions (revised order)	alone	Exhibitions of 20th century Los Angeles (Calif.) modern art
Art, Modern—20th century—California—Los Angeles—Exhibitions (revised order)	bibliographic record, alphabetical list	Exhibitions of 20th century modern art from Los Angeles, Calif.

Table F4. Subject Heading #9

Subject headings	Representation	Expert-supplied meanings
Housing—United States—Law and legislation (original order)	alone	Law and legislation of U. S. housing
Housing—United States—Law and legislation	bibliographic record,	Law and legislation of housing in the U. S.

(original order)	alphabetical list	
Housing—Law and legislation—United States (revised order)	alone, alphabetical list	Law and legislation of housing in the U. S.
Housing—Law and legislation—United States (revised order)	bibliographic record	Law and legislation of U. S. housing

Table F5. Subject Heading #10

Subject headings	Representation	Expert-supplied meanings
Handicapped—Washington (State)—Seattle metropolitan area—Transportation (original order)	alone, alphabetical list	Transportation of handicapped in the Seattle (Wash.) metropolitan area
Handicapped—Washington (State)—Seattle metropolitan area—Transportation (original order)	bibliographic record	Transportation of the Seattle (Wash.) metropolitan area handicapped
Handicapped—Transportation—Washington (State)—Seattle metropolitan area (revised order)	alone, bibliographic record	Transportation of handicapped in the Seattle (Wash.) metropolitan area
Handicapped—Transportation—Washington (State)—Seattle metropolitan area (revised order)	alphabetical list	Transportation of the Seattle (Wash.) metropolitan area handicapped

<div align="center">Table F6. Subject Heading #11</div>

Subject headings	Representation	Expert-supplied meanings
Jews—Germany—Berlin—Intellectual life—Congresses (original order)	alone	Congresses of the intellectual life of Berlin (Germany) Jews
Jews—Germany—Berlin—Intellectual life—Congresses (original order)	bibliographic record, alphabetical list	Congresses of the intellectual life of Jews in Berlin, Germany
Jews— Intellectual life—Germany—Berlin—Congresses (revised order)	alone, bibliographic record	Congresses of the intellectual life of Berlin (Germany) Jews
Jews— Intellectual life—Germany—Berlin—Congresses (revised order)	alphabetical list	Congresses of the intellectual life of Jews in Berlin, Germany

<div align="center">Table F7 Subject Heading #16</div>

Subject headings	Representation	Expert-supplied meanings
Art, Modern—20th century—Germany—Berlin—Exhibitions (original order)	alone, alphabetical list	Exhibitions of 20th century Berlin (Germany) modern art
Art, Modern—20th century—Germany—Berlin—Exhibitions (original order)	bibliographic record	Exhibitions of 20th century modern art in Berlin, Germany
Art, Modern—Germany—Berlin —20th century—Exhibitions (revised order)	alone, alphabetical list	Exhibitions of 20th century Berlin (Germany) modern art
Art,	bibliographic	Exhibitions of 20th century

Subject headings	Representation	Expert-supplied meanings
Modern—Germany—Berlin —20th century—Exhibitions (revised order)	record	modern art in Berlin, Germany

Table F8. Subject Heading #21

Subject headings	Representation	Expert-supplied meanings
Jews—Egypt—Politics and government (original order)	alone, bibliographic record, alphabetical list	Politics and government of Jews in Egypt
Jews—Politics and government—Egypt (revised order)	alone, alphabetical list	Politics and government of Jews in Egypt
Jews—Politics and government—Egypt (revised order)	bibliographic record	Politics and government of Egyptian Jews

Table F9. Subject Heading #24

Subject headings	Representation	Expert-supplied meanings
English poetry—Middle English, 1100–1500—Criticism, Textual—Congresses (original order)	alone, bibliographic record, alphabetical list	Congresses of textual criticism of Middle English (1100–1500) poetry
English poetry—Criticism, Textual—Middle English, 1100–1500—Congresses (revised order)	alone	Congresses of Middle English textual criticism of Middle English (1100–1500) poetry
Jews—Politics and	bibliographic	Congresses of textual criticism

government—Egypt (revised order)	record, alphabetical list	of Middle English (1100–1500) poetry

