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Submissions should include a separate file attachment for the title page that contains the following information in this exact order:

- Title of the manuscript
- Each author’s full name; position/title; institutional affiliation, including address, city, state, zip code; home, office, and cell phone numbers; and e-mail addresses (identify the main author who should receive all correspondence).
- Number of words in the article (including all parts--everything)
- Biographical paragraph (50-60 words) for each author

- Any acknowledgments or information about manuscript history (e.g., basis in a conference presentation)

The second separate file attachment should be the manuscript file that begins with the title of the article, a 50-100 word abstract, 3-5 keywords or phrases describing the focus of the article, and the body of the manuscript. **Do not include any identifying information in this file. Do not include any personal identification or institutional affiliation in this file.**

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- Times New Roman, 12 font-size text within article
- Bold and center primary headings, with major words capitalized
- Bold and left-align secondary headings, with major words capitalized
- No footnotes or endnotes
- No page numbers or headers or footers

Tables and figures may have varying font sizes (but must adhere to APA Style). Include tables or figures formatted and placed correctly within the manuscript.

Include the References page (Works Cited only) at the end of the manuscript, followed by any appendix information, if necessary.

All submissions will be reviewed by the editor and two reviewers, using a blind-review process. Authors will receive feedback 6-8 weeks after the initial peer review. Manuscripts will be "accepted," "accepted with minor revisions," "possibly accepted after major revision and resubmission for further peer review," or "rejected."

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To ensure your manuscript is considered for publication in the 2015 *Journal of Research in Business Information Systems*, submit manuscript by *October 1, 2014*, to marcel.robles@eku.edu.

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Table of Contents

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Examining Effects of a Bridge Program on Student Career Awareness and Interests in Science and Technology Careers: A Pilot Study for the First Year of CSI Summer Academy

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Abstract

This pilot study examined how a summer bridge program affected high school student career awareness and interests in forensic science and technology. This bridge program consisted of three job shadowing components including field trips, team interactions, and virtual interviews that were designed to conduct crime scene investigations (CSI). Simulated learning environments were based on three theoretical frameworks. The technological framework was derived from 3-D immersive simulation. The contextual framework was based on real-world scenarios and modern-day crimes that required content knowledge of forensics and criminology. The andragogical framework was based on social constructivism and collaboration. The target population included students in grades 9-12 attending 250 high schools across the state of Oklahoma. The sample size included 35 high school students who were randomly selected out of 95 applicants. A survey, consisting of seven-point, Likert-type scales (i.e., strongly disagree, …. and strongly agree), was used to quantify the phenomenological experience of participants, and was administered to students as pre- and post-test measures of career interest and awareness. Score gains from pre- and post-tests were compared to answer research questions. Paired-sample t-tests demonstrated that the CSI Summer Academy had statistically significant positive impacts on student career awareness in both forensic science and technology. While there was not a statistically significant effect on career interests, factors such as self-selection of participants with pre-existing domain-related interests and the timing of survey administration might have contributed to this result. The study's small sample size limited the researchers' ability to

generalize results to a larger population. Future studies should build on findings of this study to probe how a bridge program affects student career awareness and interests in relation to gender and ethnicities.

Keywords: innovative model, job shadowing, and simulation

Introduction

Research Background

The need for specialists in the fields of forensic science and technology (referred to as forensics hereafter) is becoming a national priority due to increased reliance on emerging technologies and science in the field of criminal justice. Forensic science is an indispensable tool for law enforcement to solve modern-day crimes (Nelson, Phillips, Enfinger, & Steuart, 2010). Forensics is an inter-discipline which requires scientific and technological (S&T) skills to perform the collection, preservation, examination, and documentation of legal evidence. Forensics is now ranked as one of the top five fastest growing professions, with an annual growth rate of 35% in the nation and a growth rate of 38% in Oklahoma (Department of Labor, n.d.; Oklahoma Employment Security Commission, 2012).

Problem Statement

It is projected that 190 new forensics professionals will be required each year in the Oklahoma metropolitan area for each of the next five years, but only 45 forensics degrees were conferred in 2012 (Oklahoma State Regents). To build a competitive and capable forensics workforce, Forensics Science Institute (FSI) at the University of Central Oklahoma (UCO) offers degrees that allow students to double major in forensics as well as a discipline within the sciences (chemistry, biology, psychology), allowing students to build the technical skills needed within that workforce.

Statement of Need

The current infrastructure and curricula in Oklahoma high schools constrain the process of recruiting and building a capable forensics workforce. S&T participation by Oklahoma youth is historically low in comparison with the national averages and those of other countries (Oklahoma State Regents of Higher Education, n.d.), and under-served students may be unaware of the immense career opportunities for the S&T/forensics professions (National Research Council, 2012).

To overcome these constraints, a bridge program was proposed to and funded by Oklahoma State Regents of Higher Education (OSRHE) to focus on solving the pressing and challenging problems faced by educators, administrators, and policy makers. A research and development (R&D) grant was also submitted to and funded by the Office of Research & Grants at UCO. The scope of the internal R&D grant was to design and implement a hybrid Crime Scene Investigation (CSI) Summer Academy (SA) based on real-world scenarios. CSI SA attendees would be immersed in role playing activities as law-enforcement officers to solve modern crimes with hands-on demonstrations, field trips, and interactions with forensics professionals. While CSI SA has defined four objectives that were assessed by an external evaluator to determine program effectiveness (See Appendix A), the scope of this pilot study was to focus on the research component and the development of this bridge program.

Purpose Statement

The overall goal of this study was to determine the effect of a bridge program on the academy attendees' awareness of and interest in forensics and S&T careers as measured by the Immersive Environment Survey (IES). Data was self-reported by academy participants.

Research Questions & Hypotheses

This pilot study sought to answer two research questions (RQ) and hypotheses (H). Proposed statistical methods were also outlined in Tables 1 and 2.

1. RQ: To what degree does the CSI bridge program affect attendee's awareness of S&T careers within forensics as measured by the IES?

2. RQ: To what degree does the CSI bridge program affect attendee's interest in S&T careers within forensics as measured by the IES?

Table 1. ***Analytical Method for the Proposed RQs***

RQ#	Instrument	Pre-Academy	Post-Academy	Dependent Variable	Analytical Method
RQ1	CSI Survey	Baseline		Career awareness	Descriptive statistics
RQ2	CSI Survey	Baseline		Career interests	Descriptive statistics

H_1: The CSI bridge program has a positive effect on student awareness of forensic S&T careers.

H2: The CSI bridge program has a positive effect on student interests in forensic S&T careers.

Table 2. ***Proposed Statistical Method for the Hypotheses (H)***

H#	Instrument	Analytical Method	Degree of Freedom	P-value
H1	CSI Survey	Paired sample T-test		
H2	CSI Survey	Paired sample T-test		

Literature Review

Project personnel implemented simulated job-shadowing learning environments (as shown in Figures 1, 2, & 3) based on the following theoretical, contextual, and pedagogical frameworks.

Figure 1. A simulated Crisis Call Center	***Figure 2.*** A simulated interview with a suspect	***Figure 3***. A simulated team meeting
		

I. Technological Framework for Simulation Technologies

Addressing Learning & Training with 3-D Immersive Simulation

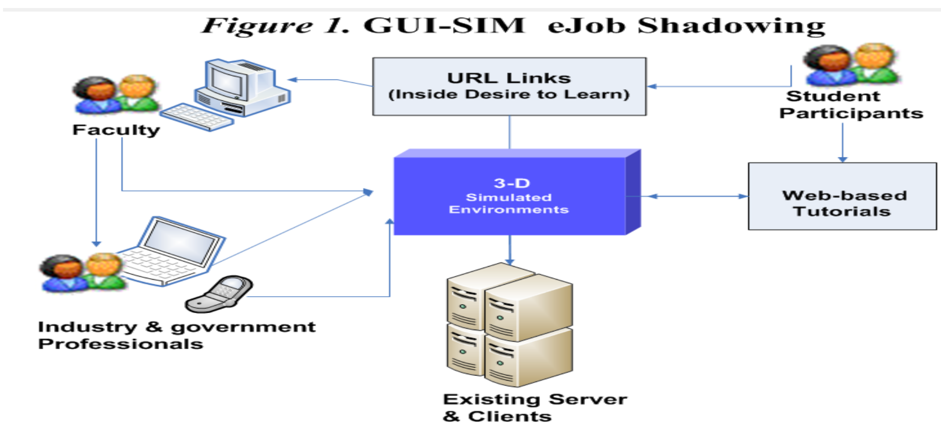
Learning management systems (LMS) such as *Blackboard* (merged with *WebCT*) and *Desire to Learn* are supported with information communication technology (ICT). Although students can access learning modules on these LMS platforms anytime and anywhere, these two-dimensional (2-D) learning environments are pre-designed and insufficient to interact with students synchronously. Further, 2-D environments tend to lack dimension and concrete representations of actual experiences (Bell, 2011). To address the limitations of 2-D learning environments, industries such as aviation, medicine, defense, and computer science use three-dimensional (3D) immersive simulations to meet their training needs. One example of a 3-D virtual world is *Second Life* which was created by Linden Lab. *Second Life* has been adopted by users representing higher education, industry, and research institutions in more than 100 countries (*Pence, 2008; Crellin & Karatzpimo, 2010).* IBM uses *Second Life* as a 3-D platform for employee training and client engagement (Montoya et al., 2011).

Addressing Learning in K-16 Education with 3-D Immersive Simulation

Simulated technologies can provide higher education a cost-effective venue for exploring, creating, and reusing permanent learning objects when they are too expensive or impossible to achieve in traditional classroom settings (*Crellin & Karatzpimo, 2010).* 3-D virtual environments allow learners to collaborate in a simulated "real-world" setting, engage learners in problem solving, and enrich learning experiences (*Bell, 2011*). Until recently, three-dimensional (3D) immersive environments have required extensive bandwidth and computing resources. Simulation in education has grown from 2% in 2000 to 35% in 2010. Harvard University has created a virtual River City to help K-12 students learn science (Allen & Seaman, 2011). An Ohio University NSF project created virtual science lab simulations that students could access from the school, home, and work (Schiller, 2011). Dartmouth University created a virtual world to train community emergency responders (Manlow, Friedman, & Friedman, 2010). EDUCAUSE Center for Applied Research worked with innovative educators to produce evidence that demonstrated simulated learning environments support interactive learning, motivate students to achieve higher educational outcomes, and transform educational practices (Dede, 2011).

For the CSI bridge program, the project team incorporated *AvayaLive™ 3-D Engage* into the design and development of simulated job-shadowing learning environments. Avaya *Engage* is an immersive and cutting-edge collection of emerging technologies of cloud- or premises-based collaboration platforms where multi-user virtual environments, simulations, games, and social media are integrated in a cohesive learning experience (*Jarmon et al.*, 2009). These integrated and cohesive learning platforms (Figure 4) provide venues for the millennial generation to naturally immerse themselves in collaborative online role-playing. Learners can use avatars, spatial audio, social networks, and Web-based tools which they are likely to be familiar with to interact in a 3-D simulated world (Dalgarno et al., 2010).

Figure 4.



II. Contextual Frameworks

Creating effective ways to use simulated teaching and learning environments requires trial and refinement, ideally conducted in the range of contexts where they will be used to maximize ecological validity (Tuzun et al., 2009). Researchers collaborated with the Center for eLearning and Continuing Education (CeCe) and partnering institutions to design and develop “authentic” learning environments with contextual real-world scenarios. These “authentic” learning environments provide students with project-based, role-playing, and hands-on approaches to acquire inter-disciplinary knowledge and critical problem-solving skills during their attendance at the CSI Summer Academy. For example, the scenario of a triage center will situate faculty to role-play as the Director of the Memorial Institute for the Prevention of

Terrorism (MIPT). Students will role-play as forensics investigators who respond to a crime incident, collect forensic evidence, and prepare forensic reports.

III. Pedagogical frameworks for Integrating Web-based Tutorials

Cognitive Learning Theory

Research shows that students need help to feel confident in their abilities to move around the simulated learning environments in order to succeed (Arya et al., 2011). Faculty must help students become comfortable using immersive technology by developing students' cognitive abilities in four ways. First, faculty can provide students with adequate learning structures that lead students to the desired learning behavior. By providing students with a course map or orientation for navigation of immersive learning environments, frustration can be reduced when learning new technologies. Second, faculty can foster self-efficacy and goal setting by engaging students with self-regulatory strategies such as logging onto the simulated learning environments regularly throughout the week to complete assignments. Research shows that successful learners in a web-based course often use self-regulatory strategies (Whipp & Chiarelli, 2004). Third, faculty can provide students with the type of feedback that motivates learning and helps students learn how to learn (Wang, Ertmer, & Newby, 2004). Fourth, faculty can reduce the amount of support over time so that students can become confident and self-reliant to perform assignments independently.

