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# Mining Social Tagging Data for Enhanced Subject Access for Readers and Researchers

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## **Disciplines**

Library and Information Science

## **Comments**

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# Mining Social Tagging Data for Enhanced Subject Access for Readers and Researchers

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## Abstract

Social tagging enables librarians to partner with users to provide enhanced subject access. This paper quantifies and compares LC subject headings from each of 31 different subject divisions with user tags from Amazon.com and LibraryThing assigned to the same titles. The intersection and integration of these schemas is described and evaluated.

## Introduction

Providing bibliographic access to materials and information is one of any Library's foundations. Until very recently, access was provided solely by the Library. The advent of Web 2.0 technology has now introduced the capability for interactive social networking. Some online websites provide tools for individuals and groups to assign personalized tags to books.

Tagging is the process by which many users add their own keywords to shared content. As users engage in this activity and more tags are associated with a title, they are displayed in lists or tag clouds. Smith describes a tag cloud as "a method of presenting tags where the more frequently used tags are emphasized – usually in size or color. Tag clouds tell you at a glance which tags are more popular. Each tag is a link." [1] Clouds usually list terms in alphabetical order or by weighted (popular) usage.



on Del.icio.us, Furl.net, Flickr and Photobucket; any web pages can be shared through the first two services, while photos are mainly shared through the latter two services. [3] Golder and Huberman described the collaborative tagging of shared website bookmarks on Del.cico.us, CiteULike, and Connotea.[4] As the social web has evolved, sites that specifically offer user tagging of books have been developed. These include Reader<sup>2</sup>, Goodreads, Shelfari, and aNobil, and LibraryThing. Some commercial websites, such as Amazon.com, allow social tagging. In this way, according to Richman, "web visitors are both consumers and producers of information." [5] New applications such as PennTags, BiblioCommons, and LibraryThing for Libraries also seek to incorporate social tagging alongside traditional Library of Congress subject headings. The Nashville Public Library, Oakville Public Library (CA.), Ann Arbor District Library (MI.) and the Thunder Bay Public Library (Ont.) are some of the public libraries that allow social tagging in their online catalogs, so patrons can find information on any number of topics just by clicking on a tag. Gail Richardson of the Oakville Public Library (ONT.) wrote: "People don't want a library that acts like just a glorified card catalog online. They want a catalog that's as good as Google and Amazon." [6]

Researchers are unlikely to want to scan through tag clouds when they are familiar with the precision of Library of Congress Subject (LCSH) headings. LCSH was developed by and for librarians and other information

specialists. Extensive training and hands-on experience are required in order to gain proficiency and expertise in applying them. On the other hand, LCSH is often criticized for being slow to make relevant changes. There is an ongoing debate about LCSH as the national standard for subject access to library materials, which has intensified with the recent work by the Library of Congress's Working Group on the Future of Bibliographic Control and the response to it from the library community. OCLC is developing the *Faceted Application of Subject Terminology* (FAST) that retains the vocabulary of LCSH while making the schema easier to understand, control, apply, and use. McElfresh suggested incorporating terms from folksonomies (or social tagging systems) "as candidates for addition to the controlled system of subject headings." [7] Macgregor and McCulloch suggest that librarians take advantage of "assessing the efficacy of collaborative tagging in relation to information storage, organisation, and retrieval, and to influence the future development of collaborative tagging systems." [8] Arch asks "If we are already making classifiers out of ordinary people, why not bring social tagging into the library? [9]

This study examines and compares the subject headings assigned to 155 books in 31 top-level subject divisions as defined by OCLC's WorldCat Analysis [10] collection management tool along with the tags assigned to the same titles by two online sites specifically oriented towards books that also allow social tagging, Amazon.com and LibraryThing. These titles were

chosen because they are widely held by many types of libraries. Would there prove to be comparative social tagging for these WorldCat titles? Traditional subject access is compared against current social tagging for the same books and describes and evaluates the intersection of these schemas and how the integration might be useful for librarians, readers, and researchers.

## Background

OCLC's WorldCat is the world's largest network of library content and services. In May 2009 there were 71,000 libraries represented worldwide and the database consisted of 136,248,352 bibliographic records with a new record added every 10 seconds.[11] OCLC's WorldCat Collection Analysis tool is a web-based service that provides analysis and comparison of library collections based on holdings information contained in the WorldCat database. The 32 top-level subject divisions within OCLC's WorldCat Analysis are:

- Agriculture
- Anthropology
- Art & Architecture
- Biological Sciences
- Business & Economics
- Chemistry
- Communicable Diseases & Misc.
- Computer Science
- Education
- Engineering & Technology
- Geography & Earth Sciences
- Government Documents
- Health Facilities & Nursing & History
- Law
- Library Science & Generalities & Reference
- Mathematics
- Medicine
- Medicine by Discipline
- Medicine by Body System
- Music
- Performing Arts
- Philosophy & Religion
- Physical Education & Recreation
- Physical Sciences
- Political Science
- Preclinical Sciences

- Health Professions & Public Health
- History & Auxiliary Sciences
- Language & Linguistics & Literature
- Psychology
- Sociology
- Unknown Classification

The division "Unknown Classification" was not used in any statistical analyses. These top level subject divisions can also be broken down into more specific categories, such as Agriculture/Veterinary Medicine or Education/History of Education. Only the top level subject sub-divisions were used in this study.

