@toread and Cool: Tagging for Time, Task and Emotion

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Abstract — This paper examines the use of non subject related tags in three social bookmarking tools (Del.icio.us, Connotea and Citeulike). Previous studies of Del.icio.us and Citeulike determined that many common tags are not directly subject related but are in fact affective tags dwelling on a user's emotional response to a document or are time and task related tags related to a users current projects or activities. A set of non subject tags from the previous studies was used to collect posts with non subject tags from the three listed social bookmarking tools. These tags have been analysed to examine their role in the tagging process.

1.INTRODUCTION

Social Classification or tagging is increasingly a subject of interest in information architecture (and related fields) as social bookmarking tools such as del.icio.us and flickr have become increasingly popular. Some argue that simple visualisations of tags, such as sorting tags by frequency or displaying tag clouds, in which tag size denotes popularity show that tagging systems form interesting new taxonomies or folksonomies of related terms. Others argue that the ample evidence of such symptoms of mob indexing, as spelling variations and lack of synonym or vocabulary control, show that such systems will never replace conventional indexing systems. Previous studies of Del.icio.us (Kipp and Campbell 2006; Golder and Huberman 2006) and Citeulike (Kipp 2006) determined that, while many common tags are subject related and may in fact form a reasonable set of "good enough" indexing terms, many other common tags are not directly subject related but are in fact affective tags dwelling on a user's emotional response to a document or are time and task related tags. This finding raises questions beyond those of convergence and divergence with traditional cataloguing and classification theory and practice and indeed suggests that users may be doing more than just classifying material with a set of potentially useful keywords. This preliminary study examines the nature and use of non subject tags in tagging systems.

2.BACKGROUND

The free form nature of social classification systems, allowing users to apply their own verbal descriptors to items rather than supplying them with a carefully controlled vocabulary list, has allowed a potentially revolutionary form of personal indexing to emerge. While users have been classifying and labelling their own documents solo for a long time, social classification systems allow these tags to be combined into a net of interconnected personal classification systems. The interconnection of these personal classification systems has the potential to provide invaluable examples of how people classify their documents.

Tagging systems assume that these user created tag networks may evolve into folksonomies and, thus, show useful patterns emerging from a mass of words. This assumption is rooted in the early history of the Internet and the web in which individual users provided information about what interested them and clusters of interested individuals formed. Concurrent with this notion is the assumption that the World Wide Web constitutes a complex, adaptive system as described in complexity theory. (Waldrop 1992, 11; Johnson 2000, 18) Potential examples of this form of

behaviour are seen in the success of Google's PageRank algorithm which was designed to take advantage of collective unconnected linking patterns to discern quality and interest levels. (Brin and Page 1998) Early studies of tagging systems suggest that they may well form a complex, adaptive system, but the rules of the system behaviour have not yet been discerned. (Anthony and Toal 2006) Certainly there is evidence that tags and social tagging systems do provide a rudimentary indexing system which has the potential to enhance search where it is not possible to provide a full scale classification system. (Golder and Huberman 2006; Kipp and Campbell 2006)

The issues of navigability, findability and relevance are at the core of information architecture and at the core of classification. Classification systems attempt to provide a solution to the problem of navigating a large document space in search of information. The sheer size of document spaces and the ambiguities inherent in natural languages make this a problematic endeavour, but a well designed classification system can compensate for ambiguities of language and provide useful interconnections between related topics. The increasing use of digital storage methods and the explosion of the creation of information on the Web has only strengthened the importance of being able to simultaneously distinguish between similar documents and locate relevant documents. Unfortunately, existing classification system have not scaled at the same rate as the accumulation of data. This gap, between the ability to generate knowledge and the ability to classify it and make it findable, is only likely to increase as the web grows.

