Social Bookmarking Use in University Courses: Student Perceptions and Behaviors

대학 수업에서 소셜 북마킹의 활용: 학생 인식 및 행태를 중심으로

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ABSTRACT

This exploratory study describes the social bookmarking perceptions and behaviors of students in university courses. Although an emerging discussion regarding the value of social bookmarking tools exists, how users adopt tools in practice is not well known. Students were asked to utilize the bookmarking tool del.icio.us to store information relating to course projects. They were also asked to comment how they employed del.icio.us for course projects. The study analyzed student perceptions and behaviors when using social bookmarking tools for university coursework. The study noted that the use of tags, notes, and networking within these social bookmarking tools remained less active and social bookmarking services in Web 2.0 as shared collaboration, shared communities, and vertical search were less present. Utilizing social bookmarking tools to facilitate personal information management includes the activities of information use, information re-use, and mobility.

초 록

본 연구에서는 대학강좌에서 학생들의 소셜 북마킹 도구에 대한 인식 및 사용 행태를 분석하였다. 소셜 북마킹의 가치에 대한 최근 활발한 논의에도 불구하고 실제 이용자들이 어떻게 소셜 북마킹을 사용하는가에 대해서는 알려진 바가 많지 않다. 본 연구는 수업에서 학생들의 소셜 북마킹 도구인 딜리셔스 사용 행태와 인식을 바탕으로 소셜 북마킹이 제시하는 가치들이 실제에서 어떻게 나타나는지를 조사하였다. 학생들은 태깅, 기술, 네트워크의 기능을 소극적으로 사용하고 있었다. 이용자는 여전히 개인 정보 수집 및 관리의 도구로써 소셜 북마킹을 사용하고 있었으며, 소셜 북마킹 도구는 정보의 사용 및 재사용성은 향상시키고 있었으나 소셜 북마킹 도구가 지향하는 협력기반 정보공유, 협력기반 커뮤니티 구축 및 도메인 검색의 가치는 충분히 실현되지 못하고 있는 것으로 나타났다.

Keywords: social bookmarking, del.icio.us, learning tool, exploratory study
소셜 북마킹, 딜리셔스, 학습도구, 탐색적 연구

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1. Introduction

The term Web 2.0, used first in 2004, is perceived to refer to a mass movement of user engagement in web-based services from viewing and consuming to collaborating, producing, and sharing (Collis & Moonen, 2008; Coutinho & Bottentuit Junior, 2008). The promoted 'social' attributes of the Web are alleged to have profound potential to facilitate teaching and learning in higher education, which can attract instructors and students to integrate Web 2.0 tools in their pedagogical activities (Abbitt, 2009; Ajjan & Harshorne, 2008; Collis & Moonen, 2008; Coutinho & Bottentuit Junior, 2008).

Social bookmarking, a particular category of Web 2.0 tools, has become popular and its values have been widely discussed in the context of education because it can enhance collaborative learning experiences (Coutinho & Bottentuit Junior, 2008). Compared to the rigidity of Web 1.0, directory systems such as social bookmarking can facilitate collaborative information discovery (Alexander, 2006; Boulos & Wheelert, 2007). Social bookmarking enables users not only to identify and retrieve resources and sites of interest by tagging them, but also to share these resources with anyone at a computer with internet access, making the action of bookmarking 'social' and thus, promoting collaborative opportunities (Boulos & Wheelert, 2007; Gooding, 2008; Gordon-Murnane, 2006).

Academic discussions of social bookmarking values are currently emerging, but the adoption of social bookmarking in institutional practice has been very limited (Ajjan & Harshorne, 2008; Boulos & Wheelert, 2007; Collis & Moonen, 2008). Although a few empirical studies have been conducted to determine the effectiveness or efficiency of social bookmarking and quantify the impact on pedagogical practice, the majority of these studies remain anecdotal or superficial (Boulos & Wheelert, 2007; Coutinho & Bottentuit Junior, 2008; Rollett, Lux, Strohmaier, Dősinger, & Tochtermann, 2007).

Since social bookmarking is still in the nascent and continuously-evolving stage (Alexander, 2006; Boulos & Wheelert, 2007), improvement of social bookmarking requires richer and systematic descriptions and investigations of real-life use situations. Particularly, information on user perceptions and the behavioral patterns of social bookmarking could be useful for developers, designers, and other experts intending to refine the tool into reflecting user perspective and experience.

