Tagging Electronic Resources for Modules – A Case Study in Web 2.0 People and Technology

Guy Saward, Lynette Pye
University of Hertfordshire, Hatfield, UK
g.r.saward@herts.ac.uk
l.j.pye@herts.ac.uk

Abstract: The aim of the TERM project - *Tagging (extra, external) Electronic Resources for Modules* - is to investigate the extent to which social bookmarking can be used to promote collaborative learning. The motivation for doing this is to enable students to get more value from the informal collections of on-line resources that they may gather to support their learning. The study has two main strands: identifying the barriers to sharing resources; and exploring potential solutions. The latter has focussed on exploiting both the social and technology opportunities provided by "Web 2.0".

The human side of sharing resources has been explored through qualitative surveys with both Computing and Art and Design students to understand the sources of information that they find most useful in their studies, how they currently record and manage references to on-line resources, and their attitudes to sharing this information. These were then reassessed following a pilot study on the use of social book marking.

The technology associated with sharing resources has been explored through the use of the del.icio.us social book marking service. A range of options for using the service were evaluated for their practicality, usability and manageability. The options included individual versus group accounts, and stand-alone access versus integration with the institution's VLE. This led to the development of a shared tagging system within the VLE, linked to a shared delicious account, which was then evaluated with one of the cohorts of students from the survey phase.

Evaluation of the TERM VLE enhancement and its use by students raises a number of interesting but potentially conflicting findings relating to their attitudes, their actions, and the technology required to support them. The majority of students were positive about tagging and sharing, but a significant minority were still using technology that did not facilitate sharing. In addition, while the students wanted to be able to share their resources, they wanted to be able to do this outside of the VLE which provides a common platform for doing so. This highlights the tension between the development of shared taxonomies versus the desire for individual control and autonomy.

The initial results of the study support the desirability of developing collaborative resource sharing, and of the use of web 2.0 platform technology in doing so. As such, they would be of interest to projects engaged in developing collaborative teaching and learning practice and the technological challenges associated with it.

Keywords: collaborative learning, Web2.0, social tagging, virtual learning environment, folksonomy

1. Introduction

Recent developments of the Internet, fuelled by socially generated content and convergence with telecoms and publishing, mean that learners have access to an ever increasing pool of resources through a wider range physical locations, devices and on-line sources. While this situation presents greater opportunities with identified benefits (JISC, 2004) and is integral to the development of blended learning (JISC 2007) it does nothing to diminish the challenge of information overload. The TERM project seeks to understand if and how social bookmarking can be used to meet this challenge as part of a blended learning approach.

The use of social bookmarking is in tune with a number of pedagogical approaches which include the development of: student centred learning, valuing learners' contributions; problem based learning, which requires a variety of resources to support student selected approaches to problem solving; and collaborative learning which is predicated on sharing between learners. In addition, the social context of higher education in the UK places a premium on demonstrating the relevance of study programmes, making the connection with employability, continuing professional development and life long learning. Allowing staff and students to share current online resources will contribute to this relevance.

Instead of looking at the management of resources themselves, the TERM project is attempting to manage the "bricolage" of web links that learners accumulate as part of their studies, whether they reference established subject specific sources, are results from search engines, or more recently point to socially generated content. Clearly, as shown by the results from section 2, social bookmarking is not the only way people manage their links to on-line resources. However, as discussed in section 3, social bookmarking does present some clear benefits. For those interested in the teaching and learning aspects of the study these sections will be particularly relevant. Section 4 outlines how a social booking service was deployed within an existing VLE and will be most relevant to readers with a technical interest in the delivery of such services.

2. Resource link management

In order for students to make use of on-line electronic resources, the first challenge is to be able to manage the links to those resources. While subsequent use of the resources themselves is equally important, issues such as annotation and collaborative updating are beyond the scope of the current work. Instead, our work has focussed on the following key questions:

- Where are students and staff going to store and access links?
- How easy is the process (of managing links) to setup and use?
- What structures are going to be used to organise the links?
- Who will be able to access/share the links?