Amazon.com (Amazon) is an e-commerce platform that offers books for sale, along with a wide variety of other items. [12] While Amazon is mostly thought of as a commercial site, it allows social tagging for registered users. The number of times a tag was used is included in parentheses after the tag. The hardcover edition of the title *Eat, Pray, Love*, for example, generated 62 unique user tags displayed in weighted (by popularity) order. The tags can also be sorted alphabetically A-Z, or Z-A, or by tag date. Along with the social tagging capability, Amazon also provides a hyperlinked classification (hierarchical, or tree) system. An example for the title *Eat, Pray, Love* was as follows in April 2008: [13]

Books > Travel > Asia > Indonesia

Books > Travel > Asia > India

Books > Biographies & Memoirs > Specific Groups > Adventurers & Explorers

This classification is not static, however, and in December 2008, the title was classified in this way:

Books > Biographies & Memoirs > Travel

Books > Biographies & Memoirs > Specific Groups > Women

Books > Biographies & Memoirs > Arts & Literature > Authors

LibraryThing is a website specifically devoted to books. It promotes itself as "an easy, library-quality catalog."<sup>[14]</sup> Registered users can create records for new titles and add books to their "shelf" or "list." There is a limit to the number of books one can add to a shelf without paying a fee.

Members can also add descriptive tags to the records. The number of times a descriptor was "tagged" to a book is included in parentheses after the tag.

LibraryThing also advertises that it "connects you with people who read what you do."<sup>[15]</sup> It links out to several other book-related sites, including WorldCat, so users can sample other tags or subject headings.

Richman writes: "Social bookmarking sites are valuable because humans are again in charge of defining what appeals to them independently. Their tags also get shared and help contribute to folksonomies, which are user-generated taxonomies that aid future

searching. Thus, a valuable page that ranks poorly with the search engines may become 'findable' because a group of users identified and shared it." [16] For example, instead of associating a fixed number of LC Subject Headings with a title, a user might use tags in this way:

- <tag> Book to read in 2009
- <tag> Book located in my Den
- < tag> Author I like to read
- <tag> Author born in \_\_\_\_\_
- <tag> Author who is an outstanding writer
- <tag> Book to recommend to Dani
- <tag> Heard about on NPR
- <tag> objective term

### Methodology

The bibliographic records used for this article were gathered during the first two weeks in April 2008. Titles were extracted from the OCLC WorldCat database via its Collections Analysis tool. The search parameters were:

1. Collection Analysis/Data to Analyze/ Limit Analysis
2. Publication Date: 2007
3. Language: English
4. Format: Books
5. Audience: Adult
6. All Divisions (subject divisions within WorldCat Collection Analysis)
7. Both fiction and non-fiction

## 8. Adult and not juvenile

The titles analyzed were the top 5 titles in each Division; the most held by library of any type in WorldCat. The Division "Unknown Classification" was not used in any statistical analyses. For each title, this data was quantified:

- number of Holding Libraries (from WorldCat)
- number of unique LCSH headings in #a of the bibliographic record
- number of unique Amazon user tags
- number of unique LibraryThing user tags
- number of subjective tags and number of objective tags in Amazon.com
- number of subjective tags and number of objective tags in LibraryThing

For standardization purposes, the tags from the hardcover edition of the book title were used from Amazon.com. "Tags associated with this product" were counted. "Suggested tags from similar products" were not counted – those are provided by Amazon and not by readers. Singular and plural forms of the same word are counted as separate tags in both Amazon.com and LibraryThing. Different tags may be assigned to the same title of a book depending on which format the reader chooses: hardcover, paperback, or Kindle.

Appendix 1 gives an in-depth analysis of 28 (19%) out of the sample of 150 titles. These titles had only one LC subject heading assigned to them. User tags from Amazon.com and LibraryThing provide many more choices and also give us a look at how users search for titles by subject. Many bibliographic records in WorldCat also include an Abstract or a Contents Note field, or both. Both of these fields were examined for the 28 titles to compare their wording against the terms used as LC subject headings and as user tags.

For the purpose of this article, objective tags are defined as either a word or phrase that appears to describe the title's content. Subjective tags are defined as based on the user's perspective, personalization, or assignment of attributes other than content-related. Many of these tags are specific to the reader who assigned them. The majority of subjective tags fell into, but was not limited to, one or more of these categories and examples:

1. Reading Status
  - Date read
  - TBR (to be read)
  - Unfinished
  - Started to read
  - Have read
  - Read, don't own
  - Never finished
  - Partially read
  - Wanted
  - Queue
  - Unread
  - Must read
  - Re-read
  - Recommended

What not to read  
Book currently reading  
Books to consider  
Wishlist/Amazon wishlist

2. Date  
2007  
Nov. 2007

3. Initials of tagger

4. Type:

Non-Fiction  
Fiction  
Autobiography  
Memoir  
Current Events  
Reference  
Self-help  
Almanac  
Essays  
How-to  
Mystery  
Thriller  
Political thriller

5. Gift suggestion  
Buy for Lindsey  
For Jessie (or someone's surname or initials)  
Birthday gift  
Books for my daughter  
Boy's gift