Social Constructivism & Collaborative Job-Shadowing Learning Experience

The philosophy underpinning the use of simulated learning environments in education is that knowledge creation is a collaborative rather than an individual pursuit and that there is not a correct, definitive or single pathway to knowledge (Lent & Brown, 1994). Further, the transformation of information into knowledge is based on the shared process of construction as part of the learning process, that is, a social construction of knowledge (Vygotsky, 1978; Manlow, Friedman, & Friedman, 2010). Simulated break-out sessions allow students to collaborate on team projects by interacting with faculty and student avatars in the virtual classroom. The 3-D audio mimics human interaction by allowing students to hear those who are closer in proximity to their avatars, while also enabling side conversations in the simulated environment without talking over other individuals.

Furthermore, the collaborative experience allows students to engage deeply due to the presence of unique student avatars. An important aspect of this project is that it offers information about how to conduct job-shadowing in a virtual environment. This potentially opens new possibilities for students to experience previously "difficult-to-access" fields of study. The integration of online 3-D multi-user virtual learning environments can engage students in solving "real-world" problems, encourage social interactions, and promote collaboration between participants. Moreover, these simulated learning environments emphasize the social and temporal aspects of communication processes in team interaction. Specifically, online group projects, which resemble virtual teams in the workplace, often lack reference points for coordinating the flow of work by time or place (Halse et al., 2011). Effective implementation of a 3-D coordination mechanism in virtual teams can reduce conflict and social loafing because the visual space allows team members to "see" what others are doing (Bronack et al., 2008). Hence, time can be spent communicating critical task-related information to increase equitable contribution to a team project (Halse et al., 2011).

Methodology for Data Collection & Analyses

Target Population & Sample Population

The target population included high school students (grades 9-12) who were Oklahoma residents attending 250 public and private schools across the state of Oklahoma. The sample population was set to 35 high school students by Oklahoma State Regents of Higher Education (OSRHE) due to budget constraints. Out of 95 students who applied, a computer program was used to randomly select 35 participants.

Instruments

The CSI bridge program used *Immersive Environment Survey* (IES) to collect quantitative data. The IES (Appendix B), consists of closed-ended questions that can be answered by participants with pre-defined Likert-type scales (i.e., *strongly disagree, disagree, undecided, agree, and strongly agree*). The instrument would be revised contingent upon findings to yield reliable results for the Academy that will be held in the subsequent year.

Data Collection

Both pre- and post-CSI surveys were uploaded to the Survey Monkey server. Academy participants were given the pre-test on the first day and a post-test on the last day of the Academy. The purpose of the pre-academy survey was to establish a baseline. The purpose of the post-test was to measure gains as the result of attending CSI Academy. Data, which were derived from both the pre- and post-tests, were self-reported by participants. Pre- and post-survey data were downloaded from the Survey Monkey server and imported into the principal investigator's (PI) computer.

Demographics of the CSI Participants

Out of 35 selected students, 33 completed the one week program while two students dropped out due to personal reasons. Figure 5 presents the diversity of the academy attendees. Figure 6 shows the breakdown of incoming grades of attendees representing 23 school districts across the state of Oklahoma. Additional demographics include 23 females (67%) and 11males (33%); five first generation students with plans to attend a college; and three students with disabilities.

Figure 5. A cohort representing 5 ethnic groups

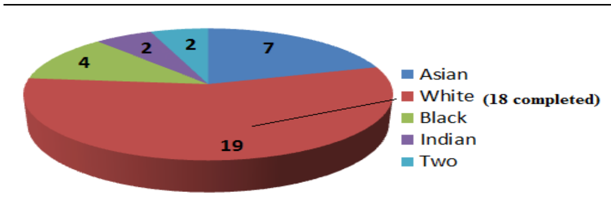
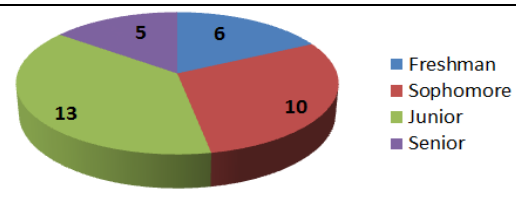


Figure 6. Incoming grades



Analyses of Research Questions (RQ)

To answer the first RQ, “To what degree does the CSI bridge program affect high school student awareness of Forensic S&T careers as measured by the IES?,” a number of analyses were conducted. Table 3 summarizes the findings.

Table 3. ***Career Awareness***

Career Awareness	Pre-test mean	Post-test mean	Difference
Q#16: I am aware of career opportunities in science and/or technology.	5.35	6.08	13.64%
Q#19: I am aware of career opportunities specific to forensic science	5.19	6.04	16.38%
Q# 22: I understand what professionals in forensics science do.	5.23	6.35	21.41%

To answer the second RQ, "To what extend does the CSI bridge program affect high school student interests in Forensic S&T careers?," Table 4 summarize the findings.

Table 4. ***Career Interests***

Career Interests	Pre-test mean	Post-test mean	Difference
Q#18: I am interested in pursuing a career in forensic technology.	5.77	6.08	5.37%
Q#21: I am interested in pursuing a career in forensic science.	5.88	5.96	1.36%

Research Hypotheses

To determine if differences were statistically significant, a paired sample t-test was performed in order to determine whether to accept or reject the first hypothesis ($H_{1)}$: "The CSI bridge program has a positive effect on student awareness of forensic S&T careers." Table 5 presents pre- and post-academy questions included in the IES gauging participant awareness in science and technology. Post-test results were significantly greater for survey questions listed in Table 5, with statistics and degrees of freedom (DF) from the paired t-test. Results demonstrated that academy attendees had significantly improved awareness of careers within forensic S&T.

Table 5. ***Hypothetical Testing of Career Awareness & Statistical Significance***

#	Survey Question	DF	t	p-value
16	I am aware of career opportunities in science and/or technology.	25	-3.340	0.003
19	I am aware of career opportunities in forensic science.	25	-2.899	0.008
22	I understand what professionals in forensic science do.	25	-5.975	0.000

A paired sample t-test was also performed in order to determine whether to accept or reject the second hypothesis ($H2_)$: "The CSI bridge program cannot be said to have an effect on student interests in S&T careers". Table 6 presents statistical analysis for questions #18 and #21 from a paired t-test. Question #18 failed to have significant gains in interest in careers in S&T ($t = -1.990$, $df = 25$, $p = .058$), while results for question #21 were not significant ($t = -.371$, $df = 25$, $p = .714$).

Table 6. ***Hypothetical Testing of Career Interest***

#	Survey Question	DF	t	p-value
18	I am interested in pursuing a career in forensic technology.	25	-1.990	0.058
21	I am interested in pursuing a career in forensic science.	25	-.371	0.714

Discussion

Although the program targets all high school (OKHS) students who are Oklahoma residents, the sample population was derived from a pool of students who self-selected to apply for the academy. As a result, while there were significant gains in forensics career awareness, the non-significance observed in interest in careers in S&T might be due to the self-selection; students with an interest in science and technology would be predisposed to these sorts of activities and would be more likely to seek out this sort of experience. Measurement sensitivity might have been confounded by the timing of the pre-academy survey; it was given to participants after the CSI Academy orientation, which may have peaked interest prior to the beginning of the academy. This could have reduced the effect size below significance, but more data would be needed to confirm that causal hypothesis. The approved budget by the Oklahoma

Regents for 35 participants further limits the sample size. As a result, researchers were unable to generalize findings to the larger population.

In our exploration of the data, some additional observations were made. Those observations reveal specifically that female participants had significantly greater returns in career awareness than did male participants. The result is intuitive due to the existence of cultural forces that can often constrain female interest and participation in science and technology. Due to our small sample size, however, additional research would need to be performed. That said, given the overall dearth of female S&T professionals, modules like the CSI Summer Academy could prove to be an integral link to increasing female representation in the S&T workforce.

Scope, Limitations, & Future Study

This study has several limitations. First, the study employed convenience sampling, and the sample size was small. Second, all participants came from the same state. Third, the time span of the Academy was one week. Hence, the scope, sample size, geographic boundary, and time constraints of the study hindered the researchers' ability to generalize the results to a larger population. Future studies should build on findings of this study to probe into how a bridge program affects student career awareness and interests in relation to gender and ethnicities.

Leadership Implications and Broader Impacts

Today's millennial generation, who grew up with immersive games, the Internet, and social networks, prefers learning through interactive methods that are available to them anytime and anywhere. However, many traditional educational institutions still use text-based lectures as the primary method to deliver learning content. Educational institutions must join forces with industry and government entities quickly to respond to changes that are upon educators in how, where, and why today's students learn.

This bridge model has the potential to transform education, teaching, and learning in global technology-rich societies. It provides avenues for researchers to explore innovative teaching strategies, simulate authentic learning environments, create effective cyber-enabled learning resources, and improve technological infrastructure in order to better recruit today's students, increase degrees conferred, improve the intellectual capital in Oklahoma, and build an competitive and capable workforce in the nation. Further, immersive simulation can offer opportunities to be on the frontier of academic research and social learning. Findings from the CSI bridge program provided educators with important knowledge for how to enhance teaching and learning effectiveness with innovative technologies. Insights from the bridge program also contributed to the discovery of a transformative model that allows institutional administrators, policy makers, grant seekers, and the research community to better support educators and inspire students.

Moreover, the bridge program fosters synergy by forming a lasting partnership with forensics professionals, well-published senior faculty, and resourceful institutions. Several significant impacts from the project can be replicated to subsequent academies and future studies. First, the bridge program, which was designed to improve the educational infrastructure and better serve a tech-savvy generation, can be replicated in other universities and summer programs, because activities can continue in the virtual world without physical forensic labs or recreating expensive crime scenes. In particular, the job-shadowing model and simulated learning environments can continue to provide avenues for researchers to explore, create, and reuse permanent learning objects, when they are too expensive or impossible to achieve in the traditional classroom settings.

Second, the value-added partnership can continue to foster sharing of forensics expertise, experience, and resources to maximize opportunities of exploring innovative teaching and learning strategies for the cyber classroom. Third, while emerging technologies may not address all educational challenges and will not replace all traditional teaching methods, the bridge program can continue to provide K-12 teachers and college professors a platform that provides educators with global access to emerging technologies, simulated learning environments, and effective cyber-enabled learning resources. Fourth, the bridge program, which was designed to target underrepresented populations, can be used to continuously recruit underserved students into the highly skilled and rewarding forensics profession.

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Appendix A

Table A-1. ***CSI Program Objectives and Supporting Activities***

Objectives	Activities
1. Broaden Forensic S&T participation in Oklahoma.	See *Student Recruitment* for targeting & selection strategies, with an emphasis on under-represented students.
2. Promote aspiration of college & early awareness of career opportunities.	See *Orientation* for college and career exploration by involving parents and students with opportunities to interact with FBI & forensic professionals.
3. Interest students in S&T & Forensic contents with experiential methods to foster problem- solving skills.	See *Daily* for job-shadowing activities including field trips, hands-on lab, role playing, and interaction in simulated environments that are designed to bring students with **transformative** educational experience.
4. Build confidence by encouraging participants to link the CSI experience with S&T curricula.	See *Post-Academy* for incentives and opportunities to foster a sense of achievement and **leadership** by presenting posters at schools, science fairs, & S&T conferences.

Appendix B

Excerpt of Immersive Environment Survey (IES) for the CSI Summer Academy

Please indicate the extent to which you agree or disagree with the following items.

#		Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
16	I am aware of career opportunities in science and/or technology. (CA-1)	❍	❍	❍	❍	❍	❍	❍
17	I enjoy learning about science and/or technology. (CO-8)	❍	❍	❍	❍	❍	❍	❍
18	I am interested in pursuing a career in science and/or technology. (CI-4)	❍	❍	❍	❍	❍	❍	❍
19	I am aware of career opportunities specific to forensic science. (CA-2)	❍	❍	❍	❍	❍	❍	❍

32. Gender

❍ Male
❍ Female

33. Age __________________

34. Race/ethnicity

❍ African American/Black
❍ Asian
❍ Caucasian, non-Hispanic
❍ Hispanic
❍ Native American
❍ Multiracial
❍ Other

End Notes

Examining Effects of a Bridge Program on Student Career Awareness and Interests in Science and Technology Careers: A Pilot Study for the First Year of CSI Summer Academy

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Technology Expectations of Millennials: Is the University in Tune?