As the majority of external, electronic resources will be accessed via a web browser, saving links as browser bookmarks is a simple, easy solution. However, when these links are stored locally on individual machines they become difficult to access on the move, share across different devices, and with different people. Online bookmarking is an extension of browser bookmarks where links are stored on a web server, making them accessible from any networked device. Social bookmarking extends this further by allowing other people access to the links stored online.

2.1 Bookmarking Services

There is a wide range of bookmarking services available with over 125 being listed by Baker (2008). The major established social bookmarking sites include del.icio.us (owned by Yahoo and recently rebranded Delicious), Digg, Furl, and StumbleUpon (owned by eBay). More specialised services are focussed on particular types of users, including academic or research services such as BibSonomy (run by University of Kassel), Connotea (owned by Macmillan) and Citeulike (sponsored by Springer). These specialised services include extra functionality such as the importing of bibliography files.

Of the general purpose services, some services are limited to personal bookmarking, while others offer other web 2.0 social services such as blogging. The move from personal bookmarking to social bookmarking is likely to accelerate through the addition of social features to functionality offered by browser toolbars, e.g. Google, or content specific sites such as Slashdot and Technorati.

2.2 The Benefits of Online/Social Bookmarking

The applicability of social book marking in allowing students to share resources is clear, with recent recommendations on its usage by Franklin and van Harmelen (2007) and Lapham (2007), and reports of its use by Bayrne (2007) and Hayman (2007). As an approach, a site such as Delicious (see Figure 1) has the benefits of being:

- **personal** – individual users create their own collection of bookmarks that are stored online;
- **fast** – as few as one click is needed to bookmark a link;
- **categorised** – links can be classified using keywords or "*tags*";
- **self-organising** – tags are suggested, based on the content being tagged and existing tags;
- **navigable** – bookmarked links can be searched or browsed using "*tag clouds*";
- **shared** – links are publically accessible, with anyone allowed to view public links;
- **social** – networks of people can monitor shared links and post suggestions to each other.

Additional features extend these capabilities through the use of "*tag bundles*" to create higher level categories, and RSS feeds which allow users to monitor public suggestions on any specified topic.
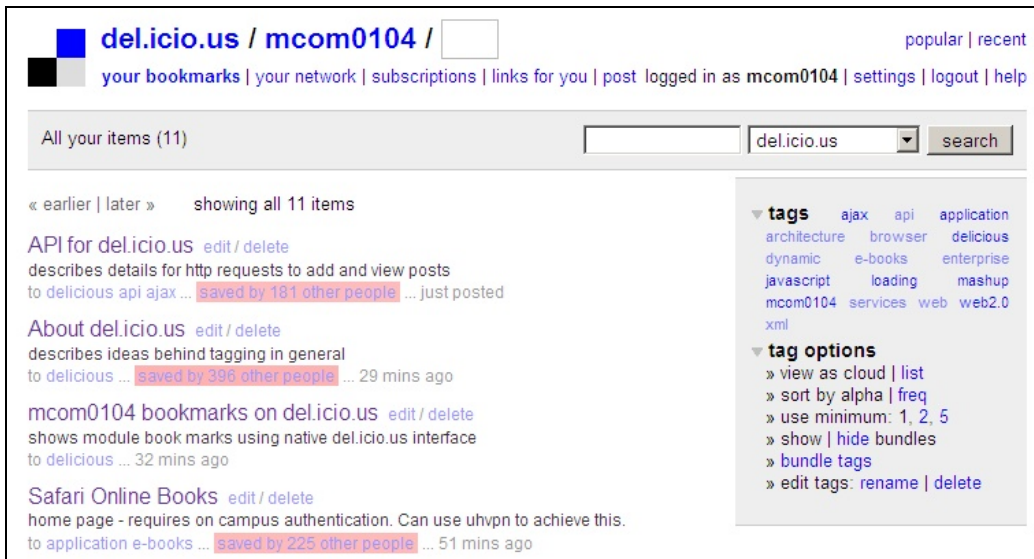
Figure 1: Module resources displayed in del.icio.us

2.3 The TERM pilot
A major part of the TERM project has been to pilot the use of social, online bookmarking in a way that minimises possible barriers to its use as described in section 3. This pilot was supported by two surveys:

- prior to the use of the pilot system, to understand how students currently manage links to resources;
- following the pilot, to understand how attitudes had changed as a result of using social bookmarking.

