

User-Generated Social Tags Versus Librarian-Generated Subject Headings: A Comparative Study in the Domain of History

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ABSTRACT

Social tagging allows users to assign any free-form keywords as tags to any digital resources through a decentralised way. Many information scientists find that there are similarities through their studies between user-generated social tags and the librarian-generated subject headings for the libraries. The present study was conducted to identify the similarity and dissimilarity between user-generated social tags and librarian-generated subject terms of 1000 books in the domain of History. The study also conducted to identify whether social tags can replace controlled vocabularies. The study finds that only a small portion of terms overlaps with each other (3.54 % of social tags & 56.07 % of SLSH terms) and Spearman's rank correlation proves that there is a good association between overlapping terms. Jaccard similarity coefficient highlights that users and the librarian use different terminologies (as $J = 0.13, 0.12$ & 0.11). Individual title wise comparison also defines that 90 per cent (88.4 %) of all book titles where users and the librarian use at least one common term. Users use the least subject & non-subject terms but use some personal tags for personal benefit whereas the librarian use only subject & non-subject terms. Matching with each book title clarifies that for describing resources users mostly use title based keywords (696) whereas the librarian use very little title based keywords (113). The study clearly defines that social tags can enhance the experience of library users. If it can be exploited properly it can complement to controlled vocabularies but can not replace the controlled vocabularies used for libraries a long time. Overall the study explicitly identifies the viability regarding the adoption of social tags into the library databases where the resources in the field of history will be accessed.

Keywords: Social tags; Sears list of subject headings; User-generated social tags; Librarian-generated subject headings; LibraryThing; Folksonomy; Social tagging.

1. INTRODUCTION

The concept of 'social tagging' or 'Collaborative tagging' has got the popularity with the emergence of web 2.0 applications which provide interactions and collaborations among the users and the content creators over a virtual space. The term 'social tagging' derives from the term 'folksonomy', a personal free tagging of information and objects for one's own retrieval¹. Social tagging allows users to assign any keywords as tags to digital resources on the web. The resources can be of any types such as videos (YouTube), music (last.fm), photographs (Flickr), web pages (del.icio.us), academic papers (CiteULike) and social cataloguing of books (LibraryThing) etc². It has become an alternative way for resource description for a long time where users can assign any free-form keywords to any resources as they want without having any knowledge of controlled vocabulary³. The underlying concept of social tagging is that it provides a decentralised way of resources description where anybody can describe any resources unlike in the conventional libraries where only experts or librarians are allowed to do that. Not only for resource description

social tags also assist to navigate and retrieve those resources on the web in future⁴. Beside social tags can be updated very quickly when the vocabulary changes and the need for the user's changes⁵. If the libraries allow users to add tags to their catalogue records which will not only make the catalogue more user-centric but will also improve the access to library collections as recommended by the library of congress (LC) working group on the future of bibliographic control⁶.

Many researchers and information scientists compared social tags with expert-generated or librarian-generated metadata and its incorporation into library databases⁷⁻⁹. In traditional cataloguing systems the scenario is different only subject experts and librarians in libraries, archives and museums generate the metadata for the content they manage¹⁰. Expert-generated or librarian-generated metadata is very rigid and difficult to scale up. It takes much time to produce as because experts and librarians first determine the subject of titles, and then consult with controlled vocabularies like library of congress subject headings (LCSH) and sears list of subject headings (SLSH) etc. and finally can generate the subject based terms for retrieving of those titles in libraries.

With the massive proliferation of literature on the web

makes that expert-generated or librarian-generated metadata is not competent to describe all the resources. Instead, an alternative decentralised way for metadata generation is needed in the view of user-driven metadata approach. The user-driven metadata is generated through the process of social tagging¹¹. LibraryThing, a social network site for book lovers is allowing users to assign any tags to any books as per need where tags are found as a tag cloud with different font size and weight reflecting the popularity of each tag¹².

Despite many advantages, social tags still suffer from quality issues. Being generated from uncontrolled vocabulary social tags suffer from homonyms, synonyms, lack of controlled vocabularies and semantic ambiguities¹³⁻¹⁴. Besides social tags contain many personal tags ('read', 'to-read', 'unread', 'read in 2015' etc.) that neither define any subject nor help in information retrieval. Personal tags are mainly used for personal purposes rather than public benefit¹⁵. Having many issues regarding incorporation into library databases, still many researchers and information scientists opined that social tagging can enhance the library catalogue as well as library website by supplementing controlled vocabularies¹⁶.