This study addresses the following questions: what are student perceptions of the use of social bookmarking as a learning tool in higher education coursework?; What are student behavioral patterns while using social bookmarking in higher education coursework? To answer these questions, an empirical study was conducted with the goal of creating a rich description of the social bookmarking application in a real pedagogical setting.

2. Theoretical Background

2.1 Web 2.0

Over the last few years, information systems based on user participation have taken the web by storm with the development of semantic web technology and the expansion of Web 2.0. The term "social" is being used for collective intelligence of Web technologies such as in the areas of social information architecture, social tagging, and social software. These changes represent "the transformation of the web from user-centered to participant-centered; put another way, these changes are addressing user needs by reflecting user opinions" (Gordon-Murname, 2006, p.29).

Amazon was the initiator in actively using customer participation in information search and identification. Amazon provides user reviews for products and these are widely considered very useful for product purchase. Consumers rely on information from others who have already experienced the product rather than information from product producers (Porter, 2008).

Web 2.0 services move beyond personal information management to dynamic interactive participation and information sharing within communities (Spiteri, 2009). Web 2.0 aims to "achieve interactivity, user control of information, radical personalization, the development of online communication, and democratic management of information" (Breeding, 2006, p.30). Web 2.0 tools like blogs, social bookmarking, and wikis drive people "to create and distribute contents like never before" (Richard, 2007, p.50).

Web 2.0 promotes the idea that when people create and save information, that information is likely to be a good source for others. The more people can store, describe, and share information, the more comprehensive resources people have at their disposal (Richard, 2007). As Porter (2008) foresaw, information generated from users is a powerful dramatic expansion of information systems, and Web 2.0 applications help make these systems better.

2.2 Social Bookmarking

Social bookmarking tools enable users to "share lists of web resources to be accessed from anywhere, by anyone (Harris, 2009, p.36)." These tools allow users to tag web resources with keywords and to share their treasures with others. Social bookmarking is related to several concepts, including the concept of tagging. Tagging an item or resource places the resource into "a subject or category (Wikipedia)." When people save and organize web resources using social bookmarking tools, they can add keywords to describe and easily identify what the web resource is about, and these keywords are called "tags." Tags can be shared with others. Social bookmarking tools collocate web resources with the same tag, and these tags can be used to search web resources.

The second concept related to social bookmarking is the concept of folksonomy. Folksonomy

is defined as "a naturally created classification system which arises as a result of user-based tagging (Kroski, 2006)." Usually, a folksonomy is automatically generated by social bookmarking software so that people can search and browse web resources based on tags.

Originally, the main objective of bookmarking was "to retain information so that people can use that information again later (Gordon-Murnane, 200, p.26)." However, social bookmarking in Web 2.0 is quite different from bookmarking in Web 1.0. Bookmarking tools in Web 1.0, including bookmarking utilities in browsers such as Internet Explorer and Firefox that provide the function to retain links or URLs for use at a later date. However, as Harry Bruce, William Jones, and Susan Dumais pointed out in their research of personal information management (2004), the majority of people who organize their information in this way did not return to their personal information management systems. Typically users had trouble remembering why they had organized or stored the information to begin with, and sometimes failed to locate bookmarks they had specifically retained.

Social bookmarking provides empowers users to give titles, tags and detailed notes to the resources that they tag. This added information is used to search and share resources with others. Social bookmarking meets personal information management needs, and enhances the ability to "keep things found" and share information with others.

Several of the most common social bookmarking features are described as follows (Gordon-Murnane, 2006; Richard, 2007):

- ***Keeping things found:*** This feature helps users to locate links or web resources marked for future reference.
- ***Sharing collaboration (folksonomy):*** Users share their interests, and these mutual interests encourage additional sharing of tags and resources. As web resources are saved using tags, the social bookmarking tool facilitates the collocation of contents with similar tags. Users can easily locate related contents that have been tagged by other users. Social bookmarking tools drive collaboration and collective knowledges such as folksonomy. As users contribute additional links and tags, social bookmarking services become more powerful (Gordon-Murnane, 2006, p.29).
- ***Sharing community:*** Identifying resources by URL or tag, social bookmarking tools encourage people to find other users with similar interests. By recognizing groupings with similar interests, people can build communities based on these interests.
- ***Vertical search/browsing:*** People may search resources using specific tags or topics. Users may also utilize keyword search or browsing by clicking URLs or tags.
- ***Discovery/serendipity:*** Users may find unexpected web resources through browsing URLs, tags or networks. Users can recognize and add other users into their network as desired. When users browse social bookmarking resources in an identified network,

it helps them to find useful resources.