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Abstract

What technologies did the students have available for personal use and for use inside and outside the secondary classroom? Did the students feel that their high schools prepared them to use technology in the college and/or work setting? What technologies did they expect to have in their college classrooms? Technology has changed the landscape of higher education and our students' technology expectations. We sought to determine the answers to these questions in order to revise our classrooms and enhance teaching strategies. Findings are reported in aggregated form using descriptive statistics.

Keywords: millennials, entering freshmen, personal use of technology, secondary school

Introduction

"The only thing we know about the future is that it is going to be different."

(Peter F. Drucker, Management Consultant, 1977)

This statement could be the motto of every higher education institution. The Internet has changed the way we communicate, shop, entertain and learn. It seems infinitely flexible and adaptable; providing instant and unfettered access to all.

In higher education our tools, technologies, and methodologies are different. Our college classrooms are different. Our students are different. We have traditional classrooms and virtual classrooms. We deliver course materials and exams via face-to-face and virtually via Skype, WebEx, or videos.

Our students leaving high schools and entering colleges and universities are reported to be the digitally literate generation. Born between 1981 and 2001, this group of students are labeled the net generation (Berk, 2009; Emeagwali, 2011; Jones, 2007; Oblinger, D., & Oblinger, J., 2006; Skiba, & Barton, 2006). This net generation is often referred to as the millennial students or “millennials”. In a recent report, the market research firm, Frank N. Magid Associates (2012) describes the millennial generation as “the first generation of increasing power in the twenty-first century.” These students are the first generation to grow up with technology (Ajjan & Hartshorne, 2008; Black, 2010, Prensky, 2007). These students often bring their laptops to class rather than paper and pen and have access to tablets, smartphones, and other mobile devices (Berk, 2009; Glenn & D’Agostino, 2008). It would seem sometimes that these students are “wired” to technology.

Since it appears that many students have grown up with technology; they seem to feel confident with the use of technology. They can use an iPod, text with a cell phone while watching streaming television on their laptops. That is, these students may have confidence in their digital literacy simply because they have successfully mastered a small portion of the available technology. (“A Digital Decade”, 2007; Berk, 2009; Hargittai, 2005; Oblinger, & Hawkins, 2006; Oblinger, D. & Oblinger, J., 2006)

Apparently a gap does exist between those who have grown up surrounded by technology gadgets and those who have not. Not every student has a computer and connectivity. Even though these students may have grown up with and feel confident using technology, one still questions whether these millennials really expect our college classrooms to use these new emerging technologies as learning tools?

The purpose of this research was threefold. We wanted to determine what prior technologies current students had been exposed to in the secondary setting, what technologies they personally use, and what technologies they expected their college classrooms and instructors to use. Specific questions of the study are (1) What technologies did the students have available for personal use both inside and outside the secondary classroom? (2) Did the students feel that their high schools had prepared them to use technology in the college and/or work setting? and, (3) What technologies did they expect to be essential in their college classrooms?

Instrument

Using adapted items from the 2011 CDW-G 21st Century Classroom Assessment Tool (CDWG, 2011), a survey instrument was developed. The 2011 CDWG questionnaire is an assessment tool designed to assess students' perceptions about technology used in both secondary and higher education and is free to download. The assessment was originally developed by O'Keef & Company. An adaptation of the 2010 version of this survey was used by researcher Karen-Martin Jones (2011) in her dissertation study directed by major professor Dr. Lisa Gueldenzoph Snyder of North Carolina A&T State University. That study also looked at millennials and their perceptions and use of technology.

The survey administered for our study was voluntary and the students were not asked any personal or identifiable information. The modified instrument was divided into 27 questions. Some of the original questions from the CDWG instrument were eliminated and some questions were reworded to conform to our study. Twenty-four questions were related to students' uses, perceptions and expectations of technology. The other three gathered generic demographic information. A copy of the adapted survey can be provided upon request.

Population

The target population of the study is defined as entering freshman students in higher education who graduated from high school in the year 2012. The accessible population of the study was operationally defined as university students enrolled in Business Administration 1800 during the fall semester of 2012. This course is an introductory computer applications course designed for entering freshmen, at a small regionally accredited four-year university. There were 222 students enrolled in the nine sections of this course offered during the fall 2012 semester.

Procedure

During the fall of 2012 those university students enrolled in the university's School of Business freshmen Introduction to Computers Applications course (BUAD 1800), both face-to-face and online sections, were surveyed. Students were asked to voluntarily submit answers to the survey. Students enrolled in face-to-face sections were given the survey in class, while students enrolled in online sections were asked to submit their surveys by a due date.

The researchers prepared the survey using Survey Monkey. A link to the survey was provided using Moodle (Moodle is a web-based course management system used as a component of all courses taught at the University). The researchers informed the students in the BUAD 1800 course sections that a survey had been launched on Moodle. The students were informed that their participation in the study was voluntary and confidential. Verbal directions were provided about the study to all face-to-face sections. Written directions were given to online sections. Students were asked to capture a screenshot of the last page of the survey and submit it to the instructor. Instructors used these screenshots to assign bonus points to the students who participated.

Data Analysis and Results

The data collected is reported in aggregate form only. Only the data obtained pertaining to the subject of this study was analyzed and reported. The appropriate descriptive statistics were used in this exploratory study. Means, percentages and frequencies were used. This paper includes data from selected questions only and will not report answers to all 27 questions.

Specifically, information about the technologies the students used in their personal lives and during their high school tenure was reported. Data about their expectations from higher education was also analyzed and reported.

Two hundred twenty-two students were enrolled in the introductory computer applications course (BUAD 1800) during the fall 2012 semester. A total of 181 students elected to participate in the survey. Of those, 81 or 45% graduated in the year 2012. Another 80 or 44% graduated between 2000 – 2011, which according to current literature, classifies them as millennial students, and twenty (11%) defined as millennials by most research graduated prior to the year 2000. The data for the 81 true entering freshman defined as students who graduated from high school in the year 2012 was extracted to conduct this study.

To help determine the technologies the students had available for personal use the following question was asked, "Which of the following technologies/Internet tools do you use for personal use (e.g., to connect with friends/family, or for hobbies, extracurricular activities or relaxation)?" Students were given a list of 20 items and were asked to check all that applied. Wireless network/Internet (95.1%), personal computer (86.4%), and smartphones (77.8%) were the top three choices as shown in Table 1. Use of iPod/MP3 players and access to social sites such as Facebook and Twitter were also used by over 50% of the population. Berk (2009) reported similar findings in an article about this generation of students.

Next, we wanted to know which of these same technologies the students had available for use in the secondary/high school classroom. We posed a question about the technologies offered by their high schools. We gave the students the same list of 20 items from the previous question and asked them to select all that applied. Wireless network/Internet (65.4%) and interactive whiteboards (45.7%) were the top two answers. Use of the internet in high school was the only technology offered at the high schools for over 50% of the population, as shown in Table 1.

Table 1

Types of Technologies Available for Students' Personal Use and Offered By the Students' High Schools

Types of Technology	**Used at Home/Personal Response %**	**Had Available in High School Response %**
Wireless network/Internet	95.06	65.43
Personal computer (e.g., laptop, tablet, netbook, desktop)	86.42	37.04
iPod/MP3 player	56.79	12.35
E-reader device (e.g., Kindle, Nook, Sony Reader)	11.11	7.41
Media tablet (e.g., iPad, Samsung Galaxy)	29.63	9.88
Smartphone (e.g., BlackBerry, Droid phone, iPhone)	77.78	12.35
Video and/or Web conferencing	16.05	18.52
Digital content (e.g., online books, material available online for download in electronic form)	17.28	16.05
Open source applications (e.g., Google Apps, OpenOffice)	20.99	24.69
Blogs/wikis	12.35	9.88
Podcasts/vodcasts	7.41	6.17
Course management system (e.g., Blackboard, Jenzabar, Moodle)	11.11	28.40
Student response systems (a.k.a. "clickers" or learning response systems)	4.94	17.28
Off-campus network access	19.75	12.35
Interactive whiteboards	7.41	45.68
Recorded class lectures	6.17	7.41
Access to social networking sites (e.g., Facebook, Twitter, LinkedIn, MySpace)	53.09	9.88
Instant message/video chat (e.g., AIM, Gchat, Skype)	38.27	7.41
Virtual learning, which delivers education to students who are not physically in the same location as the teacher and/or other students	4.94	20.99
Multimedia content streaming	19.75	8.64

A follow-up question about the students' use of technology while in high school shed a bit more light on how much they actually used technology during their high school tenure. The item on the survey asked students to indicate how strongly they agreed or disagreed with the following statement: "I used technology more outside of school than I did in class." All of the 81 students answered the question. Most (64.2%) of the students indicated that they agreed with this statement. Only about 10% of the respondents indicated that they disagreed with this statement (see Table 2).

Table 2

Students' Use of Technology While in High School

Answer Options	**Response %**	**n**
Strongly agree	28.40	23
Agree	35.80	29
Neutral	25.93	21
Disagree	8.64	7
Strongly disagree	1.23	1

When comparing the answers to the two questions, it does seem that these students are using technology much more at home than they are at the high school/secondary level. This would make sense, as it appears that many of these rural high schools did not have unlimited access to current technology. This idea led us to look at the results from another question on the survey. We asked how strongly the students agreed or disagreed with the following statement: "My high school prepared me to use technology successfully in college and/or when I enter the workforce." Many (64.2%) of these students indicated that they agreed that their high school had prepared them for using technology in the college setting (see Table 3). This is an increase as compared to the entire sample of surveyed students (n = 181) where only 53% agreed.

Table 3

Students' Perceptions of Preparedness to Use Technology in College or the Workforce by Their High Schools

Answer Options	**Response %**
Strongly agree	19.75
Agree	44.44
Neutral	23.46
Disagree	8.64
Strongly disagree	3.70

Finally, we addressed the issues of what technologies these students expected to see in their college classrooms and just how important the availability of these technologies were when they made their choice of a higher education institution. To address the first issue, the same list of 20 items was provided and the students were asked to check all that applied. Access to the internet (95.1%), computers (76.5%), and course management systems (60.5%) were ranked as the top three technologies essential to the college classroom. Smartphones, off campus network access, and interactive whiteboards were also seen as essential by over 50% of the students (see Table 4).

Table 4

Types of Technology Students Expected to See in Their College Classroom

Types of Technology	**Response %**
Wireless network/Internet	95.06
Personal computer (e.g., laptop, tablet, netbook, desktop)	76.54
iPod/MP3 player	32.10
E-reader device (e.g., Kindle, Nook, Sony Reader)	39.51
Media tablet (e.g., iPad, Samsung Galaxy)	45.68
Smartphone (e.g., BlackBerry, Droid phone, iPhone)	53.09
Video and/or Web conferencing	37.04
Digital content (e.g., online books, material available online for download in electronic form)	37.04
Open source applications (e.g., Google Apps, OpenOffice)	41.98
Blogs/wikis	27.16
Podcasts/vodcasts	23.46
Course management system (e.g., Blackboard, Jenzabar, Moodle)	60.49
Student response systems (a.k.a. “clickers” or learning response systems)	35.80
Off-campus network access	54.32
Interactive whiteboards	51.85
Recorded class lectures	34.57
Access to social networking sites (a.k.a. Facebook, Twitter, LinkedIn, MySpace)	29.63
Instant message/video chat (e.g., AIM, Gchat, Skype)	27.16
Virtual learning, which delivers education to students who are not physically in the same location as the teacher and/or other students	41.98
Multimedia content streaming	33.33

To determine the importance of these technologies in the college selection process, we asked "How important was the institution's technology offerings to you, including equipment and access to that equipment?" Sixty (74.1%) of the eighty-one 2012 graduates said that it was somewhat to very important. Only 2.5% indicated that it was "not at all important".

We were then led to the next question, "Please indicate how strongly you agree or disagree with the following statement: Learning and mastering technology skills will improve my educational and career opportunities in the future." Nearly all of the students, 93.9% agreed with this statement. The students seem to be aware of how important technology skills are to their future (see Table 5).

