

USING TAGS TO IMPROVE FINDABILITY IN LIBRARY OPACs:
A USABILITY STUDY OF LIBRARYTHING FOR LIBRARIES

BY

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ABSTRACT

Library of Congress Subject Headings (LCSH), one of the standard descriptive languages used in library catalogs, are often criticized for their lack of currency, biased language, and atypical syndetic structure. Conversely, folksonomies, which rely on the natural language of their users, offer a flexibility often lacking in controlled vocabularies and as such may offer an alternative to or a means of augmenting more rigid controlled vocabularies such as LCSH. Content analysis studies have already demonstrated the potential for folksonomies to be used as a means of enhancing subject access to materials. Despite a sizable number of libraries now using the LibraryThing for Libraries catalog enhancements, and the development by some libraries of their own tagging systems (e.g., PennTags, MTagger), little research has been undertaken to determine the effectiveness of folksonomies as a means of enhancing item discovery in library catalogs. This project examines the utility of folksonomies as a means of enhancing subject access to materials in library OPACs through usability testing with the LibraryThing for Libraries catalog enhancements. Initial findings from the usability test indicate that while they cannot replace LCSH, folksonomies do show promise for aiding information seeking in OPACs. Overall, participants indicated that folksonomies could be useful for surveying broad subject areas or for exploring materials in a topic area with which the user is not familiar, while subject headings remained the preferred access mechanism for information seeking that is tied to more focused research. In the context of information systems design, the study revealed that while folksonomies have the potential to enhance subject access to materials, that potential is severely limited by the current inability of catalog interfaces to support tag-based searches alongside standard catalog searches.

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1. Introduction

In 2004, Thomas Vander Wal coined the term “folksonomy” to refer to user-defined labels (or “tags”) that facilitate the organization and classification of information. Folksonomies are most frequently used in conjunction with social software websites, and allow users to collaboratively tag bookmarks, photographs, and other information items. In contrast to traditional subject-indexing languages that typically employ controlled vocabularies, folksonomies rely on the contemporary language of those who create the tags. Vander Wal (2007) maintains that the value of folksonomies is rooted in “people using their own vocabulary and adding explicit meaning, which may come from inferred understanding of the information/object. People are not so much categorizing, as providing a means to connect items (placing hooks) to provide their meaning in their own understanding.” In addition to reflecting natural language, folksonomies offer a flexibility often lacking in controlled vocabularies. At any time, users can add new terms to a folksonomy to reflect current events or changes in the lexicon; similar changes in controlled vocabularies may take months or years to occur (Kroski, 2007; Spiteri, 2006). Due to their adaptability and flexibility, folksonomies may offer an alternative to or a means of augmenting the more rigid controlled vocabularies traditionally used in library classification systems.

For many years, Library of Congress Subject Headings (LCSH), the traditional subject language of libraries, have been heavily criticized for their lack of currency, biased language, and atypical syndetic structure. In a study of end-user understanding of subject headings, Drabenstott, Simcox, and Fenton (1999) found that in only 36% of cases did users correctly interpret the meaning of the headings. In a similar study, Drabenstott, Simcox, and Williams (1999) found that among librarians, only 52%-55% were able to correctly interpret the meaning of various subject headings. In their report *On the Record* (2008), the Library of Congress Working Group on the Future of Bibliographic Control called attention to problems with LCSH, noting that its “terminology is sometimes outdated or not intuitive to the

inexperienced user. LC does update its subject terms, but from outside LC the results often appear to be arbitrary and unexpected” (34). Subject access in catalogs has been enhanced through the use of specialized controlled vocabularies (e.g., Thesaurus for Graphic Materials, Getty Thesaurus of Geographic Names), however, many accessibility issues surrounding LCSH remain. In contrast to LCSH, folksonomies and user-based tagging systems are free of encumbrances that dictate application and usage. Tagging systems do not limit the number of tags that can be assigned to a given item, nor do they prescribe that a certain level of specificity be present in the assigned tags. Therefore, a user can tag an item using terms that are general or specific, and use as many terms as they wish. Taggers are also not limited by a controlled vocabulary, and thus may assign terms that have topical or personal relevance to a work.

Recent research (Adler 2009; Lund & Washburn, 2009; Pirmann 2008; Rolla 2009; Thomas, Caudle, & Schmitz 2009) has demonstrated the potential for folksonomies to be used as a means of enhancing subject access to materials. The addition of folksonomies to catalog records may be particularly useful for items that lack meaningful subject headings, such as works of fiction. Adler (2009) and Pirmann (2008) found that folksonomies may also be useful in augmenting descriptions of items whose content is not adequately described in LCSH (e.g., transgender or women’s studies materials). Related research on the collaborative tagging system CiteULike (<http://www.citeulike.org>) has also demonstrated that folksonomies can aid in resource discovery in an information system. Kipp and Campbell (2010) studied the search patterns of users in both CiteULike and PubMed, and found that participants used tags assigned to articles in CiteULike to aid in the search processes, and as a source of additional search terms.

Although the referenced studies comparing folksonomies with LCSH have demonstrated their potential to augment subject access to items, it is critical to note that these studies have largely been conducted as content analyses. While Kipp and Campbell’s (2010) research on CiteULike has

demonstrated that users will employ folksonomies as an aid for discovering additional resources, more extensive studies are needed to determine the possible benefits of including folksonomies in other information systems. Despite the fact that a sizeable number of libraries use tags as a way to enhance catalog searching, either by developing their own tagging systems (e.g., PennTags, MTagger, Social OPAC [SOPAC]), or by the inclusion of tagging features into some catalog systems (e.g., VuFind, WorldCat Local), little research has been undertaken to determine the effectiveness of folksonomies as a means of enhancing item discovery in library catalogs. This study examines the utility of tags as a means of enhancing subject access and discovery of items in library OPACs through user testing with the LibraryThing for Libraries catalog enhancements. A detailed description of how LibraryThing for Libraries works will be presented in Section 3.

2. Literature Review

2.1 Overview of Folksonomies & Tagging

Since their inception, folksonomies have become an increasingly used form of information organization on the web. First popularized through use on websites such as Flickr and Delicious, folksonomies and the option to create tags for online content now appear on thousands of sites – from business to news to e-commerce to blogs to social media. Libraries, archives, and museums – institutions that have traditionally relied on controlled vocabularies to describe items in their collections – have also begun to leverage folksonomies as an additional means of item description (Bearman & Trant, 2005; Trant, 2009a). Early adopters and proponents of folksonomies maintain that a distinct advantage to this system of organization is their organic development, where terms originate from the user base and are reflective of the users’ natural language (Mathes, 2004; Quintarelli, 2005; Shirky, 2005; Weinberger, 2006). Drawing on the broad range of users’ vocabularies additionally means that folksonomies can serve as a way of bridging the “semantic gap” that often exists between a specialized

or controlled vocabulary and the non-specialized language of users. Kellogg Smith (2006) highlights this “semantic gap” in the context of museums, noting that discrepancies between “specialists’ artwork descriptions in standard museum records and what non-specialists are familiar with...shuts out many information and image seekers” (5).

In addition to bridging gaps in language, employing the “wisdom of the crowds” to create folksonomies allows for a more thorough examination and description of a topic, as Feinberg (2006) explains:

[The] combined knowledge of a group of people will be more accurate than the knowledge of any individual, even an expert individual. While the editor of a controlled vocabulary may miss a term that a particular user might associate with a concept, a wide user base constantly adding and applying terms will be more likely to include it. In addition, this broad user base will add new terms to the system quickly, bypassing the lag associated with formal vocabulary development. (5)

Whereas controlled vocabularies are developed by a small number of domain experts, folksonomies actually benefit from larger numbers of users being involved in their creation. Munk and Mork (2007) note that in a folksonomy, users can see tags applied by other users and thus over time a consensus may emerge regarding the preferred terminology (or terminologies) for a topic or concept. Campbell (2006) asserts that tagging systems are highly scalable, and with larger numbers of users engaged in tagging, “patterns of order will emerge; these patterns will be truer, more convincing, more user-centered, and more useful than the patterns imposed by formal classification schemes...[and they] will acquire greater accuracy and greater sophistication” (4-5). Due in part to their crowd-sourced nature, folksonomies also offer what Mathes (2004) describes as low barriers to entry and low cognitive costs. Whereas the use of a controlled vocabulary often involves significant training for those who seek to understand and use it, folksonomies allow a user to immediately begin assigning metadata to an information object based on their own knowledge, using terms that are familiar to them.

Although proponents of folksonomies herald their reliance on natural language and ability to bridge semantic gaps, critics of folksonomies have often pointed to their lack of vocabulary control as their most significant problem. Most collaborative tagging systems lack mechanisms by which any sort of control can be applied to tags – thus leading to high levels of synonyms or near-synonyms, homonyms and homographs, variations in spelling, and other anomalies that can clutter the system and cause high levels of noise in a search results set (Macgregor & McCulloch, 2006). Ambiguities in word use (e.g., “gore” as a noun to describe the content of a book versus “Gore” as an author’s name), variations in word forms (e.g., singular versus plural nouns, abbreviations), and users entering tags from their native language can also present problems for effectiveness of information retrieval via folksonomies (Kipp & Campbell, 2006; Peters, 2009). Additionally, whereas a controlled vocabulary typically offers a distinct level of specificity for item description, the same cannot be said for folksonomies, as individuals may tag items with very general or very specific tags (Peters, 2009). The usefulness of folksonomies may also be undercut by the fact that not all users tag for “aboutness” of an item. Golder & Huberman (2006) conducted an analysis of tags in Delicious and found that in addition to content-related tags, users also assigned tags relating to the use of an item (e.g., to read), ownership of an item, and for task organization (e.g., job search). Due to the context in which these types of tags are assigned, they likely would not be of use to anyone aside from the person tagging the item.