- ***Portability/mobility:*** People can access social bookmarking tools from anywhere that internet access is available. People can re-discover and re-use web resources bookmarked in social bookmarking tools regardless of geographical location.

Social bookmarking tools also have disadvantages. Currently, there are no defined structures or systems by which to add tags; therefore, tagging systems are sometimes messy. There is no way to control synonyms (e.g., "trip" and "travels") or word variants (plural/singular, capitalization, abbreviation). Effective and efficient search may be hindered by these limitations; for example, searching by "trip" does not retrieve the same set of resources that have been tagged with the term "travels." Similarly, searching by "UNC" does not retrieve the same set of resources that have been tagged with "University of North Carolina", nor does searching with "University of North Carolina" retrieve resources tagged with "university of north carolina."

Several empirical studies have been performed to demonstrate how the values of social bookmarking tools are displayed in practice. In a 2008 study, Morrison compared the search performance of social bookmarking sites with those of search engines and subject directories. 45 users evaluated the relevance of search results with various information needs. Search engines displayed higher precision and recall, but the precision and recall of the social bookmarking tool del.icio.us was not far behind. Information retrieval by folksonomies in del.icio.us had similar recall precision in information retrieval by subject categories. Morrison (2008) concluded that search by del.icio.us is quite useful and enhances query handling to make retrieval experience better.

Millen, Whittaker, and Feinberg (2007) found that people used del.icio.us for community browsing (examining community bookmarks by time, frequency, users, and tags), personal searching (looking for bookmarks from the user's personal collection of bookmarks), and explicit searching (using the traditional search box to enter a set of search terms), even though community browsing is the most frequently observed search method. While conducting a field study of an enterprise bookmarking tool within a corporate environment, the research team analyzed log files for one year. The results of this study demonstrated that social bookmarking tools provide diverse exploratory searching options and are good for personal information management and social navigation.

2.3 Social Bookmarking as a Learning Tool

According to Boulos & Wheelert (2007), the sociable technologies of social bookmarking have the potential to promote active and engaged learning. Expansion of social connections through social bookmarking tools allows an increase in the number of ways in which users collaborate and share their creations with others, and also helps

participants to construct their own knowledge through social interaction and exploration (Gooding, 2008; Rosen & Nelson, 2008). Additionally, working with others and sharing one's ideas improve thinking and deepen understanding.

Those social attributes of social bookmarking mentioned above fit well with the pedagogies of social constructivism (Collis & Moonen, 2008; Rosen & Nelson, 2008). The foundational concept of social constructivism is that learners actively construct their own knowledge through collaborative processes. Use of social bookmarking in teaching and learning settings can facilitate pedagogical activities into the learner's interaction, collaboration, and participation, and finally increase the opportunities of learner construction and organization of individual knowledge.

Due to the immense pedagogical potentials of social bookmarking, adoption of social bookmarking in educational settings has been highly valued and discussed (Rosen & Nelson, 2008). However, since social bookmarking is in a nascent stage and evolving its architectures, the potential for pedagogical innovation through the affordance of social bookmarking has not been frequently reflected in teaching and learning practice (Collis & Moonen, 2008). Only a few educators and institutions have introduced or implemented social bookmarking as a learning tool in their courses or programs (Ajjan & Hartshorne, 2008; Boulos & Wheelert, 2007; Coutinho & Bottentuit Junior, 2008).

In their study, Coutinho and Bottentuit Junior (2008) suggest that using social bookmarking for pedagogical activities in courses helps learners to become (1) capable information technology users, (2) information seekers, analyzers, and evaluators, (3) problem solvers and decision makers, (4) creative and effective users of productivity tools, (5) communicators, collaborators, publishers, and producers, and (6) responsible, and contributing citizens.

Although faculty in educational institutions recognize the benefits of social bookmarking as a learning tool and have demonstrated willingness to integrate social bookmarking into their courses, only a small ratio of faculty members actually implement it (Ajjan & Hartshorne, 2008). Ajjan and Hartshorne insisted that in order to promote pedagogical use of social bookmarking in effective and efficient ways, faculty members need to have effective support systems affecting the faculty's familiarities with, development of technological knowledge and skills for, and deep understanding of social bookmarking.