The rise of social bookmarking sites, with collaborative tagging systems, suggests an alternative method for creating classification systems. Some scholars have suggested that social bookmarking sites could function as a solution to the problem of scaling controlled vocabulary to match a rapidly expanding document set by providing "good enough" or rapid indexing of documents, to be followed by more rigorous vocabulary control as the documents mature. (Hammond et al 2005; Morville 2005) Others have suggested that tags coupled with topic maps and tag clusters may eventually provide all the benefits of a controlled vocabulary using tag networks to control for terminological differences, while still allowing the use of user terminology. (Shirky 2005)

In the past, classification was left to trained indexers or remained personal and private. Now, tagging allows ordinary users to participate in collaborative indexing ventures on the web allowing an unparalleled view of how users actually index items as well as suggesting a possible method for allowing classification to scale with the growth of information.

Studies of social bookmarking tools suggest that there are differences between indexing as created by users versus trained indexers. Kipp (2006) examined tag use in Citeulike, a social bookmarking service which is specialised for academics. Special bookmarklets allow academics to post references to journal articles to Citeulike from electronic article databases and easily store necessary bibliographic information for producing reference lists, as well as encouraging these users to tag the articles with useful keywords. Tags were collected for a subset of information science related articles and compared to controlled vocabulary terms applied to these articles (indexing terms from major indexers like INSPEC and Library Literature). While many tags chosen by Citeulike users were indexing terms or related to indexing terms, a surprising number of these terms were not subject related at all. Terms such as toread and fun showed up in the sample. (Kipp 2006) These terms do not describe the aboutness of the document and would seem at first glance to be noise in the tag cloud. A study of Del.icio.us by Kipp and Campbell (2006) found similar results. While a majority of tags were subject related and, in fact, bore some evidence of the development of a decent consensus on the aboutness of the studied URLs, over 16% of the tags in this study were found to be non subject related.

These non subject tags tended to belong to one of two groups: affective tags and time and task related tags. Affective terms consist of words that describe an emotional state. Rubin, Stanton and Liddy (2005) discuss the use of affective terms in text to discern the emotional slant of a text. Their work attempts to classify subjective evaluative terms in the text into positive or negative affect categories. Examples of positive affect terms are enthusiastic and excited. Examples of negative affect terms are dull and unhappy. (Rubin, Stanton and Liddy 2005) Time and task

related tags consisted of compound words such as 'toread' and 'todo' and appeared to indicate a desire to combine information about tasks and activities with subject classification terms. Many of the time and task related tags examined in this study are of the form 'toread', 'todo', 'tobuy' and especially cover many spelling variations of the word 'toread'.

If these tags are widely used, they may indicate a desire on the part of users to more closely associate the task of classifying a subject and tying it to a concrete project or task. An analysis of these time and task tags along with affective tags and other non subject tags could shed additional light on the tagging phenomenon. As well, such an analysis could provide invaluable information on how users classify and organise information.

3.RESEARCH QUESTIONS

- What patterns of user tagging activity emerge on examination of affective or time and task related tags?
- How do users use time and task related tags or affective tags to indicate the value they see in a document?
- What implications do the use of affective or time and task related tags have for the organisation of information?

4.METHODOLOGY

This study examines the use of non subject tags in three social bookmarking tools which do not fit the mould of traditional cataloguing and classification. These tags include two major categories:

- affective (emotional) tags
- time and task related tags.

The three social bookmarking tools chosen for this study were Del.icio.us, Citeulike and Connotea. Del.icio.us (http://del.icio.us) is a social bookmarking service oriented towards any user. No special features are provided to encourage any particular group or the bookmarking of any specific type of item. Citeulike (http://citeulike.org) is a social bookmarking service designed for use by academics who wish to bookmark academic articles for later retrieval. Connotea (http://connotea.org) is a social bookmarking service designed, like Citeulike, for academics. While Citeulike was originally quite strict in only allowing academic journals, Connotea allowed academics to store less scholarly material from the beginning.

Data was collected from Del.icio.us, Citeulike and Connotea via python scripts designed to gather information on all posts related to specified tags.[1] Posts in a social bookmarking tool consist of at minimum a title, URL and associated user name. A majority of posts (94% in Kipp and Campbell 2006) will have associated tags. A minority of posts will also contain a written description or note.