2. LITERATURE REVIEW

Bogers & Petras¹⁷ conducted a comparative study to know whether social tags can replace or improve professionally assigned metadata used for books. The study compared a test collection of over 2 million book records with metadata elements from Amazon, the British Library, the Library of Congress and LibraryThing which concluded that social tags and controlled vocabulary complement each other.

Wu, D. *et al.*⁹ examined the relationship between social tagging and controlled vocabulary-based terms in information science domain. The study shows that more overlap between social tags and controlled vocabulary-based terms. The study also highlights that social tagging can enrich the controlled vocabulary.

Petek¹⁸ compared user generated metadata with librarian generated metadata on digital images collected from Flickr and Digital Library of Slovenia respectively. The study was conducted to identify whether any dissimilarity exist between those metadata. The result shows that tagging has perpetual quality can be used for enriching digital images but tagging is mostly done for personal benefit.

Lu, C. *et al.*⁵ conducted a study to know the connection between social tags and expert-assigned terms and the feasibility of implementing those social tags into libraries. The study shows that social tags can improve the accessibility of library collections.

Rolla¹⁹ made a comparison between user tags from LibraryThing and library-supplied subject headings for a group of books. The study mainly focuses that there is a difference between those metadata and for that reason user tags can not replace entirely controlled vocabularies such as Library of Congress Subject Headings.

3. RESEARCH QUESTIONS

- Do social tags and SLSH terms follow the same vocabulary?

- Do both social tags and SLSH terms are the same based on usage?
- Do social tags and SLSH terms use keywords from the title of books?
- Do social tags enhance the subject access like SLSH terms?
- Can social tags replace controlled vocabularies?

4. DATASET

The present study compares two types of metadata of which one is user-generated social tags and other one is librarian-generated subject terms used for libraries. Thousand book titles in field of History were randomly sampled under the study. The study uses LibraryThing (www.librarything.com) for collecting user-generated social tags whereas uses Sears List of Subject Headings (19th ed.) for librarian-generated subject headings. The study primarily collects 41313 user-generated social tags from LibraryThing database and 3227 SLSH terms from librarian-generated subject headings using Sears List of Subject Headings (19th ed.) for thousand book titles in History. After removing duplicates unique social tags and unique SLSH terms are 6123 (average 6.12 per book) and 387 (average 0.39 per book) respectively. The overall comparison was carried out based on those unique social tags and SLSH terms.

5. METHODOLOGY

The study measures the effectiveness of social tags in comparison with sears list of subject heading (SLSH) terms in the domain of History. There are many active social cataloguing sites like Goodreads (<https://www.goodreads.com>), Litsy (<https://www.litsy.com>), Anobii (<https://www.anobii.com>), Readgeek (<https://www.readgeek.com>) and LibraryThing (<https://www.librarything.com>) etc. on the web and these provide users different experiences of resource organisation. But the present study prefers the LibraryThing database (a social cataloguing site for book lovers) for collecting social tags²⁰. This is because LibraryThing provides a collection of social tags which are assigned by users under a given subject in alphabetical order. The collection of social tags is also called technically as 'Tag Cloud'. Tags in the 'Tag Cloud' are visualised by different font size which represents the popularity of tags under a given subject. Beside, LibraryThing database has a vast collection of books from LOC online catalogue, Amazon.com and 4967 other sources also¹¹. A thousand books written in the English language in the domain of history were sampled under the study. The data collection procedure was carried out from September to October 2019. Those books were selected which had been catalogued by at least ten users (≥ 10) and had been assigned at least three social tags (≥ 3) simultaneously in the LibraryThing database. Tags hold different tag frequency in the LibraryThing database. Tags contain more tag frequency means the tag is more popular to users. That means the number of users uses this tag to define that particular book. The present study selects those tags only which had at least twice tag frequency (≥ 2) or more than that in the LibraryThing database.