3. Research Method

The study addressed in this paper aims to explore student perceptions and behaviors within a social bookmarking system and to further investigate the potential benefits and overall use of the social bookmarking system as a learning tool in a university coursework setting.

3.1 Research Participants

Two separate university courses (42 students in course A; 18 students in course B) were examined for the purposes of this study. The coursework and the design for both courses were identical, which reduced the variation of course types. In addition, the courses were delivered in two universities that have similar academic rankings.

For the final project, students (working as individuals rather than groups) chose a library and information science school web site, analyzed the domain and user information needs within that domain, and evaluated and redesigned the web site according to principles of information architecture design and information needs analysis.

Students were asked to complete two types of assignments - one for domain analysis and user information needs, the other to address information architecture design. Students set up individual social bookmarking accounts using del.icio.us and were required to collect and share information resources which they considered useful for the course project.

The students taken the courses, mostly junior or seniors in the program, had basic skills in information technology because they had taken several information technology courses in previous semesters.

Since active students' participation was considered to provide richer information on students' perceptions and behaviors in using social bookmarking, the total number of resources bookmarked was used as a criteria to select the students for this study. The data of seventeen students who bookmarked at least ten web resources were investigated for the final data. The seventeen students were composed of 10 females and 7 males and all in twenties.

3.2 del.icio.us.com

del.icio.us (http://del.icio.us) was the first social bookmarking tool, launched in 2003 by Joshua Schachter of Memopool. del.icio.us was selected as a research instrument in this study because it is one of the best known social bookmarking tools.

del.icio.us allows diverse features. For content description, users can describe contents by title, tag, tag bundle, and note content. To perform content searching, users can either search or browse by tag, tag bundle, URL and user name. Figure 1 demonstrates how people describe and make sense of links using URL, title, notes, and tags in del.icio.us. Figure 2 proposes that users can find web resources by browsing and keyword search.

3.3 Data Collection Process

Data was collected using two techniques utilizing student comments and student bookmarking behaviors. Students were asked to hand in their assessment of domain analysis and user information needs in the ninth week of the semester. Students

〈Figure 1〉 Save a New Bookmark in del.icio.us

〈Figure 2〉 Find Web Resources in del.icio.us

were also required to write descriptions detailing how they used social bookmarking tools to complete their assignment.

Researchers analyzed student behaviors while using social bookmarking tools for eight weeks, from early-March to early of May in 2009. Researchers examined each student's use of bookmarking, tags, notes, and networks in del.icio.us for students' behaviors. Researchers also analyzed student commentary on utilizing social bookmarking tools to complete their class assignments.

3.4 Data Analysis

To analyze data, Gordon-Murnane (2006)'s six features of social bookmarking were considered - keeping things found, sharing collaboration, sharing community, vertical search, discovery/ serendipity, and portability/ mobility.

To ensure trustworthiness, inter-coder reliability

was tested between two researchers to gauge the stability of the coding schemes and to measure the extent to which different coders arrive at the same coding decisions. The inter-coder reliability rate was calculated using Miles and Huberman's formula (1994, p.64):

Reliability = Number of agreements/total number of agreements + disagreements

Researchers calculated initial inter-coder reliability with this test and had a discussion to ensure that both understood the other's coding. According to Miles and Huberman (1994, p.64), initial reliability rates are not likely to exceed 70%, but final inter-coder agreement should approach or exceed 90% if the coding schemes in a study are valid. Total initial range of agreement was quite close to 80% and the total final rate of agreement was higher than 90%. Therefore, the coding scheme used was valid according to suggested rates of inter-coder reliability.

4. Findings

4.1 Students' Perceptions

In this study, students were asked to describe the benefits of using the selected social bookmarking tool during class activities. The categories of their responses were similar to the most common features of social bookmarking depicted by Gordon-Murnane (2006) and Richard (2007). The categories and the frequencies of the students' responses are shown in table 1.