The list of affective and time and task related tags used for this study was assembled from a number of sources. First, a study by Kipp and Campbell (2006) which examined patterns in tagging. Analysis of this data showed approximately 16% of tags were time and task related. Time and task or affective tags were located in multidimensional scaling graphs of cotag (coword) data. (Kipp and Campbell 2006) Additional tags were collected from a pilot study by Kipp (2006) examining the similarities and differences between descriptors, author keywords and user tags assigned to academic articles bookmarked in Citeulike. Despite the scholarly nature of this social bookmarking site, affective tags were located in the sample and time and task related tags were also part of the population. Additional affective tags were collected from Rubin, Stanton and

[1]These scripts, named delicious.py, citeulike.py and connotea.py, collect data based on a given URL, tag or user name. RSS feeds are used where available, otherwise data is collected via a screenscrape of the HTML.

Liddy (2005) on the subject of techniques for natural language processing of affective terms in text. This list is not an exhaustive list of either time and task or affective tags, but does provide a good preliminary examination of the phenomenon.

Examples of affective tags include interesting, fun and cool. Examples of time and task related tags include @toread, todo, and tobuy. The full list of tags examined is in Appendix A.[2]

For each tag in the list, the python scripts will collect all posts which have been tagged with this tag from each of the three social bookmarking tools. These posts are stored for later analysis. Posts were collected from all three social bookmarking sites between October 20th and October 31st. Posts from each social bookmarking tool were collected in a single collection sweep lasting from 5-6 hours for Citeulike and Connotea to 40 hours for Del.icio.us.

5.ANALYSIS AND RESULTS

A total of 83 tags were examined in this study. Of this number, 48 fell into the category of time and task related tags, 30 were affective tags and the remaining 5 consisted of the prepositions for, on, in and of and the conjunction and. A majority (78) of the tags were in English; 5 tags were in French (lire, alire, @lire, acheter, amusant). Tags in languages other than English did occur in the two previous studies, but were a very small part of the populations. This does not suggest that other language tags do not appear frequently on the three tools, only that they do not yet appear frequently in the popular tag clouds.

A total of 1831 posts were collected from Citeulike, 2891 from Connotea and 198630 from Del.icio.us. This gives a total of 203352 posts in all from all three sites.[3] Since the number of posts obtained from Del.icio.us is several orders of magnitude larger than the other two sites, data was normalised by total posts per site for comparisons.[4]

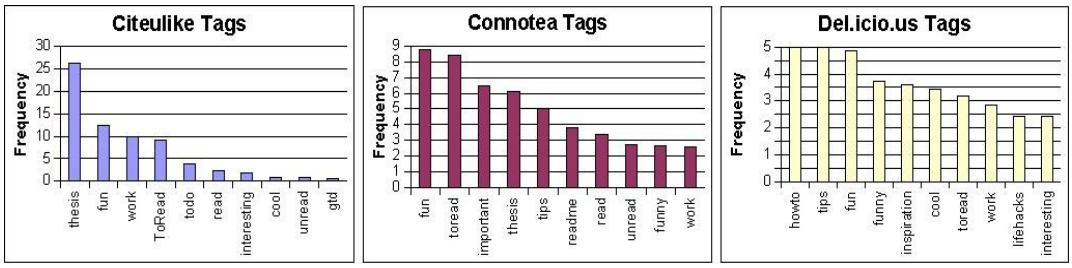

Figure 1: Top 10 Tags by Normalised Frequency

A number of the tags in this study are very popular and appear on the respective popular or frequently used tag cloud pages for their sites. [5] As of October 31st, 2006, the tags 'cool', 'daily', 'fun', 'funny', 'toread' and 'work' appear in Del.icio.us' tag cloud, the tag 'and' appears in

[2]It is worth noting that tags in Connotea and Del.icio.us are not case sensitive, but tags in Citeulike are case sensitive.

[3]It is worth noting that Del.icio.us recently announced that it had reached 1 million users while Citeulike and Connotea, catering to a more specialised audience, have smaller numbers of users.

[4]The normalisation used in this preliminary result is rough, but of a reasonable magnitude. Del.icio.us has announced that it recently acquired 1 million users and Citeulike and Connotea are estimated at several thousand users apiece.