On the other side, subject headings for the entire set were prepared in consultation with sears list of subject headings

(SLSH), 19th Edition. Unlike the library of congress subject headings (LCSH), Sears list covers very limited standard terms for each subject. This is as because sears list was designed to cover small libraries where collections require more general subject headings rather than specific subject headings. In traditional convention subject headings using controlled vocabulary like sears list of subject headings (SLSH) are generally prepared like a string of words (France-History-20th century) to elevate the precision in information retrieval. In the string of words, each subject term is separated from others by a ‘hyphen’ (-). To make the parity with social tags, SLSH terms concatenated by a hyphen were separated²¹. Separated SLSH terms were collected for the study accordingly.

6. DATA ANALYSIS

6.1 Terminological Overlapping in History

Terminological overlapping reflects the unique overlapping terms (common terms) that have been used in both social tag and SLSH term vocabularies. To identify the fact, social tag vocabulary containing 6123 unique social tags and SLSH term vocabulary containing 387 unique SLSH terms were compared and found that 217 unique terms are common which is mentioned in Table 1.

That means users and librarian use those 217 common unique terms for defining books. Besides, the common terms occupy a very low portion of social tags (3.54 %). That means a major portion of social tags (96.46 %) are not present in SLSH term vocabulary. Another way, common terms occupy a major portion (56.07 %) of SLSH term vocabulary. That means there are 56 per cent chances to be used SLSH terms as social tags by users.

Table 1. Total terms, unique terms and overlapping terms

	Total terms	Unique terms	Overlapping terms	Per cent
Social tags	41313	6123	217	3.54
SLSH terms	3227	387		56.07

6.2 Rank Correlation of Overlapping Terms in History

The study also tries to measure the terminological association of overlapping terms based on usage in both vocabularies. That means the study is to identify whether a term is equally popular when used as social tags and SLSH terms. Spearman’s rank correlation was used where social tag vocabulary and SLSH term vocabulary were presumed as X and Y corresponding frequencies were presumed as rank. Overlapping terms were sorted (highest to lowest) according to their corresponding frequencies in both datasets. After careful consideration of data in both datasets, it is found that the ranks are found tied in many observations. Then a correction factor for both datasets is being added to the Spearman’s rank correlation equation where m = no of times the rank is tied. The following equation was used for Spearman’s rank correlation with correction factors in case of tied ranks. The Rank correlation factor is 0.93. That means there is a good association between

overlapping terms of both vocabularies.

$$r = 1 - \frac{6 \sum d^2}{n(n^2 - 1)} + CF_1 + CF_2 \tag{1}$$

Correction Factor for Social tags (CF_1)

$$CF_1 = \frac{m(m^2 - 1)}{12} \tag{2}$$

Correction Factor for SLSH term (CF_2)

$$CF_2 = \frac{m(m^2 - 1)}{12} \tag{3}$$

6.3 Jaccard Similarity Coefficient and Distance Based on Usage in History

In this portion the study wants to measure the similarity and dissimilarity between highly used social tags by users and highly used SLSH terms by the librarian. Jaccard similarity coefficient was used for gauging the similarity and Jaccard distance was used for gauging the dissimilarity between tags and terms. Top frequent social tags & SLSH terms were ranked in both datasets according to their corresponding frequencies and grouped into three different top frequent levels like 100, 200, 300 to show the similarity and dissimilarity in different levels. The following equation was used for the Jaccard similarity coefficient.

$$J(A, B) = \frac{|A \cap B|}{|A \cup B|} = \frac{|A \cap B|}{|A| + |B| - |A \cap B|} \tag{4}$$

(Where A = social tags & B = SLSH terms)

The following equation was used for the Jaccard distance.

$$1 - J(A, B) = \frac{|A \cup B| - |A \cap B|}{|A \cup B|} \tag{5}$$

(Where A = social tags & B = SLSH terms)