6. Format  
MP3  
iTunes  
First edition  
Large print  
Kindle  
Audible.com  
11 CDs

7. Referral

Bellaonline recommended  
Mary Kate's pick  
Starred Kirkus  
Book club/group  
Oprah  
Daily Show  
50 Book Challenge  
Science Friday  
Colbert Report  
Jon Stewart  
700 Club  
Starbucks book  
Sports Page book club  
David Letterman  
NYTimes Notable Books  
Music reading project  
Book Fair 2007

#### 8. Location

Office copy  
School copy  
Dining room  
Carnegie Library of Pittsburgh  
Peoria Public Library  
Main  
Home Ec Dept.  
Library book  
Permanent collection catalog

#### 9. Bibliographic

Title of book  
First edition  
Large print  
7-day loan  
Classification number (e.g., 613.25)  
Illustrations, woodcuts

#### 10. Opinion

Hilarious, Disturbing  
Good book (brilliant), Bad book (beyond the pale)  
Good person, Bad person (reference to author)  
Uncomfortable book for holding and reading

11. Author  
Author's name  
Favorite author  
Arkansas author  
Female author

12. Publisher  
McGraw-Hill  
Warner Books

Examples of objective tags assigned by users are given in Appendix 1 as "User tags that are LCSH" and "Other User tags."

Golder and Huberman point out that "a significant amount of tagging, if not all, is done for personal use rather than public benefit. Nevertheless, even information tagged for personal use can benefit other users. For example, if many users find something 'funny,' there is a reasonable likelihood someone else would also find it to be so, and may want to explore it." [17] Another large subjective category is what Guy and Tonkin refer to as "sloppy tags ... misspelt, badly encoded, such as unlikely compound word groupings, singular versus plural form, personal tags that are without meaning to the wider community, single-use tags that appear only once in the database." [18] In this study, these tags were counted as subjective terms. Golder and Huberman refer to the lack of control in social tagging as noise: "The probability of noise in a user's result set is therefore very high. The corollary dictates that this impacts negatively upon retrieval

precision, as well as limiting the ability to collocate similar or related resources. “[19] The beauty of the subject access provided by librarians who use social tagging is that they will have weeded out the “noise” that might adversely affect the users searching capabilities. Catalogers can filter out subjective tags such as “Must read” or “Hilarious” and selectively choose appropriate headings from the objective tags assigned by readers.

This study looked at the number of LC subject headings as well as the subjective (personal) and objective (topical) tags that users of Amazon and LibraryThing assigned to the 5 most widely-held titles in each of 31 subject divisions as defined in OCLC’s WorldCat Collection Analysis tool. The results from this study are presented in Table 1.

Table 1: LCSH and User Tag Analysis of Books in OCLC WorldCat Subject Divisions\*

OCLC WorldCat Analysis Subject Divisions	Avg. # Holding Libraries	Avg. # of unique LCSH <sup>≠a</sup>	Total # of tags in AZN & LT	Avg. %/# objective tags in AZN and LT		Avg. %/# subjective tags in AZN and LT		Notes
				N	%	N	%	
<b>Agriculture</b>	1320	3	408	286	70	122	30	
<b>Anthropology</b>	974	5	280	150	54	130	46	
<b>Art &amp; Architecture</b>	793	3	118	75	64	43	36	
<b>Biological Sciences</b>	1032	3	161	109	68	52	32	
<b>Business &amp; Economics</b>	1627	3	322	213	66	109	34	
<b>Chemistry</b>	570	1	152	114	75	38	25	1 record with no tags in LT.
<b>Communicable Diseases &amp; Misc.</b>	366	5	108	61	56	47	44	No records for 2 titles; 1 record with no tags in

OCLC WorldCat Analysis Subject Divisions	Avg. # Holding Libraries	Avg. # of unique LCSH <del>=</del> a	Total # of tags in AZN & LT	Avg. %/# objective tags in AZN and LT		Avg. %/# subjective tags in AZN and LT		Notes
								LT.
<b>Computer Science</b>	758	3	344	275	80	69	20	1 record with no tags in LT.
<b>Education</b>	1287	2	141	92	65	49	35	1 record with no tags in LT.
<b>Engineering &amp; Technology</b>	1051	3	492	314	64	178	36	
<b>Geography &amp; Earth Sciences</b>	1252	3	291	198	68	93	32	
<b>Government Documents</b>	349	2	21	19	90	2	10	No record for 1 title in AZN. No records for 2 titles in LT.