[5]Tag cloud sites: Del.icio.us - http://del.icio.us/tag/, Citeulike - http://www.citeulike.org/, Connotea - http://www.connotea.org/cloud

Connotea's cloud and the tag 'of' appears in Citeulike's cloud. Many of the affective terms were only lightly used in Citeulike and Connotea but appeared in Del.icio.us, no doubt due to the size of the respective populations and the nature of the different sites. Only one of the affective terms from Rubin et al (2005) was not used at all.

As noted in the graphs in figure 1, fun is a popular tag on all three sites and is surprisingly heavily used on Citeulike and Connotea considering their bias towards scholarly articles.

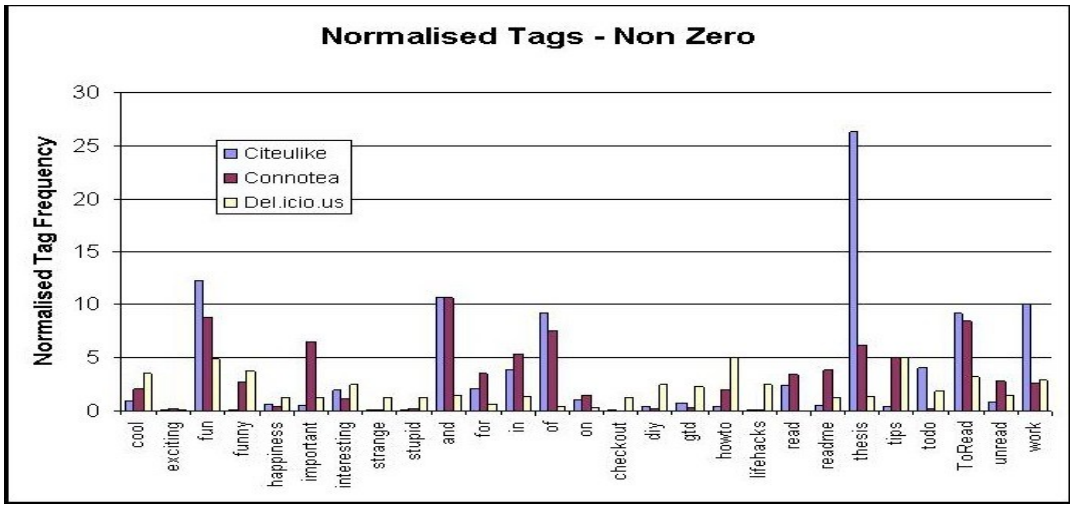

Figure 2: Comparison of Normalised Tag Frequencies by Social Bookmarking Tool

The most popular tags across all sites in raw numbers were ToRead and fun. The presence of the tag 'fun' on Citeulike and Connotea was initially a surprise, however, Connotea allows scholars to bookmark non scholarly materials and in any case it is certainly reasonable to expect dedicated scholars to find some scholarly material fun or interesting.

The prevalence of prepositions and conjunctions such as 'of', 'in' and 'and' in the tag lists was a surprise. An examination of the tag lists from which these tags occur suggests that the use of these prepositions is by people who are using phrases to tag an item instead of individual words or meaningful compound words. This indicates a class of user who may not be entirely aware of how the various sites form tags, e.g. spaces are not generally a legal character inside a tag.

Time and Task Related Tags

Many of the toread tags have very low usage numbers on Citeulike and Connotea, in fact many variations which are quite popular in Del.icio.us are not used at all. When normalised, however, these tags are shown to be more common in Citeulike within the context of this sample.

The diversity of toread type tags in Del.icio.us versus that in Citeulike and Connotea does suggest that users of delicious are more highly divided on how to write 'toread'. It is unknown whether this is due to the much larger size of the user base or to the differing natures of the user base.

Citeulike provides additional logic for tagging an item as toread and providing an interest marker of how interested you are in reading it, despite this some users have used the toread tag. Neither of the other services offers this as a possibility. This may account for the relatively higher total number of toread type tags in Connotea.

