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AUTHOR	LeRouge, Cynthia; Blanton, Ellis; Kittner, Marcy
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ABSTRACT

Colleges of business are particularly known for assigning large-scale team projects as a means of enhancing learning. Though students may assemble in one location for "traditional" classroom-based learning, time and distance may create challenges as students attempt to fulfill requirements associated with large-scale team projects. This study explores the use of collaborative group tools found in common course management systems (e.g., Blackboard[C] and WebCT[C] and community sites (e.g., MSN Communities[C] as a means to address logistic and project material organization problems associated with large scale team projects in colleges of business. It investigates relationships among social and technical factors to enhance the learning outcomes that can result from student project teams deploying collaborative group tools. Specifically, this study uses qualitative inquiry of team stakeholders to compare perceptions of use of collaborative group tools from both a user and non-user perspective and develop a causal model identifying potential net benefits from the use of collaborative tools and antecedents to benefits to facilitate current understanding as well as future research. Additionally, this study provides prescriptions for use of collaborative group tools to facilitate successful application of collaborative group tools to student group projects. Includes three tables and one figure. An appendix lists the open-ended survey questions. (Contains 11 references.) (Author)

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THE OTHER SEMI-VIRTUAL TEAM: USING COLLABORATIVE TECHNOLOGIES TO FACILITATE STUDENT TEAM PROJECTS

Cynthia LeRouge
University of South Florida

Ellis Blanton
University of South Florida

Marcy Kittner
The University of Tampa

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1

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Colleges of business are particularly known for assigning large-scale team projects as a means of enhancing learning. Though students may assemble in one location for "traditional" classroom-based learning, time and distance may create challenges as students attempt to fulfill requirements associated with large-scale team projects. This study explores the use of collaborative group tools found in common course management systems (e.g., Blackboard© and WebCT©) and community sites (e.g., MSN Communities©) as a means to address logistic and project material organization problems associated with large scale team projects in colleges of business. We investigate relationships among social and technical factors to enhance the learning outcomes that can result from student project teams deploying collaborative group tools. Specifically, this study uses qualitative inquiry of team stakeholders to compare perceptions of use of collaborative group tools from both a user and non-user perspective and develop a causal model identifying potential net benefits from the use of collaborative tools and antecedents to benefits to facilitate current understanding as well as future research. Additionally, this study provides prescriptions for use of collaborative group tools to facilitate successful application of collaborative group tools to student group projects.

INTRODUCTION

If only it was as easy as a simple math problem:

Addend 1-Team projects in business courses
\+ Addend 2-Team time, logistic, and project organization challenges
\+ Addend 3-Team access to virtual group collaborative technologies
= Net Gains (Well, maybe!)

Globalization, the distribution of team members, technology support, and a quest for efficiency, has propelled the existence of both successful and unsuccessful virtual and semi-virtual team structures in professional organizations and a resulting viable research stream. In a similar fashion, technological advances (and access), the distribution of members, and a quest for efficiency, are propelling a new context for semi-virtual or virtual teams in an academic setting, namely the business student group project.

Colleges of business are particularly known for assigning large-scale projects (extending the duration of a semester or multiple semesters) as a means of enhancing learning. Students may congregate in one place to attend class sessions; however, logistical and schedule barriers may impede project team assembly outside of the classroom meeting time. The barriers may be exacerbated in situations where a team project is

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2

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assigned in a distance-learning context or where a project connects distributed team members from different universities or geographic locales. As such, the use of collaborative technologies to support student group projects provides a situation of virtual or semi-virtual teams existence as well as a means to further explore technology-mediated learning (particularly in the development of computer mediated communication skills in the context of teamwork).

Common course management tools like Blackboard© (http://www.blackboard.com/) and WebCT© (http://www.webct.com/) allow instructors/course managers to create group sections on the course web site to facilitate project work. The features of such group sections typically include threaded asynchronous communication (e.g., group discussion board), synchronous communication (e.g., group virtual classroom), file storage, and group e-mail capabilities. Additionally, publicly available sites, such as MSN Communities© (http://communities.msn.com/) can provide students with web site space providing community message board, calendar, link, photo albums, lists (e.g., to do list), and custom web pages in addition to all of the features associated with the course management tools.