OCLC WorldCat Analysis Subject Divisions	Avg. # Holding Libraries	Avg. # of unique LCSH <del>≠</del> a	Total # of tags in AZN & LT	Avg. %/# objective tags in AZN and LT		Avg. %/# subjective tags in AZN and LT		Notes
				N	%	N	%	
Health Facilities, Nursing & History	660	6	162	110	68	52	32	
Health Professions & Public Health	499	4	82	63	77	19	23	1 record with no tags in LT
History & Auxiliary Sciences	2102	3	872	524	60	348	40	
Language, Linguistics & Literature	2304	4	757	307	41	450	59	this Subject Division also uses Genre/Form descriptors (not counted)
Law	1554	3	498	232	47	266	53	
Library Science, Generalities & Reference	1051	4	464	193	42	271	58	

OCLC WorldCat Analysis Subject Divisions	Avg. # Holding Libraries	Avg. # of unique LCSH <del>≠</del> a	Total # of tags in AZN & LT	Avg. %/# objective tags in AZN and LT		Avg. %/# subjective tags in AZN and LT		Notes
Mathematics	674	3	100	53	53	47	47	1 record with no tags in LT
Medicine	1509	4	306	126	41	180	59	
Medicine by Discipline	764	4	129	47	36	82	64	1 record with no tags in LT
Medicine by Body System	365	4	85	40	47	45	53	1 record with no tags in LT
Music	1281	2	368	166	45	202	55	
Performing Arts	971	2	196	82	42	114	58	
Philosophy & Religion	1546	2	801	381	48	420	52	
Physical Education & Recreation	1073	4	282	54	19	228	81	
Physical Sciences	1507	3	287	120	42	167	58	

OCLC WorldCat Analysis Subject Divisions	Avg. # Holding Libraries	Avg. # of unique LCSH <del>a</del>	Total # of tags in AZN & LT	Avg. %/# objective tags in AZN and LT		Avg. %/# subjective tags in AZN and LT		Notes
Political Science	1491	3	568	225	40	343	60	
Preclinical Sciences	750	5	129	55	43	74	57	
Psychology	1370	2	249	116	47	133	53	
Sociology	1657	3	582	185	32	397	68	
<b>TOTALS</b>	<b>1,272</b>	<b>3</b>	<b>9,755</b>	<b>4,985</b>	<b>51</b>	<b>4,770</b>	<b>49</b>	

\*LCSH=Library of Congress Subject Headings

AZN=Amazon.com

LT=LibraryThing

## Results

This analysis provides a snapshot of how users utilize tagging systems. Thirty-one percent of user tags in Amazon and 20% of the tags in LibraryThing are objective tags with nearly the same proportion of subjective tags. Twenty-three percent of the tags associated with a title in Amazon were subjective, as were 26% of the tags in LibraryThing. The social tagging provided by users also contains numerous objective terms that are LC subject headings and could be added to bibliographic records for enhanced access. Examples of these are given in Appendix I as "User tags that are LCSH." McElfresh writes: "We could encourage social tagging in our libraries, and then incorporate terms from those vocabularies both as cross-references for terms already found in library catalogs and as candidates for addition to the controlled system of subject headings." [19] Examples of these objective tags are given in Appendix 1 as "User tags that are LCSH references," "User tags, places or people," and "Other User tags."

Library of Congress (LC) Subject Cataloging Policy (LC Subject Cataloging Manual) recommends assigning a maximum of six subject headings per title, but LC practice is to assign no more than ten headings to a work.[20] The average number of LC subject headings assigned to the most widely held titles in this study was 3. A subject heading was counted only if it was unique. For example, the subject heading "Smoking" was used

4 times with sub-divisions for the title *Cigarette Century*. For the purposes of this article, the subject heading was tallied only once.

The number of tags per title on Amazon.com and LibraryThing (both objective and subjective) will increase as more readers add the book to their “collection.” The average number of tags for the titles examined in this study was 315 per OCLC subject division, or 63 per title. There were records for all the extracted titles from each Subject Division in all categories in both Amazon and LibraryThing, except for one title in the Government Documents subject division: *Report on Enforcement of Laws Protecting Religious Freedom: fiscal years 2001-2006*.

Findings show that overall, 51% of the social tags are objective and 49% are subjective. However, some subject divisions differ widely from the overall total, such as Government Documents (90% objective tags) or Language, Linguistics and Literature (only 40% objective tags). This can be explained by differentiating between a collection that is likely to be held by a reader and a collection that is held by a Library. It is likelier that a greater number of readers will own or read a book that falls into the Language, Linguistics and Literature category, which includes popular novels, than a reader will own or read a report that falls into the Government Documents category. Books that fell into the History & Auxiliary category had the highest number of tags, an average of 174 per title. Government Documents titles had the fewest tags, an average of 5 per title. Eight categories

(Chemistry, Communicable Diseases & Misc., Computer Science, Education, Health Professions & Public Health, Mathematics, Medicine by Discipline, and Medicine by Body System) each had one title that had no tags associated with it. Two categories (Communicable Diseases & Misc., Government Documents) each had 2 titles that had no records in LibraryThing.

Examples of titles within each category are given in Appendix 1.

The quality of the Content notes and Abstracts examined in Appendix 1 varied and often do not replace the need for more subject access. Content notes are frequently the same as the title's chapters; catchy, but not objective. Abstracts are more descriptive. However, there was only one title with an Abstract that took advantage of using keyword descriptors. The Abstract for *The Lucifer Effect* consisted of a brief narrative followed by a list of key terms (or tags), names and phrases ranging from Abu Ghraib and Achilles to Taguba Report, Terror, and World War II.