At first glance, 'toread' seems to be a tag with very little value outside of a single person's personal organisational system, but Amazon's recommendation system has shown that collective information about buying patterns can be very useful for users who are interested in finding material that is like the material they are currently reading or watching. This suggests that the toread tag could function like a colleague's e-mail suggesting that the article is interesting and worthy of a little of your time. As a tag, it functions as an indicator of interest.

Tagging relies inherently on the same kinds of methods people use to organise their personal information. Research in personal information management has found that people tend to organise their information, not just to enhance findability, but also to remind them of what they were working on. In fact, in studies of how people classify documents, participants often provide situational factors such as contextual project information in addition to document specific factors such as title and subject. (Kwasnik 1991) Additionally, people find it easier to locate things by physical location than via classification. Hence the worth of project folders or inboxes. (Malone 1983) Other researchers corroborate these findings and also note that users find it easier to find things by recognising them than by searching for or remembering them. (Bewley et al. 1987, 662; Sellen and Harper 2002) Bowker and Star discuss this phenomenon and also remark on the highly task oriented folk taxonomies people develop for organising the things on their desk. (Bowker and Star 1999, 2-3) Recent research has been examining this question in the realm of the organisation of digital files. (Jones et al 2005)

Tags that appeared to be related to specific projects, such as acronyms or tags which looked very much like university course codes, were present in both previous studies, however these tags were not included in this study as finding them is often a hit or miss proposition. Similar to the toread tags, though, these tags could be highly useful for finding specific information about specific projects or locating material that other students or professors found useful for a course.

Affective Tags

The affective tags were noted in the previous two studies as an oddity in what appeared to be a rudimentary distributed classification effort. Tags such as cool or fun do not appear to add anything to the subject classification of an item and would also not seem to be good candidates for search terms for information retrieval.

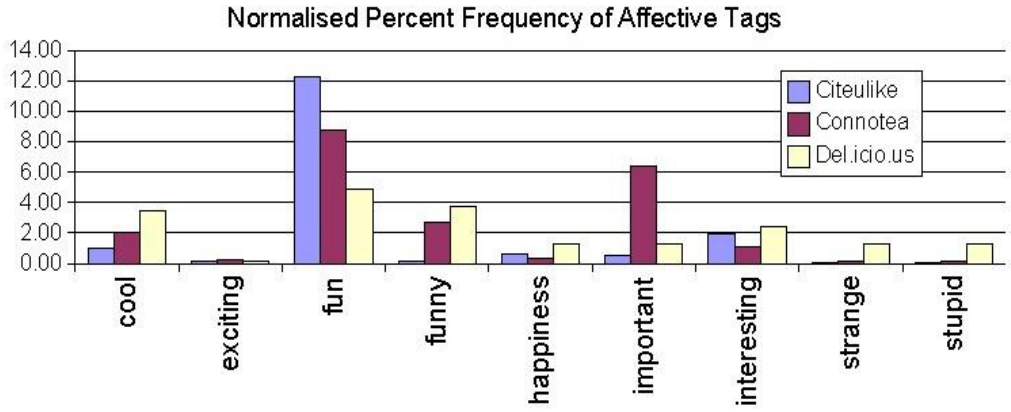

Figure 3: Comparison of Affective Tag Usage

In Kipp and Campbell (2006) it was suggested that such tags represented an attempt by users to add an additional personal access to classification. These terms presumably indicate the user's

emotional reaction to the document, or perhaps the emotional reaction the user expects to have after putting information in the document into practice. These terms are obviously subjective and have thus far been excluded from classification systems for this reason alone. However, the use of such terms in social bookmarking tools suggests that they are meaningful for users.

Non Subject Tags in Combination with Subject Tags

A preliminary analysis of subject tags allied with non subject tags shows that scholars posting articles on Citeulike and Connotea do indeed find some scholarly articles to be 'fun' or 'cool'. Especially fun were articles in the realm of mathematics, physics and computation.