2.2 Folksonomies & Enhanced Subject Access

Despite the disadvantages discussed above, research has demonstrated the potential for folksonomies to be used as a means of enhancing subject access to materials in libraries, archives, and museums. Content analyses of tags assigned to titles in LibraryThing and subject headings assigned to the same items (Adler, 2009; Pirmann, 2008) have revealed that folksonomies may be especially useful in augmenting descriptions of items whose content is not adequately described in LCSH (e.g., transgender or women’s studies materials). The addition of folksonomies to catalog records may also be

useful for items that lack meaningful subject headings, such as works of fiction (Lund & Washburn, 2009; Mendes, Quinonez-Skinner, & Skaggs, 2009), or items for which LCSH does not reflect current terminology (Spiteri, 2006). Kipp's (2011) most recent study compared user-assigned tags, author-assigned keywords, and controlled vocabulary terms assigned by professional indexers to articles indexed in PubMed and tagged in CiteULike. Some tags and author-assigned keywords had exact matches in the controlled vocabulary, while other terms that were not exact matches were identified as providing important additional access points (Kipp, 2011). Thomas, Caudle, and Smith (2009) analyzed tags assigned to titles in LibraryThing and found that 35% of tags represented synonyms or related concepts that are not used in LCSH, further supporting the notion that tags have significant potential to enhance subject access. In the museum community, initial results from studies at the Metropolitan Museum of Art, and further studies with the *steve.museum* project, have demonstrated the potential for folksonomies to enhance access to items in art collections (Trant, 2006; Trant, 2009b). Matusiak's (2006) study comparing controlled vocabularies used in a large digital image collection with tags assigned to photos in Flickr found that tags could serve as a means of providing additional access points for images, although they likely cannot replace the depth of description found in controlled vocabularies.

With regard to the usefulness of folksonomies, the question arises, how much overlap is there between user vocabularies and already existing controlled vocabularies? Studies examining the overlap between the two have shown mixed results. Wetterstrom (2008) compared user-assigned tags with LCSH and found that 75% of tags did not match any subject headings and only 15% of tags had a partial subject heading match. An analysis of user-assigned tags in the *steve.museum* project found that 86% of tags were not matched in museum documentation or vocabularies, and the vast majority of these tags – 88% – were assessed by museum staff as being useful for locating items (Trant, 2009b). In a sizeable dataset (8500 book titles whose records featured a total of 7600 LCSH and 176,000 tags in LibraryThing),

Lu, Park, and Hu (2010) found only a 2.2% overlap between the subject headings and the tags. Tagging patterns in LibraryThing tend to reflect Golder & Huberman's (2006) theory that tags fall into a number of categories, with not all pertaining to the "aboutness" of an item. The dataset used in Lu, Park, and Hu's study may have contained a large number of tags not related to the subjects of the books, thus skewing the percentage of tag-to-LSCH matches.

In an examination of tags assigned to items on LibraryThing and Amazon.com, Lawson (2009) found that user-assigned tags did have some overlap with already existing subject headings. Of particular significance was the fact that in a group of 28 titles in which only one subject heading was assigned to each title, users assigned a total of 176 tags that were officially recognized subject headings but were not used in the item's catalog records. Yi and Chan (2009) compared tags from Delicious with the LCSH authority file, and found that in a set of 300 tags, approximately 61% had a complete-word match with a subject heading, and an additional 28% of tags were "very close in form" to at least one established subject heading. These studies demonstrate that while there may exist some overlap between controlled vocabularies and user vocabularies, there are remain a large number of user-generated terms that are not captured in traditional indexing languages.

2.3 Information Retrieval with Folksonomies

Although research has demonstrated that folksonomies can enhance access to items that are traditionally described using controlled vocabularies, the value of folksonomies for information retrieval on a wider scale has not been researched extensively. Morrison (2008) compared the precision and recall effectiveness of search engines (e.g., Google, Microsoft Live), web directories (e.g., Yahoo, Open Directory Project), and folksonomies (e.g., Delicious, Reddit), finding that Delicious returned results that were nearly as relevant as those found via Microsoft Live. In terms of recall, search engines, which rely on automatic data collection, significantly outperformed both web directories and folksonomies. Additionally, Morrison (2008) found that folksonomies were least effective in searches for a specific item

or queries requiring a short, factual answer. Due to the fact that users tend to assign general tags to items, it follows that tags would not perform well for very specific queries, but rather are more suited for browsing (Hassan-Montero & Herrero-Solana, 2006). Gelernter's (2007) study found that participants preferred using LCSH strings to tag clouds (drawn from LibraryThing) for information seeking by a 3 to 1 ratio. Further, participants indicated that LSCH terms were more useful for judging the relevance of an item than tags from LibraryThing.

In a study of tagging practices and tagging use in the MovieLens movie recommendation system, Sen et al. (2006) found that only 19% of users felt that tags helped them find items. In the context of finding items, tags classified as factual (e.g., action, Disney) were rated useful by 48% of users, and tags classified as subjective (e.g., classic, funny) were rated as useful by 27% of users. Despite the overall low percentage of users indicating that tags helped them to find items, the ratings of the individual tag categories do show some support for the idea that tags can mediate information discovery. Kipp and Campbell (2010) compared users' search experiences and success with locating relevant materials in PubMed, a medical research database that uses a controlled vocabulary (MeSH) for indexing, and CiteULike, a social bookmarking site designed for academics. Some participants reported difficulty in searching in PubMed as their chosen search terms did not match those used in MeSH. On the whole, participants felt that tags were useful for linking to related items, rather than as guides to a specific subject. However, participant opinion on the utility of tags was split; some participants felt the tags were a useful addition to the system, while others believed they were either too general or too specific to be used in an effective search.

2.4 Folksonomies in Libraries and Museums

One of the recommendations of the Library of Congress Working Group on the Future of Bibliographic Control was for the development of "library systems that can accept user input and other non-library data without interfering with the integrity of library-created data" and "methods to guide

user tagging through techniques that suggest entry vocabulary (e.g., term completion, tag clouds)” (2008, p. 32). With the rising popularity of folksonomies and tagging systems, libraries and museums have begun integrating tagging features into their catalogs and websites. In the case of LibraryThing for Libraries, tag data from the LibraryThing database is incorporated into a library’s catalog and displayed on individual item records; however, patrons are not able to assign tags to items through the LTFL system¹. Other tagging systems, such as PennTags (<http://tags.library.upenn.edu/>) at the University of Pennsylvania and MTagger (<http://www.lib.umich.edu/mtagger/>) at the University of Michigan, allow users to assign tags to library resources – including books, journal articles available through databases, library web pages, and image collections – but do not draw on existing tagging data from outside sources (Day, 2006; Varnum, 2008). Some catalog systems, including WorldCat Local, VuFind, and SOPAC (Social OPAC), are being designed with tagging capabilities built into the interface. In the museum community, the steve.museum project (<http://www.steve.museum/>) allows users to tag images representing art works in a number of the nation’s leading art museums – including the Guggenheim Museum, the Indianapolis Museum of Art, the Metropolitan Museum of Art, and the San Francisco Museum of Modern Art (Trant, 2009b). The steadily increasing number of libraries using LTFL² and the development of the aforementioned catalog systems that allow user tagging demonstrate that libraries are responding to the LCWG’s recommendation and patron desires for catalog interfaces that allow for varied means of browsing and searching for materials.

¹ A more detailed description of how LibraryThing for Libraries operates will be presented in Section 3 of this paper.

² As of April 2011, LTFL is used by 256 libraries and library consortia, reaching a total of 1616 individual libraries. (Source: http://www.librarything.com/wiki/index.php/LTFL:Libraries_using_LibraryThing_for_Libraries)

3. How It Works: An Overview of LibraryThing and LibraryThing for Libraries

Designed as a social cataloging website, LibraryThing allows users to assign descriptive metadata to books in the form of tags. Many of these tags pertain to the “aboutness” of a book, while others are more reflective of an individual user’s library (e.g., “to read”, “have read”, “in office”). Within LibraryThing, each work³ has what is referred to as a “social information” page that displays basic publication information about the work, reviews, and a tag cloud which enumerates the most commonly used tags for that work. These tags function as a discovery mechanism through which users can locate other titles that have been assigned a given tag. As of April 2011, LibraryThing lists over 1.3 million members, who have cataloged over 61 million books and added nearly 75 million total tags to titles in the database, making it the largest social cataloging site in the world.

More recently, LibraryThing has leveraged the descriptive metadata assigned to works into LibraryThing for Libraries (LTFL), a series of enhancements that can be incorporated into a library’s online public access catalog (OPAC). In an OPAC, the LTFL display will add a tag cloud of the most popular tags to a title’s catalog record; libraries can also elect to include a recommendation feature,



Figure 1: Screenshot of the LibraryThing for Libraries display which appears on catalog records in the University of Texas catalog.

³ The LibraryThing database is maintained at the “work” level, where each work is a collection of individual editions of a book (Smith, 2008).

which will direct users to similar books in the library’s collection (FAQ – LibraryThing for Libraries, 2011). As is typical with tag clouds, frequency of tag use is indicated by font size, with more frequently used tags appearing in larger font than lesser-used tags. The LTFL interface also includes a “tag browser” – by clicking on a tag in the LTFL display in a catalog record, users can see a list of other titles within the library’s collection that have also been assigned that tag. Titles displayed are listed according to relevance to the tag, and a list of related tags gives users additional browsing options (FAQ – LibraryThing for Libraries, 2011).

Before being incorporated into the LTFL display, tags are subject to a vetting process by a LibraryThing librarian. Tags are vetted as “terms”, meaning that only tags that relate to the “aboutness” of a title are retained for inclusion in the LTFL displays. Problematic tags, such as those of a personal nature or opinion tags (e.g., “to read”, “not recommended”), are excluded from the displays.



Figure 2: Screenshot of the tag browser component of the LibraryThing for Libraries catalog enhancements. This display shows the titles tagged with “climate change” in the UTX catalog.