When faced with a team project in a distance education course or in a classroom based course, instructors may make these collaborative technologies (hereafter, project team tools will be referred to as collaborative technologies) known and available to students or students may independently seek such collaborative technologies. Collaborative technologies may be used as an alternative to some or all face-to-face meetings, to facilitate communication among team members, and/or as a means to organize course project materials.

RESEARCH OBJECTIVES

These collaborative technologies hold the promise of facilitating what seems to be an immediate need for project teams in colleges of business - communication convenience, member access, and project organization. As well, exposure to collaborative technologies may prepare students for virtual team arrangements they may face in the future in the work place. However, it seems little is known regarding situational propriety and the antecedent factors to fulfilling technological promises (Izard & Reeve, 1986; Patel & Russell, 1999). In a recent article addressing the status of technology mediated learning research in IS, Alavi and Leidner highlight a void in research studies that "focus on forming relationships among technology and relevant instructional, psychological, and environmental factors that will enhance learning outcomes" (Alavi & Leidner, 2001). In response to this void, we seek to investigate relationships among social and technical factors to enhance the learning outcomes that can result from student project teams deploying collaborative technologies in colleges of business.

Specifically, this research seeks to satisfy three objectives to enhance understanding of this phenomenon and facilitate successful application of team collaborative technologies to student group projects.

- Compare perceptions of use from both a user and non-user perspective.
- Develop a causal model identifying potential net benefits and their antecedents to facilitate current understanding as well as future research.
- Provide prescriptions for use based upon qualitative inquiry of team stakeholders.

Our basic research question can be stated as, "What social and technical factors are necessary to make web-based collaborative technologies a viable resource to students in project teams?"

To attend to these objectives, we provide the theoretical and logical foundation serving as an underpinning to field inquiry, present the interpretive fieldwork performed in this study and the emerging model, and provide insight to guide research and practice.

THEORETICAL FRAMEWORK

Contextual Domain

Researchers engaged in the study of IS success urge the academic community to pay careful attention to domain context in defining and measuring each component of success included in studies (DeLone & McLean, 2002; Seddon, 1997). Research also indicates that users prefer to tailor constructs and measures to the type of system under evaluation to facilitate understanding and application (Jiang & Klein, 1999). Though research in virtual teams in a professional context may provide some insight, it is our position that the deployment of collaborative technologies in education is a context with innate idiosyncrasies that merits distinct research to develop a comprehensive model that identifies

situational relevant variables and relationships. Professional projects staffed by distributed teams exist in a multitude of forms; conversely, there is general consistency in form that distinguishes the academic project deploying the collaborative technologies. Traditional idiosyncrasies in the student team project context follow.

- Academic project teams are short lived (typically not exceeding a semester) and have inflexible deadlines.
- Team members do not have predefined roles in entering the project.
- Team members may not have history with or even knowledge of other members.
- Team assignment is an informal and perhaps even arbitrary process.
- Outside of perhaps class time, team members do not have a predefined work location and hours for team activities.

Furthermore, it is difficult to equate the motivators (e.g., the motivation of grade pressure) of student team members to the motivators (e.g., the sustenance and embitterment of a livelihood) of professional team members.

In response to these unique characteristics, we seek to explore the phenomena of interest from a ground-up, context specific perspective using an interpretive paradigm recognizing the socio-technological nature of the phenomenon.

Socio-technical System

The deployment of collaborative technologies to support a distributed (or semi-distributed) work arrangement is undeniably a socio-technical system as the system is a composition of technology, human interaction, and the environment. As such, we must look beyond the technology in attending to the purpose of this study.

Computer mediated communication technologies (CMC) have been employed facilitating distance communication in synchronous, asynchronous, and multi-media forms. CMC technologies—electronic mail, computer conferencing, distribution lists, and chat rooms—have all been employed to enable and support distributed work arrangements. However, ambiguity regarding whether these technologies create richer and more meaningful communication exist (Kraut, Rice et al., 1998). Kraut refers to this ambiguity as the computer-mediated communication paradox. The basic assumption of CMC theories is that CMC does not transmit the same level of vibrancy and interaction that exists in face-to-face interaction (Lisetti & Bianchi, 2002). Therefore, users of CMC systems are thought to adapt to their CMC technology and therefore to exhibit fewer of their natural communication behaviors.

