Web 2.0 and Folksonomies in a Library Context

Abstract. Libraries have a societal purpose and this role has become increasingly important as new technologies enable organizations to support, enable and enhance the participation of users in assuming an active role in the creation and communication of information. Folksonomies, a Web 2.0 technology, represent such an example. Folksonomies result from individuals freely tagging resources available to them on a computer network. In a library environment folksonomies have the potential of overcoming certain limitations of traditional classification systems such as the Library of Congress Subject Headings (LCSH). Typical limitations of this type of classification systems include, for example, the rigidity of the underlying taxonomical structures and the difficulty of introducing change in the categories. Folksonomies represent a supporting technology to existing classification systems helping to describe library resources more flexibly, dynamically and openly. As a review of the current literature shows, the adoption of folksonomies in libraries is novel and limited research has been carried out in the area. This paper presents research into the adoption of folksonomies for a University library. A Web 2.0 system was developed, based on the requirements collected from library stakeholders, and integrated with the existing library computer system. An evaluation of the work was carried out in the form of a survey in order to understand the possible reactions of users to folksonomies as well as the effects on their behavior. The broad conclusion of this work is that folksonomies seem to have a beneficial effect on users' involvement as active library participants as well as encourage users to browse the catalogue in more depth.

Keywords: Library 2.0; folksonomies; Web 2.0.; system development; design research.

1 Introduction

Libraries form an essential part of academic institutions. Their role transcends the mere function of depositories of published information sources. Academic libraries have traditionally enabled and facilitated the exchange and growth of information, knowledge and culture among teachers, students and the general public. In this sense libraries represent a focal point of academic life and as such

serve also a societal purpose of bringing together people around common themes. This purpose is nowadays enhanced and facilitated by the use of technology and, in recent times, by the so-called Web 2.0 (Maness, 2006).

As with all organizations, libraries continuously undergo change. Change is determined predominantly by users' evolving needs and users' needs are sometimes induced by the presence of novel technology which makes possible what was previously not possible or impractical. Web 2.0 represents an example of such a technology.

Web 2.0 is based on a few underlying principles. Among these the following three principles capture the essence of Web 2.0 as opposed to other digital technologies and the Web (1.0) itself: (1) the Web is the platform, (2) the user controls their own data and (3) architecture of participation (O'Reilly, 2005). The combination of these principles has enabled the production of Web-based applications that have evolved the Web into a participative Web. Thus, the natural overlap of intention and purpose between Web 2.0 (as a technology) and libraries (as a driver of knowledge integration) has lead to development and research in the area of Library 2.0 (Bradley, 2007).

As Houghton-John (2005) defines it, Library 2.0 "simply means making [a] library's space (virtual and physical) more interactive, collaborative, and driven by community needs". Although these aims are not novel to libraries (Godwin and Parker, 2008), the definition can be interpreted in light of the greater awareness of the relevance of social participation among a library's community. Library 2.0 has multiple facets reflecting the typical means of user participation that Web 2.0 enables. These facets include blogging, tagging, social bookmarking, social networking, podcasting and so on. Library systems that use or have experimented with such technology include the University of Pennsylvania (Allen and Barnhart, 2008) and the Kresge Business Administration Library (Zimmer and Ziph, 2008). The former developed a bookmarking system called PennTags, while the latter introduced podcasting.

The research presented in this paper investigates the use of folksonomies in an academic library context as a means to improve user classification of published material and as integrated support to traditional classification systems. Folksonomies result from individuals freely tagging resources available to them on a computer network. The research is development-based and structured into two main parts: design and evaluation. Firstly, a folksonomy-based system was developed for the library of Brunel University in the United Kingdom. Secondly, the system was evaluated through a survey to library stakeholders in order to understand the benefits and limitations of the adoption of folksonomies in academic libraries.

The paper is structured as follows. Section 2 presents the background and the motivation to the problem as well as the technical Web 2.0 tools used to realize the developed system. Section 3 briefly discusses the research design of the study. Section 4 presents the developmental phases of the study in terms of requirements, design and implementation. The evaluation follows in Section 5 and conclusions are presented in Section 6.

2 Background

2.1 Library Classification Systems

Traditionally libraries are viewed as collections of published material (books, journals, audiovisuals, etc.), each of which having a physical location on a shelf. Modern classification systems date back to the 19th century. The main purpose of such systems was the classification of publications according to predefined subject categories and the physical addressing of the material on a library's shelves. Classification systems that are widely adopted by modern libraries include the Library of Congress Subject Headings (LCSH) and the Dewey Decimal Classification (DDC). The primary difference between the two systems lies in the way in which subjects are categorized and how the categories are coded. For example, the category referring to 'rare books' is coded as Z1019-1033 in LCSH and 090 in DDC. These codes then form the basis of 'call numbers' used to find publications.