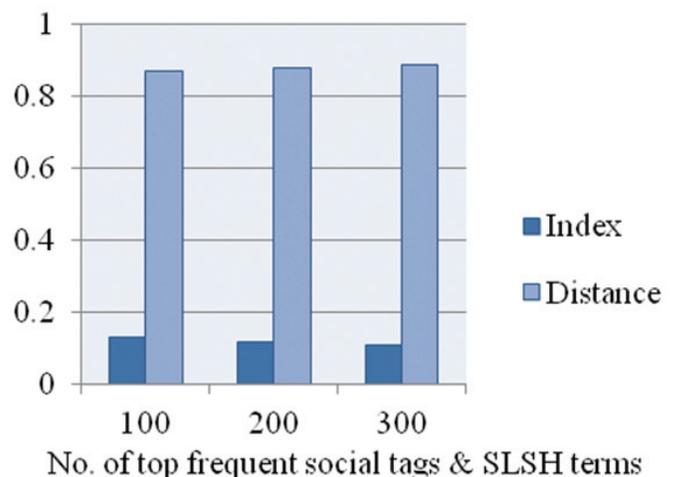


Figure 1. Jaccard similarity coefficient and Jaccard distance.

In the equation, $n =$ number of top frequent terms, $A =$ set of n frequent social tags and $B =$ set of top n frequent SLSH terms. Figure 1 shows the Jaccard index when n varies from 100 to 300. Jaccard similarity index becomes 0.13, 0.12 and 0.11 respectively for three different levels which indicates a low overlap between social tags and SLSH terms. On other side, Jaccard distance comes 0.87, 0.88 and 0.89 between them. This indicates top frequent social tags and SLSH terms used by both users and the librarian is different.

6.4 Top Thirty Frequent Social Tags and SLSH Terms in History

Subject-based terms are very effective for retrieving the exact documents through the library catalogues. To make library catalogues more effective, librarians and library professionals use more subject-based terms using some controlled vocabularies in the library since past. Subject-based terms denote the terms belong to a particular subject whereas non-subject terms denote the terms not belong to a particular

Table 2. Top thirty frequent social tags and SLSH terms with special reference to History and its allied subject

Social tags	Freq. in social tag vocabulary	Freq. in LCSH term vocabulary	LCSH terms	Freq. in LCSH term vocabulary	Freq. in social tag vocabulary
history	994	683	history	683	994
non-fiction	902	-	United States	319	-
to-read	693	-	world war, 1939-1945	127	-
American history	514	-	biography	123	340
unread	468	-	civil war	101	176
read	461	-	1861-1865	91	-
USA	459	-	campaigns	78	17
military history	426	06	Great Britain	53	152
US history	413	-	revolution	49	86
20th century	401	19	Europe	46	330
politics	391	-	politics and government	46	43
European history	357	-	Germany	43	143
war	353	-	India	35	53
biography	340	123	19th century	33	275
Europe	330	46	causes	32	-
military	326	03	France	32	116
hardcover	301	-	world war, 1914-1918	32	-
world history	285	01	social conditions	30	16
19th century	275	33	colonial period	27	58
ebook	266	-	England	27	-
kindle	260	-	civilization	26	54
American	247	-	presidents	26	69
wishlist	234	-	1600-1775	25	-
paperback	230	-	1775-1783	24	01
wwii	225	-	kings and rulers	22	13
Modern History	210	-	Rome	22	45
America	200	-	Soviet Union	22	62
own	191	-	1933-1945	21	01
historical	187	-	Greece	20	41
British history	181	-	Southern States	20	09