These findings render it increasingly important for researchers interested in virtual collaborations and collaborative technologies to take a *socio-technological approach* to their studies. This provides guidance to process as well as product as a product's success could be enhanced by developing technology that adapts (or co-adapts) to social processes (such as a medical visit) at the center of human lives (Lisetti & Bianchi, 2002).

User Based View

To address the socio-technical perspective adequately, we adopt a user-based view. It is important to understand what users perceive to be important, because it is these issues that underpin their perceptions of information system success (Whyte, Bytheway et al., 1997). According to the user-based approach, end users are the ultimate judge and jury regarding the technology. As stated by Whyte, the difficulty with the user-based approach is to find the set of variables that strongly and positively correlate with the perceived performance of successful information systems. To deal with this difficulty, we query users and non-users as respondents to identify the issues, variables, and relationships associated with the deployment of collaborative technologies in this academic context.

Voluntary Use

We restrict the scope of this study to the use of team collaborative technologies as a supplement to a "traditional," classroom based business course to support project teams (hence, the possibility of semi-virtual teams). We specifically sought contexts of voluntary use during the course of this study where students plausibly have the option to meet face-to-face during the course term to work on project activities. We select this context in order to explore both use and non-use given otherwise equal parameters (e.g., potential users enrolled in the same course). We feel voluntary deployment would provide the greatest insight into the

research objectives as indicated by prior IS research on technology acceptance (Venkatesh & Davis, 2000).

METHODOLOGY

Procedures

We used open-ended survey instruments as a means of qualitative inquiry to explore student perceptions and experiences with using collaborative technologies to support group projects. Open-ended survey instruments versus structured interviews were used to allow respondents to reflect on their response, provide information at a convenient time, and to access the collaborative tool with project team content for reference purposes. Two forms of survey instruments were used—one for students that opted to use collaborative technologies and one for students that did not.

Items on the two instruments were the same or closely parallel where possible to facilitate comparison between the use group and the non-use group. Survey instrument items were derived through analysis of transcripts related to five semi-structured interviews with instructors requiring a major course project that enable group features in their course web system (e.g., Blackboard© or WebCT©) or present the use of publicly available tools like MSN Communities© and the experiences of one of the authors in using these tools in classroom settings. The interviews began with a digest of the research intent. There were two basic questions guiding the interview process.

- What questions would you recommend asking students to learn more about the application of these tools to their course projects?

- What do you believe are some of the high-level issues in using these tools? How would you recommend inquiry into these issues?

These questions sparked further interview probes and discourse. Four instructors (two of whom had participated in the interview process) served as a pre-test panel to review open-ended questions developed. Open-ended questions were piloted using five students. Pilot and pre-testing resulted in minor revision to items and instructions. Open-ended questions included in the instruments are provided in Appendix A.

Context

Given our objective of explorative inquiry, we sought a context which would provide a breath of use situations (courses, instructors, and collaborative technologies) to enhance the potential for comprehensive study. We chose to conduct this study within a College of Business at a large metropolitan university in the southeastern United States. This site was conducive to the study as the university academic computing system supported:

- multiple forms of course environments (Blackboard© and WebCT®), through technology, training, and "customer support," for at least three years prior to the study (utilization of these tools was at the discretion of the professors),

- instructors in various departments who had chosen to use various tools,

- free dial-in Internet access for students, and

- many on-campus computer labs for students.

We spoke with instructors from various departments to identify those courses that included a large-scale (semester duration) group project and those instructors who apprised students of and afforded students the opportunity to use collaborative technologies in some form. We specifically sought situations where the instructor had taught the identified course before and had repeatedly used the same form of group project. We primarily addressed undergraduate courses as an attempt to focus our study to users/non-users not already using parallel tools in a work setting. However, we did collect information from a team of graduate IS students working on a project for comparative purposes.

Research Process

We contacted instructors teaching relevant courses before the start of a semester requesting participation. Instructors teaching screened courses and willing to participate were identified in the Information Systems, Finance, and Marketing Departments. Students in four upper-division undergraduate courses participated in the study along with one graduate project team. Each of the instructors confirmed they apprised students of collaborative technologies available throughout the course as an elective means to facilitate group projects.