Ambiguous tags may be checked against the individual works to which they were applied to determine their nature; however, other than these instances, there is no consistent analysis of the tag-work relationship during the vetting process (Green, 2008). The LTFL developers have also incorporated usage guidelines for tags that are included in the LTFL displays. A general guideline is that a tag must be used a certain number of times overall in LibraryThing for it to be used in LTFL. Originally, a threshold of 15 times use was established; however, recent reviews of tagging practices in LibraryThing have led the developers to adopt a more nuanced approach. Presently, a greater weight is placed on those tags that are assigned by a sizable number of users; this helps to eliminate tags that are routinely assigned by a few users to many different items (Green, 2008).

There are two important points to note regarding tags that appear in LTFL displays. First, LTFL tags are static, meaning that a user tagging an item in LibraryThing will not immediately affect the tags displayed through LTFL. Periodically, the LTFL developers run a process that updates the LTFL tag database. Occasionally tags may be eliminated from LTFL this way, although more often it is newly approved tags that are added to the database (Green, 2008). Second, within LibraryThing, it is possible for a work to have dozens or even hundreds of tags assigned to it. The LTFL display can be programmed to display a set number of tags on a catalog record, regardless of the number of tags applied to that work in LibraryThing. In cases where there are more tags applied to a work than the LTFL display can accommodate, the most frequently used tags for that work are what is displayed on the catalog record (Green, 2008).

Another limitation of LibraryThing for Libraries is that the data associations are largely ISBN driven, meaning a title's catalog record must have an ISBN attached in order for LTFL data to be displayed on it (FAQ – LibraryThing for Libraries, 2011). ISBNs came into usage in the late-1960s (ISBN Users' Manual, 2005), but were not immediately adopted by all publishers. Additionally, ISBNs were not

retroactively assigned to materials published pre-late-1960s, and some ISBNs were reused by publishers so they may not be unique. More recently, LibraryThing has implemented the LibraryThing Connector, which allows for some data associations with titles that do not have ISBNs on their catalog records. It is estimated that this will allow for data associations to be made with an additional 5-15% of titles across all types of libraries (Spalding, 2009). LibraryThing reports that as of March 2009, the overlap in titles between a public library collection and the LibraryThing database is, on average, approximately 75% (FAQ – LibraryThing for Libraries, 2011). The percentage of overlap for academic libraries is acknowledged to be lower, although LibraryThing gives no estimates. However, a 2009 study at the California State University Northridge library found that of 472,000 distinct ISBNs, LibraryThing data was available for 46% of these ISBNs (Mendes, Quinonez-Skinner, & Skaggs, 2009). At Brigham Young University, a much smaller overlap was found: out of 3.7 million volumes, only 433,000 (12%) were found to have ISBN matches in LibraryThing (Lund & Washburn, 2009). This discrepancy in the number of ISBN matches may be due to the differing nature of the collections, as BYU's collection likely includes a much larger number of older items that are lacking ISBNs. In an academic library context, the application of LibraryThing data is also limited by the fact that many academic titles have not been tagged, or have only been minimally tagged, by users in LibraryThing. For the purposes of this research project, the known item searches were confined to more popular books, so that participants would be assured of an opportunity to explore titles that had substantial tag data attached to them.

4. Methods

This study examines the utility of tags as a means of enhancing subject access and discovery of items in library OPACs through usability testing with the LibraryThing for Libraries (LTFL) catalog enhancements. In recent years, several studies comparing folksonomies with LCSH have demonstrated their potential to augment subject access to items (Adler 2009; Lund & Washburn, 2009; Mendes,

Quinonez-Skinner, & Skaggs, 2009; Pirmann 2008; Rolla 2009; Thomas, Caudle, & Schmitz 2009).

However, these studies have largely been conducted as content analyses, with no actual hands-on user testing to examine the efficacy of folksonomies as an information retrieval aid or mechanism. While Kipp and Campbell's (2010) research on CiteULike has demonstrated that users will employ folksonomies as an aid for discovering additional resources, more extensive studies are needed to determine the possible benefits of including folksonomies in other information systems. Despite a sizable number of libraries⁴ now using the LibraryThing for Libraries catalog enhancements, the development by some libraries of their own tagging systems (e.g., PennTags, MTagger, Social OPAC [SOPAC]), and the inclusion of tagging features into some catalog systems (e.g., VuFind, WorldCat Local), little research has been undertaken to determine the effectiveness of folksonomies as a means of enhancing item discovery in library catalogs. This study seeks to fill this gap in the research by addressing the following questions:

(1) How do users characterize the experience of searching for bibliographic items using subject headings and folksonomies?

- (a) Are there any distinct advantages or disadvantages for each type of access structure?
- (b) Is one more preferable than another?

(2) In what ways can folksonomies be used to enhance information discovery of materials in OPACs?

(3) Do users prefer folksonomies for browsing or searching?

Data was collected from three sources: a usability test in which participants engaged in a total of six different search and discovery tasks using an LTFL enabled catalog; semi-structured interviews conducted immediately following the usability test; and a demographic questionnaire administered to assess various factors, including participants' typical usage of the library catalog and familiarity with social bookmarking and tagging tools.

⁴ As of April 2011, 256 libraries or library consortia are using LTFL. Of these, 75 (30%) are academic libraries. (Source: http://www.librarything.com/wiki/index.php/LTFL:Libraries_using_LibraryThing_for_Libraries)

4.1 Usability Test

The usability test administered to participants in this study was divided into three portions: (1) open-ended (native) search; (2) known item searches; (3) unknown item searches. Usability testing experts strongly encourage the design of tasks that are representative of typical user activities (Kuniavsky, 2003; Nielsen, 1993); the tasks used in this study were designed to be representative of users' typical searches in an OPAC. All portions of the usability study were conducted using the University of Texas at Austin Library catalog, as the University of Illinois presently does not have a LTFL enabled catalog. The UT-Austin catalog was selected for the study as it was the largest (as of April 2010) academic library using LTFL. UT-Austin is a Research I university with approximately 9.45 million volumes in its collection (per ARL 2007-2008 collection statistics). Each usability test session was recorded using screen capture software (Morae) and a webcam. Participants were encouraged to use the "think aloud" technique (Nielsen, 1993) to articulate their experiences of searching and finding materials for the duration of the study. As described by Nielsen, the "think aloud" technique enables researchers to "understand how [users] view the computer system...[and] shows how users interpret each individual interface item" (195). Rubin and Chisnell (2008) also note that the "think aloud" technique is advantageous in that it allows the researcher to "capture preference and performance information simultaneously, rather than having to remember to ask questions about preferences later" (204). This technique typically yields a substantial amount of qualitative data, even with a small test population.

Part 1 of the usability test consisted of an open-ended search in which participants were instructed to first conduct a keyword search on topic of personal or research interest. After finding an item relevant to their initial search, participants were asked to demonstrate or explain how they would typically go about finding similar items. Participants were not directed to examine any particular bibliographic record data (e.g., subject headings, tags) during this process, but rather were asked to articulate their search strategies and process for finding relevant and related materials in the library

catalog. This task was utilized to give the researcher a sense of the various methods participants use when searching the catalog.

Part 2 of the usability test consisted of three known item searches, in which participants were directed to view the records of predetermined items in the catalog, and then find items related to each original item. The known item search task was utilized to ensure that participants viewed some records that contained substantial LibraryThing tag data. For each known item, participants were first directed to look at the item's catalog record to determine its subject and scope, and then directed to find similar items in the catalog. In the initial task instructions, participants were not specifically directed to use the subject headings and tags to find items. Due to the fact that a primary focus of this research was to compare the usefulness of subject headings and tags for finding items, the researcher did point out these features to participants who did not demonstrate any inclination to use them during this portion of the study. The three known item searches used for this part of the study were:

- (1) *A People's History of the United States: 1492 – Present*: This is a fairly general book covering a broad topic, and its catalog record includes limited bibliographic data (one subject heading).
- (2) *Team of Rivals: The Political Genius of Abraham Lincoln*: This title is focused on a very specific topic, and its catalog record includes substantial bibliographic data (six subject headings, contents note, and summary).
- (3) *An Inconvenient Truth: The Planetary Emergency of Global Warming and What We Can Do About It*: This title is focused on a very specific topic, and its catalog record includes some bibliographic data (seven subject headings).

Each of these titles' records included tag data from LibraryThing. Fifteen tags were present on each record – the maximum number allowed under the University of Texas' LTFL configuration.

Part 3 of the usability test consisted of two unknown item searches. Participants were directed to conduct a keyword search on a predetermined topic, and from the search results, find an item they felt to be relevant to the topic. From the initial item selected, participants were then directed, as in part 2 of the test, to find similar items in the catalog. The topics specified for these searches were “artificial intelligence” and “comparative religion.” These topics match LibraryThing tags appearing on their list of “Top 50 Long Tags.”⁵ At the time the study was conducted, the “comparative religion” tag had been used approximately 4,000 times in LibraryThing, and the “artificial intelligence” tag approximately 7,000 times. Although “artificial intelligence” is a recognized subject heading, it was selected as one of the two topic searches to give participants the opportunity to contrast items found via a subject heading and via a tag where there was an exact match subject heading-tag match.

4.2 Demographic Questionnaire

At the conclusion of the usability tasks, participants were administered a demographic questionnaire to assess a number of factors, including: level of experience with computer systems and applications, use of search engines, use of the library catalog, use of social bookmarking and tagging tools, and familiarity with the concept of tagging.