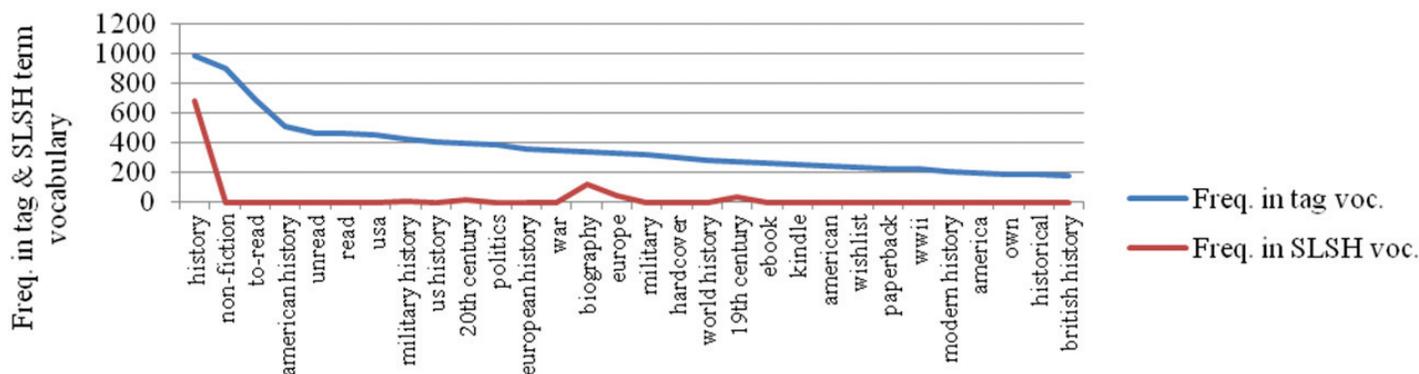


Figure 2. Top frequent social tags with their frequency in tag and SLSH term vocabulary.

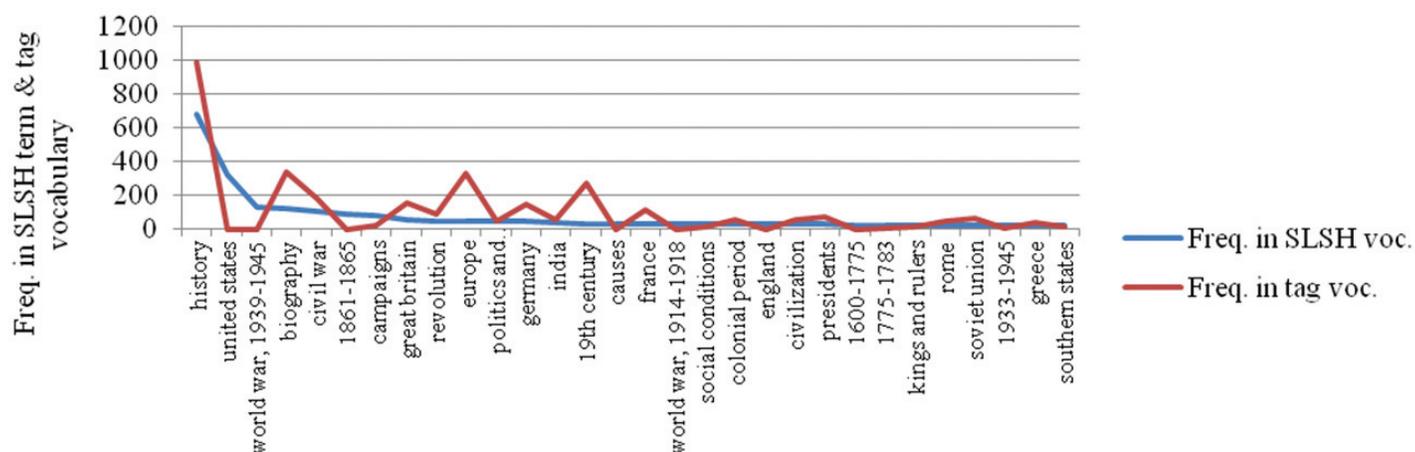


Figure 3. Top frequent SLSH terms with their frequency in SLSH and tag vocabulary.

subject but allied subject. In this portion, the study wants to measure which vocabulary contains more subject-based terms and which contains more non-subject terms. Table 2 defines that social tag vocabulary contains twelve subject-based terms (12), nine non-subject terms (09) and nine personal tags (09) e.g., ‘to-read’, ‘read’, ‘unread’, ‘kindle’, ebook’ and ‘wishlist’, ‘paperback’, ‘own’, ‘hardcover’. Personal tags are such tags that have been used by users not to define any subjects but to meet their own need.

