Abstract

Today's complex and dynamic business environment creates a demand for college graduates who can effectively use collaboration technologies in a team environment. However, choosing and using appropriate technologies can be a challenging task. In this research, we propose a comprehensive study on evaluating and promoting an appropriate collaboration technology for student teams. The research plan includes three phases: 1) identifying the important features of collaboration technologies; 2) creating an evaluation framework, assessing available collaboration technology products on the market, and selecting one product, and 3) empirically validating the effectiveness of the recommended collaboration technology. Results from phase one revealed that students consider document and content sharing, supporting team communication, and no cost technology as the top three features of collaboration technologies. Our study, once fully implemented, will provide deeper understanding and guidance on successfully using collaboration technologies for teams in a college setting.

Keywords

Collaboration Technology, Student teamwork, empirical study, evaluation framework.

Introduction

Teamwork skills are vital for today’s college graduates (Aasheim et al. 2012; Ahmed et al. 2012; Robles 2012, Zhang et al. 2015). According to a recent study that examined core competencies of college graduates, teamwork or collaboration is consistently cited as a key workplace skill in multiple studies that surveyed recruiters, HR professionals, hiring managers and executives (Eisner 2010). Meanwhile, with a changing workplace environment characterized by globalization, cost-cutting, cross-functional projects and mobility, organizations increasingly rely on collaboration technologies to support teamwork (Alnuaimi et al. 2010; Brown et al. 2010). This increases the demand for college graduates who possess the skills to effectively use collaboration technologies to achieve team goals (Staggers et al. 2008).
Among the efforts to prepare students to have such skills, researchers have provided advice to teams on how to build virtual collaboration skills by using a specific technology platform (Long and Meglich 2013) and how to choose appropriate technology for virtual team meetings (Bull Schaefer and Erskine 2012). However, collaboration technologies provide many more features beyond supporting virtual team meetings, such as sharing documents, tracking activities, planning and scheduling tasks, and coordinating member effort (Dumova and Fiordo 2009). Given the proliferation of collaboration tools on the market and the wide range of features they offer, choosing and using appropriate tools can be an overwhelming task for college students. Thus, students still face challenges choosing appropriate collaboration tools to meet their specific team needs and effectively using the chosen technologies.

To address this challenge, we propose an empirical study with the following steps. First, we explore which features provided by collaboration technologies are a good fit for student teamwork in a university setting. Second, we develop an evaluation framework to assess and select appropriate collaboration technologies that fit college students' needs. Third, we evaluate whether the recommended collaboration technologies facilitate team collaboration in either traditional on-campus classes or online classes. In the rest of the paper, we review the literature on the use of collaboration technology in college student teams, present detailed research design, report the preliminary results from a survey, and discuss implications of the study.

**Literature Review**

Collaboration technology supports multiple people to work together regardless of their physical locations or whether they work at the same time or at different times (Dennis et al. 1988; DeSanctis and Gallupe 1987). Examples of early collaboration technologies include e-mail (Markus 1994), group decision support systems (DeSanctis and Gallupe 1987) and web-based conferencing systems (Warkentin et al. 1997). In recent years, features provided by collaboration technology have expanded greatly, including: sharing documents; presenting, sharing and annotating a screen; polling participant status; recording meetings; tracking activities; planning and scheduling; and coordinating member effort (Dumova and Fiordo 2009; Xu 2007).

With the growing trend of using collaboration technologies to support teamwork (Alnuaimi et al. 2010; Brown et al. 2010), organizations are seeking employees who know how to use these technologies effectively (Staggers et al. 2008). To respond to such needs, a number of studies have been conducted in areas such as teaching the use of collaboration technologies to students (Long and Meglich 2013; Staggers et al. 2008), investigating critical technology-related issues that influence student virtual project team performance (Weimann et al. 2013), and choosing the appropriate technology for virtual team meetings in class projects (Bull Schaefer and Erskine 2012). Despite their significant contributions to prepare students for real-life teamwork using collaboration technologies, there are still a few areas under-addressed by this body of research.