Peterson writes: "Catalogers have always had to balance adherence to cataloging rules and authority files with creating cataloging that is current and relevant to users." [21] Cataloging rules are very complex because they are intended and designed to describe and provide access to complex entities. These systems were founded by and for librarians and information specialists. Extensive training and hands-on experience are required in order to gain proficiency and expertise in applying them. The majority of users of a library or website does not have the time or interest in learning how to use

them extensively. Researchers and academic specialists need more specialized systems than a general reader. This dilemma has been complicated in new ways because of user demands in the world of Web 2.0. McElfresh finds that "Folksonomies are much nimbler and more flexible than controlled vocabularies tend to be. Perhaps the answer lies in balancing controlled vocabularies with user-created systems of description." [22]

### Conclusions & Recommendations

There are specific instances and categories where social tagging can enhance traditional subject cataloging and provide more comprehensive access for our users. The 28 titles given in Appendix 1 were each assigned one LCSH subject heading. Readers assigned a total of 176 objective tags that are also LCSH subject headings to these titles that were not used in the cataloging record. An additional number of tags (also noted in Appendix 1) are LCSH references. One example from Appendix 1 is title number 15 "From the Palmer Raids to the Patriot Act: a history of the fight for free speech in America." The title was assigned one LCSH heading: Freedom of speech -- United States -- History. Among the user assigned tags were the LC subject headings: Censorship, Civil rights, Communism, Intellectual freedom, Law, Social justice, Libel (and slander), and Freedom of the press. While social tagging does consist of a great deal of subjective tagging, there is enough objective tagging available on bibliographic-related websites such as Amazon

and LibraryThing that librarians can use to provide enriched bibliographic records.

The limited analysis of 150 records and detailed analysis of 28 records (Appendix 1) provides several key informational points:

- The subject cataloging fields on the bibliographic records examined are predominately MARC tag 650 (topical term). The average number of unique headings in the 650 field was 3 in #a. Many times the term in #a of the 650 field was repeated with a variant #x (General subdivision), #y (Chronological subdivision), or #z (Geographical subdivision). "Sub-field a" was frequently repeated numerous times when other unique descriptors could have been used. LC subject cataloging policy already allows greater usage of subject headings than are usually assigned to a title and sites such as Amazon.com and LibraryThing can provide objective tags known to be relevant to readers and that could be used to enhance a cataloging record.
- There was a lack of MARC tags for subjects other than topical terms. Personal names (600 tag), corporate names (610 tag), and geographic (651 tag) subject headings were rarely used in the bibliographic records. Some of the titles analyzed are "lightweight" (perhaps popular) and may not warrant in-depth subject description. Many scientific/technical/medical/ works do not have personal, corporate or

geographic components. Also, it must be recognized that some social tagging is of such a general nature that it would be hard to argue for their inclusion in a catalog record, especially in a research library setting. While they were not heavily used in social tagging, they are other important access points for a cataloger to consider.

- Older imprints (pre-2007) were not examined. Hypothetically, the quality of tagging for older titles would resemble that of 2007 imprints in the same category. Conversely, the quantity of titles in LibraryThing and Amazon.com for older imprints would decrease, although there would likely be a larger number of older titles tagged in the Language, Linguistics and Literature category than in the Government Documents category.
- Each major category in WorldCat Collection Analysis has layers of subdivisions that were not examined as part of this study. For example: Agriculture/Veterinary Medicine or Education/History of Education. The more esoteric sub-categories might hold titles that do not appear in LibraryThing or Amazon.com

Beyond these points, there are still multiple uses for social tagging in the implementation of new services and in support for users.

Two examples of services and support for users are educational (internal) and instructional (external). Some libraries are losing the luxury of

employing catalogers who are also subject experts, or are part of a unit of librarians dedicated solely to cataloging. New catalogers or those new to a particular subject area are trained to consult the Library of Congress *Subject Cataloging Manual*. They should also be trained to consult new complementary tools available to assist them in providing subject access that will be relevant for users: social tagging schema included in sites such as LibraryThing or Amazon.com. Consulting these resources may lead them to a relevant LCSH heading.

As librarians offer instructional and other outreach programs they should consider including presentations on social tagging options to participants. Librarians at Boston University's Alumni Medical Library integrated social tagging into their instruction on the use of Medical Subject Headings (MeSH). They reported that the inclusion of social tagging in their program "provided a means to show, not tell, students about the pitfalls of natural language tagging and the benefits of controlled vocabulary." [23] Instructional programs could also demonstrate best practices for tagging options available within the Library's LMS, along with commercial resources such as LibraryThing or Amazon.com. Encouraging users to contribute to social tagging systems increases the pool of headings within these tools, particularly if the contributors are experts in academic fields.

It is also important that library search tools be broadened to support and take advantage of the use of social tagging. Library users welcome the

intuitive nature of social tagging. Library instruction and user support personnel could enhance library user success by teaching the adept use of social tags in research.

Social tagging can intersect with and can inform traditional subject cataloging. The perspective of the user can assist and can inform the cataloger in enhancing controlled vocabularies and access points. We are enriched by using a larger framework. Banush writes: "Catalogers who think broadly about their roles as librarians and partners in scholarly endeavors will never find themselves lacking new challenges to tackle or new ways to contribute to the intellectual life of their parent institutions." [24] By examining social tagging and using it to enhance subject access in library cataloging records we can make cataloging more inclusive and helpful to improve the overall library experience of our users.