Table 5

Students' Perceptions of the Impact Learning and Mastering Technology Skills Have On Educational and Career Opportunities

Answer Options	**Response %**
Strongly agree	63.0
Agree	30.9
Neutral	3.7
Disagree	0.0
Strongly disagree	2.5

Conclusions

In summary, millennial students are being introduced to some technology at the high school level, but not to the degree we may have thought. Wireless network/Internet (65.4%) and interactive whiteboards (45.7%) were the top two answers, but even these were not widely available. The students' general use of technology at the secondary level seems to be quite restricted if the internet in high school was the only technology available to over 50% of the population. It would be necessary to take this study further and find out on a more detailed level exactly how much technology was used for educational purposes during high school both in and out of the classroom to draw a more detailed conclusion.

Another conclusion that can be drawn from this research is that the instructors of this introductory computer applications course may have to do some “remedial” work with these students, as approximately 36% did not feel they were prepared for using technology when they reached us at the post-secondary level. The good news is this is down slightly when compared to the entire sample (n = 181) where 47% did not feel prepared. If we divided this group into smaller sample groups we could determine if the high schools are actually improving over time. At this point instructors cannot assume these students have been exposed to the technologies we currently use at our institution.

As to their personal use of technology, these millennials seem to have a bit more experience. Wireless network/Internet (95.1%), personal computer (86.4%), and smartphones (77.8%) were the top three technologies used.

As to whether our millennials expect us to have a technological classroom ready for them, the answer is yes. Access to the internet (95.1%), computers (76.5%), and course management systems (60.5%) were ranked as the top three technologies essential to the college classroom with several more listed as essential by more than half the students. College classrooms need to have internet capabilities and there should also be access to computers readily available to students. As instructors, we must seek to understand the workings of our course management system and strive to use it to its full potential. We must remember that less that 3% of the students surveyed said that the institution’s technology offering, including equipment and access to that equipment was “not at all important”. So, as a recruiting tool, we need to be able to say that we are using current technologies to their fullest potential.

The overall goal of this study was to gather data to explore the perceptions and opinions about the use of different technologies by college freshmen in higher education. This information should help to provide faculty from the school of business a framework to address the technology experience and needs of students, specifically “millennial” students. The faculty needs to stay abreast of the expectations that the students have about emerging technologies and make any changes necessary to teaching methodologies. If necessary, faculty members need to be willing to learn from these “millennial” students and become more technologically savvy in the classroom. It might also be helpful to know this information should money for new technology become available.

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End Notes

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The Consumerization of IT: BYOD

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Abstract

BYOD, or Bring Your Own Device, is becoming increasingly popular in the workplace. Though some employers are still weighing the advantages and disadvantages, managers interviewed for this pilot study cited few problems with the practice. BYOD advantages include savings realized from not having to purchase and maintain expensive devices and higher productivity among workers who use familiar technology. The primary disadvantage is a heightened security risk. While support and security must be addressed, the consumerization of IT is resulting in more productive employees. IT professionals must find ways to foster this increased productivity through effective management that includes clearly defined policies.

Keywords: BYOD, workplace technology, IT consumerization

Introduction

The practice of employees using their personal communication devices for business purposes has become more and more prevalent. According to NetBase, interest in BYOD was 14 times greater in 2012 than in 2011 (Lai, 2012). This activity, coined BYOD for "bring your own device," is effectively moving a major part of the IT function from the organization to the individual. This consumerization of IT is especially popular with the younger segment of the workforce.

It is estimated that by 2014, nearly two billion smartphones will be in use globally (Quittner, 2012). According to a 2012 survey by the Pew Research Center's Internet & American

Life Project, 66% of respondents ages 18-29 owned a smartphone, along with 59% of those ages 30-49, 34% of those ages 50-64, and 11% of those ages 65 and over (Rainie, 2012). The millennial workforce is comprised of 80 million people born between 1976 and 2001. According to Crawford (2012), by 2014, 36% of the workforce will be millennials and by 2020, they will comprise 46% of the workforce. As stated by Evan Kaplan, CEO of iPass (the world's largest commercial Wi-Fi network), "the millennial workforce is a master of digital technology and relentless seekers of productivity" (Rhodes & Kaplan, 2012). This younger, tech-savvy generation is driving policy and practice for many organizations. Cisco found that 40% of college students and 45% of current employees would accept a lower paying job with a choice of device, than a higher paying job with less flexibility (Graham, 2012).

One attractive impact of BYOD for companies is the ability to gain competitive advantage through increased employee productivity as the work day is extended by employees working from home (Thomson, 2012). To capitalize on this possibility, many companies are allowing BYOD while others are issuing company-owned devices that can access the corporate network, including laptops, tablets and smartphones. In many organizations, personally-owned mobile devices are sanctioned by the IT professionals as they acknowledge the advantages and have found solutions to mitigate apparent challenges.

However, the emergence of BYOD presents a dilemma for some employers as they weigh the advantages and disadvantages of allowing personally-owned devices to access company servers for business applications. In some organizations BYOD is not allowed because IT departments worry about the information employees are storing on their devices and have not found a solution to protect sensitive company information (Schiller, 2011).

Purpose of the Study

The current tech-savvy workforce is demanding tools to help them be more effective and efficient at work and it seems only practical to use one device for both work and personal use. This pilot study will utilize an author-developed questionnaire to examine the practice of employers allowing BYOD and the inherent advantages and challenges of this practice. Results of this pilot will lead to the implementation of an expanded study of BYOD practices among a wide audience of business practitioners.

Review of Literature

BYOD has already taken hold in countries around the world, with or without organizational sanctioning. A 2012 study by Avande Inc., a global IT consulting firm, found that 88% percent of business leaders from 17 countries said they are aware that employees are already using personal technology for work (Graham, 2012). A recent Cisco Systems Inc. survey of 1,500 information technology executives showed that while 48% of companies said they would never authorize employees to bring their own devices to work, 57% of IT managers acknowledged some employees use personal devices at work without consent (Gale, 2012). A Cisco study of 600 US IT and business leaders indicated that 95% of their organizations permitted employee-owned devices, and 84% said their organizations provided support for the BYODs (Pearce, 2012). Juniper Research reported that 150 million workers already employ BYOD, and this figure should approach 350 million by 2014 (Dickinson, 2012).

BYOD has introduced a wide assortment of devices into the typical organization's IT environment. According to the Vodafone Group ("Bring Your Own Device," 2012), IT equipment provided by employers a decade ago was usually much better than personally owned devices. However, with the beginning of personal mobile technology (smartphones) that enabled anywhere and anytime internet connectivity, business and industry turned to the BlackBerry as the executive mobile phone of choice for much of the 2000s ("BYOD Here to Stay," 2012). The BlackBerry supported RIM's security system that supported password locks, the ability to remotely wipe out the contents in a device's memory when needed, and the use of the Advanced Encryption Standard allowed employers to secure sensitive documents (Stienert-Threlkeld, 2011). Since BlackBerry use was almost exclusively limited to the business context, consumers purchased their own device of choice for personal use.

According to Delaney (2012), the growing smartphone base combined with huge sales of media tablets is forcing a reassessment of the client platform and IT best practices to support it. Projections for continued growth of mobile device adoption is substantiated by ABI Research reports that in the third quarter of 2012 alone, Apple shipped a record 17 million iPad devices; and projections are that there will be 7.4 billion mobile devices and another 1.2 billion smartphones added over the next five years ("BYOD Here to Stay," 2012).

While concerns still are raised, resistance of organizations is diminishing to the consumerization of IT through BYOD. According to a 2012 study by Avanade, approximately 60% of companies are adapting their IT infrastructure to accommodate employees' personal devices instead of restricting how employees can use them. This trend is evidenced by the fact that 84% of respondents in the Avanade study reported relative ease in integrating employee-owned devices, applications, and online services with enterprise IT systems (Rashid, 2012). CIOs are keenly aware that employees who desire to use personally-owned equipment to avoid multiple devices are also accustomed to purchasing their own monthly service plans, thereby saving the companies significant out-of-pocket expense (Steinert-Threlkeld, 2011).

If properly managed, BYOD can result in higher morale and workplace satisfaction for employees. At the same time, employers enjoy a cost effective way to control overhead expenses associated with the offering of IT capabilities. Many companies offer compensation for the business use of employees' equipment and provide antivirus and antimalware software for all users, though these costs are fractional as compared to the cost of purchasing devices for employee use. Hillman (2012) summarized advantages and disadvantages to be considered by organizations contemplating the implementation of BYOD as shown in Figure 1:

Fig. 1: Comparison of Advantages and Disadvantages of BYOD

Advantages of BYOD	**Disadvantages of BYOD**
The organization saves money on expensive devices it would otherwise have to buy.	Potential increased security risk exists in the absence of IT policies and good device management.
Employees may take better care of equipment they own.	The company may have to pay something toward employees' personal phone service.
The organization can take advantage of newer technology more quickly.	Employees could be responsible for repairs or replacement costs, even if the device is damaged on the job.
Employees will be more productive because they can select, within company parameters, the technology they want, and control the features.	Employees who no longer completely control their own devices and may not want to "play along."

For BYOD to work, employers must find effective ways to securely manage personal devices (Graham, 2012), while assuring employees that the organization will not intrude into their personal communications and files (Narisi, 2012). Employers must devise BYOD policies that address the needs of both employers and employees. While many organizations do not as yet have BYOD policies, other fail to clearly communicate policies that are in existence. According to Rick Dakin, CEO of the IT risk and compliance firm Coalfire, "It seems that mobile-device management (MDM) technology is well ahead of the communication efforts at many organizations" (Eddy, 2012, 7). IT user policies are often quite lengthy; and though employees will likely sign such agreements, they are unlikely to read them thoroughly. A recommended strategy is to have employees initial each of point of the policy (Pearce, 2012).

McLellan (2013) advocated a comprehensive approach to BYOD management that begins with the implementation of effective BYOD policies. Successful implementation of BYOD requires carefully crafted policies for use and expectations that strike a balance between the interest of the organization and that of employees. While a BYOD policy must address security for the organization, it must also provide the employee with some assurances of privacy. The creation of effective BYOD policies requires joint participation of multiple departments including legal, management, compliance, risk, and IT (Hinkes, 2013). Provisions for shared information assets should include assurances that the company will not read personal text messages and email, eavesdrop on calls, and make backups of users' data are reasonable expectations (Pearce, 2012).

Other BYOD policy recommendations include the following:

- Limit the type and extent of organizational support to devices and platforms (Hillman, 2012).
- Require users to register every device (Lohman, 2012).
- Specify complex passwords or use access identity such as fingerprint identification (McClellan, 2013).
- Provide anti-virus software for all devices (Tom, 2012).
- Require swift notification when a device is lost or stolen.

- Include the right to wipe the device of company related applications and files in the case of loss or employee separation (Gale, 2012), while leaving the remainder of data on the personal device intact (Graham, 2012).
- Spell out whether the organization is responsible for data corruption, software issues, or other problems associated with work use of the device (Barwick, 2012).
- Consider some financial contribution for the equipment in the form of a compensation stipend. This action makes setting limits on device use more palatable to employees. (Savitz, 2012).
- Include information about the type and extent of support the organization will offer for BYODs (Lohman, 2012). An effective acceptable use policy must address both support procedures and user expectations (Probert, 2012).
- Require exiting employees to allow IT personnel to inspect their devices when they leave to ensure that all company-related information has been deleted (Narisi, 2012).

Employee agreement with BYOD policies should be obtained in writing. A recommended approach is to require employees to initial each point in the policy, rather than merely signing at the end of the policy (Pearce, 2012).

Study Design

The researchers devised a 13-question survey, and administered it to a small sample comprised of 18 members of an academic department’s business advisory council who were professionals in leadership/management positions in Texas businesses. Three individuals responded to the survey, representing businesses from the pharmaceutical sales, retail sales, and the risk management, insurance, and employee benefits sectors. The survey included demographic questions related to gender, age range, type of business, and number of employees.

On the use of technology for work, respondents were asked about (1) the work use level of their portable technology devices (laptops, tablets, and/or smartphones), (2) if they had a company issued device for use at home, (3) whether their employers allow the use of personally-owned technology devices for business purposes at work, and if so (4) whether a formal BYOD use policy existed. Respondents were also asked their opinion of the best reason for a company to allow employees to bring their own devices and what problems their organizations had encountered due to authorized or non-authorized employee BYOD use.