Among the six categories, 'keeping found things found' and 'sharing community were the most frequently reported as positive aspects of using social bookmarking. Ten out of seventeen students (58.9%) perceived the use of social bookmarking as helping to keep links and web resources found now available in the future using quick and convenient methods. The following highlighted student responses demonstrate this perception of social bookmarking:

〈Table 1〉 Categories and Frequencies of Students' Perceptions regarding Benefits of Using the Social Bookmarking Tool

	N	%
keeping found things found	10	58.9
sharing collaboration (tagging)	2	11.8
sharing community	9	53.0
vertical searching	2	11.8
discovery/serendipity	2	11.8
portability/mobility	2	11.8

Bookmarking by using delicious was very helpful. Whenever I needed to visit the homepage of ..., I didn't search it and clicked the bookmarking, which made me save my time (student A).

Since I collected the website addresses in delicious, I could quickly move to other websites and compare the contents related to my assignments (student B).

A high ratio of the students (53%) reported that the del.icio.us tool helped them to find other users who had interests similar to theirs and to build communities of interests. The aspect of sharing community using del.icio.us is specifically seen in the student descriptions as follows:

By using del.icio.us, I bookmarked blogs of my classmates for the collection of information related to my interests and easily access the blogs later (student C).

del.icio.us showed the number of people who bookmarked the URL that I did the same and led me to see all of the links that those people made, which made me collect helpful resources through others' delicious sites as well as mine (student D).

The remaining four benefit categories of using the del.icio.us tool were mentioned by only a few of the students (11.8%). Student E said that he favored using del.icio.us because it helped him to copy the sites that he wanted, bookmark them, and annotate them through tagging. By contributing tags, this student participated in sharing collaboration and contributed to the collective knowledge or folksonomy. In addition, some of the students searched bookmarked resources by browsing tags or URLs (vertical searching).

Two students perceived that the del.icio.us tool to enabled them to capitalize on the insights of others to locate information related to their assignment and to experience serendipitous findings. Student F described such experiences as follows:

I could identify what kind of resources my peer students had collected, which led me to encounter many good resources through serendipity (student F).

Although using del.icio.us as a social bookmarking tool has portability characteristics distinguished from the bookmarking system of Web 1.0, only two students reported it. Student G responded as shown:

The del.icio.us enabled me to re-find and re-use web resources bookmarked in tools regardless of places because I could access the del.icio.us anywhere the internet access is available. This aspect complements the Web browser's favorite function that is saved at only one computer, which is very useful for me to use it (student G).

4.2 Students' Behavior Patterns

Multiple student behavior patterns were analyzed to understand how they utilized the social bookmarking tool in class. Among six features Gordon-Murnane (2006) and Richard (2007) depicted, three features - 'sharing collaboration', 'sharing community', and 'vertical search' - were mainly investigated in the study because student behaviors with the use of other three features - 'keeping found things found', 'discovery/serendipity', and 'Portability/ mobility'- were hard to be recognized by analyzing the use of social bookmarking tool. This section addressed students behavior patterns with the three features in detail. Student behavior patterns are shown in table 2.

Students added eighteen resources using the social bookmarking tool on average. They rarely used the social bookmarking tool for out-of-class resources: the average number of resources bookmarked for out-of-class purposes was 0.53. Seven students did not assign tags at all when bookmarking. The types of resources that students bookmarked were resources identified by other students, personal blogs, library and information science websites, related literature, and other web resources. How students' patterns presented in table 2. links to features of social bookmarking tools were discussed in following sections.

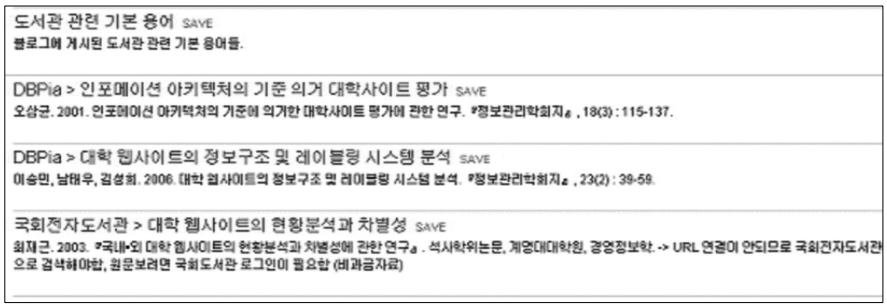
4.2.1 Sharing collaboration

Information was collected and shared mainly through folksonomy tagging (Gordon-Murnane, 2006). However, the study found that tagging was not actively employed, thus information sharing and collection through tagging were limited.