The initial survey was conducted with two different cohorts totalling 60 students from two separate Computing and Art & Design subject areas. The pilot system was used on a master's level Computer Science module with 20 students and 15 responses were captured in the follow-up survey as described below. This 60 credit module on Web Services included the development of a web service case study, working in self-selected teams on an application idea generated by the group. As such, the students were working in an environment that combined elements of student centred, problem based, collaborative learning.

The main resources the pilot students were provided with included a selection of on-line books (provided via the Safari service), journals and other online resources. Links to these resources were contained in study guides that have been developed and used for both on-line and on campus versions of the module. Some additional links were also provided via the pilot bookmarking system. It was expected that students would supplement the module resources with ones of their own. In particular, the system development case study required them to identify resources to help with defining the goals and requirements of their application, the selection of select appropriate technology and the implementation of part of their system.

The following sections discuss the social and technical challenges in facilitating the sharing of this wide range of resources. Each section focuses on one of the study's two main strands: identifying the barriers to useful sharing of resources; and exploring potential, usable solutions. The focus on usefulness and usability is derived from technology acceptance models, e.g. TAM (Davis 1989) and e-TAM (van der Heijden 2000). These models show that, unless compelled, users will generally only use systems they perceive to be both easy to use *and* useful, i.e. where they believe the system will enhance their performance.

3. Useful bookmarking, social barriers and Web 2.0
The TERM project has investigated the usefulness of social bookmarking through the study of the pilot group of student, their attitudes and their ability to make use of, and benefit from, a shared bookmarking service.

3.1 Baseline survey – current practice in resource link management
The preliminary survey provided a baseline of students' activities and attitudes. In general the aim was to understand the sources of information that they find most useful in their studies, how they currently record and manage references or links to on-line resources, and their attitudes to sharing this information.

General questions on student behaviour in the pilot (included as part of the survey) provided responses that were in line with larger surveys (e.g. Weiler 2005, Conole et al 2006) which show the Internet to be one of (if not the) the dominant source of information, and an increasing use of laptops and other personal, mobile computing devices.

More specific questions in the preliminary TERM survey were intended to answer the basic questions:
- Are students saving links to online electronic resources as part of their routine studies?
- What methods are they using to save links?
- Would (and do) they share links?

The results show that all respondents were saving resources using a wide range of approaches. The most common method was to capture links in a single simple document with formats ranging from text files, to Microsoft Word and even HTML files. More convoluted methods included emailing links back to oneself and some students simply recorded links on paper. Few (<10%) made use of browser bookmarks and none made use of online bookmarks, let alone a social bookmarking service.

Students did not explicitly report inhibitions about sharing links with other students, e.g. to protect some form of competitive advantage. Nevertheless, sharing resources was a less common activity compared to bookmarking for personal use. The most common response to this issue was "I *sometimes* share (a useful website or other on-line information source related to my studies) with other students".

3.2 Pilot results and follow-up survey
During the module, students could bookmark additional resources using functionality provided through the VLE as described in section 4. Resources bookmarked by one student could then be viewed by all other students from within the VLE as shown in Figure 2.

By the end of the module, all students had viewed the module's shared list of bookmarks at least once within the VLE with the majority of students reporting that they checked the list most of the time when they needed help. The number of students actually sharing a link through the TERM resource list was significantly lower with approximately one quarter of the students saving a link to the module page. By the end of the module, fifty additional resources had been found and shared through the module resource list with just over half being contributed by a core group of students.

The follow-up survey showed that the majority of students remained positive about tagging and sharing with an increase in sophistication about the bookmarking technology used on the module. Despite this, a significant minority were still using technology that did not facilitate sharing. In addition, while students reported wanting to be able to share their resources, the majority wanted to do this through links saved outside of the VLE. This is reinforced by the use of other bookmarking services (apart from the TERM pilot system described below) by two students.

3.3 Barriers to bookmarking
The student activities and perceptions seen during the pilot study do show the need for more sophisticated management of links and bookmarks by students. At an individual level, students would benefit from using an online service that offers more functionality than a simple word processed list, was easier to create than editing a webpage, more durable than pieces of paper, and simpler than organising and managing emails.