First, with one exception (Weimann et al. 2013), most research has focused on virtual teams instead of both virtual teams and traditional face-to-face teams. However, as recognized by Weimann and colleagues (2013), although student teams are not usually spread across geographic locations, they often have limited face-to-face meetings due to team members’ different class and work schedules. When the line between traditional and virtual teams is blurred (Gaudes et al. 2007), it is important to consider both types of teams’ technology needs for effective teamwork, which is still lacking in the literature. Second, when it comes to choosing appropriate tools, student teams may consider a different set of factors and have unique sets of constraints from “real world” teams, who are constrained by organizational standards or policies (Majchrzak et al. 2000). We are not aware of any research that has investigated the features of collaboration technology that are critical to students in an educational environment. Third, although researchers have recognized the importance of the selection of collaboration technology (Bull Schaefer and Erskine 2012; Weimann et al. 2013), we have not seen research that investigates how to guide students to choose appropriate technology for all of their teamwork needs (besides virtual meetings, which was investigated by Bull Schaefer and Erskine 2012). This is an important topic since research has shown that the improper selection of communication and collaboration tools introduces discontinuities in project work and impacts team performance (Weimann et al. 2013).
To fill the research gap identified above, we propose a comprehensive empirical study, which is discussed in the next section.

**Research Design**

Grounded in Task-Technology Fit theory (Goodhue and Thompson, 1995), we believe that the best collaboration technologies for student teamwork are those best address students’ collaborative needs. In this vein, an empirical study is used to identify and promote suitable collaboration technology products. As illustrated in Figure 1, our research is planned in three phases: 1) discover the important features of an effective collaboration technology product; 2) assess available products in the market and make a selection; 3) use the recommended products and evaluate its effectiveness.

**Figure 1. Research Design**

**Phase 1. Identification.** The goal of this phase was to identify the important features of a collaboration technology product in a university setting. A student survey was used as the research method. The survey instrument was built based on a study by Xu (2007) and it collected the following information: 1) demographic information; 2) participants’ experience with collaboration technology products; 3) participant ratings of the features of a collaboration technology product. Graduate students and undergraduate senior students at the participating university were selected as subjects of this study since most of them already had experience with team projects. The participants were invited from both online classes and traditional on-campus classes. The questionnaire was distributed through the Web and participation was totally voluntary. The phase one study is complete and the results are reported in the research findings section.

**Phase 2. Assessment and Selection.** There are two major activities in this phase. First, we will create an evaluation framework by synthesizing the survey results and literature. The framework is a metric system containing four categories: file and content, team communication, project management, and additional features, as well as general evaluation. Each category contains several sub-features related to collaboration technology products. Each category and each feature may carry different weights. The total score will indicate the merits of a collaboration technology product.

Second, we will use the evaluation framework to assess available collaboration technology products in the market. The assessment will be conducted in two rounds. In round one, the researchers will identify a broad range of available collaboration technology products in the market and perform an initial
assessment using the evaluation framework. Each researcher will conduct the task independently. Any differences in the assessment results will be reconciled in group meetings. The goal of round one is to narrow down the selection of collaboration technology products to three or four candidates for further analysis. In round two, each researcher will pick one collaboration technology product and perform a thorough analysis using the evaluation framework created in the first activity of phase two. In addition, the assessment process will also include installation and actual use of the collaboration technology. At the end of the phase, the researchers will discuss their findings, reconcile any differences, and make a selection collaboration technology products. The recommendation may include a standalone collaboration technology product or a combination of products. The output of phase two is the evaluation framework and recommended collaboration technology products.

Phase 3. Implementation and Evaluation. The objective of phase three is to empirically validate the effectiveness of the recommended collaboration technology product(s). Based on the task-technology fit theory (Goodhue and Thompson, 1995), we currently have two preliminary hypotheses:

1) The recommended collaboration technology product(s) facilitate team collaboration in either an online class or a course setting where teams have face-to-face meetings.

2) The impact of the recommended collaboration technology product(s) is more prominent in an online class setting than in an on-campus class setting.

As shown in table 1, we will use a two by two factorial design in phase three of the study. The findings of both phase two and phase three will be summarized and reported in future research outlets.

<table>
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<tr>
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<th>With recommended collaboration technology product(s)</th>
<th>Without recommended collaboration technology product(s)</th>
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<tbody>
<tr>
<td>Online Class</td>
<td>Group 1</td>
<td>Group 2</td>
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<tr>
<td>On-campus Class</td>
<td>Group 3</td>
<td>Group 4</td>
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Table 1. Two-by-two Factorial Design for Empirical Study

Phase One Research Findings

For phase one of the proposed study, we created a questionnaire (the survey instrument is available upon request) and distributed it to 137 students majoring in Information Technology at a regional public university in the southeastern United States. The subject pool included online and on-campus courses, and graduate level and undergraduate level courses. The survey was anonymous and participation was voluntary. We received 113 responses and the response rate was 82.5%. Two responses were deleted because they were completed in less than 40 seconds. Thus, we had 111 valid responses.

