Supporting Group work in class projects:
Social Bookmarking and Collaborative Editing

Summary Report for
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A virtual team which is an \textit{ad hoc} collection of individuals, brought together for a specific purpose are used extensively in a wide variety of business contexts such as product design, software development, management consulting, and health care. Managers rarely have the luxury of managing a project in a single location or organizing a project with a co-located team, making virtual teamwork a necessity. Business school curricula are increasingly integrating virtual teamwork in their curricula to expose and train students in the ability to manage and work in geographically and temporally distributed workgroups. In addition, the nature of the student body in RCB makes virtual teamwork in group projects a necessity, since co-location, though desirable, is often very difficult.

Courses in several disciplines such as management, marketing and CIS typically involve group work that require constant communication between group members as well with the instructor. Rarely such group work is accomplished in face-to-face meetings. With a geographically disbursed student body such as in RCB such physical meetings are difficulty to organize due to schedule constraints. Often such meetings are scheduled during weekends and are reported to be not very productive; hence the increased interest in the use of collaborative tools such as social bookmarking and collaborative editing.

Computer based support for group work in RCB courses is typically restricted to online chat tools, email and shared file servers. A new breed of tools that support social bookmarking and collaborative editing offer excellent capabilities that support virtual teamwork. Cloud computing and Social Bookmarking – the use of web-based tools and services for storing data and processing – has become increasingly recognized as a viable mechanism for individuals and corporations to view computing as a utility or a service available over the Internet. Software-as-a-Service (SaaS) has been considered as the core concept underlying cloud computing (Erdogmus, 2009). Cloud computing has proliferated in numerous areas focusing on providing storage,
computing, and various support services. Examples include Google Apps – a cloud computing platform that provides a suite of tools including word processing, spreadsheet, and presentation software, Amazon’s Elastic Computing Cloud – which includes a string of storage and computing resources, and Salesforce.com – provider of CRM software-as-a-service. Much of the development in this area along with possible future innovations in cloud computing have been stoked by the development of suitable technologies including Google Apps (such as Google Docs for Collaborative Editing) and Microsoft’s Azure platform for web services. Cloud computing proponents have touted significant economic advantages in transitioning to cloud computing model from a traditional buy-own model. The new model may include software applications, computing resources, infrastructure as services provided over the Internet by vendors whose core competence focuses on establishing and maintaining a reliable and scalable infrastructure and services. Advantages may include cost savings resulting from pay-as-you-go model for cloud computing as opposed to incurring fixed costs of supporting an internal Information Technology department (Vizard, 2009). Despite the rapid development and use of cloud computing technologies, there has been little attention on understanding the factors that may dictate the widespread adoption of such technologies. Several challenges still remain in enabling the viability of cloud computing for complex and sensitive applications (McAfee, 2006). Concerns range from cost, flexibility, reliability, performance, interoperability, and security (Lin et al., 2009). For example, a recent glitch at Google Docs may have allowed unauthorized access to some documents to some users (Wildstrom, 2009). Security is still considered as one of the critical factors that will impact the adoption and use of cloud computing technologies (Bradner, 2009; Fontana, 2009). While economies of scale might enable cloud computing hosts to provide levels of security that small companies might not have been able to afford otherwise, use of shared infrastructure for sensitive processes and data pose challenges. While cloud computing and the issues surrounding the adoption and use of the same are rapidly gaining attention in practice, there has been limited research on gaining insights into the factors that enable adoption of these technologies in the classroom. For example, since cloud computing focuses on offering services over the Internet, security and feature richness constitute important factors that may impact students’ inclination to use such systems. Specifically, the ability to meet student demands for quality is a significant factor that determines the adoption of collaboration tools
such as collaborative editing and social bookmarking tools (Millen et al., 2005). For example, reusability, efficiency, reliability, scalability and availability have been identified as critical quality factors for the consumers of SaaS model of computing. Further, since the importance of varies quality factors varies with the nature of cloud computing services, a careful examination of these factors to support different models of cloud computing merits further examination. Our innovation sought to address this issue in the context of cloud computing that provides tools such as Google docs that enhance productivity.