However, the TERM pilot shows that using an online bookmarking service is not without its own barriers. The use of shared machines (which accounted for over half of the students in the study) in educational establishments or "locked down" machines in commercial settings (e.g. Internet cafes) restricts the extent to which the user environment can be customised. This means students are unlikely to be able to install browser toolbars or buttons that provide the fastest, most streamlined

tagging functionality. In addition, bookmarking services require a degree of computer literacy that is often assumed to be present in "digital natives" but may actually be lacking (Kennedy et al 2008).

Breaking down potential barriers to using social bookmarking were the motivation for developing the simplified, integrated bookmarking service outlined below. Whether this, combined with appropriate support and direction, will be sufficient to lead to wide-scale adoption is the subject of further work.

4. Usable bookmarking, technology barriers and Web 2.0
The second strand of the TERM project has been to identify usable solutions that address known and anticipated issues arising out of the requirements for useful bookmarking systems.

4.1 User Requirements
Students' perceptions of the usefulness of a shared bookmarking solution, and therefore their acceptance of it, will depend upon the number, relevance and quality of resources being shared. This will in turn relate to the system's usability, i.e. the effort required to use the system. To be successful any bookmarking solution must minimise the effort required. If not, and the (perceived) effort required to use the system is high, then students will not use the system. This will lead to fewer resources being added, a lower perceived usefulness and reduced motivation to make the effort to use the system. In this situation, students will revert to their own, individual "point" solutions that they feel comfortable with.

Minimizing the perceived effort of using the system is therefore one of the primary requirements of the proposed bookmarking system, and indeed of any Web 2.0 application. In order to achieve this, the user requirements for the proposed system combined features of browser bookmarks with social bookmarking services including:
- no account sign-up;
- "single click" bookmarking to allow simple, direct posting of links;
- direct access to bookmarked resources through the institution's VLE;
- easy to browse/filter list of resources related to tags;
- shared tagging to produce and maintain a group folksonomy or collabory.

In addition, from an administrative perspective, the teaching team should be able to retain control over resources shared for a specific module, both in terms of the links included and the tags assigned to them.

4.2 Reusing Web 2.0 Services
In order to provide a fast solution the study set out with the aim of reusing an existing bookmarking system, rather than developing a bespoke solution from scratch. This approach is also in keeping with Web 2.0 concepts (O'Reilly 2005) that support "*mash-ups*" where the Internet is used as a platform to provide access to open, shared data through simple (re-)usable technology.

The key architectural issues for developing a solution were: to decide which service to use; and how the functionality of that service was to be used to meet the user requirements listed above. Delicious was chosen as the service provider given it is one of the most popular and long standing sites, with a well defined interface for developers to work with. This popularity is reflected in its track record of use in the education sector by organisations such as the UK's Joint Information Strategy Committee (Fraser, 2007) and Education Network Australia (Hayman 2007), individual practitioners, e.g. Bayne (2007) and the TERM project team itself in previous work.

4.3 Group versus Individual Tagging
One drawback of previous work is that the resources for a particular group or course were managed through a single tag, e.g. jisc_emerge (JISC 2008), myednapoc (EDNA 2008) and idel-links (Bayne 2008). Taking this approach for the TERM project would require individual students to sign up for individual del.icio.us accounts, thereby raising a barrier that the study deliberately set out to avoid.

In contrast, if a single user account were shared by all students taking a module, the students and teaching staff could build a collection of resources that was part way between the two extremes offered by del.icio.us where bookmarks are either public (and therefore part of the global del.icio.us folksonomy) or private.

The use of a single shared account would have the benefits of:
- having a single point of access – all bookmarks submitted by all students could be viewed in one place - instead of having the bookmarks spread across multiple user accounts;
- generating tag suggestions from information drawn from the whole cohort of module students, rather than either just a single individual or the entire del.icio.us user community;
- allowing tag and bookmark management, e.g. renaming and merging tag, through a single user account.

The end result would be the development of a focussed shared folksonomy at a smaller scale than that created by the whole global del.icio.us community but with more flexibility than using a single tag to group bookmarks.