Findings

All three managers who participated in the survey said their employing companies allowed use of personally-owned devices for business purposes at work, while two of the three managers indicated that their company had a formal use policy. Major points of the policies were that employees must abide by the same standards of conduct that would apply to company-owned equipment and employees were prohibited from sharing sensitive, classified, and proprietary information from and about the company. The best reason noted for a company to allow employees to bring their own devices to work was that the practice allows flexibility for employment-related work and communications in situations where it is impractical for the company to provide a device to every employee. The practice also saves on costs of providing devices to employees who need them for work purposes.

The consensus of the respondents was that there are relatively few problems encountered through the authorized or non-authorized use of BYOD for work when the company WIFI is restricted to employees who have submitted to the BYOD policy. However, respondents acknowledged that unauthorized sharing of company information whether intentional or unintentional could be a problem.

A solution offered by the study's participants for balancing the interests of employers and employees concerning the use of BYOD was for the business to provide required devices at a reduced cost to employees while establishing standards for use as company property. The business would pay the employee a stipend to offset costs of the monthly data plan. Another option would be offering a business-assisted purchase to ensure standardization in abilities across the team and to set parameters for 24/7 availability as needed. Both of these options are worthy of exploration by organizations seeking to maximize the benefits of BYOD while minimizing potential risk.

Conclusions and Recommendations

BYOD is here to stay. The phenomenon is reshaping the way IT is purchased, managed, delivered, and secured. From simple applications such as allowing workers to access corporate email on their personal smartphone to full-blown programs in which the company subsidizes the purchase of personal devices, BYOD has the potential to increase worker productivity, create a more flexible working environment, and reduce IT costs.

While BYOD offers inherent advantages to both the organization and the individual, it is not without its challenges. Device, application, network, and data must all be effectively managed in order for IT professionals to gain control and protect sensitive company data. If not already doing so, most organizations will in the near future have to adjust their IT infrastructure to accommodate employees' use of their own mobile devices. The challenge is to secure data on devices that the company does not own; thus, IT professionals must shift the focus from securing the device to securing the user. For many organizations, this will mean that help desks will need to support a larger selection of devices and operating systems than they currently do.

Organizations that encourage or allow BYOD must clearly communicate to employees the expectations for security as well as privacy. New policies and procedures for device procurement and management, application deployment, and data ownership must be developed, along with carefully written BYOD user policies. Communication of organizational expectations for BYOD through clearly written policies protects the interests of all parties.

Opportunities for Further Research

Results of the current pilot survey warrant further investigation of the implementation of BYOD in various organizations and how those organizations are managing BYOD activity through the use of policies and practices. A wider survey audience could involve university business alumni or members of particular professional organizations. Through expanded research, investigation of policies employed in various business organizations could lead to the development of best practices for managing BYOD.

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End Notes

The Consumerization of IT: BYOD

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Multiple Software Upgrades/Changes: Faculty Perceptions Related to Change Management and Technology Acceptance

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Abstract

This project investigates faculty perceptions regarding several software changes at a medium-sized university within the University of Louisiana System. Within a two-year timeframe, the university changed five software packages--software for email, assessment of student learning, course management, faculty annual reporting, and enterprise software for processes such as registration, human resources, and finance. The researchers surveyed faculty regarding their perceptions of ease of learning and use, as well as their perceptions of the software change related to change management. Findings revealed that faculty were generally accepting of the technology changes; however, they appeared particularly disappointed with the new course management software.

Keywords: software upgrades, change management, technology acceptance, faculty perceptions

Introduction

Beginning in the spring of 2010 through spring of 2012, the researchers' university made several software changes. The first change was to adopt Digital Measures software in January 2010 as a way of capturing data concerning faculty activities, teaching loads, and so forth for annual evaluations. This change was an upgrade from previous years when word-processed forms based on a customized design were prepared and submitted by faculty each January.

This change was followed by the Banner system replacing the Student Information System (SIS) during registration for fall 2010. The change to Banner was mandated by the administrative board overseeing the university and affected most of the universities in the state university system. Faculty used Banner for advising students by accessing such information as student transcripts and course schedules; checking course catalogs, course availability and options; and checking their own course enrollments. Although SIS had previously supported these tasks, Banner required new interfaces, new screens, and new navigation.

The University switched to Gmail for faculty/staff use (from previous use of GroupWise) in December of 2010. Projected budget savings motivated this particular change.

Moodle replaced Blackboard in August of 2011 (early adopters using that semester), with all faculty required to convert to Moodle by spring 2012. Once again, the change from Blackboard course management to Moodle anticipated significant savings labeled as a way to deter faculty layoffs.

The LiveText system for capturing student assessment of learning was also rolled out fall 2011. The administration perceived usage of this software would facilitate documentation of assessment of learning for general education as well as various accrediting agencies. Additionally, it would support students' abilities to compile electronic portfolios. Figure 1 graphically reflects this timeline.

Figure 1: Timeline of Software Changes

	2009						2010												2011											
System	…	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Faculty Evaluations	Custom System						Digital Measures																							
Student Info Sys	SIS									Banner																				
Email	Groupwise																	Gmail												
Course Mngt	Blackboard																									Moodle				
Accreditation																										LiveText				

The researchers, who all teach in some area of information systems, viewed that some software changes were relatively easy changes (email), while other software changes such as moving to the Banner system and changing to the Moodle course management system were more comprehensive changes. Although some training had been offered for each of the new software packages prior to conversion, the researchers had informally heard various opinions on topics such as user acceptance, ease of learning and use, strengths and weaknesses of the various software, and whether the changes were all necessary. The discussion and complaints appeared to increase with each new software package change during this time span.

Purpose of the Study

The purpose of this study was to determine faculty perceptions related to each of the five technology changes identified above. Perceptions regarding ease of learning, ease of use, and usefulness, tie to the basic technology acceptance model (TAM) (Davis, 1989). Additionally, faculty perceptions were studied related to elements of change management including the university’s need to change to improve effectiveness or to improve information management, as well as training and support offered related to the changes. For all these items, the researchers chose to gather data and research the following:

- Are there differences in perceptions based upon gender?
- Are there differences in perceptions based upon age?
- Are there differences in perceptions based on years of teaching experience?

The findings of the study will provide insight into various aspects of managing technology change within an institution of higher learning and afford an overview of differences in perceptions of males and females, younger and older faculty, and those with differing years of teaching experience. Findings can also assist managers in proactively addressing interventions for future technology changes.

Related Literature

How and why individuals adopt new information technology has been studied by many researchers over the past few decades, including researchers such as Agarwal and Prasad (1997); Brown (2009); Davis (1989); Davis, Bagozzi, and Warsha (1989); Halawi and McCarthy (2007); Venkatesh (1999); and Venkatesh and Morris (2000), to name just a few. These studies used either the Technology Acceptance Model (TAM) or variations of that model. Frequent comparisons in studies included differences in gender, age, and technology experience. As early as 1999, Hu *et al.* reported that researching and explaining user acceptance of new technology was one of the most mature research areas in information systems literature. Hu *et al.* summarized findings of various TAM studies and identified that user perceptions of ease of use, ease of learning, and usefulness of a system all play a part in user acceptance of a new technology. To further support the importance of user perceptions, Bhattacherjee's (2001) study results found user satisfaction with an information system's *use* and *perceived usefulness of its continued use* determined a user's intent to continue using the technology.

Venkatesh, Morris, G. Davis, and F. Davis (2003) described several streams of research within the broad area of adoption of new technology and developed and validated what is known as the Unified Theory of Acceptance and Use of Technology, based upon conceptual and empirical similarities across the eight models they researched. The authors identified a key value of such studies—they help managers "understand the drivers of acceptance in order to proactively design interventions (including training, marketing, etc.) targeted at populations of users that may be less inclined to adopt and use new systems" (p. 426). Their unified model identified "three direct determinants of intention to use (performance expectancy, effort expectancy, and social influence) and two direct determinants of usage behavior (intention and facilitating conditions)" (p. 467). Further, they identified significant moderating influences of experience, willingness to volunteer, gender, and age as integral features. In their study, performance expectancy included such constructs as perceived usefulness, extrinsic motivation, job fit, and outcome expectations. Effort expectancy included perceived ease of use and complexity. Social influence involved what others think, social factors, and image.

The research stream related to TAM and variations continues. Schepers and Wetzels' 2006 meta-analysis of the TAM identified differences in studies reviewed; however, they did conclude that the original TAM relationships are confirmed. Recently, Turner, Kitchenham, Brereton, Charters, and Budgen (2010) examined evidence, through a systematic literature review, that TAM predicts actual usage. They found behavioral intention likely correlates with actual usage, but perceived ease of use and perceived usefulness are less likely correlated with actual use. Ultimately, some variation in findings related to technology acceptance can be associated with to the particular group researched.

Within the area of organizational change research, Avey, Wernsing and Luthans (2008) note "Employee resistance is commonly recognized as one of the biggest obstacles and threats to organizations attempting to change to keep up or ahead of evolving internal and external conditions" (p. 64). Their findings from a study of working adults from a wide cross-section of U.S. organizations suggest, "employees' positive psychological capital and positive emotions may be important in countering potential dysfunctional attitudes and behaviors relevant for organizational change" (p. 64).

Rafferty and Griffin (2006) commented, "When change occurs very frequently, individuals are likely to feel fatigued by change and experience an increase in anxiety due to the unpredictability of change in that setting" (p. 1155). Their review of empirical research also revealed that employees have major concerns related to the planning that accompanies change efforts in an organization.

Brown's study of a University's replacement of a legacy system included both organizational change and technology acceptance models (2009). His findings revealed the following predictors of a user's personal initiative regarding acceptance of the new system: perceived ease of use, perceived usefulness, and change efficacy. Brown further noted, "perceptions of new technology are tied to perceptions of the change agents' management of the implementation process, as well as the ramifications of the organizational change on the organization as a whole" (p. 248). He further suggests that change agents, "should be wary of thinking that a new technology can 'sell itself' to the change recipients" (p.250).

Higher education specifically has been a focus of additional studies concerning management of technology change. A study of Digital Measures implementation (Baker-Eveleth and Stone, 2008) concluded that participants' behavioral intentions to use the software were affected by previous computer experience, ease of system use and administrator support. Orr, Williams, and Pennington (2010), studying institutional efforts to support faculty in online teaching, note the value of strategic communication by top decision makers and management. Since switching to a different course management system would be viewed as a significant organizational change by many faculty, lack of effective strategic communication could lead faculty to question the necessity and/or value of the change. Concerning training provisions, Lee and Busch (2005) found adequacy of training was identified as related both to faculty willingness to participate in distance education and to use of a course management system. Likewise, Fedorowicz, Gelinas, Usoff, and Hachey (2005) recommended effective and diverse training as an important component of integrating an enterprise system across an institution.

Based on a literature review of the factors that influence technology acceptance as well as change management, the studies show differences in perceptions may exist among various groups based on such factors as age, gender, and experience with technology. The researchers believe it beneficial to study a group involved in numerous significant technology changes that occurred within a reasonably short timeframe. Of further interest is whether there is a difference in faculty perceptions for the technology changes that occurred near the end of the timeframe.

Methodology

Based on a review of both the technology acceptance model and change management literature, the researchers developed a survey instrument that focused on the five different software changes implemented at the university beginning spring semester 2010 through spring 2012. The survey was reviewed for validity of questions and format prior to full dissemination.

The survey was designed to gather classification data of gender, age, years of teaching experience, and background of teaching either hybrid or fully online courses. Participants were also asked to rate themselves on confidence in learning and using new software, as well as where they fit in the adoption of new technology (early, middle, and late portion of software users). Five survey sections followed (one for each software change) with questions concerning effectiveness, peer perceptions, ease of use, usefulness, need for change, training provided, and utilization of the system in their current position. Faculty could skip any software they did not use (such as LiveText, which was not used by a majority of the faculty at the time the survey was conducted). An open-ended question at the end of each software section solicited any comments the participant would like to make.

The final instrument was created using Google forms, and all faculty received a link to the electronic survey in very early May 2012. As an incentive to encourage faculty to participate at the end of a semester, participants who voluntarily chose to include a contact phone number became eligible for drawings for $25 restaurant gift cards (one awarded for each 50 participants). All faculty received three follow-up messages to encourage participation.

Frequency counts, percentage distributions, and cross-tabulations were prepared for data analysis. Furthermore, t-tests, analysis of variance, and Pearson correlations were used to identify if there were significant differences between different classification groups related to gender, age, and teaching experience.