On other hands, SLSH term vocabulary also contains eleven subject-based terms (11) and nineteen non-subject terms (19). The study reveals that out of top thirty frequent terms, only four (04) terms e.g., ‘history’, ‘19th century’, ‘biography’, ‘europe’ are common and of which one is a subject-based term mentioned as bold in Table 2. That means four common terms (04) and one subject-based term (01) are used by users and librarian in both vocabularies. Besides, the study also clarifies that twenty-two terms (22) out of the top thirty terms are used as social tags but not used in SLSH term vocabulary. Another way, seven terms (07) out of the top thirty terms are used as SLSH terms but not used as tags. That means there is more possibility of adopting SLSH terms as social tags rather than social tags as SLSH terms. Term frequency analysis also reveals that the term ‘history’ is used in 994 titles out of 1000 titles in social tag vocabulary whereas 683 titles in SLSH term vocabulary. That means users prefer the term ‘history’ in almost all the titles (99.4 %) but the librarian uses the term in near about

70 per cent titles (68.3 %). Other terms also have a different frequency which identifies the usage of terms in both datasets. The analysis overall reveals that users mostly use generalised terms but the librarian uses mostly subject-based terms.

6.5 Individual Title Wise Comparison of Social Tags with SLSH Terms in History

In this portion, the study compares the social tags assigned by users with SLSH terms assigned by the librarian for each book. The study reveals that in 884 books (88.4 %) where at least have one term matching and the rest for 116 books where no term matching is found. That means in major books (884) where both users and the librarian use at least one common term and the rest where both use different terms. Figure 4 reveals individual book-wise different matching scenario in the range of 0 to 100 per cent. The study reveals that in 185 books where 100 per cent matching is found. That means in those 185 books, where all the SLSH terms are used as social tags by users.

The other matching percentages are ≥ 80 per cent for 8 (0.8 %) books, ≥ 70 per cent for 61(6.1 %) books, ≥ 60 per cent for 232(23.2 %) books, and ≥ 50 per cent for 197 (19.7 %) books, ≥ 40 per cent for 58 (5.8 %) books, ≥ 30 per cent for 101 (10.1 %) books, ≥ 20 per cent for 42 (4.2 %) books and 0 per cent matching for 116(11.6 %) books.

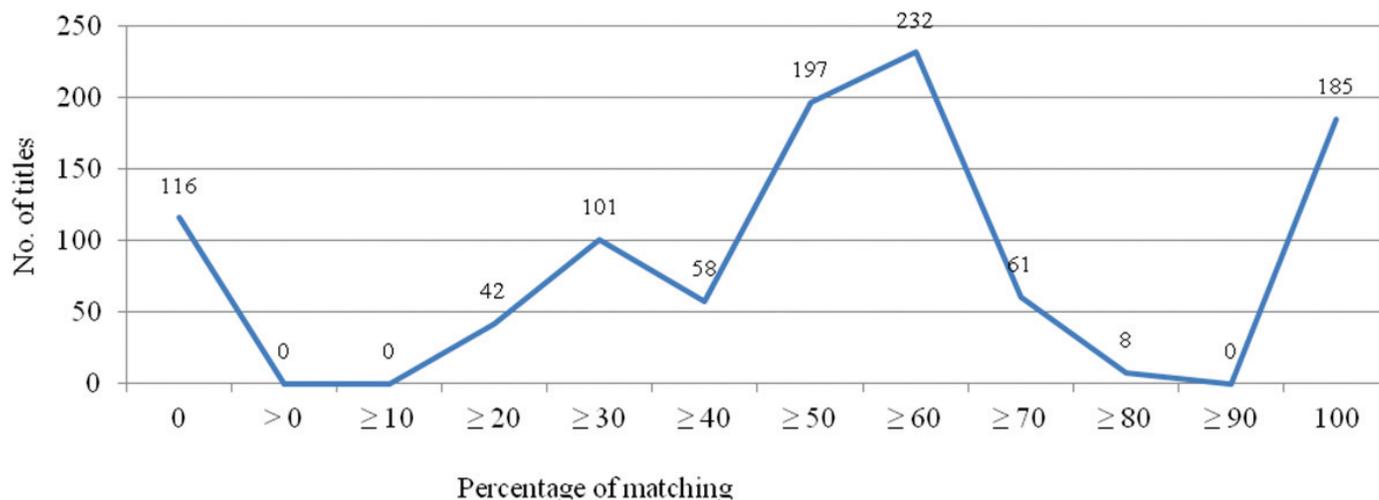


Figure 4. Individual title wise matching of social tags with SLSH terms.