4.4 Extending del.icio.us
As the del.icio.us service stands, without any development work it is only possible either to treat a student cohort as a network of related users, but without the benefits of a shared folksonomy; or to allow unrestricted sharing of a single account by all students, with all the security risks that this entails. Even if there is no malicious activity (e.g. locking other students out through password changes) the service is not designed to provide the safe guards offered by other collaborative tools (e.g. wikis) such as version comparison and roll-back.

The chosen solution was to implement additional functionality, through and on top of the del.icio.us API. This functionality allowed unregistered del.icio.us users to post suggestions to a shared user account, as described below, with authentication being provided through the StudyNet MLE.

4.5 The Deployed Solution
The bookmarking system developed around del.icio.us has been deployed within StudyNet (Jeffries et al, 2005), the University of Hertfordshire's MLE as shown in Figure 2.
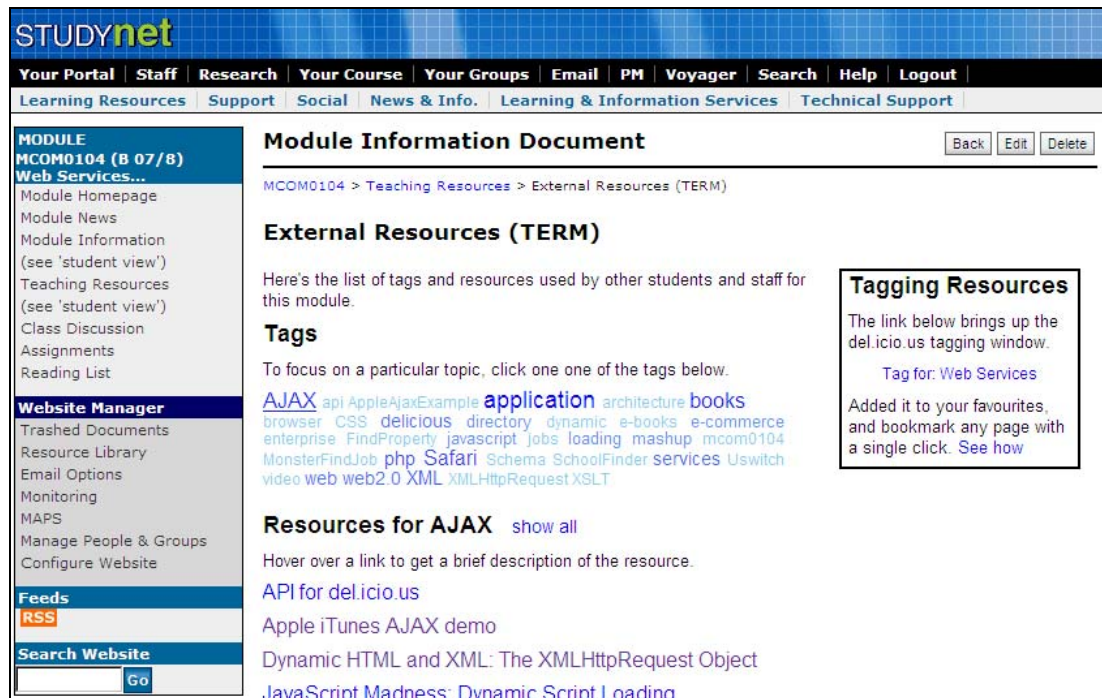

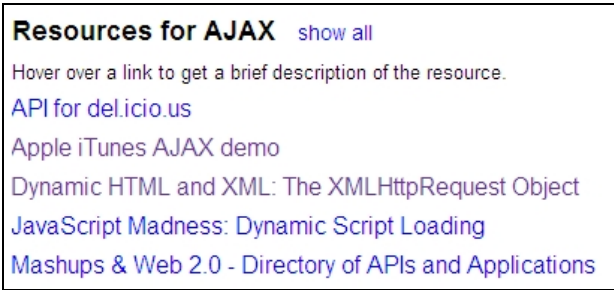**Figure 2:** The TERM resource page display within a StudyNet module site

Figure 3: List of module resources generated by imported del.icio.us javascript

The components (of increasing complexity) required for the deployed TERM system include:

- a single, publically del.icio.us account - used to store all the module bookmarks and tags, the contents of which can be viewed directly at http://del.icio.us/mcom0104 (see Figure 1);;
- a resources web page – which uses simple scripts provided by del.icio.us to display a list of resources (see Figure 3) and tags (see Figure 4) that can be used to filter the resources;
- additional browser code (written in Javascript) - added to the resources page to keep users within StudyNet as they browse, rather than being redirected to del.icio.us;
- browser shortcuts (see Figure 5) – these "*bookmarklets*" provide fast access to tagging functionality from the browser toolbar, akin to the del.icio.us browser buttons.