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## Appendix 1: Specific Titles, Tags, and LC Subject Headings

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### 1. Title: **Leviathan: the history of whaling in America**

Category: Agriculture

**LCSH: Whaling – United States—History.**

User tags that are LCSH: Marine mammals, History, Natural history, Naval history, Ambergris, Ocean, Whale oil, Sixteenth century, Eighteenth century, Nineteenth century, Whales

User tags that are LCSH references: Environmental history

User tags, places or people: Herman Melville, Martha's Vineyard, Massachusetts, New Bedford, Maui

Other User tags: Historic trades, Conservation, Nautical, Pilgrims, Whaling history, Trade & Commerce – United States.

Abstract: Whales, Whale oil

Contents note: Whales, Whaling, Nantucket

### 2. Title: **Non-Traditional Careers for Chemists: new formulas in chemistry**

Category: Chemistry

**LCSH: Chemists – Vocational guidance.**

User tags that are LCSH: Chemists, Career change(s), Biotechnology, Graduate schools

User tags that are LCSH references: none

User tags, places or people: none

Other User tags: none

No Abstracts note

Contents note: No matches

3. Title: **Case Against Perfection: ethics in the age of genetic engineering**

Category: Biological Sciences

LCSH: Genetic engineering – Ethics.  
Genetic engineering – Moral and ethical aspects.

User tags that are LCSH: Bioethics, Biotechnology, Ethics, Eugenics, Genetic Engineering, Medical Ethics, Genes, Stem cells – Research

User tags that are LCSH references: Political Philosophy

User tags, places or people: none

Other User tags: Designer genes, Genetic manipulation, Artificially enhanced humans

No Abstract note

Contents note: Ethics, Eugenics, Designer, and Stem cell

4. Title: **Dreaming in Code: two dozen programmers, three years, 4,732 bug, and one quest for transcendent software**

Category: Computer Science

LCSH: **Computer software – Development.**

User tags that are LCSH: Algorithms, Business, Business failures, Computer programming, Open source software, Project Management, Technology, Engineering

User tags that are LCSH references: Software development, Creativity, Ethnography, Hacker(s)

User tags, places or people: Mitch Kapur, Andy Hertzfeld

Other User tags: Code, Coding, Programming, Chandler

Abstract: Software, Mitch Kapor, Chandler

Contents note: Software

5. Title: **The Children in Room E4: American education on trial**

Category: Education

LCSH: **Discrimination in Education – Connecticut – Hartford.  
Discrimination in Education – Law and legislation –  
Connecticut – Hartford.**

User tags that are LCSH: Education, Equity, Journalists, At-risk youth, Discrimination

User tags that are LCSH references: Pedagogy

User tags, places or people: Simpson-Waverly (Elementary School)

Other User tags: Achievement gap, Court case

No abstract

Contents note: No matches

6. Title: **This Moment on Earth: today's new environmentalists and their vision for the future.**

Category: Engineering & Technology

LCSH: **Environmental protection – United States.  
Environmental protection – United States – Citizen  
participation.**

User tags that are LCSH: Global warming, Citizenship, Earth, Education, Biology, Ecology, Environmentalists, Nature, Toxicology, Science

User tags that are LCSH references: Environment, Climate change,

User tags, places or people: none

Other User tags: Activism, Conservation, Environmental activism, Grassroot

Abstract: Environment

No Contents note

**7. Title: Deceptively Delicious: simple secrets to get your kids eating good food**

Category: Engineering & Technology

LCSH: **Cookery, American.**

User tags that are LCSH: Baking, Diet, Parenting, Recipes, Motherhood, Gluten free diet, Nutrition

User tags that are LCSH references: Vegetables, Cookbook

User tags, places or people: Jessica Sklar Nederlander, Seinfeld

Other User tags: Baking and cooking, Cookery – Healthy, Feeding (your) kids, Food choices, Healthy cooking, Kids, Meal planning, Healthy eating, Picky eater, Cooking for kids, Children’s cookbook, Easy cooking, Family meals, Children’s nutrition, Fun foods, Healthy desserts, Purees

No Abstract

Contents note: Purees, Recipes, Nutritional, Children, Dessert

**8. Title: With Speed and Violence: why scientists fear tipping points in climate change**

Category: Geography

LCSH: **Climatic changes.  
Climatic changes – History – Chronology.**

User tags that are LCSH: Weather, Ecology, Environmental sciences, Global warming, Science, Water, Hurricanes

User tags that are LCSH references: Environment, Peak oil theory, Climate change

User tags, places or people: none

Other User tags: Tipping point, Climaticide

No Abstract

Contents note: Climate change

**9. Title: Battleground Iraq: journal of a company commander**

Category: Government Documents

LCSH: **Iraq War, 2003- -- Personal narratives, American.**

User tags that are LCSH: Government documents, Iraq War

User tags that are LCSH references: Army

User tags, places or people: Iraq

Other User tags: Military

No Abstract

No Contents note

**10. Title: Status of Education in Rural America**

Category: Government Documents

LCSH: **Rural Schools – United States -- Statistics.**

User tags that are LCSH: none

User tags that are LCSH references: none

User tags, places or people: none

Other User tags: none

No Abstract

No Content note

**11. Title: To Die Well: your right to comfort, calm, and choice in the last days of life**

Category: Health Professions

LCSH: **Right to die.**

User tags that are LCSH: Death, Grief, Health, Nursing, Euthanasia, Hospice care, Suicide