At the close of the semester, instructors discerned which student teams used collaborative technologies and which did not and proceeded with data collection. Information regarding the study was not provided to the students prior to this point in time. After announcing the topic of study, students were asked to complete the appropriate survey instrument. The instructor distributed respective surveys and related instructional materials to students. Students were directed by their instructors and survey instructions to return the surveys to the researchers via campus mail in the provided self-addressed envelope. Assurance of anonymity was conveyed both through verbal instructions from participating instructors and through the survey instructions. The response rate was 92% (113 of 123 surveys distributed were returned). Table 1 provides the distribution among disciplines and user versus non-user. Table 2 provides a brief participant history broken down by user/ non-user.

Responses to open-ended questions were analyzed to discern antecedent and consequence factors of effective use by one researcher using an inductive method for developing a coding scheme described by Boyatzis (1998). A second researcher analyzed the responses using the developed coding scheme noting suggestions for refinement/ improvement to the schema. Two additional researchers apprised of the study reviewed the coding schema and coding details. An iterative process of review between the researchers continued until thematic convergence and an agreement on labels and definitions was reached. The model presented in Figure 1 resulted from this iterative process among researchers.

The final model is represented in Figure 1. Each of the constructs is supported by a preponderance of evidence resulting from this analysis process of respondent comments. Once the model was finalized, responses were then reanalyzed by two researchers to determine if statements supporting the construct were from users, non-users, or both (see Table 3).

TABLE 1
PARTICIPANTS BY DISCIPLINE AND USE/ NON-USE

Discipline	Collaborative Tool Users	% Collaborative Tool Users	Collaborative Tool Non-Users	% Collaborative Tool Non-Users	Total
Information Systems	14	56	11	44	25
Finance	0	0	16	100	16
Marketing	18	24	56	76	74
Total	**32**	**27**	**83**	**73**	**113**

TABLE 2
PARTICIPANT HISTORY—USER/NON-USER

	Users		Non-Users		Total	
History Item	**Yes (%)**	**No (%)**	**Yes (%)**	**No (%)**	**Yes (%)**	**No (%)**
Did you participate in group projects in college of business courses prior to this course?	13 (41)	19 (59)	43 (53)	38 (47)	56 (50)	57 (50)
Have you used course web sites in the past?	26 (81)	6 (19)	56 (69)	25 (31)	82 (72)	31 (27)
Have you used group features of course web sites or web communities in the past?	4* (36)	7* (64)	17* (37)	31* (65)	21* (36)	38* (64)

*This question was added to the survey after 54 surveys had already been collected.