4.3 Semi-Structured Interviews

For the final portion of this study, participants were interviewed to allow them to articulate their impressions of the search and discovery process. Researchers recommend administering post-test questionnaires or interviews in usability testing as a means of “gather[ing] consistent qualitative information and ratings from each participant. It allows [the researcher] to get answers to specifically targeted questions...that may not have been answered by the user’s behavior during the test” (Prasse & Connaway, 2008, p. 223). These interviews took place directly following the usability tasks and

⁵ Top 50 Long Tags are tags with more than 20 letters; see: <http://www.librarything.com/zeitgeist>

completion of the demographic questionnaire. The following questions were used as a guide in the semi-structured interview:

1. On a 1-5 scale (1 being least useful; 5 being most useful), how useful did you find the user-assigned tags were in locating items related to your searches? How were the tags useful? How were they not useful?
2. On a 1-5 scale (1 being least useful; 5 being most useful), how useful did you find the subject headings were in locating items related to your searches? How were the subject headings useful? How were they not useful?
3. Which structure, tags or subject headings, allowed you to find similar/relevant items more easily?
4. Do you think that having user-assigned tags/recommendations in the library catalog could be a useful feature?
5. If the option existed to search or browse by tags in the library catalog, is that something you would use?
6. How do you use social bookmarking tools? (Note: this question was only asked of participants who indicated on the demographic questionnaire that they had experience using social bookmarking or tagging tools.)

4.4 Site and Sample

All participants were currently enrolled students at the University of Illinois at Urbana-Champaign. Graduate student participants were recruited through a message published in the University's weekly GradLinks newsletter, which is sent to all graduate students via email. Undergraduate student participants were recruited via fliers placed in the Undergraduate Library and distributed in selected English Composition classes. To ensure no relationship with subjects, employees of the Library (e.g., Undergraduate Library student workers, graduate students who hold assistantships in the Libraries) were excluded from this study. In the interest of maintaining a participant pool that had no specialized or advanced knowledge of library catalog systems, students in the Library & Information Science program were also excluded from the study.

4.5 Demographics

A total of 13 participants were recruited for this study. Nielsen (2000) has advocated that in usability testing, a small participant population is sufficient to uncover the majority of issues in the system being tested; an initial study with just five participants typically will reveal approximately 85% of its usability problems. Due to differences in their research habits and levels of library experience, the researcher chose to conduct sessions with both graduate and undergraduate students; seven of the participants were graduate students and six were undergraduate students. Graduate student participants ranged in age from 22 to 39 years old, and undergraduate students from 18 to 22 years old. Participants were drawn from a wide range of academic departments, including: English, education, anthropology, communications, natural resources and environmental sciences, community health, Spanish, and Slavic studies.

All participants reported that they frequently (at least once a day) or often (1-3 times per week) use search engines. Among graduate students, 86% (6 of 7) reported frequent use of search engines, while 50% (3 of 6) undergraduate students said they frequently used search engines. Self-reported use of the Library's online catalog was mixed among undergraduates: three indicated they rarely (1-3 times per month) use the catalog; one reported sometimes (3-5 times per month); one reported often (1-3 times per week); and one reported frequently (at least once a day). Self-reported use of the online catalog was greater among graduate students, with five reporting they often (1-3 times per week) use the catalog, and two reporting they use the catalog frequently (at least once a day).

Most participants in the study (10 of 13, or 77%) reported that they never use social bookmarking or tagging sites. Two graduate students reported that they rarely (1-3 times per month) use these sites, and one undergraduate student reported that they sometimes (3-5 times per month) use these sites. Social bookmarking and tagging sites which participants had used included Flickr, Reddit, StumbleUpon, and GoodReads. Participants' familiarity with the concept of tagging was mixed. Four

participants (1 graduate, 3 undergraduate) reported no knowledge of tagging. Five participants (3 graduate, 2 undergraduate) indicated that they use tags created by others but do not tag items themselves. Two participants (1 graduate, 1 undergraduate) indicated that they use tags created by others and tag items themselves. Activities mentioned by these participants included tagging blog posts, tagging computer files for a dissertation, tagging photos on Facebook, and tagging on music sites. Finally, one graduate student reported experimenting with tagging but did not use tags on a regular basis, and one graduate student reported knowledge of tagging, but indicated he did not use tags or tag items.

4.6 Conduct of Test Sessions

Institutional Review Board permission for this study was granted in February 2010, and all usability test sessions were conducted in April 2010. All usability test sessions were conducted in a private work area in the Information Technology office at the University's Main Library. Each participant was supplied with a consent form for his or her review prior to the test session; at the actual test session, the consent form was reviewed with participants and they were given a copy of the form to sign if they had not already done so. Each session began with a brief overview of the study and the usability session process. Participants were not given any information about the usability tasks, interview questions, or any other potentially leading information in advance of the test sessions. Participants were told they were taking part in a study examining students' use of library catalogs, during which they would be asked to do some searches in a library catalog to test various features of that catalog. Participants were also informed that the study was being conducted using a library catalog from another institution, as the University of Illinois library catalog did not contain the features that the researcher was testing. Each session was structured in three parts: usability tasks, demographic questionnaire, and semi-structured interview. All usability test sessions and semi-structured interviews were recorded using screen capture software (Morae) and a webcam. The usability task part of each session typically lasted

between 20 and 30 minutes, and the semi-structured interviews comprised an additional five to ten minutes, for total test session times of 25 to 45 minutes. At the conclusion of the study, participants were given a \$15 gift card to the Illini Union Bookstore for their participation.

All interview data was reviewed and coded using broad categories that were based on both the research questions and the questions posed in the semi-structured interviews. Due to the large amount of data typically generated in usability testing, experts recommend organizing data into meaningful categories prior to in-depth analysis (Kuniavsky, 2003; Rubin & Chisnell, 2008). The initial categories for data analysis included: methods of searching for and finding materials; useful aspects of subject headings; useful aspects of tags; non-useful aspects of subject headings; and non-useful aspects of tags. Within these broad categories, more nuanced codes were developed, using Kuniavsky's (2003) approach, in which each problem is described in a short sentence. For example, a code developed under the category "non-useful aspects of subject headings" was "general headings assigned to a large number of titles yield too many items to look through." The complete coding manual is presented in Appendix C at the end of this paper.

5. Results

Data collected in both the usability test sessions and the semi-structured interviews was concentrated in three primary areas:

1. Search and discovery methods: data was collected through both the initial open-ended search task, and participant comments about search strategies and processes as manifest throughout the usability study.
2. Use of subject headings and tags in participants' information seeking activities.
3. Evaluations of the usefulness of subject headings and tags were collected and analyzed.

5.1 Methods of Searching and Finding Materials

In the initial, open-ended search task, participants were instructed to conduct a keyword search on a topic of personal or research interest. After finding an item from their initial search, participants were then asked to demonstrate or explain how they would typically go about finding similar items. In this initial task, only one of the 13 participants looked at more than a single page (50 items) of search results; several participants did not even scroll through one full page of search results. This is consistent with research on search engine use that suggests up to 75% of users will only look at the first ten to twenty results from a search query (Jansen, Spink, & Saracevic, 2000; Silverstein, Marais, Henzinger, & Moricz, 1999). In the context of finding related items, 11 of the 13 participants (85%) either used or mentioned subject headings as a mechanism for accomplishing this task. Some participants commented at this point on the variability of usefulness among subject headings, noting that some subject headings are too general and generate too lengthy a list of titles to be helpful, while other headings are too specific and thus do not give adequate results in terms of related items. Participants also mentioned using subject headings as a means of generating ideas for additional keyword or subject searches.

In addition to using subject headings in the open-ended search task, participants employed other strategies for finding related materials. Although an activity not facilitated by the library catalog, three participants mentioned browsing the bibliographies of books or articles as a primary strategy for finding additional materials. One participant also mentioned using Amazon as a place to look for related items. Yet another participant explained that after finding a pertinent item, subsequent searches would incorporate keywords drawn from the item's title.

5.2 Overall Searching and Finding Behaviors

From the observations across all the search tasks in this study and the responses to the semi-structured interviews with participants, some interesting patterns in searching and finding behaviors emerged. Overall, 62% (8 of 13) participants used the strategy of selecting a subject heading from item's

catalog record and using this heading as an entry point for browsing the catalog’s subject heading lists. One participant, whose search stemmed from the subject heading “global warming,” explained that this strategy was a good means of “getting ideas about topics related to global warming.” It was also observed that when starting from a very general subject heading (e.g., global warming; United States – civilization), participants then tended to browse for more specific headings which would give a smaller results set. Fifty-four percent (7 of 13) participants either mentioned or employed a strategy of using keywords from the title of a pertinent item to formulate additional keyword searches. Many participants also noticed the recommended titles feature in the LibraryThing for Libraries catalog display; 62% (8 of 13) used this feature to browse for related titles.

Searching and Finding Behaviors	Number of Participants (n=13)
Browse subject headings for relevant topics	8
Browse recommended titles in the LTFL display	8
Use keywords from a relevant title to perform additional searches	7
Search via a combination of tags in the LTFL tag browser	4

Table 1: Prominent searching and finding behaviors exhibited by participants across all tasks in the usability study.

Participants were encouraged to explore the various features of the LibraryThing for Libraries tag browser, although they were not given any specific instructions or information about its capabilities. Although the default in the tag browser is to browse titles associated with one tag, a search box in the browser screen does allow users to conduct tag-based searches. Thirty-one percent (4 of 13) participants used the LTFL tag browser to conduct combined tag searches (e.g., “American history” and “presidents”). Participants using this search strategy observed that their combined tag searches yielded smaller, more focused search results sets, even when using very general tags typically found in

LibraryThing. However, some difficulties were encountered with this search strategy, mostly due to the limitations of LTFL. Most LibraryThing tags are single or two-word tags, and as such, the search function did not work well if entering a lengthy keyword string (e.g., “overview of American history,” as entered by one participant). Additionally, the LTFL tag browser search will only retrieve items that have LibraryThing data on their catalog records. Finally, the search is strictly limited to tags, and does not extend to a keyword search of information about the items as is possible in a typical keyword search conducted in an OPAC.