Survey Findings

A total of 123 faculty completed the survey (38.2% response rate). Table 1 provides details of participant classification questions. More females than males responded to the survey, and those age 50 and above represented 46% of the participants. Years of teaching experience varied, as was expected, with those having 21 or more years being the largest group of respondents (29%). Approximately one-fourth of the respondents have not taught either hybrid or fully online courses; the largest group of respondents (36%) had been teaching online courses for three or more years.

As illustrated in Table 2, close to one-half of the respondents rated themselves as having high confidence in learning and utilizing new software. Almost three-fifths of the respondents classified themselves as being in the first third of adopters of new technology.

Faculty Perceptions

Simple averages of faculty opinions for all technologies are presented in Figure 2. Respondents are nearly neutral on the need for change and whether the changes improved information management. They are most strongly in agreement that they are capable of transitioning to the new technologies and are able to utilize the new technologies. This is not surprising since 41% of respondents had some confidence and 47% were highly confident in their ability to learn new software. Respondents mildly agree that their peers have embraced the change to the new technology. They also agree that the new technologies are easy to use and that they are useful for their job. Furthermore, they agree that training was offered and they are satisfied with the training. Consistency of perceptions is confirmed as respondents *disagree* that transitioning was a mistake and that the new technology was difficult to learn.

Table 1: Characteristics of Respondents

Respondent Characteristic	No.	Percentage
Gender		
Females	71	57.72
Males	51	41.46
No response	1	0.81
Age		
Under 30	8	6.50
30 - 39	21	17.07
40 - 49	36	29.27
50 and above	57	46.34
No response	1	0.81
Teaching Experience		
5 years or less	23	18.70
6 – 10 years	26	21.14
11 – 15 years	23	18.70
16 – 20 years	11	8.94
21 or more years	36	29.27
No response	4	3.25
Online Teaching Background		
Never	32	26.02
Less than 1 year	21	17.07
1 to 2 years	25	20.33
3 or more years	44	35.77
No response	1	0.81

Table 2: Software Learning Confidence and Adoption Speed

Respondent Self-Reporting	No.	Percentage
Confidence in learning software		
Very little confidence	1	0.81
Little confidence	5	4.07
Neutral	8	6.50
Some confidence	50	40.65
High confidence	58	47.15
No response	1	0.81
Speed in adopting new technology		
Within first third	72	58.54
Within middle third	35	28.46
Within last third	15	12.20
No response	1	0.81

Figure 2: Faculty's Overall Opinions [For All Technologies]

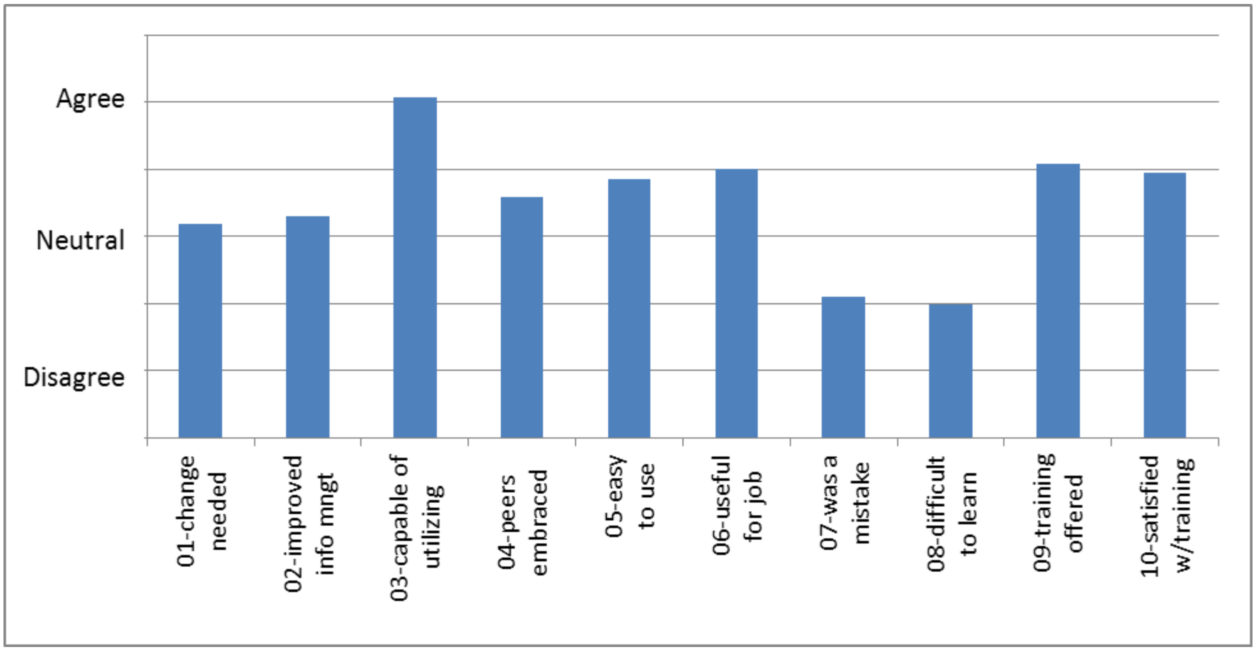


Figure 3 depicts how frequently faculty utilize the new technologies introduced at the university and the amount of training that they attended for each of the new technologies. As the researchers anticipated, Gmail was used most often, with the Moodle course management system next highest in usage. As illustrated in Figure 4, respondents invested the least amount of structured training time for the Gmail switch. Overall, respondents invested the most training time for the Moodle course management system out of the five software changes in the study.

Figure 3: Technology Usage by Faculty

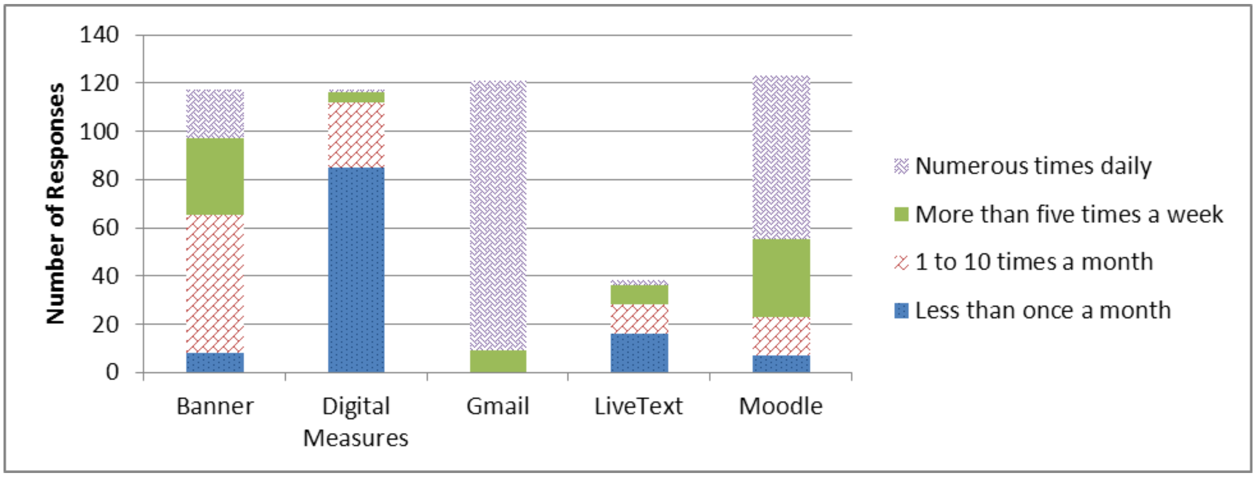
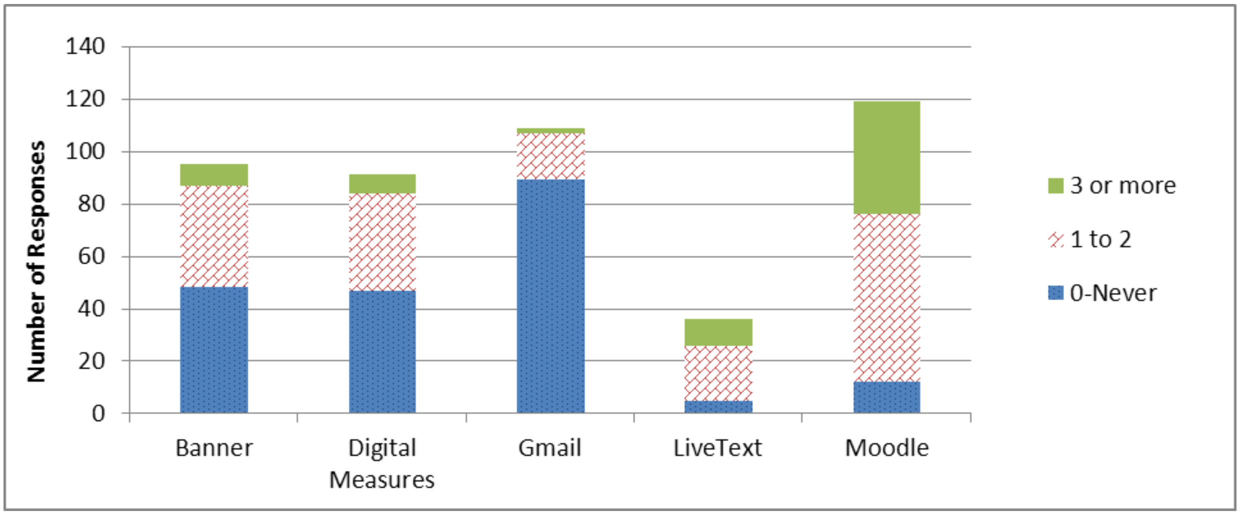
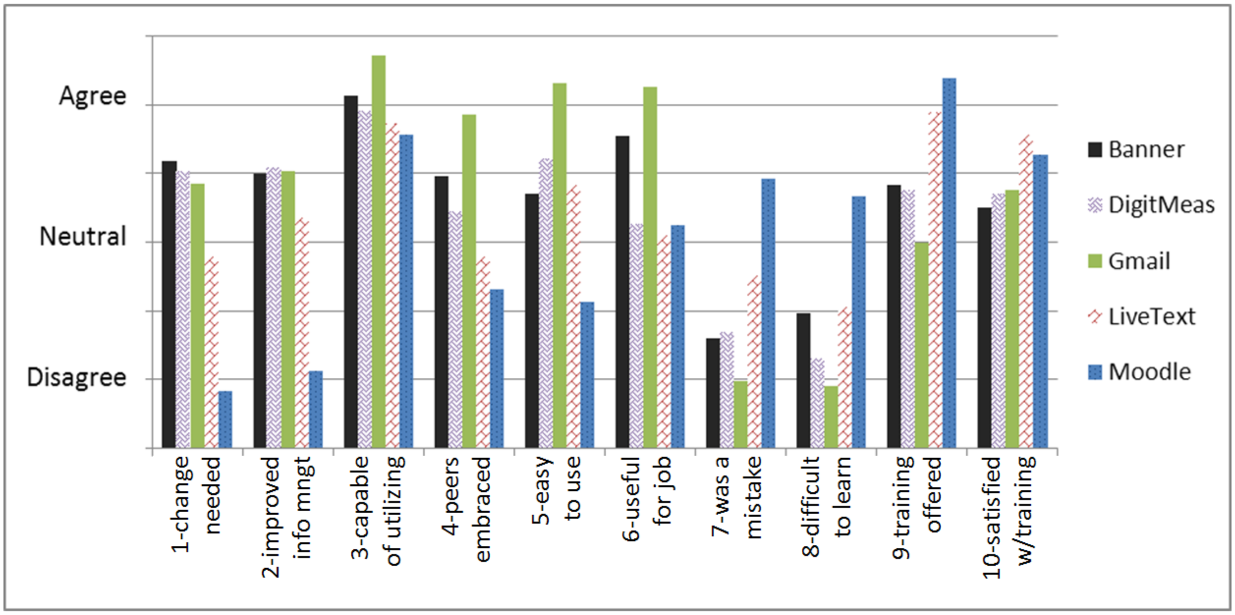


Figure 4: Training Sessions Attended by Faculty



When the researchers looked at the breakdown of faculty opinions by technology (see Figure 5), they identified relevant differences in faculty perceptions. Faculty perceptions regarding Banner and Digital Measures are rather positive. They agree that change was needed and that the change has improved information management. They feel capable of utilizing these technologies and that their peers have embraced the change. Additionally, they find the software easy to use and useful for their job. Along the same lines, they do not find these technologies difficult to use nor do they feel that either was a mistake. These opinions may be partially due to the amount of time faculty spend using these software products. Most faculty have limited need to utilize Banner other than entering final grades, accessing class lists, and advising students. Moreover, many of the budgeting and purchasing processes that are done through Banner are more often carried out by administrative staff rather than faculty. Similarly, Digital Measures is software that is not frequently used. Faculty must enter information into this system for annual evaluation purposes; therefore, many faculty may use it only each January. From the faculty's perspective, these systems appear to be an improvement over the software previously used for these purposes.