User tags that are LCSH references: Dying, Death with dignity

User tags, places or people: none

Other User tags: Terminal illness

No Abstract

Contents note: Dying, Death

**12. Title: The Coldest Winter: America and the Korean War**

Category: History

LCSH: **Korean War, 1950-1953 – United States.**  
**Korean War, 1950-1953 – Campaigns.**

User tags that are LCSH: Marines, Korean War, Twentieth century, Cold War, Communism, History, Military history, War, World War II (1939-1945), Mountain warfare

User tags that are LCSH references: American history

User tags, places or people: Acheson, Douglas MacArthur, Eisenhower, Korea, North Korea, South Korea, Stalin, Truman, Chiang Kai-Shek, Kim Il Sung, Mao Zedong, Russia, 38<sup>th</sup> Parallel, Naktong River, Puson, Ridgway, Willoughby, Seoul, Yalu River

Other User tags: Korean history, War coverage, Post WWII history

Abstract: MacArthur, Eisenhower, Acheson, Ridgway, Mao, Truman

Contents note: Military, North Koreans

**13. Title: Narn i chîn Húrin: the tale of the children of Húrin**

Genre/Form: Fantasy fiction

Category: Language, Linguistics & Literature

LCSH: **Middle Earth (Imaginary Place) – Fiction.**

User tags that are LCSH: Twentieth century, Twenty-first century, Elves, Dragons, Hobbits (Fictitious characters), Tragedy

User tags that are LCSH references: Medieval literature

User tags, places or people: Húrin, Gormenghut, Anubis Gates, Nienor, Glaurung

Other User tags: Epic, Epic fantasy, Warriors

No Abstract

Contents note: Húrin, Galurung

**14. Title: Simple Genius**

Genre/Form: Mystery fiction

Category: Language, Linguistics & Literature

LCSH: **Government investigators – Fiction.**

User tags that are LCSH: Mathematics, Murder, Crime, Secret Service, Cryptography, Opium, Heroin, Betrayal

User tags that are LCSH references: none

User tags, places or people: Camp Peary, Washington, D.C., CIA, Afghanistan

Other User tags: Codes, Secret Service agents, Collateral murders

No Abstract

No Contents note

**15. Title: From the Palmer Raids to the Patriot Act: a history of the fight for free speech in America**

Category: Law

LCSH: **Freedom of speech -- United States -- History.**

User tags that are LCSH: Architecture, Censorship, Civil rights, Communism, Intellectual freedom, Law, Social justice, Libel (and slander), Freedom of the press, Twentieth century, Twenty-first century,

User tags that are LCSH references: 9/11, American history

User tags, places or people: Supreme Court

Other User tags: Activism, Free speech, First amendment, States of emergency, Constitution

No Abstract

Contents note: No matches

**16. Title: Poincaré's Prize: the hundred-year quest to solve one of math's greatest puzzles**

Category: Mathematics

LCSH: **Mathematics – Problems, exercises, etc.**  
**Mathematics – Popular works.**

User tags that are LCSH: Problem solving, Science, Mathematics

User tags that are LCSH references: none

User tags, places or people: none

Other User tags: History of mathematics, Mathematics culture

No Abstract

Contents note: Math

**17. Title: The Pythagorean Theorem: a 4,000-year history**

Category: Mathematics

LCSH: **Pythagorean theorem -- History.**

User tags that are LCSH: Art, Geometry, History, Mathematics, Philosophy, Science

User tags that are LCSH references: none

User tags, places or people: Pythagoras

Other User tags: History of mathematics, Math history, Math and science, Numbers

No Abstract

Contents note: Pythagorean theorem, Pythagoras

**18. Title: Probabilities: the little numbers that rule our lives**

Category: Mathematics

LCSH: **Probabilities – Popular works.**

User tags that are LCSH: mathematics, Philosophy, Data mining, Artificial intelligence, Science, Statistics

User tags that are LCSH references: none

User tags, places or people: none

Other User tags: Probability, Information design

Abstract: Probability, Mathematics

Contents note: Probabilities, Mathematical, Statisticians

**19. Title: Complete Guide to Asperger's syndrome**

Category: Medicine

LCSH: **Asperger's syndrome.**

User tags that are LCSH: Autism, Syndrome(s)

User tags that are LCSH references: none

User tags, places or people: none

Other User tags: Autism spectrum, Clinical, Women with Asperger's syndrome, Adults with Asperger's syndrome

No Abstract

Contents note: Asperger's syndrome

**20. Title: Parkinson's Disease: a complete guide for patients and families**

Category: Medicine by Body System

LCSH: **Parkinson's disease – Popular works.**

User tags that are LCSH: Health, Brain, Medicine, Disease(s), Dementia, Lewy Body (Dementia)

User tags that are LCSH references: none

User tags, places or people: none

Other User tags: Parkinson's, Chronic illness  
No Abstract

Contents note: Parkinson's disease, Disease

**21. Title: Musicophilia: tales of music and the brain**

Category: Music

LCSH: **Music – Psychological aspects.**  
**Music – Physiological aspects.**

User tags that are LCSH: Art, Brain, Medicine, Music, Neurosciences, Pathology, Psychology, Science, Neuropsychology, Musicology, Neurology, Music therapy, Cognition, Composing (Music), Dementia