On the whole, participants’ behavior in the usability test and responses to the semi-structured interview questions reinforced the notion that searching is an iterative, evolving process. Bates (1989) described the nature of evolving searches: “users may begin with just one feature of a broader topic, or just one relevant reference, and move through a variety of sources. Each new piece of information they encounter gives them new ideas and directions to follow and, consequently, a new conception of the query.” Some of the search strategies articulated by participants (e.g., using keywords from a title as the basis for subsequent searches; using tags as a source of keyword search terms) were reflective of the constantly changing nature of the search process. As will be discussed in more detail later in this section, not all participants used the subject headings or tags in each of the search tasks – rather, they engaged in an iterative process, likely following the access points they judged to be most useful or relevant to their query. On the surface, this may manifest as seemingly haphazard search behavior, where users are not consistent or methodical with their processes. For example, when browsing subject heading lists, rarely did participants actually look at the list of titles associated with the subject heading they had selected from a catalog record. More common was that they scanned the list of subject headings and selected one or more headings from the list through which they browsed for materials. Similarly, participants’ selection of tags for browsing was not consistent – in some cases, participants selected the

more commonly used tags for browsing, and in other cases they gravitated to the less frequently used tags.

5.3 Use of Subject Headings and Tags

Participants' use of and familiarity with subject headings was fairly consistent across both the graduate and undergraduate student populations. In the initial open-ended search task, 86% of graduate student participants (6 out of 7) demonstrated familiarity with subject headings and used them without prompting. Similarly, 83% (5 out of 6) undergraduate student participants were familiar with subject headings and used them without prompting. One participant from each group did not use the subject headings in open-ended search task, and therefore was prompted look at the subject headings in the first known item search task. Throughout the course of the three known item search tasks and the two unknown item search tasks, not all participants used the subject headings. Indeed, in only one of the five search tasks (task #4 – find books on the topic of artificial intelligence) did all participants use the subject headings as a means of finding additional materials. The term “artificial intelligence” is a subject heading; its presence as such may have influenced subject heading use in this particular task.

In the context of their typical search behaviors, participants reported varying levels of use of subject headings. Five participants (4 graduate, 1 undergraduate) indicated that they used subject headings as a primary or initial search strategy. An additional five participants (all undergraduates) said that they “sometimes” use subject headings in catalog searches, but are more likely to use headings as a browsing mechanism. The remaining participants indicated infrequent use of subject headings, stating they were likely to use them only when other methods (e.g., keyword searching) were not effective.

Participants' use of and familiarity with tags varied across groups. In the first known item search task, 71% of graduate student participants (5 of 7) used the tags in the LibraryThing for Libraries (LTFL) tag browser without prompting. Conversely, only 50% (3 of 6) of the undergraduate students used the

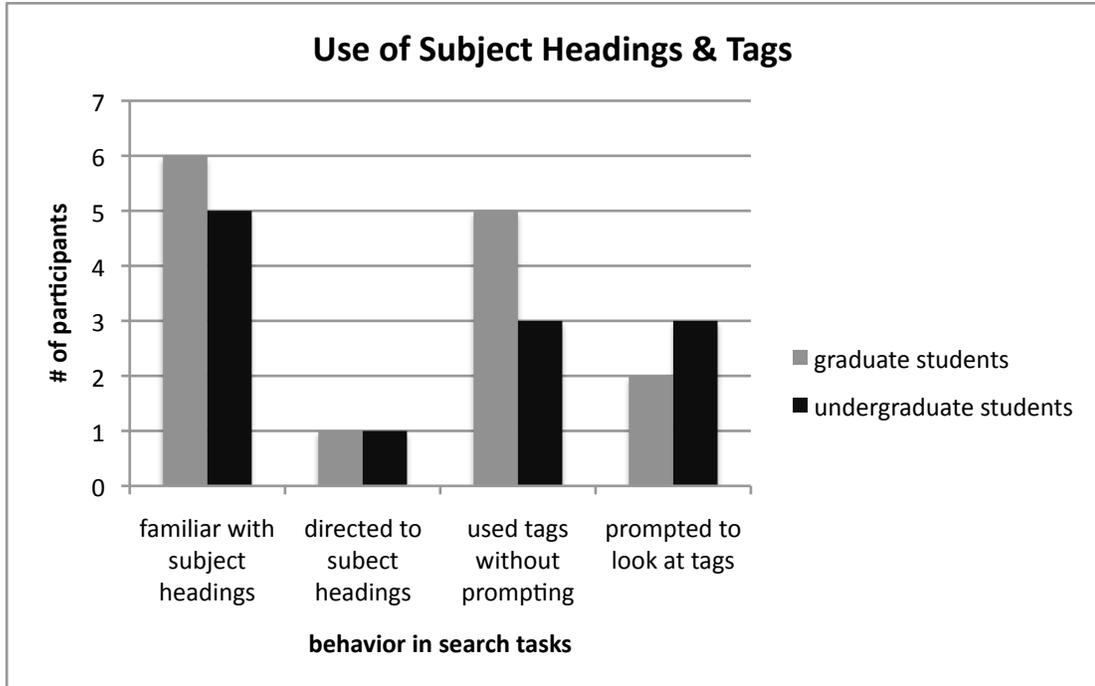


Figure 3: Participants’ use of subject headings and tags in the initial search tasks. Use of subject headings is measured from the initial open-ended search task, and use of tags is measured from the first known item search task.

tags without prompting⁶. Participants who did not use the LTFL tag browser in the first known item search task were prompted by the researcher to do so in the subsequent search tasks. Of the five participants who had to be directed to use the LTFL tags, three reported no prior knowledge of tagging. As was observed with subject heading use, not all participants used the tags as a means of finding related items in the subsequent search tasks. One graduate student participant consistently did not use the tags in tasks two through five – although interestingly enough, this participant was not one who had to be directed to use the tags in the first known item search task. In the second and third known item search tasks, only a few participants chose to use the tags as their first means of browsing for additional

⁶ In the open-ended search task, five participants viewed items that had tags attached to them; of these, only one participant used the tags to locate additional materials.

materials. In known item search #2 (*Team of Rivals*), 4 of 13 (31%) participants used the tags first, and in known item search #3 (*An Inconvenient Truth*), 2 of 13 (15%) used the tags first.

5.4 Ratings of Subject Headings and Tags

At the conclusion of the search tasks, participants were asked a series of questions in a semi-structured interview format, with a primary focus of these interviews being the evaluation of the usefulness of both the subject headings and the tags. Participants were asked to rate both access mechanisms on a 5-point Likert scale (with 1 being least useful; 5 being most useful) and give reasons for why they rated each as such. Overall, both graduate and undergraduate students rated the subject headings as being more useful than tags, although their ratings were not as disparate as may have been expected. On average, graduate students rated tags at 3.29 (ratings ranged from 2 – 4) and subject headings at 3.96 (ratings ranged from 3.75 – 4). For undergraduate students, tags were rated at 3.83 (ratings ranged from 2 – 5) and subject headings at 4.08 (ratings ranged from 2.5 – 5). Fifty-four percent of participants (7 of 13) rated subject headings as more useful than tags; 23% (3 of 13) rated tags and subject headings as equally useful; and 23% (3 of 13) rated tags as more useful than subject headings.

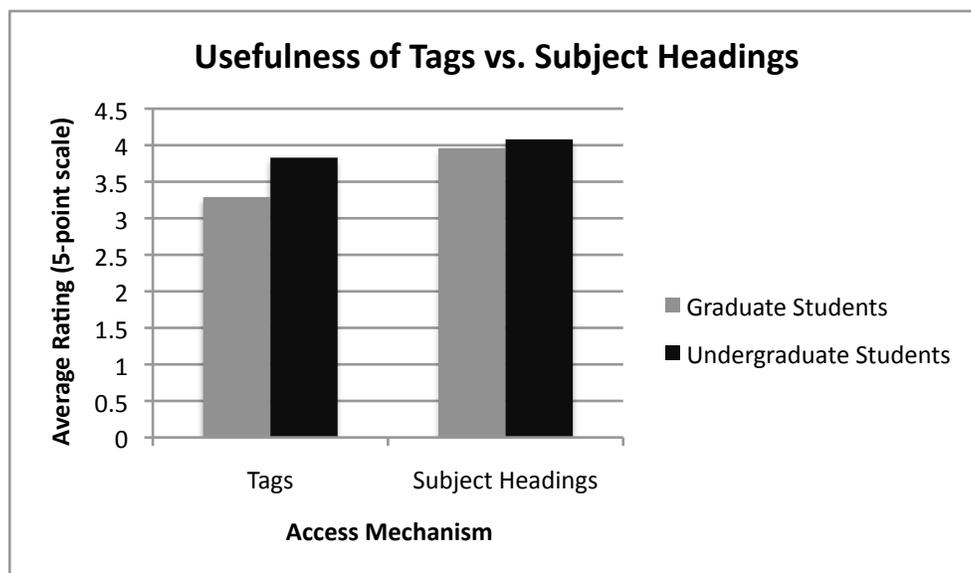


Figure 4: Participants' average ratings (on a 1-5 scale, where 1 = least useful and 5 = most useful) of the usefulness of tags and subject headings.

5.5 Evaluations of Subject Headings

Subject headings can often be categorized as falling into one of two categories – general headings (e.g., United States – civilization) that represent a large topic area, and specific headings (e.g., Greenhouse effect, Atmospheric -- Government policy -- United States) that represent a very small topic area. In their evaluations of subject headings, 11 of 13 participants (85%)⁷ indicated that the general subject headings were not useful due to the large number of titles to which they are often assigned. For example, the subject heading “global warming” is assigned to 359 titles in the University of Texas catalog; one participant remarked that this was “far too many” titles to peruse. This reinforces the notion that most users will only look a limited number of results (10-20 on average) from a search query (Jansen, Spink, & Saracevic, 2000; Silverstein, Marais, Henzinger, & Moricz, 1999). Participants further explained that when conducting very targeted research, they need specific subject headings to lead to them to appropriate resources, and thus general subject headings that yield a large results set are not useful. One participant compared general subject headings to her own keyword searches, explaining that “if [the subject headings] are the same or nearly the same as the keywords I searched, then they don’t make much of a difference. If they are specific enough, narrowing down the field, then they are

Useful Aspects of Subject Headings	Number of Participants (n=13)
Specific headings support information seeking in more focused or narrow research queries	10
Structure of headings – from general to more specific – aids refinement of search queries	6
General headings can give good overview of material in a subject area; serve as a starting point for researching an unfamiliar topic	4
Authoritative source of terms – assigned by LOC	3

Table 2: Most commonly cited useful aspects of subject headings

⁷ Percentages given in this section may be greater than 100, as some participants cited reasons why subject headings were both useful and not useful.

useful.” Some participants (4 of 13, or 31%) did recognize that general subject headings could at times be useful, especially as a means of gathering items for a broad literature review, or as a starting point into researching an unfamiliar topic.