FIGURE 1
COLLABORATIVE TECHNOLOGIES TO SUPPORT STUDENT TEAM PROJECT MODEL

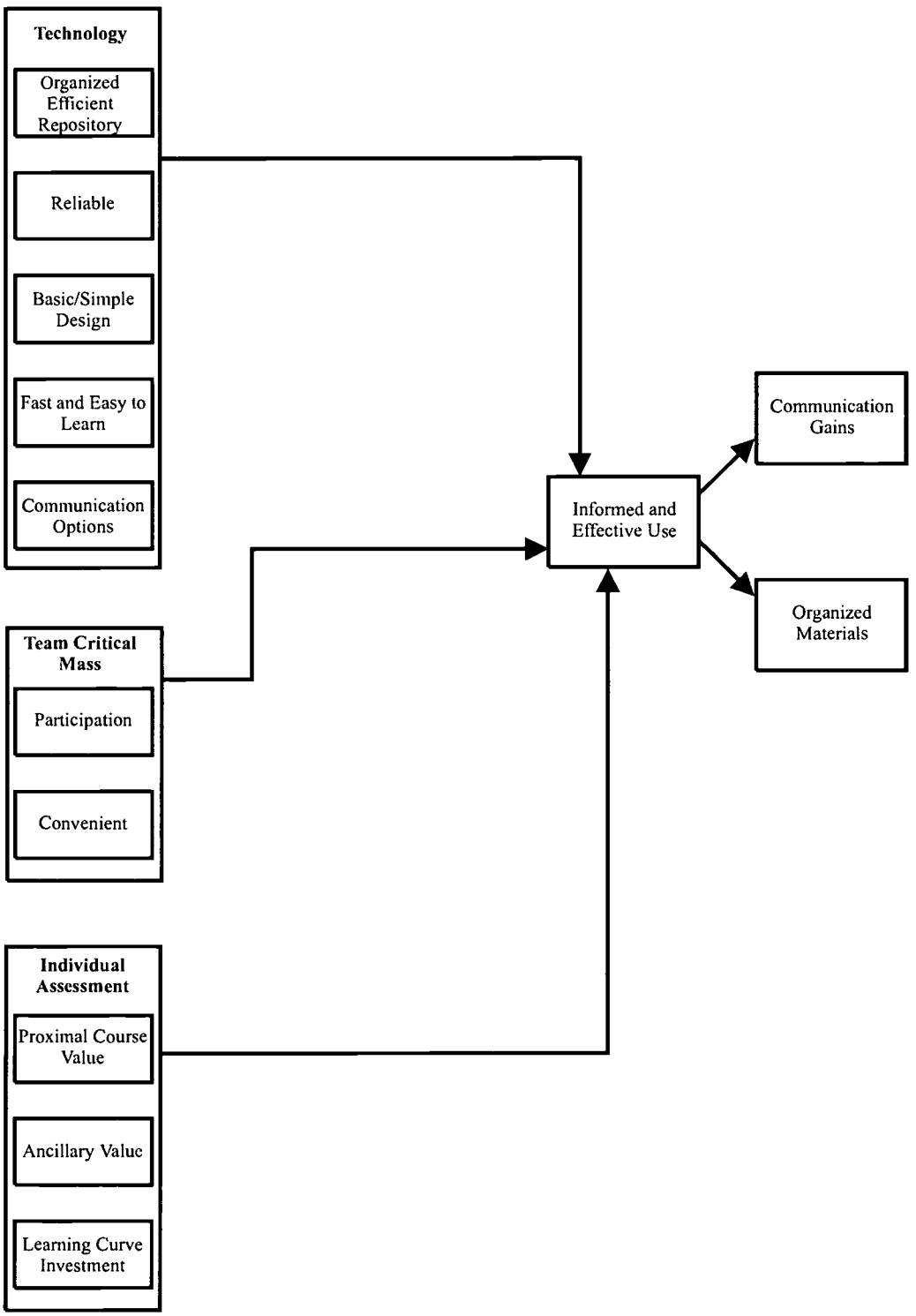

TABLE 3
DISTRIBUTION OF CONSTRUCTS INDICATED BY USERS AND NON-USERS

Model Constructs	Users	Non-Users
Technology		
Organized efficient repository	x	x
Reliable	x	x
Basic/Simple Design	x	
Fast and Easy to Learn	x	x
Communication Options	x	x
Team (Critical Mass)		
Participation		x
Convenience		x
Individual Assessment		
Learning Curve Investment	x	x
Proximal Course Value	x	x
Ancillary Value	x	x
Informed and Effective Use	x	
Communication Gains	x	
Organized Materials	x	

DISCUSSION

Based upon quantitative data analysis, informed and efficient use depends upon three dimensions of issues: the technology itself, individual assessment, and team critical mass. This section defines each of the model constructs associated with these dimensions, provides a trail of evidence via quotes and paraphrases from respondents, and addresses differences between users and non-users.

Antecedents to Informed and Effective Use—Technology Related Constructs

Organized, efficient repository. Both users and non-users asserted that the collaborative technologies should provide effective file management features. Respondents noted collaborative technologies should provide a/an "place to organize one's work," efficient (storage) system," and "place to organize and store materials."

Reliable. Reliability encompasses failures of the system as well as problems encountered in accessing the system through log in. Both users and non-users expressed the need for dependable technology. There seems to be reliability issues with some existing systems in use as users noted that the "*site was not always working*" and referred to "*mechanical failures of the site.*"

Basic/simple design. Interestingly, only users expressed the need for a basic and simple design. Perhaps non-users did not spend enough time in exploration to make an evaluation or design issues were best discovered through the course of use over the semester. Design complexity issues were particularly noted in user responses to collaborative technologies disadvantages through comments such as, it was "confusing about where to post messages," and the site was "difficult to understand." It seems that designers of collaborative technologies specifically designed for educational use should be judicious in adding features as students noted there were "too many tools to use."