Figure 5: Faculty Opinions by Technology



Perceptions related to Gmail are more positive than all other technologies. This is not surprising since Gmail is powered by Google—which prides itself on developing software that is intuitive, easy to use, and user friendly. This point is reinforced by Gmail receiving the highest ratings for faculty feeling capable, peers embracing change, ease of use, and usefulness—all despite receiving the lowest level of training with the software. This system is also the one that is most used by faculty, and they seem to be very happy with the change to this system. One particularly positive note received from faculty is that Gmail provides them with much more storage space than our previous email system. Faculty no longer have to be concerned with archiving and deleting old emails. Cutting out this tedious process has surely positively affected faculty opinion. In addition, the switch to Gmail has also provided the faculty with easier web and mobile device access to email and access to Google Docs.

Faculty, by-and-large, do not utilize LiveText. Only 38 of the 123 of the faculty responding (30.9%) report any usage of the system. Moreover, of those, only 10 (26%) utilize the system at least monthly. The survey results indicate that faculty feel that, of the technologies thus far considered (Banner, Digital Measures, and Gmail), this one is the first that was not needed and their peers have not accepted the conversion to this technology. With LiveText, we also see a higher level of agreement with the statement that “management made a mistake in transitioning to this system” (although as a whole, they still disagree with this statement—there is just less disagreement). These negative feelings may be in part indicative of a need for faculty to accept the “culture of assessment” that is being pushed upon higher education—as this system is designed to aid the university in managing its assessment processes.

When it comes to systems that are strongly disliked by faculty, Moodle is at the top of that “negative” list. Moodle serves as the university’s classroom management system, and it recently replaced Blackboard, which had been used for the previous 10 years, in this role. It is not surprising, therefore, that faculty utilize this software very frequently. Eighty-one percent use the system more than five times per week, and 55% use the system multiple times per day. Except for Gmail, this is the most frequently used system. Based on survey responses, faculty seem to resent being forced to use this system. Moodle received the lowest ratings of any of the systems when considering whether change was required and whether information management was improved because of the change. It also received the lowest ratings when considering whether faculty feel capable of utilizing the system and whether their peers have embraced the change to this system. It received markedly lower ratings for ease of use and markedly higher ratings related to it being difficult to learn. Moodle was the only system where faculty “agreed” (on average) that transitioning to this system was a mistake and that it is difficult to use. These perceptions exist despite Moodle being the technology where faculty attended the most training classes. Ninety percent of faculty responding attended training for Moodle (and 36% attended at least three training events). This is particularly significant because less than 50% of the respondents attended training for the other technologies. Perhaps such a large percentage of faculty attended training after realizing that they would not be able to figure out the system on their own. The negative opinions shared may indicate that they are still struggling with it.

Details of means and standard deviations for respondent characteristics of gender, age, and years of teaching experience, as well as each of the technology perceptions for each software change are provided in the Appendix.

Perception Differences among Groups

In examining the survey responses, the researchers performed analyses to determine whether any statistically significant differences exist among various groups of faculty members. Groupings investigated were based on gender, age, and years of teaching experience. Few differences were found (See Table 3.). The details of the statistical procedures performed follow. Footnotes used in the table indicate the statistical procedure that identified this difference as significant (1-t-tests, 2-ANOVA, and 3-Pearson correlation). All tests were conducted at a level of significance of .05.

Independent Samples t-test

Relating to the 45 technology-related questions on the survey to the data collected during the spring 2012 semester, the researchers formulated hypotheses (H1-H45) about the differences in the mean of the dependent variables by **gender**.

As presented in Table 4, seven hypotheses in this grouping were found to be statistically significant. The first hypothesis was males feel the same about the statement *"Overall, I find Digital Measures is useful in my job"* as females. Males had a mean of 2.85 while females had a mean of 3.31. Equal variances were assumed (sig. = .504) and the hypothesis of equal means was rejected (sig. = .022).

Table 3: Summary Table of Significant Differences among Groups

System	Measure	Gender	Age	Teaching Experience
Digital Measures	Usefulness	Females find system more useful.[1,3]		
	Was a Mistake	Males feel more strongly that it was a mistake.[1,3]		
	Difficult to Learn	Males find it more difficult to use.[1,3]		
Banner	Usefulness	Females find it more useful.[1,3]		
	Easy to Use			More experienced faculty find system more difficult to use.[3]
	Was a Mistake			More experienced faculty more often find system to be a mistake.[3]
	Capable of Utilizing		Younger faculty feel more capable than older faculty.[3]	
Gmail	Needed to change	Males see more need for change.[1,3]		
	Improved Info Mgmt	Males feel more strongly that info mgmt. was improved.[1,3]		
	Capable of Utilizing		Younger faculty feel more capable than older faculty.[2,3]	More experienced faculty feel more capable.[3]
	Easy to Use		Younger faculty find system easier to use.[2,3]	More experienced faculty find system easier to use.[3]
	Usefulness		Older faculty find the system more useful.[3]	
	Was a Mistake		Older faculty feel it was more of a mistake.[3]	
	Training Classes		Older faculty feel more strongly that helpful training classes were offered.[2,3]	
LiveText	Capable of Utilizing	Females feel more capable of utilizing.[1,3]		
	Peers Embraced		Older faculty feel that peers have embraced change more than younger faculty.[3]	More experienced faculty more strongly agree that peers have embraced the system.[3]

([1] t-tests, [2] anova, [3] pearson correlation)

Table 4: Independent Samples t-test Grouped by Gender

Hypothesis	Met Test Assumption	Test Outcome	Sig. Level	N
H_o: Mean of *"Overall, I find **Digital Measures** is useful in my job"* for Males = Mean of "*Overall, I find Digital Measures is useful in my job*" for Females	Yes, equal variances assumed	Reject H_o	.022	115
H_o: Mean of *"I think that management made a mistake by introducing this change to **Digital Measures**"* for Males = Mean of "*I think that management made a mistake by introducing this change to Digital Measures*" for Females	Yes, equal variances assumed	Reject H_o	.042	114
H_o: Mean of *"**Digital Measures** was difficult to learn how to use"* for Males = Mean of "*Digital Measures was difficult to learn how to use*" for Females	No, equal variances were not assumed	Reject H_o	.006	113
H_o: Mean of *"Overall, I find **Banner** is useful in my job"* for Males = Mean of "*Overall, I find Digital Measures is useful in my job*" for Females	No, equal variances were not assumed	Reject H_o	.041	117
H_o: Mean of *"Nicholls needed to change to **Gmail** to improve effectiveness"* for Males = Mean of "*Nicholls needed to change to Gmail to improve effectiveness*" for Females	Yes, equal variances assumed	Reject H_o	.007	118
H_o: Mean of *"The change to **Gmail** is improving Nicholls' information management"* for Males = Mean of "*The change to Gmail is improving Nicholls' information management*" for Females	Yes, equal variances assumed	Reject H_o	.014	120
H_o: Mean of *"I am capable of fully utilizing **LiveText** in my job"* for Males = Mean of "*I am capable of fully utilizing LiveText in my job*" for Females	No, equal variances were not assumed	Reject H_o	.079	37

The second hypothesis was males feel the same about the statement *"I think that management made a mistake by introducing this change to Digital Measures"* as females. Males had a mean of 2.56 while females had a mean of 2.20. Equal variances were assumed (sig. = .176) and the hypothesis of equal means was rejected (sig. = .042).

The third hypothesis was males feel the same about the statement *"Digital Measures was difficult to learn how to use"* as females. Males had a mean of 2.44 while females had a mean of 1.94. Equal variances were not assumed (sig. = .008) and the hypothesis of equal means was rejected (sig. = .006).

The fourth hypothesis was males feel the same about the statement *"Overall, I find Banner is useful in my job"* as females. Males had a mean of 3.55 while females had a mean of

3.93. Equal variances were not assumed (sig. = .031) and the hypothesis of equal means was rejected (sig. = .041).

The fifth hypothesis was males feel the same about the statement *"Nicholls needed to change to Gmail to improve effectiveness"* as females. Males had a mean of 3.78 while females had a mean of 3.16. Equal variances were assumed (sig. = .954) and the hypothesis of equal means was rejected (sig. = .007).

The sixth hypothesis was males feel the same about the statement *"The change to Gmail is improving Nicholls' information management"* as females. Males had a mean of 3.82 while females had a mean of 3.30. Equal variances were assumed (sig. = .055) and the hypothesis of equal means was rejected (sig. = .014).

The final hypothesis was males feel the same about the statement *"I am capable of fully utilizing LiveText in my job"* as females. Males had a mean of 3.33 while females had a mean of 4.12. Equal variances not were assumed (sig. = .000) and the hypothesis of equal means was rejected (sig. = .079).

Analysis of Variance

The researchers established 45 ANOVA tests, where the 45 Likert-type statements were the factors and **age** was the variable. As presented in Table 5, only three of the hypotheses related to **Gmail** questions were found to be statistically significant. For the statement, "*I am capable of fully transitioning to Gmail in my job*," there was a statistically significant difference between groups as determined by one-way ANOVA ($F(3,116) = 2.928$, $p = .037$). Because of unequal group sizes, Fisher's LSD post hoc test was used to determine the nature of the difference between the age of the faculty; this analysis revealed that there was a statistically significant difference between the mean of the faculty of ages 30-39 ($M = 4.71$, $SD = .463$) and the mean of the faculty ages 50 and above ($M = 4.16$, $SD = .910$, $p = .006$. There were no other statistically significant differences between the other age groups' means implicating that the mean of the faculty of ages under 30 did not significantly differ from the mean of the faculty of ages 30-39, the mean of the faculty of ages 40-49, and the mean of the faculty of ages 50 and above. In addition, the mean of the faculty of ages 30-39 did not significantly differ from the mean of faculty of ages 40-49 and the mean of the faculty of ages 40-49 did not significantly differ from the mean of faculty of ages 50 and above.

Table 5: ANOVA Significant Difference Findings

		Sum of Squares	df	Mean Square	F	Sig. Level
*I am capable of fully transitioning to **Gmail** in my job.*	Between Groups	5.341	3	1.780	2.928	.037
	Within Groups	70.526	116	.608		
	Total	75.867	119			
*Overall, I believe **Gmail** is easy to use.*	Between Groups	7.105	3	2.368	2.933	.036
	Within Groups	92.861	115	.807		
	Total	99.966	118			
*Training classes were offered to help me learn how to use **Gmail.***	Between Groups	6.552	3	2.184	2.897	.038
	Within Groups	84.439	112	.754		
	Total	90.991	115			

For the statement, "*Overall, I believe Gmail is easy to use,*" there was a statistically significant difference in average between groups as determined by one-way ANOVA ($F(3,115) = 2.933$, $p = .036$). Because of unequal group sizes, Fisher's LSD post hoc test was used to determine the nature of the difference between the age of the faculty; this analysis revealed that there was a statistically significant difference between the mean response of the faculty of ages 30-39 ($M = 4.62$, $SD = .498$) and the mean response of the faculty ages 50 and above ($M = 3.96$, $SD = 1.017$, $p = .005$). There were no other statistically significant differences between the other age groups' means implicating that the mean of the faculty of ages under 30 did not significantly differ from the mean of the faculty of ages 30-39, the mean of the faculty of ages 40-49, and the mean of the faculty of ages 50 and above. In addition, the mean of the faculty of ages 30-39 did not significantly differ from the mean of faculty of ages 40-49 and the mean of the faculty of ages 40-49 did not significantly differ from the mean of faculty of ages 50 and above.