Demographic Information

Among all respondents, the majority (65%) was male and 42 percent were younger than 30 years old. The overwhelming majority of respondents (92%) were graduate students. Eighty-one percent of the participants had work experience. The demographic information is consistent with the general student population at the participating department. Eighty-nine percent of the respondents had worked in at least one team project and 36 percent had worked in more than six team projects.

Usage of Collaboration Technologies Products and Participants’ Attitudes

Only 49 percent of the participants had used some kind of collaboration technology products in their team projects. The top four reasons preventing them from using collaboration technology were: not familiar with collaboration technology product (60%); cost of the collaboration technology product (24%); the collaboration technology product lacked features I wanted (22%); the collaboration technology product was difficult to use (20%). This result is somewhat surprising since our subjects are IT students and they
should be more comfortable using technology. This could be explained by a majority of the participants being graduate students and not having computing backgrounds in their undergraduate studies.

The majority of the participants thought that collaboration technology would be helpful in their team projects. Fifty-six percent of the respondents indicated that collaboration technology is useful to teamwork in on-campus classes while 77 percent held the same belief for an online environment. This finding is consistent with our hypothesis that collaboration technology would have a greater impact in an online class than an on-campus class.

**Important Features of Collaboration Technology**

In the survey, we listed four categories of collaboration technology features and a cost factor. We asked the participants to indicate the importance of each feature category using a five-point scale (1 – very unimportant, 2 – somewhat unimportant, 3 – neutral, 4 – somewhat important and 5 – very important). Input from participants is summarized in Table 2. The top rated feature of a collaboration technology is document (file) and content sharing, followed by team communication and cost of the collaboration technology. We used team communication as a general term which includes both synchronous communication such as video chat and asynchronous communication such as email. Project management features also received a high rating. The mean of rated importance score for project management is significantly lower than that of the team communication even though their percentage of rated importance scores were the same. This was because more participants rated team communication as “very important” than they did on project management. Additional features such as mobile support and social media connections were not very important to the respondents. The survey results form a strong foundation for building an evaluation framework to assess different collaboration technologies on the market.

<table>
<thead>
<tr>
<th>Features/Cost of collaboration technology product</th>
<th>Mean of rated importance</th>
<th>Percentage of rated importance</th>
</tr>
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<tbody>
<tr>
<td>Document (file) and content sharing</td>
<td>4.27</td>
<td>80.95%</td>
</tr>
<tr>
<td>Team communication</td>
<td>4.21</td>
<td>77.88%</td>
</tr>
<tr>
<td>Collaboration technology product is free at no cost</td>
<td>4.10</td>
<td>74.04%</td>
</tr>
<tr>
<td>Project management (task management)</td>
<td>3.99</td>
<td>77.88%</td>
</tr>
<tr>
<td>Additional features for mobile support, interaction with existing social networking sites, and others</td>
<td>3.50</td>
<td>50.48%</td>
</tr>
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*Note: percentage of rate important is calculated by dividing the number of participants who rated the feature as very important and somewhat important by the total number of participants.*

**Table 2. Top Rated Collaboration Technology Features**

**Discussion and Conclusion**

Bounded in the college environment, this study presents a three-phase research approach to recommend and validate a set of collaboration technologies suitable for student team project. Phase one has been completed and we identified the important features of collaboration technology from users’ perspective. Major part of phase two was finished and we are in the process of analyzing the results. Phase three of the study will be conducted in the near future.

As research in progress, this study contributes to the IS/IT community in the following ways. The research methodology can be adapted to study collaboration technology in different settings and may be theorized from common findings. Our research method can also be used as an exemplar for product selection types of projects. The evaluation framework, once developed, could be adapted to assess collaboration technology in other domains. The empirical validation, when successfully carried out, will
be the first of its kind to our knowledge and the results of the study will benefit the adoption of collaboration technology among student teams.

There are a number of opportunities to extend the study in the future. First, the respondents are mainly graduate students who enrolled in regular courses with group projects as part of the course. We intended to garner more responses from undergraduate students in capstone courses, in which they are required to do a semester-long group project where collaboration is essential and intense. However, the response rate was very low and their opinions were not significantly represented in the results. Second, at this time, we are targeting collaboration in formal class projects in an educational environment. It would be interesting to expand the study to more contexts and generalize our findings for whole educational environments, including student collaborations across courses or even departments; collaborations between faculty and students; and collaborations among faculty for the purpose of teaching, research and service. Third, some common features of collaboration, such as knowledge management, socialization, and collaborative task support, were not included in the initial survey as they are not used widely in student projects. As we expand our application domains, these features may become important. Finally, our survey did not specifically ask if the features are important enough to be supported in one collaboration suite. It may be interesting to see how a combination of different tools used together may actually offer a better user experience.

REFERENCES