Table 3. Total terms, unique terms and common terms appeared on titles

	Total terms	Unique terms	Overlapping terms
Social tags	1446	696	104
LCSH terms	431	113	

Table 4. Top social tags & SLSH terms appeared on titles

Social tags appeared on titles	Frequency	SLSH terms appeared on titles	Frequency
History	117	History	93
Civil war	52	Civil War	45
War	48	India	19
America	26	Europe	17
Europe	23	Germany	13
India	20	Japan	10
Germany	16	New England	10
Revolution	15	Revolution	9
New England	14	France	8
Britain	12	United States	8

Table 5. Social tags and SLSH terms

	No. of titles where at least one tag appeared	No. of titles where at least one SLSH term appeared	No. of titles where both appeared
Social tags & SLSH terms	854	357	331

6.6 Social Tags and SLSH Terms Compared with Each Book Title in History

Document titles play an important role in retrieving the resources on the web as well as in library catalogues. Since past, it has been found that either in the library or on the web, users mostly search for information or documents using its titles. This is because users think that titles are very easy to remember rather than the author or subject of documents. Besides, sometimes title-based search yields effective results than subject-based search²²⁻²³.

The study compares user assigned social tags and the librarian assigned SLSH terms for each book with the terms appeared on the title of that book. That means the study wants to know whether users or the librarian use mostly title based terms for cataloguing books. Table 3 reveals that in total 696 unique social tags (11.37% of total unique social tags) and 113 unique SLSH terms (29.19% of total unique SLSH terms) were matched with both vocabularies respectively and out of which 104 unique terms (14.94% of unique social tags & 92.04 per cent of unique SLSH terms appeared on titles) are common. The study reveals that unique terms appeared on titles were matched mostly with the social tag vocabulary. Even the quantity of matching of unique title terms with social tag vocabulary was six times more than the title terms matched SLSH term vocabulary. This is because users mostly prefer to use title based terms whereas the librarian prefers to use subject-based terms using controlled vocabularies.

Top ten frequent unique social tags and unique SLSH terms appeared on titles are mentioned in Table 4. The study also tried to identify how many books have at least one social tag or one SLSH term was matched with their title terms. Table 5 reveals that 854 (85.4 %) books have at least one social tag matched with their title terms and 357 (35.7 %) books have at least one SLSH term matched with their title terms and the both were appeared for 331 books (33.1 %) out of 1000 books. Figure 5 reveals that how many unique social tags and unique SLSH terms are matched with the terms appeared on each book title. The study reveals that in major books i.e., 409 (40.9 %) books in social tag vocabulary have at least one social tag matched with title terms and in case of SLSH term