Both LCSH and DDC present rigid taxonomies that make changing of the categories quite difficult (Antelman et al., 2006). In fact such classification systems undergo change based on the work and decisions taken by central bodies. This policy has the benefit of making the categorization of concepts and subjects consistent across libraries. On the other hand, the sole adoption of either LCSH or DDC as the basis of classifying and providing knowledge on published material reduces the possibility of other forms and levels of information. More specifically, a library member's role is reduced to that of just a borrower.

In order to empower library users and make them more active participants within the community served by a library (e.g., a University), Online Public Access Catalogs (OPAC) enhance the adoption of traditional classification systems so as to allow for individuals to 'say their own' about the publications they read. One means of achieving this requirement is by the use of 'tags'; users would be able to express information about a certain publication by conceptually attaching keywords to it. Although tags in themselves are not taxonomical classes, they can be adopted to overcome some limitations of classification systems and can be used to derive classes of publications having the same tag(s). More specifically: (1) multiple classification of titles can occur and (2) categories derived from tags are not fixed but can be generated by a user. Tags are the foundational elements of folksonomies. Folksonomies represent one of the 'conceptual technologies' that Web 2.0 is based on.

2.2 Web2.0 and Library Systems

The term Web 2.0 was coined in 2004 by O'Reilly Media (Needleman, 2007) and the key concept is using the Internet as a platform (O'Reilly, 2005). Web 2.0 was defined as follows:

> "Web 2.0 is the business revolution in the computer industry caused by the move to the Internet as platform, and an attempt to understand the rules for success on that new platform. Chief among those rules is this: Build applications that harness network effects to get better the more people use them. (This is what I've elsewhere called 'harnessing collective intelligence.')" (O'Reilly, 2006)

2.0 is not a version number in the same sense as in software releases, it is an expression meaning the current state of the art of web development. Much of the functionality of Web 2.0 was also possible, and in many cases, exists in the traditional Web. However, Web 2.0 implements this much better and with enhanced response and interactivity allowing a richer user experience, one example being online applications like the word processor docs.google.com. (Ankolekar et al., 2007; Needleman, 2007).

In Web 2.0 the user is seen as a contributor; when (s)he tags some information or an object it benefits the community. Community is an important part of Web 2.0 and popular sites like flickr.com, del.ico.us and youtube.com all have communities. The collective intelligence obtained gives valuable organized information in the form of a folksonomy, which will be discussed later (O'Reilly, 2005).

In order to get the responsiveness and interactivity from Web 2.0 sites a development technique called AJAX (Asynchronous JavaScript and XML) has emerged (Zajicek, 2007). According to Ankolekar et al. (2007) AJAX is the technological pillar of this generation of Web pages. In addition to responsiveness and interactivity, Web 2.0 can provide a desktop application feel and functionality. It also enables easy implementation of content/services from other websites; this is called mashup. A mashup is a collection of services added to a page from different web sites. Service sharing is encouraged in Web 2.0, which helps improve the user experience by enhancing the site with useful services, for example stock market information on a business news page (Ankolekar et al., 2007). AJAX enables this by not requiring a page reload to update content. This improvement in interactivity has boosted the availability and popularity of social tagging.

Social tagging has lead to the definition of folksonomy which is " . . . the result of personal free tagging of information and objects (anything with a URL) for one's own retrieval. The tagging is done in a social environment (usually shared and open to others). Folksonomy is created from the act of tagging by the person

consuming the information." (Vander Wal, 2005). While the tagging is done socially, it is not a direct collaboration between participants, but the result of this tagging is shared in the community and as a result, produces collective intelligence.

Folksonomies let users organize the information in a way that suits them, so they can easily retrieve the information later. Sometimes people have surprising ways of tagging information. It may seem unnatural to librarians for instance, but it is the way the users' minds connect with and understand the information. This could lead to cross-links between information that would never have come to light without the use of folksonomy. This is one area where a folksonomy really could show its usefulness in a library environment. Another is that libraries have a special keyword search technique that is difficult for normal users to understand and folksonomies use an easier vocabulary (West, 2007).