The value of shared collaboration within social bookmarking tools is based on the assumption that people save web resources with tags. The tool collocates resources with similar tags so that information can be located by a participant's voluntary collaboration without the assistance of librarians or a pro

〈Table 2〉 Frequencies of Students' Use of Social Bookmarking Tool

	N	%
Average Number of bookmarks	18	
Average number of tags assigned	0.78	
Average number of networks	1	
Average number of adding other bookmarks	1.88	
Students assigning ~~tag~~ tags	10/17	58.8
Students utilizing networks	12/17	70.6
Students adding other bookmarks	11/17	64.7
Students assigning notes	8/17	43.33
Resources having tags	120/312	38
Resources not having tags	192/312	61.54
Resources having notes	165/312	52.89
Resources not having notes	147/312	47.11



〈Figure 3〉 The Limited Use of Tags in del.icio.us

vider's purposive collocation. The study found that 41.2% of the students did not assign tags when they bookmarked web resources. The average number of tags that students assigned for resource identification was 0.78. The rate of resources bookmarked which did not have tags was 61.54 % (192 out of 312). This result represents that students participated in tagging activities far less than researchers had expected. As shown in figure 3, even a student who added detailed notes for a bookmarked resource tended not assign a tag.

This study identified about 38% of the studied resources could be located using tags. However, the remaining about 62% of untagged resources challenge the presumed tagging benefits as noted by social bookmarking tool supporters. This result was also supported by student commentary - only two students responded that they found the tool useful to locate tagged resources.

4.2.2 Sharing community

Bookmarking other user's bookmarks and adding resources from an online network were observed as sources of sharing communities. Twelve out of seventeen (70.6%) students added other students to their networks, and eleven out of seventeen (64.7%) bookmarked other student's bookmarked resources. The study data demonstrated that a high-percentage of students built communities of interest using bookmarking and network tools.

〈Figure 4〉 The Detail Use of Notes in del.icio.us

Given this high percentage, the analysis of user behaviors for sharing communities revealed several interesting findings.

Students added one person to their network on average, and added an average of 1.88 previously-bookmarked resources to their own bookmarking. When examining the use of networking in detail, it was discovered that most students added a teacher to their network, and tended to use bookmarking to add other students' del.icio.us resources to their own resource pool.

The number of networks and previously-bookmarked resources added per student was a little less than researchers had expected. Researchers had anticipated observing prolific activity amongst sharing communities since they had encouraged the students to share and explore others' bookmarking behaviors and had instructed the students on how to use the networking functions available to them.

The behavior patterns of students who did utilize the networking functions was quite remarkable. These students mainly added teachers to their network. Student commentary also supported this activity; six students commented felt they could move to other student resources from their teacher's bookmarked resources, and they reported this activity to be useful. However, despite student recognition of the benefits of networking, they rarely added others, nor did they search other by user name. Student responses also indicated that they primarily built communities of interest by browsing URLs.

Social bookmarking services in Web 2.0 is different from bookmarking services in Web 1.0 in that it is based on active of participant interactions (Hong, Kim, & Cha, 2008). Participants are information creators as well as beneficiaries from information provided by other users. This passive activity makes it hard to urge the use of social bookmarking services as they presented in the context of Web 2.0.

4.2.3 Vertical search/browsing

As found in the above section regarding shared collaboration, the rate of the students who did not assign tags when bookmarking web resources was 41.2%. The rate of resources bookmarked which did not have tags was 61.54 % (192 out of 312).

The analysis of detailed tagging behaviors generated interesting findings. Most students assigned very generic tags or terms that appeared in the resource title. As shown in figure 4, a student bookmarked a resource considered useful for target audience analysis, as indicated in a note; however, assigned tags were often author names and resource types also appearing in the title.

Lancaster (1998) suggested that the guidelines of exhaustivity and specificity for indexing terms were valuable in search applications. Indexing terms are usually assigned to indicate "what the resource is about" and are often referred to as resource subjects.

Despite the argument that "the number of terms assigned to a document is a cost-effectiveness consideration, the more terms used for indexing, the greater chance that the resource will be retrieved and identifiable with others (Lancaster, 1998,

p.29).” For indexing purposes, the utilization of specific terms is typically preferred over more general terms.

For indexing purposes, the utilization of specific terms is typically preferred over more general terms. For example, if the resource is about medical libraries, the use of a combination of indexing terms - Science Libraries and Medical Science - are better than the use of Medical Science and Libraries, since medical libraries are specific scientific characteristics.