Participants evaluations of the specific subject headings were nearly opposite from their evaluations of the general headings. Seventy-seven percent (10 of 13) characterized the specific subject headings as being useful, on the basis of the fact that specific headings often yielded a smaller, more focused list of titles. Participants also remarked that items found using a very specific heading were more likely to be similar to the other items with the same heading, and that specific subject headings often include more detail relevant to the search topic (e.g., dates or time periods for historical research). Conversely, 31% (4 of 13) participants found the specific headings to not be useful, as in some cases a very small number of titles were assigned heading (e.g., “Genius – case studies” which is assigned to only four titles in the University of Texas catalog, besides the original title *Team of Rivals*). Participants explained that when trying to cast a broad net and conduct a thorough overview of a particular topic, such a small number of titles would be of limited use. One participant likened such a small list of titles as being akin to “searching in circles” as the specific subject heading simply directed him back to a few titles he had already viewed.

In addition to the evaluations of the general vs. specific subject headings, participants offered some comments on the overall usefulness of subject headings. Several mentioned that the overall

Non-Useful Aspects of Subject Headings	Number of Participants (n=13)
General subject headings assigned to a large number of titles yield too many results to look through	11
Relevancy of items found via subject headings is not consistent	5
Specific subject headings assigned to a very small number of titles do not yield enough results	4

Table 3: Most commonly cited non-useful aspects of subject headings

structure of subject headings helped them navigate from a general to more specific research focus. One undergraduate student explained, “within two or three successive branchings of subject headings, I can usually find some category [heading] that has titles particularly relevant to whatever my search happens to be. Rarely can I find titles [listed under] the first branch of a subject heading.” Somewhat related to this point, several participants also noted that subject headings were useful as a browsing mechanism, as they selected a subject heading from item’s catalog record and used this heading as an entry point for browsing the catalog’s subject heading lists. Three participants also mentioned that subject headings are an authoritative source of terminology as they are created by “professionals with knowledge of [specific] subjects” at the Library of Congress. As a corollary to this, one participant who was very attuned to keyword searching explained that terms found in subject headings were useful in constructing additional keyword searches.

Some general observations about instances in which subject headings are not useful were also made. Five participants commented on the relevancy of items found via subject headings, noting that searching this way did not always produce consistent results. One participant specifically mentioned the heading “United States – civilization” (assigned to *A People’s History of the United States*) and explained that upon looking at other titles assigned this heading, many did not seem to be relevant or clearly related to the topic. Another participant commented on the need for synonymous terms to be added as subject headings; he specifically highlighted the book *An Inconvenient Truth*, which bears the subject heading “global warming” and suggested that “climate change” be added as an additional heading to facilitate finding materials on this topic. Participants also commented on inconsistencies in subject headings, such as the use of both “20th century” and “twentieth century,” as a possible barrier to their usefulness.

5.6 Evaluations of Tags

In contrast to subject headings, most tags found in the LibraryThing data used in LibraryThing for Libraries are very broad in scope. As with the general subject headings, participants found there to be advantages and disadvantages to the general nature of the tags. Forty-six percent (6 of 13) of participants felt that tags were useful in that they generated a broad list of titles, which would be helpful when doing a survey of the literature on a given topic. Four of the six undergraduate participants mentioned that the general nature of the tags could be useful when researching an unfamiliar topic, or as a means of becoming acquainted with the library's holdings in that topic area. Graduate students, whose research tends to be focused on very narrow or specific topics, were on the whole less enthusiastic about the level of usefulness of the tags. However, they did recognize that tags could aid discovery of materials on an unfamiliar topic or be useful if conducting a survey of existing literature in a broad subject area. Similar to the findings of Kipp and Campbell (2010), some participants also observed that tags could be a good source for identifying related terms to use in keyword searches. One participant explained that the tags supplied her with "a lot of keywords that ... I probably wouldn't think of without it, and those keywords will bring up many books that you wouldn't have seen otherwise." For example, the title *An Inconvenient Truth* has the tags "global warming" and "climate change" displayed on its record; the appearance of such synonyms may be useful to users who are unfamiliar with the

Useful Aspects of Tags	Number of Participants (n=13)
Generate a broad list of titles, which is useful for doing a literature survey on a broad topic	6
Provide additional options for searching and browsing	6
Generate a broad list of titles, which can be useful for finding a research starting point if unfamiliar with a topic	3
Source of ideas for related terms to use in keyword searches	3

Table 4: Most commonly cited useful aspects of tags

topic, or who are having difficulty formulating keyword searches.

Overall, 46% (6 of 13) participants felt that tags were a good alternative to subject headings, in that they provided more options and ideas for searching and browsing in the catalog. One participant pointed out that tags could be useful when looking at the catalog record for a title that did not have many subject headings assigned, but did have a number of tags assigned (such was the case for *A People’s History of the United States*, one of the titles used as a known item in the usability test, which has only one subject heading listed). Another participant observed that tags seemed to be “more flexible” and reflective of contemporary language and usage, and not as “set in stone” as subject headings. In this sense, tags could be useful as a means of identifying titles related to topics where subject headings have yet to be created.

As with the subject headings, participants also identified some disadvantages to tags. As noted earlier, perhaps the greatest disadvantage to tags is their general nature, which renders them not very useful for users who are searching out materials on a very specific topic. Some participants found that some tags assigned to a title were not particularly relevant – based on either their prior knowledge of the book in question, or their interpretation of the book’s content based on its catalog record. One participant, who was familiar with both *A People’s History of the United States* and *An Inconvenient Truth*, remarked that the most commonly used tags for the former title⁸ were too general, while the

Non-Useful Aspects of Tags	Number of Participants (n=13)
Tags are too general when working with specific research topic – e.g. tag “US History” leads to a list of wide-ranging titles	9
Relevancy of items found via tags is not consistent	6
Authority control issues: no clear definitions for tags, some appear to mean almost the same thing (e.g., environment vs. environmentalism)	4

Table 5: Most commonly cited non-useful aspects of tags

⁸ The four most commonly used tags for *A People’s History of the United States* are: history, American history, USA, and politics.

most commonly used tags for the latter title⁹ were a better representation of the book's content. The same participant observed that the list of books tagged with "climate change" (originating from the catalog record of *An Inconvenient Truth*) seemed to be more relevant than those tagged with "Abraham Lincoln" (originating from the catalog record of *Team of Rivals*), and thus felt that the usefulness of the tags and the list of items they generate many depend on the user's level of familiarity with the subject at hand. One participant, who was familiar with the concept of tagging, guessed correctly that LTFL only displays the most commonly used tags¹⁰, and noted that it may be useful if lesser used tags were also displayed, as they may give better sense of the content of a book.

Four participants commented on the lack of authority control found in tags – indeed, this is one of the most common criticisms of tagging systems. In particular, one graduate student pointed out that both "American civil war" and "Civil War" appeared as tags for *Team of Rivals*, and both "environment" and "environmentalism" appeared as tags for *An Inconvenient Truth*, although there was no discernable difference in the lists of titles that were accessed via these pairs of tags. Other participants observed that there were some redundant tags (e.g., "Lincoln" and "Abraham Lincoln"; "American history" and "US history") that could perhaps benefit from being combined into a single tag¹¹. Ambiguity in the meanings of tags was also cited by at least one participant, who pointed out the tag "gore", assigned to *An Inconvenient Truth*. Although the tag was in reference to the author's last name, browsing the list of titles assigned the tag "gore" reveals that users have tagged titles in genres such as horror and science fiction with this tag as well. The problem of tag ambiguity (Macgregor & McCulloch, 2006; Peters, 2009) results in users having to sort through titles that do not necessarily have anything to do with the topic

⁹ The four most commonly used tags for *An Inconvenient Truth* are: environment, global warming, science, and climate change.

¹⁰ Libraries using LTFL can specify the number of tags displayed; the University of Texas displays at maximum 15 tags on a catalog record.

¹¹ LibraryThing does allow tag combining, with the general rule being "Tags should be combined only when they are the same in both meaning and usage on LibraryThing." Users can propose a tag combination, which is then voted on by LibraryThing users to determine whether or not it will be changed into a single tag. More information on tag combining is available at: http://www.librarything.com/wiki/index.php/Tag_combining

they are attempting to explore. Somewhat related to the lack of authority control found in tags, one participant raised the issue of user-created tags possibly being marred by “inflammatory content” and commented that tags would perhaps be more useful and neutral if librarians or other information professionals, instead of users at large, created them.