One major issue with social tagging is how much control should be given to the users. Should they be able to add any tag, should they be allowed to edit tags that are not their own and should they be able to delete their own or other's tags? Marlow et al. (Marlow et al., 2006) explain different types of tagging rights and support that can be used in social tagging. As with most technology it is about compromise. Tagging rights are about who should have control over a resource, who should be able to add, edit or remove a tag. This is usually linked to user rights. The best solution in a perfect world would be to allow everyone to edit all tags, but there is always the possibility of someone accidentally or intentionally, deleting or changing a tag.

Another aspect impacting folksonomy management is the kind of tagging support used. Marlow et al. (2006) mention blind, viewable and suggestive tagging. Blind tagging occurs when the users do not see the tags while they themselves are tagging. Viewable tagging enables users to look at what others have tagged the resource as before they add their own tags and suggestive tagging suggests tags to the user. When using blind tagging the users will not be affected by what they read and this could help create a more uniform folksonomy, but on the other hand blind tagging could lead to very similar tags that are only misspelled or in plural

form. It is very easy for users to be affected by existing tags, even if the tag is not really a good description for a resource it will probably be added by other users if it is visible. Suggestive tagging is even worse in this area and if it is used, one has to be careful not to add terms that are too broad as this could easily make users add that tag instead of a more narrow and descriptive one of their own.

During this research a meeting with domain experts revealed an issue special to libraries: they are serious academic institutions. Thus, they have a few requirements usually not seen in other social tagging sites such as youtube or flickr. A student searching for literature on a subject would probably prefer to have an option of checking which user group tagged the book or journal. For example, for a Masters or PhD student, quality of the material is particularly important and if it has been tagged by an undergraduate student they would probably want to check its accuracy.

The tags added to a folksonomy can be arranged into a tag cloud (Figure 2). A tag cloud is a collection of the most popular tags arranged in a cloud-like manner so that the more popular terms are represented with larger font sizes (Notess, 2006). Since popular terms are more clearly noticeable, tag clouds can improve users' browsing experience. Tag clouds encourage users to browse when they normally would not; it is very tempting to look at a tag when it is larger than others and indeed the issue of which tags to show in a cloud (and how to display them) is an active research theme (Hussan-Montero and Herrero-Solana, 2006).

West (2007), however, notes that tagging has not yet become popular in libraries, however the University of Pennsylvania library developed PennTags, a Web 2.0 application where users can add tags. This is a good introduction to tagging in libraries, but in this case it is not for books. It is a social bookmarking application supporting tag browsing as a crucial part of this project. West (2007), Notess (2006) and Fichter (2006) discuss Library 2.0 and its usage areas, but they do not drill down on the basics, nor have they developed an application of this kind themselves, at least they make no mention of it. West (2007) discusses a Web 2.0 tagging site called LibraryThing, which is not a library as such. On their Web site they classify themselves as the world's largest book club. Users can add their

books and describe them using tags. The problem with this solution is that the tags cannot be browsed as with PennTags. An example could be trying to find a programming book on AJAX. The user would click on programming, then on Web 2.0 to narrow the search, but this does not occur. The reason is that the system switches from tags related to programming to tags related to Web 2.0 instead of showing all books related to both programming and Web 2.0 like it would in PennTags. Tag browsing is definitively functionality that has to be included in the system being developed.

2.3 The Current Situation

As noted above, libraries can use different classification systems to categorize their literature. Traditionally, when searching for a new subject in a library the user would normally have two options available: (1) browse the shelves first hand or (2) use an Online Public Access Catalog (OPAC) to search electronically. Browsing the shelves can be useful but tedious; the book or journal has to be removed and reading the introduction or abstract before putting it back. On the other hand using a computer system to search gives fast results, but can often miss out on relevant and related information because of the search term that is submitted by the user. However, if at least one book on the subject is found, it should be easier to find more related material. The electronic database of the Brunel University Library is catalogued using LCSH. Although this provides a keyword search, when someone begins a literature review on an unfamiliar subject they might not know the specific terms that should be used to find the literature they are seeking (Chan, 2005).

LCSH strictly categorizes/indexes the literature, however a library system should focus on the ease of use for the public, not the cataloguers. For example, if synonyms are not exactly the same then they will still be placed under the same heading. Only great differences require separate entries (Chan, 2005). Although the current system at Brunel University appears to be lenient, many users can have problems finding information, especially if they have limited knowledge of the subject, for example in the early stages of a project. Be it pre-university, undergraduate or postgraduate students, all can have difficulty finding information if they do not know the correct terms. This is where tags provide benefits; if a user

knows the main subject area (for example, ‘business’), the ‘business’ tag could be connected to a multitude of other words and terms (tags) that other users relate to this topic.