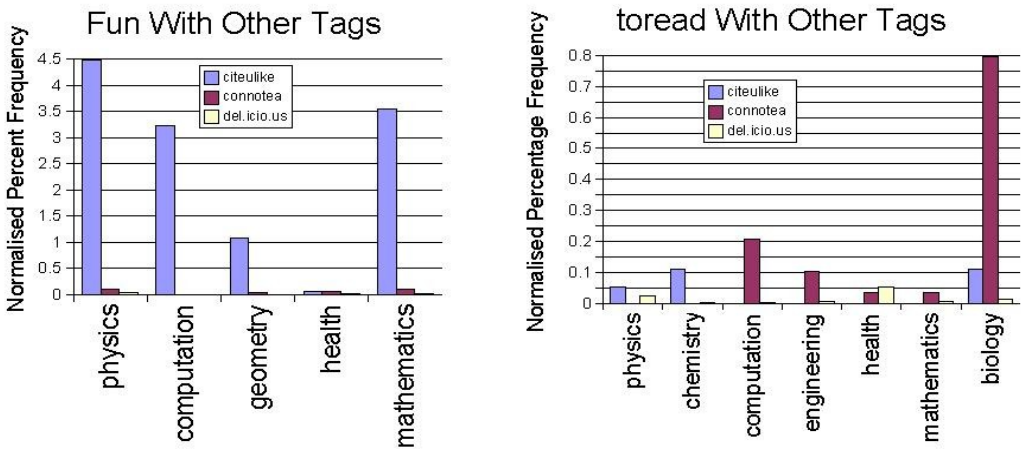

Figure 4: Non Subject Tags in use with other tags

The tag 'toread' was also linked with many articles tagged with various scientific field related tags. Relative usage on Citeulike was low, but again, this is likely due to the existing additional mechanisms available to users who wish to indicate their desire to read an article. Usage on Connotea was quite high as there is no additional mechanism for indicating intent to read.

6.DISCUSSION

The idea behind social bookmarking tools is to harness the power of the network effect on the web to create a more useful search system by combining the efforts of users in the assignment of labels (tags) to a bookmarked item. Users post a bookmark to the social bookmarking tool of their choice. This bookmark may be a website, a journal article, a video, a picture or some other form of media. To this bookmark are added tags and any other descriptive material. The system is then free to list information about a bookmarked item such as: the list of users who bookmarked it, the list of associated tags and so on. Likewise, the system can combine tags to show which items have been tagged with the same tag or set of tags.

Many users of del.icio.us, citeulike and connotea appear to want to store more than just the subject of the documents they are bookmarking. Tags such as @toread, tobuy, todo, fun and cool suggest that users see their relationship to these documents in different ways. While the latter tags express an emotional connection to the document, the former show evidence of a desire to attach personal information management information to documents. This desire to combine personal information management and document classification echoes findings in document use research at Xerox in

which users categorised items in order to better understand their relationship to other items and to tasks the users wished to perform. (Sellen and Harper 2002)

The use of such non subject tags, tags which are deliberately excluded from traditional classification systems due to their potentially temporary or task specific nature, shows that users may see classification as a holistic process closely tied to themselves and their work. This view of classification is of interest to all who design classification systems to aid users in the location of information.

A large part of information architecture is involved in the examination of how users seek and use information. Another important aspect of this is how they relate to information. (Bates 1998, 1048) Findings from this study suggest that users relate information to time related tasks, activities and their own emotional reactions.

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APPENDIX: ALL TAGS COLLECTED

Affective Tags

@cool
amusing
awesome
bastards
boring
cool
curious
exciting
favorite
favourite
fishy
frustrating
fun
funny
happiness
happy
important
inspiration
intense
interesting
jarring
odd
relaxing
remarkable
strange
stressful[6]
stupid
trendy
unusual

Time and Task Tags

.tobuy
.toread
@daily
@learn
@pending
@read
@readreview
@todo
@toread
*read
*toread
2read
checkout
daily
diy
followup
gtd
howto
lifehacks
Old
read
read_later
readlater
readme
Recent
SitesToRead
thesis
tips
to-do
to-read
to-visit
toblog
Tobuy
todescribe
todo
ToDo
ToRead
toread
unread
week
week1
week2
week3
work

Other Unusual Tags

on
of
for
in
and

[6]Not used.