5.7 Assessing Relevancy

In addition to being asked to rate the usefulness of tags and subject headings, participants were also asked, “Which structure, tags or subject headings, allowed you to find similar/relevant items more easily?” Seventy-seven percent (10 of 13) participants indicated that subject headings more easily allowed them to locate relevant items in the search tasks. One participant found the tags were more useful in finding relevant items, and noted that subject headings were largely inconsistent as a means of locating relevant items. One participant was divided on which mechanism better for locating relevant items, finding that ease of use depended on the subject in question: for commonly searched subjects, he found the tags to be better, and for academic and historical topics, the subject headings were better. One participant found subject headings to be easier for locating relevant items, but also stressed that if tags were an option in the library catalog he was using, he could foresee using them for searches, although this would require “figuring out how to use the tags to best advantage.” Regarding the relevancy of items found via tags, one participant remarked that she found tags mostly led to irrelevant results: “I don’t know why [the tags] were referring me to certain things, the titles were in kind of a hodgepodge list, it’s overload and I don’t know what I’m looking at.” Another participant found there to be variation in the relevancy of items located using the tags. More specific tags (e.g., “Abraham Lincoln”) did facilitate the discovery of relevant items, while more general tags (e.g., “nature”) “led me in a very, very different direction than what I was looking for, which was books global warming.” These findings echo those of Gelernter (2007), whose participants indicated that LSCH terms were more useful for judging the relevance of an item than tags.

5.8 Tags in the Catalog: Yes or No?

As a final part of the semi-structured interview, participants were asked two questions about the feasibility of having tags in a library catalog: 1) Do you think that having user-assigned tags/recommendations in the library catalog could be a useful feature?, and 2) If the option existed to search or browse by tags in the library catalog, is that something you would use? Without exception, participants felt that having user-assigned tags in the catalog could be a beneficial feature for users. As previously mentioned, several participants believed tags could be a useful browsing mechanism when researching unfamiliar topics or conducting a broad search of materials in a given topic area. A few participants also mentioned that tags could be a source of ideas for keyword searches. Others felt that the tags simply offered “another way of finding things” and that as long as subject headings were retained in the catalog, there was no downside to having tags in the catalog. One graduate student explained that although he would not use tags in academic research, he could see their value for browsing for materials to read for personal interest.

Participants were mixed in their responses to whether or not they would use tags in a library catalog. Fifty-four percent (7 of 13) said they would use tags; 31% (4 of 13) said they might use tags; and 15% (2 of 13) said they would not use tags if they were present in a library catalog. Both of the participants who said they would not use the tags were graduate students, and they cited the general nature of the tags and their relatively narrow research topics as being incompatible. Participants who indicated they would use tags reiterated the idea that general tags could be useful when starting a research project on an unfamiliar topic, or when attempting to cast a wide net and collect items for a literature search. One participant reported that during her last research paper assignment, she had substantial difficulty finding materials when using subject headings, and felt that tags might offer a better and more easily navigable means of finding materials. For the participants who indicated that

they might use tags, the decision would largely be situational – given a broad or unfamiliar research topic, or if they could not find materials via other methods of searching, they would try using tags.

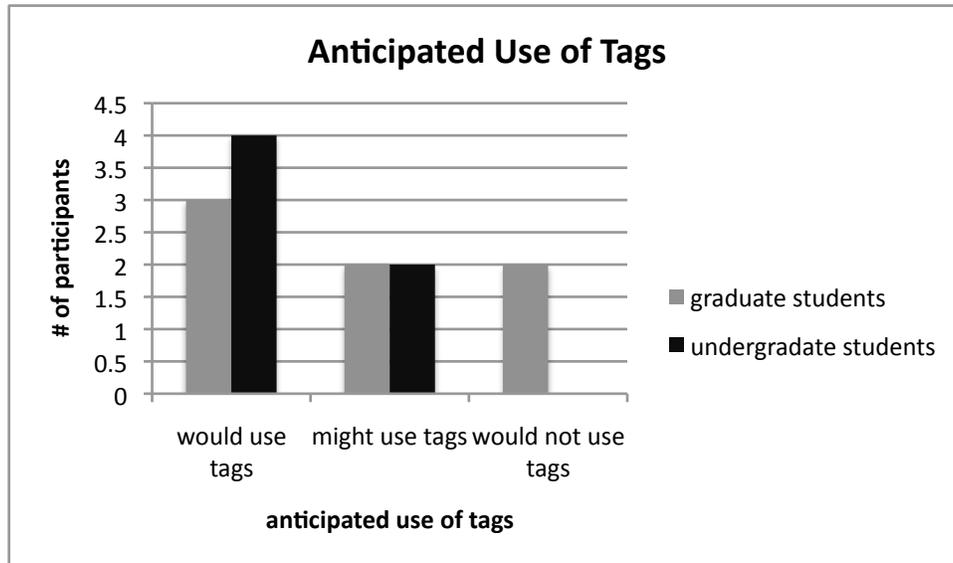


Figure 5: Participants’ anticipated use of tags, in response to the question: “If the option existed to search or browse by tags in the library catalog, is that something you would use?”

6. Discussion and Implications

This project sought to address a broad question in information access:

Given the complexity and recognized problems with Library of Congress Subject Headings, can user-assigned tags enhance item discovery in library catalogs?

Results of usability testing with the LibraryThing for Libraries catalog enhancements indicate that while tags can be a useful mechanism for finding materials in library catalogs, they cannot replace the more traditional subject headings. Based on their experiences in a series of information seeking tasks, participants rated subject headings as being slightly more useful than tags as a mechanism for finding related materials in the catalog. Fifty-four percent of participants (7 of 13) rated subject headings as being more useful than tags, while 46% (6 of 13) rated tags as being equally useful or more useful than subject headings. More revealing, perhaps, is the fact that 77% (10 of 13) participants felt that subject

headings more easily allowed them to locate relevant items in the search tasks. This could be due to the fact that participants were more familiar with subject headings as an access mechanism; 11 of 13 participants reported using subject headings to find materials in the course of their normal research activities. Although the majority of participants had some familiarity with tagging, most were not actively engaged in using social bookmarking or tagging sites, and none mentioned using these sites in the context of locating library resources. The lack of familiarity with browsing or finding items via tags may have lead participants to feel more at ease and successful in their information seeking tasks when using the more familiar subject headings.

Interestingly, participants' methods of browsing for materials in the catalog illustrated one of the primary advantages of subject headings – their hierarchical structure – while also revealing some of the shortcomings of tags. The hierarchical structure of subject headings facilitates browsing from a broad, general heading down to narrower, more specific headings. In contrast, tagging systems are “flat” with no structure to support browsing from general to more specific tags. Nearly two-thirds of participants used the strategy of browsing the catalog's subject heading lists, and it was observed that they explored titles listed under more specific headings with greater frequency than those listed under general headings. Conversely, when browsing by tags, there was no mechanism by which participants could “drill down” through the tags to narrow their search. Some participants remarked that browsing by tags led them to a hodgepodge of titles, not consistent in relevancy to the topic being researched, and they expressed frustration that there was no way to narrow or refine their results set. Conducting tag-based searches in the LTFL browser did allow for more focused search results sets, however, only four participants experimented with this feature; of those, only two conducted successful searches.

Another critical issue for the effectiveness of tags in the context of this study was that by and large, LibraryThing tags assigned to items tend to be very general in nature. Several participants indicated that tags such as “American history” or “environment” were too general to be useful if they

already had an established research focus for a project. In such cases, participants indicated they would be more inclined to use subject headings to locate additional materials, and preferred to use the more specific subject headings where they were present. Some participants also felt the tags usefulness was undercut by problems such as ambiguity in meaning (e.g., “gore”) or cases in which the meaning of multiple tags was very similar (e.g., “environment” vs. “environmentalism”). Participants also raised questions regarding the source and neutrality of the tags. Of particular concern was the notion that crowd-sourced tags could potentially be biased or inflammatory in nature; one participant went so far as to say, “if librarians were doing the tagging, that would be useful, but I guess I just don’t trust my peers.” Some participants also expressed frustration with the relevancy of results generated by LTFL. The tag browser displays a list of books in the library’s collection that have been assigned a given tag, although it is not evident to users how this list is sorted. According to LibraryThing, the results in the tag browser are displayed according to relevancy to the initial tag. While scanning lists of titles in the tag browser, several participants remarked that titles were of mixed relevancy and did not appear, in their judgment, to be sorted with the most relevant results at the beginning of the list.

Despite the inclination to use subject headings over tags, most participants recognized that in certain contexts (e.g., research on an unfamiliar topic; conducting a broad literature review; generating ideas for additional keyword searches), tags could serve as a useful device for finding information that they could not find through other means. To that end, most participants indicated that they would use tags to search or browse for items in a library catalog if that option were available, and all participants agreed that having user-assigned tags in the catalog could be beneficial feature for users. Even those participants who were not inclined to use the tags as a means of finding research related materials indicated that they might use tags as a means of finding items for leisure or personal reading. Some participants who experimented with searching combined tag strings in the LTFL browser noted that leveraging tags into more complex searches (e.g., searching for “climate change” and “sustainability” as

opposed to just browsing the titles tagged with “climate change”) could increase their usefulness and allow for more robust ways of information seeking and discovery.

The results of this study have a range of implications for the design of information retrieval systems. While this study has demonstrated that tags can be a useful mechanism for finding materials in library catalogs, it has also highlighted some of the difficulties users may have in navigating tagging systems. Of particular concern and interest to this research is the fact that the LibraryThing for Libraries catalog display does not offer any solid means by which users can “drill down” to isolate either more specific or less commonly used tags. Titles in LibraryThing may have dozens, and in some cases hundreds, of tags assigned; however, the richness of this tag data is not accessible with LTFL displaying at maximum only the top 30 tags assigned to a title. A participant who was familiar with tagging systems noted that it could be useful if lesser-used tags were displayed or otherwise accessible. Less commonly used tags are searchable through the LTFL tag browser; however, the search feature is not overly evident, and only four participants in the study actually used this feature. The LTFL browser also includes a list of related tags – those identified as being similar to the tag being searched. However, observation has revealed that tags appeared on the “related tag” lists are not always, in fact, closely related (Figure 2 presents a good example of this). Related tag lists in the LTFL browser could have the potential to support access to the less commonly used tags, however, the current listings are very hit-and-miss in terms of actual relevancy to the original tag. The fact that less commonly used tags are rather difficult to access may present a barrier to the notion that tags can enhance subject access in library catalogs.