Quality refers to ‘the degree to which a set of inherent characteristics fulfills a need or expectation that is stated, generally implied, or obligatory’ (Hoyle, 2006). Functional requirements describe the services the system should provide, how the system should react to particular set of inputs, and how the system should behave in particular situations. For example, when we consider a system such as Google docs, a particular set of functional requirements emerge as important. Google docs facilitates collaborative writing, which includes brainstorming, note-taking, outlining, organizational planning, drafting, revising, and editing (Baecker et al., 1993; Ede & Lunsford, 1990). Collaborative writing involves the production of a shared document that is developed through substantive interaction among team members (Ede & Lunsford, 1990). Since the interaction among team members forms the essence of collaborative writing, support for ‘group formation’ is a critical functional requirement. Document control, which involves coordinating and controlling changes in documents and making such changes visible to collaborators, is also considered a critical component of collaborative writing (Baecker et al., 1993). The ability to write synchronously has been identified as an important functionality that can avoid problems in blending individually completed work products together (Noël & Robert, 2004; Rimmershaw, 1992). Finally, the ability to communicate and share ideas have been established as critical functionalities of collaborative writing tools (Noël & Robert, 2004).

Non-functional Requirements (NFR) deal with building quality into software systems. They describe important constraints upon the development and behavior of a software system (answering the question ‘how well does the system provide the intended services to the user?’). Systems must exhibit software quality attributes such as reliability, maintainability, accuracy,
performance, and security. Although they play a significant role in systems development, they are difficult to address and are often discovered late in the development process in an ad-hoc fashion (Nuseibeh, 2001).

**Methodology**

The innovation involved the use of these tools in CIS 3001, a course on IT project management. During Summer and Fall 2008 and Spring 2009, students were asked to use Etherpad (which was merged with Google Docs), a collaborative editing tool and Delicious, a social bookmarking tool. These tools supported a variety of collaborative editing functions such as co-authoring of documents, tracking of the history of each edit that was done on the document, the ability to ‘go back in history’ to previous versions of the document at any point in its evolution and viewing the entire history of evolution of the document. These tools was selected after a careful evaluation of other candidate tools such as Zoho writer, WriteBoard, ThinkFree and even earlier versions of Google Docs. A variety of factors such availability, spell checking, real-time collaborative editing, and export/import of various file formats were considered in the selection of the tool used in the innovation. Social bookmarking systems provide the following capabilities that will be of immense help for students engaged in group projects that require the use of Web based sources:

- Allow individuals to create bookmarks and share them with the group members.
- Allow individuals to create tags and allow the uses to organize and display the collection with meaningful labels.
- Share bookmarks, tags and reorient the view of the collection based on tags and user names.

Besides quantitative data, qualitative data was gathered from students in the treatment group to assess their perceptions of the various functionalities offered by the tools to help identify the features that are considered most critical in their intention to use such tools. On an average, subjects had about 13 months of experience in using virtual communication tools. Subjects had an average of over 13 months of IT work experience. These subjects are suitable for this study.
because they are likely to use collaboration tools that are hosted on the cloud for their teamwork and are experienced in using similar tools.

**Procedure**

We initially conducted a Q-sort, pilot study, and expert review. Four PhD students majoring in information systems participated in the Q-sort. They were asked to categorize thirty-two measurement items into eight constructs: reliability, control, compatibility, security, flexibility, timeliness, share, group formation. In turn, these eight constructs were categorized into either functional or non-functional quality by them. Each group was asked to collaboratively write an article about IT outsourcing using GoogleDocs. They were given seven sub-sections on IT outsourcing. Each of them filled out one section of his/her choice. Participation of subjects in the study was voluntary. The subjects were given one week to complete their assignment. At the completion of the assignment, the URL for the online survey site was provided. This procedure is to ensure that subjects had used Google docs for collaborative writing before completing our survey.

**Measures and Results**

We adopted established multi-item measures for most constructs. Measurement items for several other constructs (compatibility, security, share, group formation, version control, revision, and synchronization) were developed based on the published research and interviews with two information systems design experts. These items were revised and validated with a pilot test. All items were measured using a seven-point Likert scale ranging from “strongly disagree” (1) to “strongly agree” (7). Table 1 shows the constructs and measures used in the study and the means for each construct.
Table 1: Definition of Constructs & Measures