In conclusion there seems to be an unfulfilled gap between LCSH and folksonomy. This can be closed by using Web 2.0 techniques and folksonomy together with LCSH to make a better user experience by improving the ease of literature retrieval through browsing.

3 Research Design

The research presented in this paper is design-based (March and Smith, 1995). Design science (Simon, 1996) is aimed at providing an effective solution to a recognized research problem. The solution assumes the form of an engineered artifact (or set of artifacts). Different design research frameworks currently exist, but at its most basic level design research has two fundamental phases: design and evaluation. Typically these phases are iterative and there can be various design-evaluation cycles (Hevner et al., 2004).

The work presented in this paper was aimed at investigating the effects of a Library 2.0 system based on folksonomies. The awareness and relevance of the problem is demonstrated by both the findings derived from the literature (Section 2) as well as the needs or requirements that arose from the research itself (specifically in the requirements gathering phase). From such requirements a solution was iteratively designed and tested. The final evaluation phase was conducted through questionnaires administered to library (4) and academic staff (2) and students (12).

The principal artifact produced was the folksonomy-based library system integrated with Brunel University’s existing system. Further artifacts produced by the research were the folksonomies produced by the test subjects during the course of development.

The following section provides an overview of the developmental work carried out in terms of requirements gathering, design and implementation. Section 5 will discuss the final evaluation.

4 System Development

4.1. Technologies

Our application was developed using AJAX (Asynchronous JavaScript and XML). AJAX eases the integration of responsiveness and interactivity in Web 2.0 sites, being the technological pillar of this generation of web pages (Ankolenkar et al., 2007). In addition to responsiveness and interactivity, Web 2.0 can provide a desktop application feel and functionality. It also enables easy implementation of content/services from other websites (mashup). Moreover, service sharing is also encouraged in Web 2.0, which helps improve the user experience by enhancing the site with useful services; AJAX enables this by not requiring a page reload to update content.

Requirements, once gathered, were modelled using UML (the Unified Modeling Language) in Borland Tech Architect. All models were created as RUP (Rational Unified Process) artifacts. In particular, UML sequence diagrams (Figure 1), which detail the logic behind the system and interaction between different methods, were found to be especially useful as they allowed us to identify flaws in the design without having to write a single line of code.

Place Figure 1 here.

4.2. Requirements Implementation

Requirements were gathered during meetings with a library domain expert and a focus group of 5 student users at Brunel University. The library expressed interest in color-coded tags as a means to identify the type of use (undergraduate, postgraduate or academic staff). This requirement was aimed at allowing users to view a specific tag's importance level (with academic staff tags ranking highest) in addition to its popularity. The decision made was that the highest-ranking group that added the tag should be shown. Even if there were, for example, 60

undergraduate or postgraduate group tags and one academic staff tag, the staff color would be shown.

Another requirement espoused by both the librarian and students was the ability to view the tags in the form of both a cloud (Figure 2) and a list (Figure 3) view, with the list view showing the number of tags in each group including the total combined. This is normal in other tagging systems like del.icio.us, the reason being that sometimes it is of value to see how many have used a tag.

Place Figure 2 here.

Place Figure 3 here.

A further requirement suggested by both groups was the capability to click on a tag in the detailed book view and automatically show the results of all other books containing that tag (Figure 4).

Place Figure 4 here.

The domain expert then arranged a meeting with the system administrator, which provided information about the library system's running environment. She explained that the library system currently operational, which our software would extend, was running an Apache web server on a Linux operating system and using an Oracle database. The decision was then made to code our software using a combination of Javascript and PHP running a MYSQL database, both freely available.

Since this is a Web 2.0 project an important requirement is the browser; it was agreed that the system should work in Internet Explorer 6 (IE6), used internally in the library and on the campus computers, but, if possible, the system should also work with other browsers such as Safari and Firefox.

Cookies were planned for keeping track of tags the user selected (Figure 5) when browsing, using JavaScript to write each tag into memory. For the library system this would be important, but it was not planned for the prototype given that it was not limited to client side scripting.

Place Figure 5 here.

In the prototype, the tags would be sent within the URL appending them as the user browses, then build the cloud based on these tags. It is important to keep track of other tags that have been browsed, as this is the way to narrow the search. A problem that was encountered regarded how to know when the user wanted to begin a new search. At least on the detailed view (single book) if the user clicks a tag it means (s)he wants to find all books with that tag. The most logical way was to reset the cookie when a "new search" button is clicked. Moreover, on the prototype it would be easy to implement a function to remove the browsed tag, widening the search.