Another question for information system design that has arisen from this study is: how can folksonomies be more seamlessly integrated into library catalogs? At present, LTFL operates only as an overlay in a catalog system. Its installation does not allow for users to conduct tag-based searches through the OPAC as they would a keyword, author, or title search; rather, tags are only searchable through the LTFL tag browser. In order for users to take advantage of the tags, they must first locate an

item that has tag data attached to it; from that point they can either browse using the tags, or search in the LTFL browser. Both VuFind and WorldCat Local permit tagging, but have no search functionality through which users can access tags. The MTagger and PennTags interfaces have an option to search by tags, however, this interface is separate from that of the library catalog search. For all the potential that tags have to enhance access to materials in library catalogs, that potential is severely limited by the inability of the interfaces to support tag-based searches alongside standard catalog searches.

7. Conclusion and Directions for Further Research

This study examined the usefulness of tags as a means of enhancing subject access and discovery of items in library OPACs through usability testing with the LibraryThing for Libraries catalog enhancements. Results of the study indicate that while tags can be a useful mechanism for finding materials in library catalogs, they cannot replace the more traditional subject headings. Participants in the study were generally enthusiastic about the addition of tags to the catalog, believing that this access mechanism could provide them with additional ways of browsing and searching for materials, particularly in cases where traditional catalog searches by keyword or subject heading are not successful. Despite the potential for tags to enhance item discovery in catalogs, their effectiveness may be limited by current system designs that do not allow for tag-based searching to be conducted in the same manner as traditional catalog searches.

This study reinforced Bates' (1989) contention that searching in information systems is an iterative and evolving process. Participants' behaviors of browsing through subject headings, chaining from one subject heading to more detailed headings, and browsing and searching via tags all reflected the need to adopt various search strategies at any given point in a query. However, these search patterns and habits may not be generalizable across all populations. Participants in this study were all university students, most of whom were moderately familiar with conducting research in library catalogs. Users who are less experienced or who are expert searchers in the searching of library catalogs

may exhibit different search strategies, particular in the use of subject headings and refinement of search queries. One possible extension of this research would be to conduct similar usability studies with (1) laypeople who are not students or otherwise experienced searchers of library catalogs, and (2) librarians or other expert searchers of library catalogs. Comparison of results from these three distinct user populations could shed more light on the degree to which tags can effectively help users locate items in library catalogs.

As with all usability testing, the process and results can often inform future test designs. Refinements to the current test design would call for more opportunity for participants to demonstrate their typical search strategies. Due to the fact that this study was designed to investigate the efficacy of subject headings and tags as access mechanisms, the researcher pointed out these devices to participants who did not show an inclination to use them. It would be interesting to observe, if left to using their normal search strategies with no researcher prompting, how long it would take participants to locate and use the subject headings and tags. The search tasks may also have imposed artificial search conditions on the participants, as they were encouraged to locate related items only by using the information found on the catalog record they were viewing. While some participants articulated that they typically would use subject headings to browse for additional items, others mentioned doing multiple keyword searches, or basing new searches off other information from the catalog record being viewed. The design of search tasks for future studies should take into account the variability of searching patterns and allow for participants to engage more freely in their usual search strategies. Future tests may also benefit from placing great emphasis on evaluating the relevancy of related items identified in the search tasks. This could be accomplished by having participants assign a relevancy rating to each item, rather than asking them for an overall assessment at the end of the study. These ratings may shed more light on the effectiveness of subject headings and tags as means of accessing information, and thus inform next steps for developing systems that can better help users locate information.

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Appendix A: Demographic Questionnaire

Age:

Are you:

- Undergraduate student
- Graduate student

Academic major or department: _____

Self-rated computer experience – please rate your experience with each of the following computer technologies on a 1-5 scale (1=no experience to 5=very experienced).

Computer applications (e.g., Word, Excel, PowerPoint, Access, etc.):

1 2 3 4 5

Operating systems (e.g., Windows, Macintosh, Linux, etc.)

1 2 3 4 5

Programming (e.g., Java, PHP, Python, etc.)

1 2 3 4 5

Social media (e.g., Facebook, Twitter, etc.)

1 2 3 4 5

How often do you use search engines:

- Never (do not use)
- Rarely (1-3 times per month)
- Sometimes (3-5 times per month)
- Often (1-3 times per week)
- Frequently (at least once a day)

How often do you use a library catalog (e.g., UIUC Library Catalog, VuFind catalog, I-Share catalog linked from this page: <http://www.library.illinois.edu/catalog/>)

- Never (do not use)
- Rarely (1-3 times per month)
- Sometimes (3-5 times per month)
- Often (1-3 times per week)
- Frequently (at least once a day)

How often do you use social bookmarking / tagging sites (e.g., Flickr, delicious, LibraryThing, CiteULike):

- Never (do not use)
- Rarely (1-3 times per month)
- Sometimes (3-5 times per month)
- Often (1-3 times per week)
- Frequently (at least once a day)

Please specify what social bookmarking sites you have used:

- Flickr
- delicious
- LibraryThing
- CiteULike
- Digg
- StumbleUpon
- Connotea
- Reddit
- Other (please specify):

Prior to participating in this study, how familiar were you with the concept of tagging?

- No knowledge
- Use tags created by others but do not tag items
- Tag items but do not use tags created by other users
- Use tags created by others & tag items
- Have experimented with tagging but do not use tags on a regular basis

When you locate a book in the library catalog and want to find items that are similar to it, how do you typically look for these items? (2-3 sentences should be sufficient)

Appendix B: Semi-Structured Interview Questions

1. On a 1-5 scale (1 being least useful; 5 being most useful), how useful did you find the user-assigned tags were in locating items related to your searches? How were the tags useful? How were they not useful?
2. On a 1-5 scale (1 being least useful; 5 being most useful), how useful did you find the subject headings were in locating items related to your searches? How were the subject headings useful? How were they not useful?
3. Which structure, tags or subject headings, allowed you to find similar/relevant items more easily?
4. Do you think that having user-assigned tags/recommendations in the library catalog could be a useful feature?
5. If the option existed to search or browse by tags in the library catalog, is that something you would use?
6. (If they said yes to using social bookmarking tools on the survey): How do you use social bookmarking tools (e.g., uploading photos on Flickr, tagging items, etc.)?

Appendix C: Coding Manual

Items of interest observed and articulated in tasks and interviews:

- 1) Methods of searching and finding additional materials
- 2) What is useful about subject headings? What is not useful?
- 3) What is useful about tags? What is not useful?

Coding for Interviews:

Methods of searching for/finding additional materials:

- (m1) scrolling through search results, choosing items to look at based on rapid evaluation of the information provided in the list
- (m2) bibliographies (consult from one useful source to find additional sources)
- (m3) browse titles via subject headings
- (m4) browse subject heading lists for topics of relevance and/or interest
- (m5) look at recommended items on Amazon
- (m6) any word, anywhere search for broad research topics
- (m7) for research involving articles, look at other articles that have cited the article being read
- (m8) compare keyword search results with subject headings for ideas for additional terms
- (m9) use keywords from title of a pertinent item to perform additional keyword searches
- (m10) advanced search – combine keyword and author or limit by date range
- (m11) call number browse
- (m12) browse via tags (LTFL tag browser)
- (m13) searching via combination of tags in tag browser
- (m14) recommended title lists in LTFL catalog display
- (m15) browse titles by author

Subject Headings

What is useful:

- (sh1) general headings to give a good overview of material in a subject area
- (sh2) browsing mechanism –start with one subject heading and look at list of headings to find related topics
- (sh3) source of terminology (use terms found in subject headings to construct subsequent keyword searches)
- (sh4) more specific headings are useful for more focused research (e.g., for a specific time period)
- (sh5) more specific headings are useful in narrowing down a research topic
- (sh6) structure of headings – from general to more specific
- (sh7) authoritative source – assigned by LOC

What is not useful:

- (su1) general headings assigned to a large number of titles yields too many items to look through
- (su2) very specific headings assigned to a small number of titles do not enough items
- (su3) too many subject headings on a title = not sure where to start with using these to browse

- (su4) need to add synonymous terms to headings (e.g., “global warming” in addition to “climate change”)
- (su5) terminology/wording in some headings is confusing
- (su6) headings that match keyword search terms are not useful
- (su7) lack of consistency in headings (20th century vs. twentieth century); occasional misspellings
- (su8)) relevancy of items found via subject headings is not consistent

Tags

What is useful:

- (t1) general tags generate a smaller list of items than do general subject headings (e.g., US History)
- (t2) tags generate broad list of titles, useful for doing a survey of titles in a given topic
- (t3) tags are reflective of contemporary language
- (t4) searching by multiple tags in tag browser allows for more focused results set
- (t5) tags generate broad list of titles, useful for finding a research starting point if unfamiliar with topic
- (t6) offer ideas for related terms to use in keyword searches
- (t7) good alternative to subject headings – provides more options and ideas for searching/browsing
- (t8) usually found multiple tags/terms related to initial search

What is not useful:

- (tg1) too general when working with specific research topic – e.g. tag “US History” leads to a list of wide-ranging titles
- (tg2) some tags not closely related to content of item
- (tg3) discrepancy in tags used on item vs. how participant would tag item
- (tg4) some books found via tags are very specific (going by book title) even if tag itself is very general
- (tg5) don’t completely reveal topic/perspective of book
- (tg6) use only contemporary language – for subjects like history, need to be contextualized and reflect terminology of the period
- (tg7) need more specific tags for books that are about a very specific subject
- (tg8) not created by an authoritative organization
- (tg9) only most frequently used tags are displayed – would like to see broader representation of how users have tagged items, include less frequently used tags in display
- (tg10) needs to be some authority control in tags – similar tags should be merged into one (e.g., Lincoln and Abraham Lincoln)
- (tg11) no clear definitions for tags (e.g., environment vs. environmentalism, what is the difference?)
- (tg12) relevancy of items found via tags is not consistent