Fast and easy to learn. To facilitate informed and effective use, the technology must accommodate an efficient learning process. Both users and non-users indicated that the collaborative technologies introduced initial learning challenges through such remarks as, the technology is "too hard" and "takes too long to learn to use." Comments indicate that initial challenges during the learning process dissuaded further use for the project.

Communication options. Communication options refers to the availability of various features provided by the technology to aid communication and discussion among group members as well as supporting technology infrastructure to provide access from any location at any time. As stated by one respondent, the technology provided "easy communication among group members at all times." Regarding communication feature set, users indicated the desirability of discussion board, meeting scheduler/calendar, and e-mail. Conversely, virtual classroom, chat rooms, and ironically e-mail were stated as being the least useful features in the sites.

Antecedents to Informed and Effective Use—Individual Assessment Constructs

The deployment of these technologies involves an individual assessment as well as the collective assessment of group use. We will first address the individual assessment constructs.

Learning curve investment. Users reported an average time required to feel comfortable in using the collaborative technologies of 36 minutes. On the surface, this would not seem to be a substantial learning curve for a new software tool. However, one user noted a "long learning curve" was an issue. It seems most non-users may have assumed a substantial learning commitment was required without actually investing the time as

represented by a failure to report an exploratory time investment and comments such as it is "too time consuming to learn a new technology" and there is "not enough free time" to learn a new technology. Communication from instructors informing students of learning curve estimates may allow students to perform a more accurate individual assessment of time requirements.

Proximal course value. From a negative perspective regarding the project itself, some students noted the use of the collaborative technologies to be "information overload" or "unnecessary." As would be expected in a decision process of voluntary use, students assess whether the technology will add additional value to project outcome. Additionally, students noted collaborative technologies can actually enhance pedagogy as represented by the comment that the collaborative technologies "facilitated class learning."

Ancillary value. Ancillary value in terms of personal enjoyment was expressed in reference to "love of computers." Additionally, a positive assessment regarding the use of the tools may encompass an expectation of use beyond the course. Both users and non-users indicated that collaborative technologies should be of beneficial use for future courses and even future work. Though there may be justified reasons some colleges allow choice in the course site technologies (e.g., Blackboard© versus WebCT©), comments regarding ancillary value for future courses imply the use of collaborative technologies within a specified institution would benefit from homogeneity. Respondents indicated the potential of ancillary value regarding a work setting through the comments related to "beneficial for all types of work," "useful to know for business and industry," "helpful in all facets of future jobs," which seemed to facilitate a positive assessment and use.

The innate nature of some disciplines, such as information systems, may indirectly convey the utilization of technology through the educational process will benefit future work settings. Individual instructors may inform the individual assessment process by communicating potential future value related to future courses and work settings.

Antecedents to Informed and Effective Use—Team (Critical Mass) Constructs

The collective assessment of the group does not seem to require an absolute positive individual assessment by all group members. However, it seems critical mass is necessary if collaborative technologies are to be used effectively.

Participation. Students identified challenges faced in using the collaborative technologies when a critical mass of group members do not employ the technology or reluctantly use the technology. As stated by one respondent, I "cannot use site because not all group members use (the site)," Statements by users indicate a lack of collective participation can definitely cause a group to abandon use of the collaborative technologies.

Convenience. Collectively, the group needs to determine the collaborative technologies provide a convenience that will address situational barriers. In a semi-virtual team situation, face-to-face and telephone meetings may be alternative means of communication. Group communication dynamics (and skills), geographic dispersion and schedule issues will influence perceived communication conveniences among choices. Situational factors indicate collaborative technologies do not provide a convenience when members find "other methods of communication easier" and "prefer meeting in person."

Consequents to Informed and Effective Use

Organized materials. Users stated collaborative technologies provide a means to organize materials used, safeguard files, and increase the overall organization of the project. In describing the value of collaborative technologies, one student stated it "provided information pertaining to the project at all times."

Communication gains. Communication gains can be thought of as enhancements to the communication process that would not be realized barring the use of the collaborative technologies. In communicating the communication values of collaborative tool use, users noted the technology both facilitated "ease of communication" and afforded "multiple forms of communication."

General Reactions

Though the aforementioned discussion provides indications that non-users reported barriers to using the web site, the majority (68%) indicated they would use the collaborative technologies in the future. As such, there does seem to be some recognized value though a technology may not be utilized for a particular course project or by a particular group.