On the subject of what type of tagging should be used in this system, blind tagging would not be a good solution as showing the tags on a book is part of the incentive to get other users to tag. So the tags would be shown as details on the book, but that does not mean suggestive tagging was used either as this might have lead to bias. In this case the decision fell on viewable tagging; even though it could potentially have a similar effect to suggestive tagging, the domain expert and the interviewed students agreed that the incentive outweighs this disadvantage.

5 Evaluation

The application was evaluated with a total of 18 users from all stakeholder groups. After a short introduction to the topics of Web 2.0 and folksonomies, users were given 30 minutes to firstly familiarize themselves with the interface of the application, after which they had to search for a book of their choice, which they then had to tag at least once. They then had to explore at least one similarly tagged book, then add a tag to it and subsequently delete it.

5.1 Questionnaire

In the final stage of evaluation, users were invited to complete an online questionnaire comprising 17 questions. The first three collected demographic data (such as age, gender, group), while the fourth question enquired about the previous Web 2.0 familiarity of the respondent, specifically in the use of social tagging systems. The rest of the questionnaire targeted directly the experience of using the library and its folksonomy. Here, positive and negative questions/statements were mixed and also interspersed in order to reduce bias (having just positively-oriented questions might, for instance, have led users to only select choices in one part of the scale). Most of the responses used a four point Likert scale (strongly agree, agree, disagree, strongly disagree), with the even number of possible responses ensuring that a neutral position could not be adopted by the evaluators.

The following questions were asked:

> Q5) "I enjoy seeing my contribution instantly appear with the help of Web 2.0."
> Q7) "I feel I'm helping others as well as myself by adding tags."
> Q8) "I don't understand why I should use my time on adding tags."

The above questions are related to incentive, if the users enjoy seeing their contribution it means they have some incentive to join in the tagging.

> Q6) "I find it difficult to describe books using only single words."

In relation to Question 6, discussions held during requirements gathering revealed that some users were not comfortable using only single words when describing/tagging a book. They wanted to use whole sentences and this may be a wider problem for the users who prefer to be more verbose in their approach.

Since the tags can be added by anyone it would also be useful to know if they have any concerns regarding this and if users feel more secure knowing which group added the different tags (questions 9 and 10).

> Q9) "I have concerns about users adding tags that are not relevant."
> Q10) "I feel more confident when knowing which group (undergrad, postgrad or staff) has added the tag when I browse."

If users feel encouraged to browse the tags by seeing the tag cloud it is a positive sign for our application (Q11); moreover, it is also important to find out if users feel tags can help them find information easier (Q13). This question also relates to incentive, because if the users adopt it and see the advantage, there may be a greater chance of them spending their time tagging.

> Q11) "I am encouraged to browse when seeing the tag cloud."
> Q13) "I think tags can help to find relevant material easier."

Moreover, it would also be beneficial to understand which view the users preferred, list or cloud; this could influence the default view in the application.

> Q12) "I prefer viewing the tags as List or Cloud. (Possible answers in for this question were List or Cloud)."

Finally, the last questions (Q14, Q15, Q16 and Q17) dealt with the potential usefulness of the developed application from a user perspective.

> Q14) "I think adding tags is a good way to keep track of my literature."
> Q15) "I think tagging can improve the user experience of the library system."

Q16) “Would you like to see folksonomy implemented into the Brunel library system?” (Possible answers: Yes or No).

Q17) “If you answered no to question 16, why not? (Select all that apply)” – (Possible answers were: “I can’t see a benefit for myself”, I can’t see a benefit for others”, “I wouldn’t use it” and “Other (please specify)”.

Data collected was analysed with the Statistical Package for the Social Sciences (SPSS), version 11.5. SPSS is a software package geared towards statistical analysis and data mining. In our work, the t-test and Analysis of Variance (ANOVA) were applied to identify differences, and to test for potential significant differences between user types (Stephen and Hornby, 1997), all using SPSS. A significance level of $p<0.05$ was adopted for the study.

5.2 Analysis of Results

As a general observation, we start off by remarking that the application had an overwhelming enthusiastic reception, with 17 out of 18 respondents revealing that they would like to see the system implemented. Moreover, t-test analysis (Table 1) reveals that the results obtained are statistically significant, with the single exception of Question 6, dealing with the difficulty of describing books using single words. The results here are sporadic at best and show no signs of a unified opinion. People who have not used tagging systems before could maybe find it difficult to describe the books in single words. Using a One-Way ANOVA test between questions 4 and 6 can confirm or reject any theory about the influence of participants’ prior experience with social tagging systems on Question 6. However, the ANOVA shows that the results are not significant statistically, and hence there is no relationship between prior experience which does not influence the answer given for Question 6.