Appendix K. Multiple Meanings for Different Orders and Contexts

Table H1. Subject heading #1

Subject headings	Representation	Expert-supplied meanings
Basketball—United States—Records (original order)	alone, bibliographic record, alphabetical list	Records of U. S. basketball
Basketball—Records—United States (revised order)	alone, bibliographic record, alphabetical list	Records of U. S. basketball
Basketball—Records—United States (revised order)	bibliographic record, alphabetical list	Records of basketball in repositories in the United States

Table H2. Subject heading #3

Subject headings	Representation	Expert-supplied meanings
Locomotives—Germany—History (original order)	alone, bibl. record	History of locomotives in Germany
Locomotives—History—Germany (original order)	alphabetical list	German history of locomotives

Locomotives—Germany—History (revised order)	alone	History of locomotives in Germany
Locomotives—Germany—History (revised order)	bibliographic record, alphabetical list	German history of locomotives
Locomotives—Germany—History (revised order)	bibliographic record, alphabetical list	History of locomotives where histories are held in German repositories

Table H3. Subject heading #13

Subject headings	Representation	Expert-supplied meanings
World War, 1939–1945—Regimental histories—Japan (original order)	alone, bibliographic record, alphabetical list	Japanese regimental histories of World War, 1939–1945
World War, 1939–1945—Regimental histories—Japan (original order)	alone, bibliographic record, alphabetical list	Regimental histories of World War, 1939–1945, in repositories in Japan
World War, 1939–1945—Japan—Regimental histories (revised order)	alone, bibliographic record, alphabetical list	Japanese regimental histories of World War, 1939–1945
World War, 1939–1945—Japan—Regimental histories (revised order)	alone	Regimental histories of World War, 1939–1945, in repositories in Japan

Table H4. Subject heading #15

Subject headings	Representation	Expert-supplied meanings
Music—Washington (D.C.)—History and criticism (original order)	alone, bibliographic record, alphabetical list	History and criticism of Washington (D.C.) music
Music.)—History and criticism—Washington (D.C.) (revised order)	alone, alphabetical list	History and criticism of Washington (D.C.) music
Music.)—History and criticism—Washington (D.C.) (revised order)	bibliographic record	History and criticism of music (performed in) Washington (D.C.)
Music.)—History and criticism—Washington (D.C.) (revised order)	alone	History and criticism of music in Washington (D.C.) repositories

Table H5. Subject heading #20

Subject headings	Representation	Expert-supplied meanings
Music—Africa—History and criticism—Bibliography (original order)	alone, bibliographic record, alphabetical list	Bibliography of the history and criticism of music from Africa
Music—History and criticism—Africa—Bibliography (revised order)	alone	Bibliography of the history and criticism of music from Africa
Music—History and criticism—Africa—Bibliography (revised order)	bibliographic record, alphabetical list	Bibliography of African history and criticism of music

Music—History and criticism—Africa—Bibliography (revised order)	alone, alphabetical list	Bibliography of music, history and criticism of materials located in Africa

Table H6. Subject heading #22

Subject headings	Representation	Expert-supplied meanings
Music—Louisiana—New Orleans—History and criticism (original order)	alone, bibliographic record, alphabetical list	History and criticism of New Orleans (La.) music
Music—History and criticism—Louisiana—New Orleans (revised order)	alone, alphabetical list	History and criticism of music from New Orleans, La.
Music—History and criticism—Louisiana—New Orleans (revised order)	bibliographic record	History and criticism of New Orleans (La.) music
Music—History and criticism—Louisiana—New Orleans (revised order)	bibliographic record	New Orleans (La.) history and criticism of music