<table>
<thead>
<tr>
<th>Construct</th>
<th>Definition</th>
<th># of Item</th>
<th>References</th>
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<tbody>
<tr>
<td>Intention to Use</td>
<td>The degree to which a person intends to use the information system.</td>
<td>4</td>
<td>(Davis, 1989; Jackson et al., 1997)</td>
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<tr>
<td>(5.3)</td>
<td></td>
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<tr>
<td>Perceived Ease of Use</td>
<td>The degree to which a person believes that using a system would be free of effort.</td>
<td>5</td>
<td>(Davis, 1989; Davis et al., 1989; Moore &amp; Benbasat, 1991)</td>
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<tr>
<td>(5.4)</td>
<td></td>
<td></td>
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<tr>
<td>Satisfaction</td>
<td>A judgment that a service provided a pleasurable level of consumption-related fulfillment.</td>
<td>3</td>
<td>(Kettinger &amp; Grover, 1994; Oliver, 1999)</td>
</tr>
<tr>
<td>(5.5)</td>
<td></td>
<td></td>
<td></td>
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<td>Non-Functional Quality</td>
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<tr>
<td>• Control</td>
<td>Reflects perceptions of constraints on the behavior of a system and encompasses self efficacy, resource facilitating conditions, and technology facilitating conditions.</td>
<td>4</td>
<td>(Ajzen, 1991; Taylor &amp; Todd, 1995)</td>
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<tr>
<td>(5.35)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>• Reliability</td>
<td>The dependability of system operation.</td>
<td>4</td>
<td>(Parasuraman et al., 1985; Wixom &amp; Todd, 2005)</td>
</tr>
<tr>
<td>(5.19)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>• Security</td>
<td>The degree of protection against potential loss and danger.</td>
<td>4</td>
<td>(Baskerville, 1993)</td>
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<td>(5.12)</td>
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Outcomes

As the results presented in Table 1 indicate, the tools were very well received by students, as measured by their satisfaction as well as the intention to use such tools in future assignments and work. The study also helped establish several key attributes that must be carefully evaluated.
while selecting tools that provide similar functionalities. Specifically, several non-functional quality dimensions that are typically overlooked in the choice of tools are very critical in tools that support groupwork.

This innovation achieved the following objectives:

- It promoted collaborative problem solving and group work in a flexible environment
- It increased the student awareness of the potential use and role of social bookmarking and collaborative editing in supporting virtual teamwork in everyday business situations
- It increased the effectiveness of group work with true group work (by co-authoring, co-browsing, or co-editing etc.)
- It helped students create common documents and resource libraries by ad-hoc study groups and sub-teams
- It helped the instructor assess the contributions of each students and also provided visibility to the work done over the entire assignment period
- It helped evaluate the individual contributions of each of the group members.
- It helped the students and the instructor to consolidate the research done by various student groups

The results suggest that while both functional and non-functional quality play a critical role in shaping system satisfaction and in turn intention to use, non-functional quality turns out to have a stronger impact when compared to functional quality. These findings have significant implications for the development and management of systems that support the cloud computing model.

The qualitative data collected from students confirm that the tools help team members

- Interact and share information asynchronously
- Helped them collectively browse and collect references material that is relevant to their group projects
• Helped not only share, but also co-edit and co-author documents. Further, they were able to assess each other’s work and contributions
• Jointly work on project deliverables (such as creating a work break down structure, project plan or project charters)
• Engage in online research, co-browsing websites together and jointly identifying relevant material
  ➢ The tools helped group work without having to constantly engage in email and file exchanges.
  ➢ Since the tools managed much of the tedious aspects of collaboration such as version control and scheduling, they helped the team focus on critical tasks.
  ➢ When students co-edit documents knowing that other group members as well as the instructor could view every aspect of their contribution, were more diligent in their writing.
  ➢ Many students enjoyed the experience and perceived an improvement in their writing skills as a result of the feedback and edits provided by their peers.

The students in the treatment group were asked whether they would recommend the p2p tool to other instructors. Some of the typical comments include:

  ➢ Have already recommended the tool to other professors
  ➢ After the experience with the tool in this course, I am using it for collaboration in other courses that involve group projects

Instructors in RCB who would like to try this innovation can easily do so. A very popular tool, Google Docs, is available for free. Several social bookmarking tools are commonly embedded in references sources and therefore, can readily be used while students engaged in search for appropriate references.

References


MOORE GC and BENBASAT I (1991) Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information systems research* 2(3), 192-222.