Place Table 1 here.

The majority of respondents (n=11) had concerns about the relevancy of the tags that are added (Q9) and this is understandable since users can add anything they

relate with a book as a tag. However many respondents (n=13) felt more confident when knowing which group had added the tag (Q10) - which was exactly the reason for adding this functionality. Nonetheless, the positive and statistically significant bias displayed by participants in respect to Q5, Q7 and Q8 highlight the high potential that incorporating tagging and a Web 2.0 approach in library systems has. Moreover, this finding is reconfirmed by the same response profiles for Q13, Q14 and Q15.

When respondents are confronted with the tag cloud, they feel encouraged to browse (Q11), 16 agree or strongly agreeing in this respect. There was however a surprise, it was almost a split response on whether list view or cloud view was preferred (Q12). The cloud view is preferred by 9 to 8, with one user electing not to respond.

6 Concluding Discussion

The novelty of the system developed by this study consists of enabling browsing capabilities to folksonomies within a library context. PennTags has this browsing capability, but is not geared towards books; also the developed system allows to widen the search by removing browsed tags, similar to a back button. In PennTags users have to start over if they select the wrong tag. LibraryThing has a similar context, but has no browsing support. It only enables the user to view tags related to a specific tag. The literature (West, 2007; Marlow et al., 2006; Notess, 2006) discusses how a system of this type could work, theorizing on the positive and negative elements, yet they do not show to any practical work.

We recognize that there are limitations to our work – we would have liked to have evaluated our solution with a greater sample size, although it is not uncommon in user-centered digital library studies (Fox et al., 1993; Theng et al., 2000); moreover it is a prototypical implementation, offered as a proof-of-concept rather than a final product. This does not mean, however, that the work is without merit.

The tagging system developed has enabled users to gain firsthand experience of tagging in a library context. Our evaluation has revealed that all but one respondent would like to see the system implemented into the library. It has shown that users

feel encouraged to browse when presented with the tag cloud and they believe this could help them find relevant material easier. This confirms, although on a low scale, many researchers' theories that folksonomies can be beneficial in a library context (West, 2007; Notess, 2006; Fichter, 2006).

A novel solution implemented in this system was the use of color to distinguish tags added by undergraduate, postgraduate and academic staff users respectively. The underlying idea was that users would feel more confident knowing the level of the person who added the tag. This impression was confirmed by the questionnaire with 15 out of 18 respondents agreeing.

This research has proven that there is a demand for a tagging system in the library of Brunel University. Future work could be to fully integrate the developed prototype into the system. Browsing the tags is an exceptional way to find similar and popular subjects and books, but more research is needed into the area. This especially includes how users can be reminded to add the main category when tagging a book. Finding a solution to this problem is critical so that the system does not exclude many books as they lack the main tags. Our developed solution could potentially be improved by asking the users for a category or alternatively adding the LCSH category automatically to the book; however this would be a far from an ideal solution and further research is needed in this respect.

Malicious users were expected, but to date they were never a problem. Even so, if the system becomes widely available the risk will become greater and a system for detecting inappropriate words/tags or spam would be beneficial. Last but not least, another area that could benefit from further research is how to limit the tags shown and still have decent diversity. As the folksonomy grows, the tag cloud has to be restricted in some way, but different users have different needs. Some would like to browse the least popular tags, while others prefer the standard most popular approach.