User tags that are LCSH references: Epistemology, Music (Psychology), Disability, Creativity, Mind

User tags, places or people: none

Other User tags: Disorders, Medical, Neurological activity, Music and the mind, Depression, Music cognition, Performing, Musical maladies, Music phenomenons, Musical aberrations, Cognitive rehabilitation

Abstract: Music, Neurological

Contents note: Music, Musical, Music therapy, Depression, Dementia

**22. Title: The Rest is Noise: listening to the twentieth century**

Category: Music

LCSH: **Music – 20<sup>th</sup> century – History and criticism.**

User tags that are LCSH: Musicology, History, Avant-garde (Aesthetics), Musical criticism, Music theory, Music appreciation, Composition (Music), Jazz (Music), Opera

User tags that are LCSH references: Classical music, Cultural history, Experimental music, Abstract music

User tags, places or people: Richard Strauss, Schoenberg, Stravinsky, Benjamin Britten, Jean Sibelius

Other User tags: Music history, Music listening, 20<sup>th</sup> century music, Contemporary, Modern music

Abstract: Music, Modern music, Stravinsky, Avant-garde, Twentieth-century music

Contents note: Strauss, Schoenberg, Jean Sibelius, Avant-garde, Benjamin Britten

**23. Title: Bambi vs. Godzilla: on the nature, purpose, and practice of the music business**

Category: Performing Arts

LCSH: **Motion picture industry – United States.**

User tags that are LCSH: Culture, Film criticism, Playwriting

User tags that are LCSH references: Movie business, Movies, Screenwriting, Direction

User tags, places or people: Hollywood, David Mamet

Other User tags: Cinema studies, Entertainers, Filmmaking, Production

Abstract: Mamet, Hollywood, Film

Contents note: Hollywood

**24. Title: The Real All Americans: the team that changed a game, a people, a nation**

Category: Physical education

LCSH: **United States Indian School (Carlisle, Pa.) -- Football.**

User tags that are LCSH: Indians, Military history, Sports, Football, Baseball

User tags that are LCSH references: American history, American Indian history, Native Americans, Army, 1908 (A.D.)

User tags, places or people: Pratt, Carlisle Indian School, Carlisle School, Jim Thorpe, Pop Warner, Eisenhower, Custer, Patton, Geronimo, Princeton, Yale

Other User tags: American racial history, History of football, Sports history, College football

Abstract: Pratt, Native American, Football, Carlisle Indian Industrial School, Yale

Contents note: Pratt, Carlisle

**25. Title: *The Canon: a whirligig tour of the beautiful basics of science***

Category: Geography

LCSH: **Science – Popular works.**

User tags that are LCSH: Astronomy, Biology, Calibration, Chemistry, Education, Evolution, Genomes, Geology, Molecular biology, Numeracy, Philosophy, Physics, Probabilities, Statistics, Technology, DNA, RNA, Genes, Religion

User tags that are LCSH references: Evolutionary biology, Scientific method

User tags, places or people: Churchill

Abstract: Physics, Chemistry, Biology, Geology, Astronomy, Evolution

Contents note: Probabilities, Calibration, Physics, Chemistry, Evolutionary biology, Molecular biology, Geology, Astronomy

Other User tags: Numbers, Popular science, Probability, Math and science

**26. Title: *APA Dictionary of Psychology***

Category: Psychology

LCSH: **Psychology -- Dictionaries.**

User tags that are LCSH: Psychology

User tags that are LCSH references: Dictionaries

User tags, places or people: APA

Other User tags: APA style

No Abstract

No Contents note

**27. Title: The Lucifer effect: understanding how good people turn evil**

Category: Psychology

LCSH: **Good and evil – Psychological abstracts.**

User tags that are LCSH: Ethics, Philosophy, Prison, Psychology, Holocaust (Jewish), Social Psychology, Mental health, Torture, Mental illness, Violence, Authority, Authoritarianism, Corruption, Organizational behavior, Whistle blowing

User tags that are LCSH references: Abuse of power, Evil, Applied psychology, Heroism, Injustice

User tags, places or people: Abu Ghraib, Iraq, Stanford Prison Experiment (SPE), Stanley Milgram

Other User tags: Politics, experiments, Groupthink, Psychology of evil, Human nature, Resistance, Situational behavior, Psychology, Systematic evil

Abstract: Psychology, Evil, SPE, Abu Ghraib, Torture, Heroism

Contents note: Authority, Evil, Abu Gharib, SPE, Prisons

**28. Title: The Power of Play: how spontaneous, imaginative activities lead to happier, healthier children**

Category: Psychology

LCSH: **Play – Psychological aspects.**

User tags that are LCSH: Play therapy, Early childhood education, Educational psychology, Education, Homeschooling, Parenting, Psychology, Child development, Play, Kindergarten

User tags that are LCSH references: School readiness

User tags, places or people: None

Other User tags: Curriculum, Social issues, Children's play, Unschooling, Brain development, Dramatic play, Fantasy play

No Abstract

Contents note: Play