Users also indicated they experienced some issues during the deployment process. However, a holistic review of user comments indicates they found the use of collaborative technologies to be positive. Furthermore, users indicated (97%) that they would use the collaborative technologies to facilitate future projects.

CONCLUSION

Technology is increasingly sought as a means to address distance, scheduling, and student volume in higher education as well as a means to complement classroom learning. If we are to understand and realize the potential of such technologies in education from a learning and access perspective, we must understand the perceptions of both users and non-users as well as recognize the nuances of the educational context in deploying tools that may also find use in professional contexts. From a research perspective, this study acknowledges these issues in explaining and modeling a particular existing phenomenon which has received little attention in literature, but seems to be growing in use, namely the availability of collaborative technologies to support group projects in college of business courses. Further work may explore the peculiarities of group dynamics especially in the initial stages of group formation that may affect the successful use of these tools, which was not particularly addressed by this study.

The results of this study provide prescriptive insight for various stakeholders in practice. For the designers of web-based technologies for classroom use, Bauhaus philosophies seem to hold, namely less is more in the eyes of the user. The short-lived nature of the project and the team may not provide the conditions where extensive functionality can be fully exploited and may even deter utilization. For college computing support infrastructures, the perceived ancillary advantages of using the same collaborative technologies/on-line course system in all courses deploying systems merit consideration. Likewise, there appears to be an apparent need for the reliability of collaborative technologies and implicitly course web sites that may be accessed by students 24/7. Additionally, computing support and/or instructors may want to consider providing some basic "training" on using collaborative technologies that includes coverage of virtual communication skills.

Finally, instructors should recognize that like many professionals, students may also face distance and scheduling issues which complicate the execution of group project tasks. The availability and information regarding the use of collaborative technologies may provide a viable option to mitigate issues for some project teams and could enhance the learning process intended by the project assignment.

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APPENDIX A
OPEN-ENDED SURVEY QUESTIONS

User Questions

Questions were customized to the course project and the collaborative technologies made available to facilitate question clarity.

1. What did you like (advantages) about using the *name of collaborative technologies* for the *name of project assignment*?
2. What did you dislike (disadvantages) about using the *name of collaborative technologies* for the *name of project assignment and course*?
3. Approximately how long did it take before you became comfortable in using *name of collaborative technologies*?
4. What facilitated your learning process and comfort level in using *name of collaborative technologies*?
5. What difficulties did you encounter in using *name of collaborative technologies*?
6. What hampered your learning process and comfort level in using *name of collaborative technologies*?
7. Explain any effects on team dynamics you noted by using name *of collaborative technologies* (positive and/or negative).
8. What features did you find most useful?
9. What features did you find least useful?
10. What changes in use would you recommend to the design or method of using *name of collaborative technologies*?
11. How do you feel using a *name of collaborative technologies* to facilitate a business course project differed from your academic project experiences that did not use a community site?
12. What information did you add/contribute *to name of collaborative technologies*?
13. Would you use a community site in the future? If so, in what context?

Non- User Questions

1. What did you like (advantages) about the idea of using the name of collaborative technologies made available associated with the *name of collaborative technologies made available* for the *name of project assignment and course*?
2. What did you not like (disadvantages) about the idea of using the name of collaborative technologies made available associated with the *name of collaborative technologies made available* for the *name of project assignment and course*?

3. Did you try to use *name of collaborative technologies* for the *project assignment and course?* If so, approximately how much time (hours and minutes) did you spend in exploring the *name of collaborative technologies*?

4. What discouraged you from using *name of collaborative technologies* for the *name of project assignment and course*?

5. Did you find the group feature set in *name of collaborative technologies* was lacking? If so, what additional features would you have liked (for example, file directory/subdirectory structure, assignment list capabilities, group calendar, etc.)?

6. How did your team members react to using the *name of collaborative tool* (positive and/or negative)?

7. Do you think the *name of collaborative technologies* have any value for student group projects? Please explain your response.

8. Would changes would your require to use *name of collaborative technologies* in the future (e.g., demonstration, instruction sheet)?

9. Would you use *name of collaborative technologies* in the future? If so, in what context?

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