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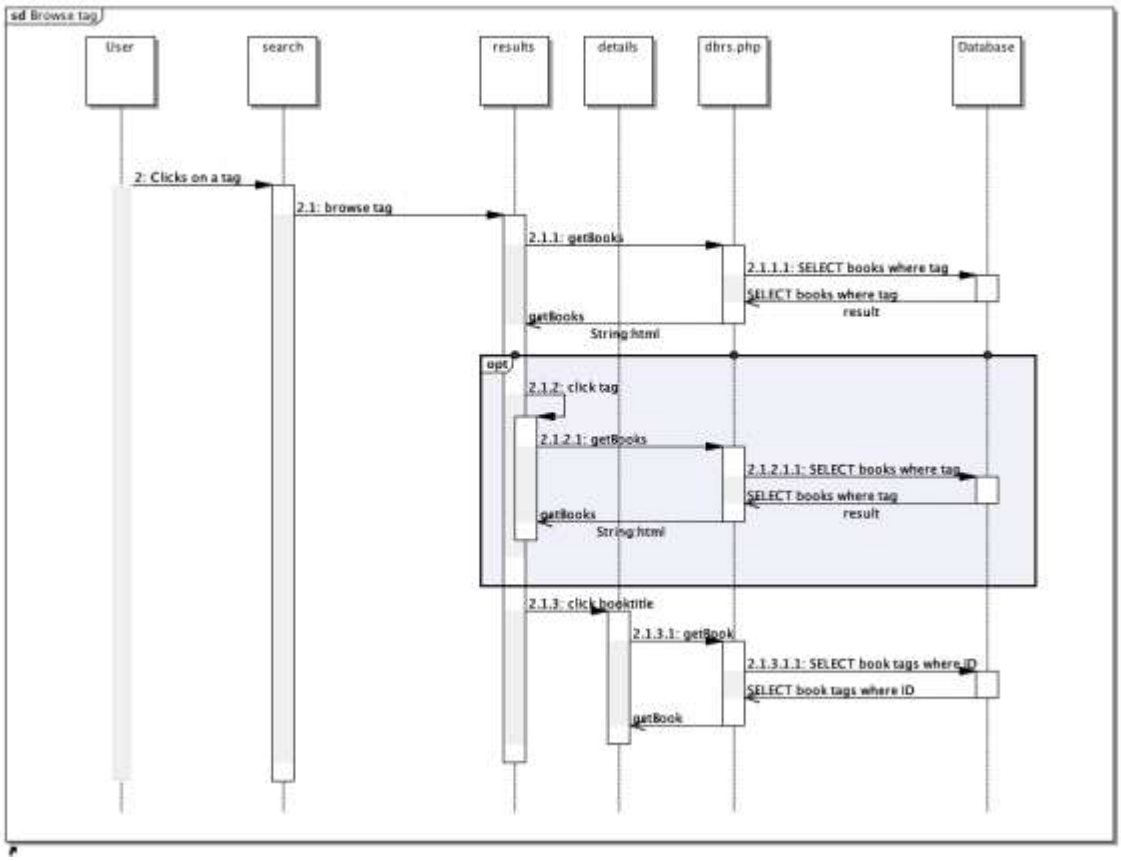

Figure 1: Browse tag sequence diagram.

Figure 2: Tag cloud view.

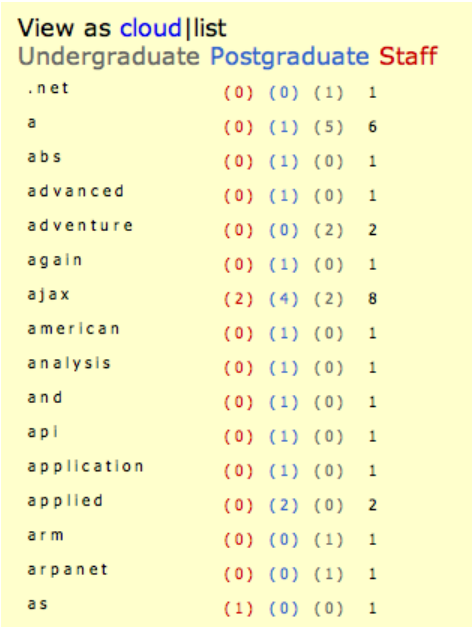

Figure 3. List view.