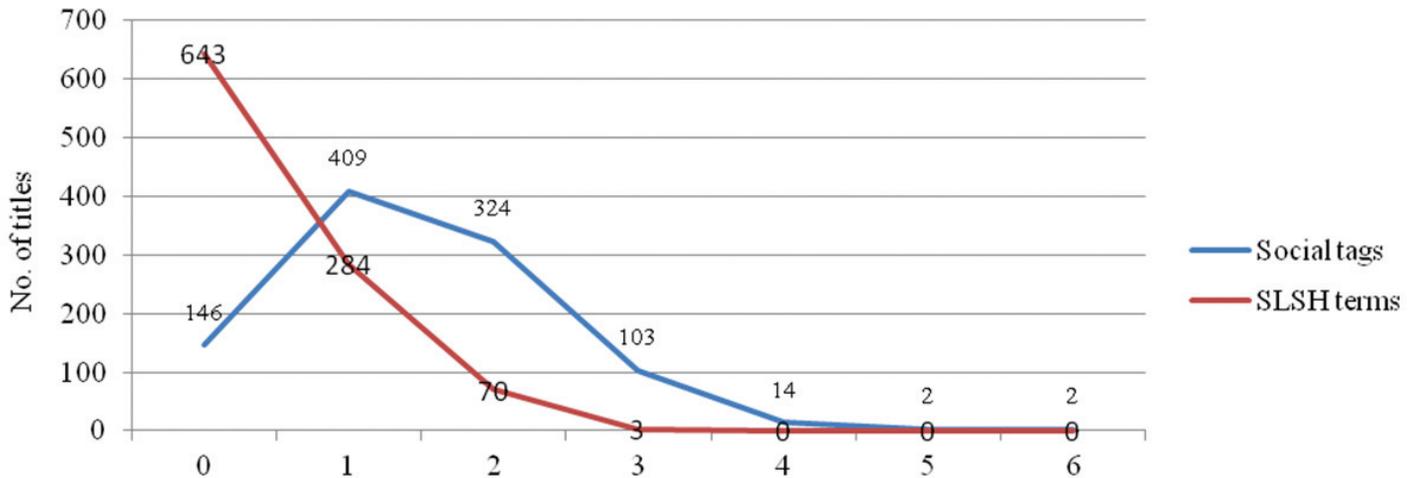


Figure 5. Social tags & SLSH terms matched with keywords appeared on each title.

vocabulary, major books i.e., 643 books (64.3 %) have zero matching with their title terms and 284 books (28.4 %) have at least one matching with their title terms. So, the study further reveals that users prefer title based terms and the librarian use subject terms.

7. CONCLUSIONS

The study reveals many fruitful results regarding the applicability of user-generated social tags in the domain of History in library catalogues.

The terminological comparison reveals that social tag vocabulary is fifteen times more than SLSH term vocabulary. Besides, the study shows that only a small portion of terms is overlapped (3.54% of social tags and 56.07% of SLSH terms) with each other. That means common terms occupy a major portion of SLSH term vocabulary but a very small portion of social tag vocabulary. That further means that social tag vocabulary contains many terms beyond SLSH terms. This is as because any user can assign any keywords for describing any resources on the web. Some users use subject-based terms and some users use terms to meet their own needs rather than subject-based terms. The study reveals a clear vocabulary difference between those databases. Though vocabulary difference exists, Spearman's rank correlation proves that there is a good association of overlapping terms in both datasets.

Jaccard similarity coefficient suggests that the similarity between top frequent social tags and SLSH terms in different word levels (100, 200 and 300) is very low (0.13, 0.12 and 0.11). That means both users and the librarian do not prefer the same terms for defining books. But individual book-wise comparison also defines that users and the librarian use at least one common term for major books (88.4 %). In the rest portion (11.6 %) both users and the librarian use different terms. The study also highlights that in 68.3 per cent of books where users share 50 to 100 per cent common terms with the librarian. Users use few subject-based and non-subject terms (21) and also some personal tags e.g., 'wishlist', 'paperback', 'hardcover', 'kindle' etc. Those personal tags may be important for the users but cannot be applied to library catalogues or library databases.

On the other side, the librarian uses only subject-based and non-subject terms (30).

The comparison consisting of each book title with social tag and SLSH term vocabulary reveals that social tags mostly matched with the title terms than SLSH terms. The study highlights that total 696 unique social tags (11.37% of total unique social tags) matched with the title terms whereas 113 unique SLSH terms (29.19% of total unique SLSH terms) matched with the title terms. Further, the study reveals that 85.4 per cent of books where users use at least one term from the title of books. On the other side, the study indicates that 35.7 per cent of books where the librarian prefers terms from the title of books. That means users mostly prefer to use title based terms for defining resources. This is as because the LibraryThing has allowed users an opportunity to define any resources based on their needs. Users of the LibraryThing may or may not have the good knowledge of the concerned subject and even they don't know how to use controlled vocabularies that library professionals or librarians use in the libraries. If they have a good knowledge of the subject, it is expected that they use subject-based terms rather than using title based terms or personal terms for good mnemonics.

Controlled vocabularies have been used over the years to describe library resources in such a way that can yield proper retrieval of information. Libraries can allow users to describe library resources through user-generated social tags alongside librarian-generated terms. That means using those social tags, libraries can stretch their catalogues by allowing the terms other than librarian or library professionals. In this way, libraries can improve their catalogues in such a way that can fulfil the variety of search requests by supplementing controlled vocabularies. Through that way, social tags facilitate to enhance the accessibility of library resources. Further, the study reveals that social tags suffer from many quality issues like homonyms, synonyms and semantic ambiguity etc. Beside social tags contain less subject terms and more personal terms that are ineffective for incorporating into library databases. In another way, social tags are not independently capable of describing the library resources and fulfilling the need of library users. In that way, the study suggests that social tags

can complement to controlled vocabularies⁵ but cannot replace it from libraries²⁴.

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