Figure 4: Tag cloud generated by imported del.icio.us javascript

The final component of the TERM system is a "*proxy*" which allows students to post links to the module's del.icio.us account without the need for them to sign in to the account, or have an existing account of their own.   As the proxy hides the del.icio.us log-in details from students, this approach has the advantage of protecting the administrative privileges of the account. Only the module team have, or needed, access to the full del.icio.us functionality such as reassigning or renaming tags, or editing and deleting bookmarks. This specialised code, hosted on a server outside of the MLE, consists of less than 100 lines written in PHP.
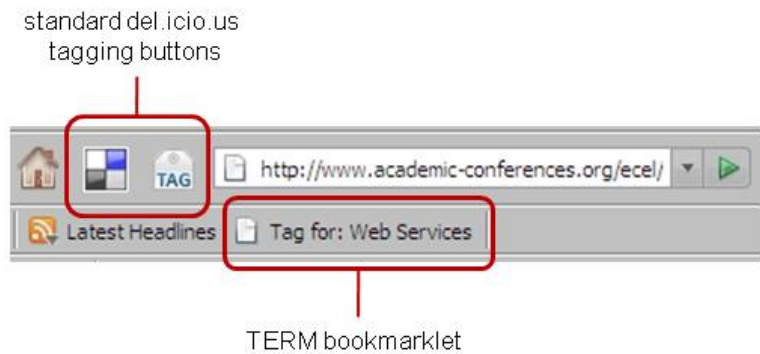

Figure 5: Browser toolbar showing del.icio.us "add in" buttons and TERM "bookmarklet" shortcut

5. Discussion

The approach to social bookmarking which is outlined above is clearly not the only possible solution to sharing resources. Other Web 2.0 technologies such as wikis and group blogs, allow users to collect and share links to resources in a relatively simple way. As these features are integrated into VLEs they are becoming a standard part of the teaching and learning repertoire. Furthermore, they and other Web 2.0 technologies such as media sharing services, social networking and collaborative editing (Franklin & van Harmelen 2007) offer better features in terms of richer content, and interactivity in the form of annotation and discussion.

However, the focus on the content (i.e. wiki page or blog post) means many Web 2.0 applications require more effort to save and tag a resource discovered and accessed through a browser than would be the case with social bookmarking. Using a blog (or wiki, or facebook page) the user must navigate to their blog page, add the link URL to their account or a specific blog entry, and provide a title or appropriate text for the link. While further organisation and annotation is possible, this adds even more to the complexity of a process which cannot compete with the speed of online bookmarking.

The usefulness of bookmarking as an application separate from other Web 2.0 solutions can be seen in the general growth of bookmarking services described previously. It can also be seen in specific developments in VLEs such as Blackboard's integration with the Scholar social bookmarking service which parallels earlier integration of discussion groups, blogs and wikis. If better annotation of bookmarked resources is required, then an extended service such as that offered by Diigo provides a better solution. As with any problem, the best solution is to select the most appropriate tool for the job.

6. Conclusions and future work

While much of this paper has been focussed on the usability of technology, the focus must remain on the *usefulness* of technology to students. While the TERM project has shown the need for and usefulness of social bookmarking for learners an extension to this pilot is investigating the relationship between personal and shared bookmarking. Planned future work is focussed on validating the initial results with larger cohorts across a wider range of subject areas.