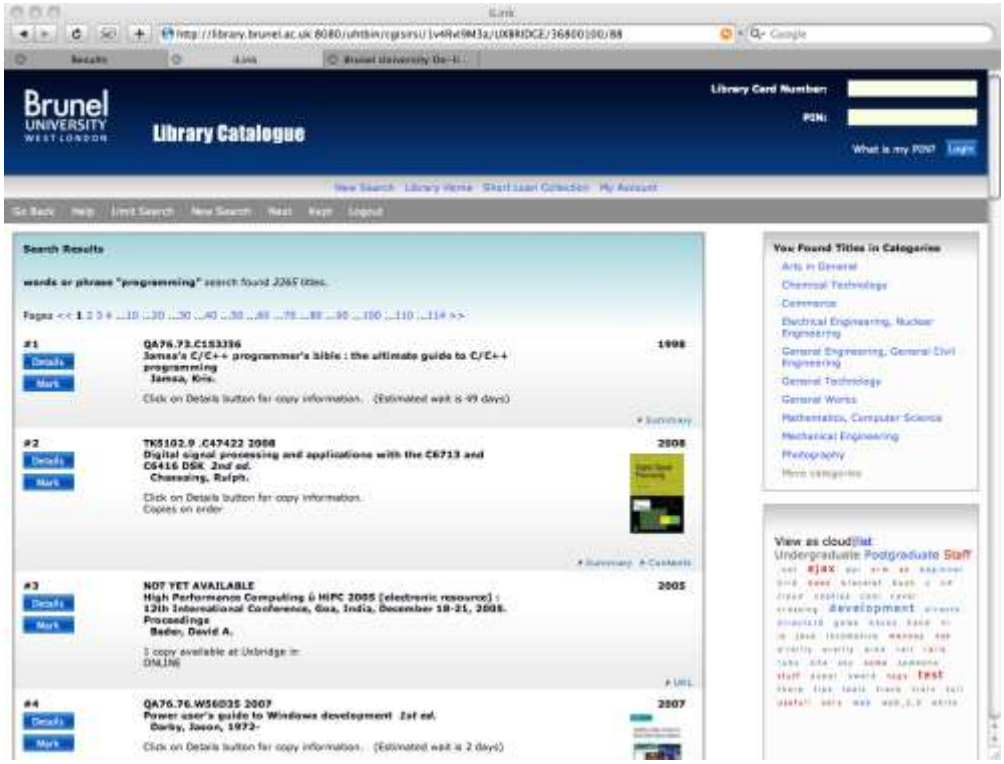

Figure 4. Books containing the same tag.

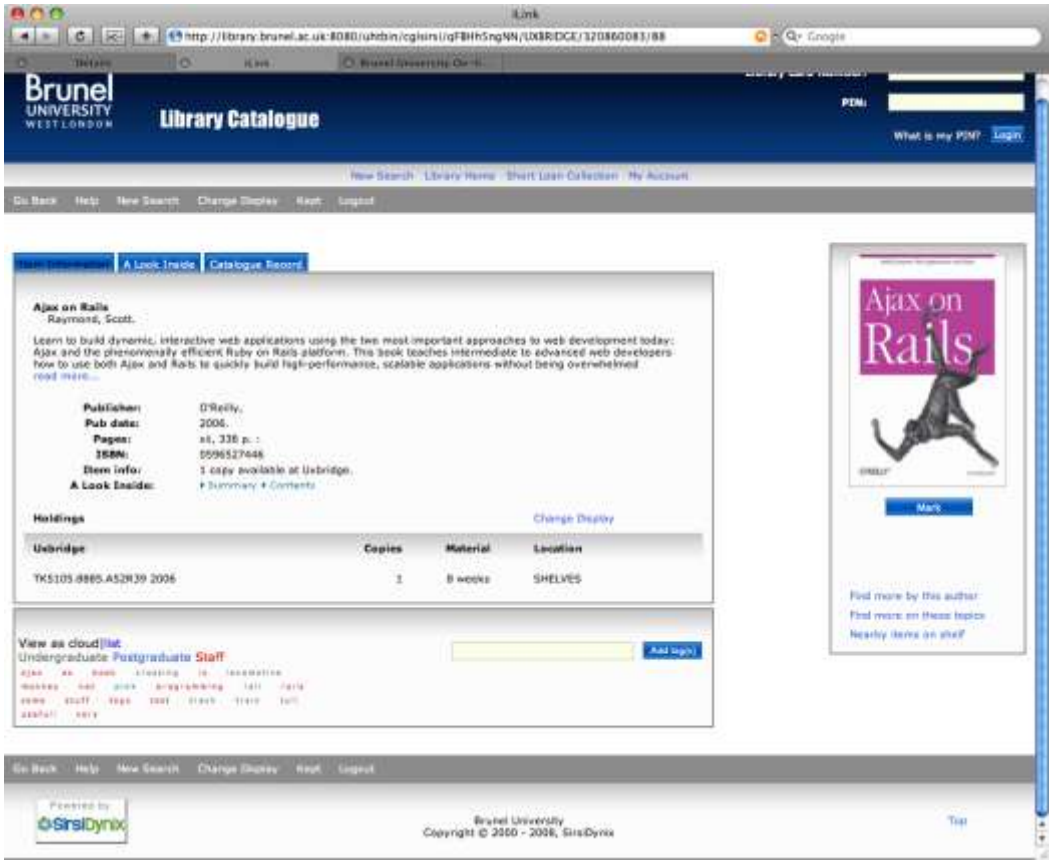

Figure 5. Adding a tag.

	t	df	p
Q5	-7.160	17	.000
Q6	-1.112	17	.282
Q7	-6.206	17	.000
Q8	4.389	17	.000
Q9	-4.373	17	.000
Q10	-3.833	17	.001
Q11	-4.932	17	.000
Q13	-7.518	17	.000
Q14	-3.419	17	.003
Q15	-7.837	17	.000

Table 1. t-test analysis.