Considering Lancaster’s (1998) guidelines, it is hard to allege that students’ tagging behaviors can be beneficial for vertical searching, since tags are often generic, rather than specific, and only a few terms (less than 1 tag per resource) are utilized.

The rate of the students who did not assign notes when bookmarking web resources was 56.67%. The rate of resources bookmarked which did not have notes was 52.89 % (165 out of 312). In addition, fifty percent of the students who assigned notes for resources provided notes which were similar to the title of the web resource, as shown in a figure 5.

The remaining 50% of students who used notes for resources gave more detailed notes explaining why they chose those resources and how they can use those resources at later time, as shown in a figure 6.

〈Figure 5〉 The Use of Tags in del.icio.us

〈Figure 6〉 The Detail Use of Notes in del.icio.us

To ensure the effectiveness or efficiency of vertical searching, it is necessary to examine how many users assign searchable tags or notes to bookmarked resources. The data gathered in this study makes it difficult to conclusively state that limited tagging and notes use support vertical search/browsing when utilizing social bookmarking services. Users tend to search for resources by relying on URL browsing. Student commentary supported the study findings regarding this behavior. Students rarely responded that they collected resources from searching tags, and four students answered that they were able to collect resources from others by browsing URLs.

5. Discussion and Conclusion

With the aim to understand how people utilized social bookmarking tools in the context of Web 2.0, this study investigated student use of del.iou.us in university classes and coursework.

The study found that most students used social bookmarking tools as personal management systems to collect and locate information resources. Utilization of tags and notes were limited. The students participated primarily as passive actors, despite responding that referencing other student's bookmarking was useful for collecting resources. Students passively looked for others and rarely added other students into their network, mainly relying on an instructor's bookmarking to find other students.

Based on the findings, some important implications can be highlighted and discussed. First, among the diverse architectures of bookmarking tools, only two aspects - keeping things found and sharing community - were frequently perceived as positive ones by the users. Students built communities and benefited from those communities by browsing URLs, not through the use of tags or notes. This activity could be interpreted to mean that users of social bookmarking tools are not familiar with using these tools and are not well prepared for the Web 2.0 environment. This is consistent with the findings of the Ajjan and Hartshorne (2008); as proposed in this study, systematic support needs to be provided for users of social bookmarking tools in order to develop Web 2.0 literacy and use the available tools in effective ways.

Although social bookmarking tools are highly recommended as learning tools because of their collaborative and participatory attributes, only a few of the students studied perceived the del.icio.us tool's social or collaborative potential, nor did they utilize vertical searching. Proponents for Web 2.0 and social bookmarking have alleged the social pedagogical potential by their social attributes. However, this study finds that students currently don't seem to fully recognize these components.

The lack of social behaviors in social bookmarking use - sharing collaboration and communities through the use of tags and vertical searching - is related to the limited use of tags, notes, and networks found in the study. This limited use may be summarized by categorizing participant activity

as passive. In order to display the value of social bookmarking services in the context of Web 2.0, the induction of active participation should be investigated further. Similarily, the motivation for student use of tags, notes, and networks - or the factors which hinder the use of tags, notes, and networks - needs to be examined in the future. The development of social bookmarking services should be based on the understanding of participant behaviors and perceptions found in this study. Social bookmarking services should find a more effective way to provide social functionality, given the limited and passive user participation identified in this study.

This study is a pilot study, and the limitations of this study should be considered when interpreting the findings. The study investigated student perceptions and behavioral patterns while using social bookmarking tools for only 8 weeks; the study period would ideally be extended to cover the whole course. Secondly, this study investigated a single class type and a relatively small number of students. The findings are probably not sufficient to adequately represent student perceptions and behaviors in general. Continued empirical investigation are needed to acquire collective knowledge and to unearth varying results. Although the study analyzed quite an amount of qualitative data, since it only utilized student bookmarking behaviors and commentary, researchers were not be able to investigate social bookmarking motivation and discussion. Further studies featuring think-aloud protocol, interviews, and log analysis are needed.

Despite these limitations, this study is valuable in that it empirically reveals that several of the noted social bookmarking service benefits in Web 2.0 are not yet presence in practice, even in an environment where social bookmarking is continuously encouraged by an instructor. The study also serves to facilitate a greater understanding of student behaviors and perceptions found in the classes examined. This study provides a base for further empirical investigation, which will be used to establish a body of research focusing upon diverse Web 2.0 tools.

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