Acknowledgements

References

Baker, L (2007) "125 Social Bookmarking Sites : Importance of User Generated Tags, Votes and Links" [online] Search Engine Journal, http://www.searchenginejournal.com/125-social-bookmarking-sites-importance-of-user-generated-tags-votes-and-links/6066/

Bayne, S. (2007) "Web 2.0 pedagogies: new texts and assessment challenges". Paper read at E-learning at the Cusp conference, Staffordshire University, May 30 [online] Staffordshire University http://www.staffs.ac.uk/images/bayne_tcm68-27425.ppt.

Bayne, S. (2008) "Recent idel-links Bookmarks on Delicious" [online] Delicious, http://delicious.com/tag/idel-links

Conole, G., De Laat, M., Dillon, T., & Darby, J. (2006). *JISC LXP: Student experiences of technologies*, final report to Joint Information Strategy Committee [online] JISC, http://www.jisc.ac.uk/media/documents/programmes/elearningpedagogy/lxpprojectfinalreportdec06.pdf

Davis, F. D. (1989) "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology", *MIS Quarterly*, Vol. 13, pp. 318-341

EDNA (2008) "Recent myednapoc Bookmarks on Delicious" [online] Delicious, http://delicious.com/tag/myednapoc

Franklin, T. and van Harmelen, M. (2007) *Web 2.0 for Content for Learning and Teaching in Higher Education*, report to Joint Information Strategy Committee [online] JISC, http://www.jisc.ac.uk/media/documents/programmes/digitalrepositories/web2-content-learning-and-teaching.pdf

Fraser, J. (2007) "del.icio.us at Emerge", [online] JISC Emerge, http://elgg.jiscemerge.org.uk/news/weblog/86.html

Hayman, S. (2007) "Folksonomies and Tagging: New Developments in Social Bookmarking" Paper read at Ark Group Conference: Developing and Improving Classification Schemes [online] EDNA, http://www.educationau.edu.au/jahia/webdav/site/myjahiasite/shared/papers/arkhayman.pdf

van der Heijden, H. (2000) "e-Tam: A Revision of the Technology Acceptance Model to Explain Revisits", Research Memorandum 2000-29 [online] Vrije Universiteit Amsterdam, http://dare.ubvu.vu.nl/handle/1871/1583

Jefferies, A., Thornton, M., Parkhurst, S., Doolan, M., and Alltree, J. (2005) "Any Time? Any Place?-The Impact on Student Learning of an On-Line Learning Environment", Proceedings of the Fourth IASTED Conference [online] www.actapress.com/PDFViewer.aspx?paperId=19721

JISC (2004) *Effective Practice with e-Learning: A good practice guide in designing for learning*, report for HEFCE [online] JISC, http://www.jisc.ac.uk/media/documents/publications/effectivepracticeelearning.pdf

JISC (2007) *JISC Strategy 2007-2009* [online] JISC, http://www.jisc.ac.uk/media/documents/aboutus/strategy/jisc_strategy_20072009.pdf

JISC (2008) "Recent jisc_emerge Bookmarks on Delicious" [online] Delicious, http://delicious.com/tag/jisc_emerge

Kennedy, G.E., Judd, T.S., Churchward, A., Gray, K., and Krause, K-L. (2008) "First year students' experiences with technology: Are they really digital natives?", *Australasian Journal of Educational Technology,* Vol 24(1), pp. 108-122

Lapham, A. (2007) "Creativity Through e-Learning: Engendering Collaborative Creativity Through Folksonomy", Proceedings of the 6th European Conference on E-Learning 2007, pp. 379-390

Motschnig-Pitrik, R. and Holzinger, A. (2002). Student-Centered Teaching Meets New Media: Concept and Case Study. *Educational Technology & Society*, Vol 5(4), pp. 160-172 [online] http://www.pri.univie.ac.at/Publications/2002/Motschnig_IEEE20002_Student_Centered_Teaching.pdf

Musser, J. (2007) "12 Social Bookmarking APIs" [online] Programmable Web, http://blog.programmableweb.com/2007/09/28/12-social-bookmarking-apis

O'Reilly, T. (2005) "What Is Web 2.0: Design Patterns and Business Models for the Next Generation of Software" [online] O'Reilly http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html

Weiler, A. (2005) "Information-Seeking Behavior in Generation Y Students: Motivation, Critical Thinking, and Learning Theory", *Journal of Academic Librarianship,* Vol 31(1), pp. 46-53