For the statement, "*Training classes were offered to help me learn how to use Gmail,*" there was a statistically significant difference in average response between groups as determined by one-way ANOVA ($F(3,112) = 2.897$, $p = .038$). Because of unequal group sizes, Fisher's LSD post hoc test was used to determine the nature of the difference between the age of the faculty; this analysis revealed that there was a statistically significant difference in average response between the mean of the faculty of ages 30-39 ($M = 2.67$, $SD = .840$) and the mean of the faculty ages 50 and above ($M = 3.23$, $SD = .763$, $p = .018$), the mean of the faculty of ages 40-49 ($M = 2.80$, $SD = .994$) and the mean of the faculty ages 50 and above ($M = 3.23$, $SD = .763$, $p = .023$). There were no other statistically significant differences between the other age groups' means implicating that the mean of the faculty of ages under 30 did not significantly differ from the mean of the faculty of ages 30-39, the mean of the faculty of ages 40-49, and the mean of the faculty of ages 50 and above. In addition, the mean of the faculty of ages 30-39 did not significantly differ from the mean of faculty of ages 40-49.

The researchers also formulated 45 ANOVA tests, where the 45 Likert-type statements were the factors and **total years teaching experience** was the variable. The mean scores of the faculty having different years of total teaching experience grouped by 0-5 years, 6-10 years, 11-15 years, 16-20 years, and 21 or more years were compared using a one-way ANOVA. The faculty having different total years of teaching experience did not differ significantly in their opinions on the 45 Likert-type dependent variable statements.

Pearson Correlations

Pearson Correlations were also calculated for the data gathered, and a few correlations are worth noting in relation to gender, age, and teaching experience.

Gender. Gender was positively correlated with one statement regarding Digital Measures, one Banner statement, and one LiveText statement. In regards to the Digital Measures statement, "*Overall, I find Digital Measures is useful in my job*" (.213), females agreed more strongly than their male counterparts that the software was useful in the job. In regards to the Banner statement, "*Overall, I find Banner is useful in my job*" (.196), again females agreed with this statement more strongly than their male counterparts did. Lastly, for the LiveText statement, "*I am capable of fully transitioning to LiveText in my job" (.382),* females agreed more strongly than males. The researchers note that LiveText was first implemented in the College of Education, in which the majority of faculty members are female.

Gender was negatively correlated with two statements regarding Digital Measures. In regards to the Digital Measures statements, "*I think that management made a mistake by introducing this change to Digital Measures*" (-.191), and "*Digital Measures was difficult to learn how to use"* (-.270), males agreed more strongly that it was a mistake and difficult to learn.

Age. Age was positively correlated with two Gmail statements and one LiveText statement. In regards to the Gmail statements, "*I think that management made a mistake by introducing this change to Gmail*" (.239), and "*Training classes were offered to help me learn how to use Gmail*" (.226), participants in the 50 and above category agreed with these statements the strongest. For the LiveText statement, "*Most of my respected peers have embraced the change to LiveText" (.352),* participants under 30 years of age disagree with this statement the most, while participants in the 50 and above category agreed with the statement the strongest.

Age was negatively correlated with one Banner statement and three Gmail statements. In regards to the Banner statement, "*I am capable of fully transitioning to Banner in my job" (-.221), p*articipants in the 50 and above category agreed with this statement the least. In regards to the Gmail statements, "*I am capable of fully transitioning to Gmail in my job" (-.225), "Overall, I believe Gmail is easy to use*" (-.243), and *"Overall, I find Gmail is useful in my job*" (-.212), participants in the 50 and above category agreed with these statements the least.

Teaching Experience. Teaching Experience was positively correlated with one statement each for Banner, Gmail, and LiveText. In regards to the Banner statement, *"I think that management made a mistake by introducing this change to Banner*" (.213), participants with 21 or more years of teaching experience agreed the most that Banner was a mistake to introduce. In regards to the Gmail statement, "*I think that management made a mistake by introducing this change to Gmail*" (.192), participants with 0 – 5 years of experience disagree with this statement the most, while, participants with 21 or more years of experience agree with it the most. Lastly, in regards to the LiveText statement, "*Most of my respected peers have embraced the change to LiveText" (.399), p*articipants with between 16 – 20 years teaching experience agree with this statement the most, while participants with 0 – 5 years of experience disagree agreed with the statement the strongest.

Teaching Experience was negatively correlated with two statements regarding Banner and one Gmail statement. Regarding the Banner statement, "*Overall, I believe Banner is easy to use" (-.224), p*articipants with 21 or more years of teaching experience agreed the least that Banner was easy to use and they also agreed the most that is was a mistake to introduce. In regards to the Gmail statement, "*I am capable of fully transitioning to Gmail in my job" (-.208), a*gain, participants with 21 or more years of teaching experience agreed the least that they were capable of fully transitioning to Gmail.

Conclusions

Over a period of two years, faculty at the researchers' university were subjected to a series of changes in technology. Administration decided to transition to five new systems during this short period of time— including an annual evaluation system, a student information system, an email system, a course management system, and an assessment of student learning system. The researchers surveyed faculty at their university to gauge their opinions and perceptions related to this series of technology changes. By and large, faculty were comfortable with the changes. Particularly favorable responses were received for transitioning to Gmail as an email system. However, the faculty expressed a considerably disagreeable attitude towards using Moodle as a course management system. Concerning the switch to Moodle from the previous course management system, the researchers note that this was the fourth major change in the short time frame. As Rafferty and Griffin (2006) noted, very frequent change can contribute to people feeling fatigued and increasing their anxiety levels. This may be contributing to the more negative perceptions reported by faculty regarding the switch to Moodle. This reasoning would lead one to believe faculty would have even more negative feelings towards the final technology change to LiveText as a system for recording assessment of student learning information. However, we do not see this happening. One explanation is that all faculty have had to adapt to Moodle, whereas a much smaller group reports being required to adopt LiveText as of the time of the survey.

In this study, statistical procedures were carried out to determine if differences in opinion existed among gender, age, and years of teaching experience. While a few statistically significant differences for particular measures related to particular technology changes were found, no interesting patterns emerge among the various groupings of faculty considered.

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Appendix

Table 6: General Descriptive Statistics

Item	Mean	Std Dev	N
Gender	1.58	0.495	122
Age	3.18	0.918	122
Teaching Experience	3.09	1.518	119

Table 7: Descriptive Statistics for Survey Questions

Technology	Statistic	Change Needed	Improved Info Mngt	Capable of Utilizing	Peers Embraced	Easy to Use	Useful for Job	Was a Mistake	Difficult to Learn	Training Offered
Banner	Mean	3.6	3.5	4.1	3.5	3.4	3.8	2.3	2.5	3.4
	Std Dev	1	1.1	0.9	1	1.2	0.9	1	1.1	0.9
	N	119	117	119	119	117	118	117	121	115
Digital Measures	Mean	3.5	3.5	4	3.2	3.6	3.1	2.4	2.2	3.4
	Std Dev	1	1	1	1	1.1	1.1	0.9	0.9	0.9
	N	120	116	119	115	114	116	115	114	111
Gmail	Mean	3.4	3.5	4.4	3.9	4.2	4.1	2	2	3
	Std Dev	1.2	1.1	0.8	0.9	0.9	0.9	1	1	0.9
	N	119	121	121	122	120	119	119	120	117
LiveText	Mean	2.9	3.2	3.9	2.9	3.4	3.1	2.8	2.5	4
	Std Dev	1.2	1.2	1	1.1	1.2	1.3	1.1	1.1	0.7
	N	38	38	38	38	36	38	37	36	37
Moodle	Mean	1.9	2.1	3.8	2.7	2.6	3.1	3.5	3.3	4.2
	Std Dev	1	1.1	1.2	1.2	1.3	1.2	1.3	1.2	0.9
	N	122	122	121	121	119	120	122	121	119

End Notes

Multiple Software Upgrades/Changes: Faculty Perceptions Related to Change Management and Technology Acceptance

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**When the Course Management System Isn't Enough:
Using Technology to Enhance the Online Learning Experience**

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Abstract

Course management systems are now available from a variety of vendors. Despite the strides made by course management systems with varying standard and add-on features, it seems that no one-size-fits-all system has been developed. The class content, the teaching style of the professor, and the learning styles of the students can all affect the success of the interactivity desired and achieved in the online classroom. This research was designed to examine student perceptions of the use of additional tools when the course management system was not deemed sufficient for the interactivity desired.

Keywords: online education, course management systems, technology, student perceptions

Introduction

Many articles have been written extoling the need for interactivity in the online classroom. Zundel (2006) states that not only should interactivity be effectively integrated, but that it is essential for enhancing the learning in online courses just as interactivity is essential for on-campus learners. Mabrito (2004) contends that success is enhanced in online courses by engaging students as active learners rather than passive participants. Mabrito goes on to state that this engagement should include ample opportunities for students to interact with not only the course content, but also with the instructor and classmates.

A course management system (CMS) is a collection of software tools housed in a platform that provides an online classroom environment for course interactions. Course management systems are now available from a variety of vendors with varying standard and add-on features. Despite the strides made by these vendors in improving their offerings, it still seems that no one-size-fits-all system has been developed. The class content, the teaching style of the professor, and the learning styles of the students can all affect the success of the interactivity desired and achieved in the online classroom. This research was designed to examine student perceptions of the use of additional tools when the course management system was not deemed sufficient for the interactivity desired.

Review of Literature

A review of the literature reveals multiple articles regarding online learning and the need the learner has for interactivity and collaboration tools. An example of this need stems directly from the growth of technology-based collaborative, team-based projects in business. A recent study (George, 2011) of 260 small businesses with 1,000 or fewer employees indicated one-third of the businesses increased spending in support of collaboration projects compared with expenditures the previous year, and only 15 percent cut spending. To fund technology needed for increased collaboration, 56 percent of businesses in the study expected information technology (IT) budgets to rise compared with the previous year, and only 20 percent expected a cut. Schools of business preparing students to enter a work environment that increasingly depends on technology-dependent virtual teams increasingly use online learning to teach students team skills and interaction with team members; however, the higher education simulated environment often lacks the array of Web 2.0 technology tools needed to accurately portray virtual teams in the work place.

Utilization of Web 2.0 technologies, by way of software as a service, is a departure from the more controlled, software-driven environment of Web 1.0 and a move toward an environment of “collective intelligence” (O’Reilly, 2005, 2. Harnessing Collective Intelligence, para. 1). This hosted approach promotes utilization of a platform that is “delivered as a service, with customers paying, directly or indirectly, for use of that service” (O’Reilly, 2005, Netscape vs. Google, para. 4). “Today, college students use Web 2.0 applications more frequently than ever in and out of the classrooms. Applications such as blogs, instant messenger, online communities, video sharing tools and web conferencing tools are gaining popularity” (Yoo & Huang, 2011, p. 241). Often, instructors and students lack “the knowledge, attitudes, and sensibilities to work together effectively online” (Vallance, Towndrow, & Wiz, 2010, p. 22). The reasons behind negative experiences in using collaboration are not limited to technological issues; often, “socio-dynamic problems between group members are…the reason for the lack of success of group work in collaborative spaces” (Vallance et al., p. 21).

As Yoo and Huang (2011) found in their study of 83 American and 100 Korean students, analysis of the data indicated “a significant difference between American and Korean students in the anxiety category for all six Web 2.0 applications. Korean participants felt more anxious about using those applications than American participants” (p. 247), yet the Korean respondents also noted that “social virtual communities are very useful and increase their productivity” (p. 247). Many American students today, who began using the Web as toddlers, are more technology-confident than their predecessors, their instructors, and perhaps more than their international peers. “Traditional classroom structures and teaching strategies may be ineffective due to the learning needs of these students who process information differently” (Bajt, 2011, p. 54).

Yet, the student experience is still managed, on all levels, by the instructor. So, the question remains, how open are teachers to introducing Web 2.0 technologies into educational settings? A study (Capo & Orellana, 2012) of 800 high school teachers in more than 50 high schools in a large southern Florida county evaluated the teachers’ perceptions of integration of

Web 2.0 technologies and found that most participants were not using Web 2.0 technologies for classroom instruction and had no plans to use blogs (51.1%), wikis (36.5%), social networking (53.3%), social bookmarking (59.9%), or audio/video conferencing (41.6%). Teacher comments in the study indicated the lack of equipment, training, and funding, as well as security issues and firewalls, were obstacles that negatively affected their willingness to adopt and integrate Web 2.0 technologies. This scenario may also be playing out in higher education, as well.

Pritchett, Wohleb, and Pritchett (2013) found in a study of 842 education professionals regarding educators' perceived importance of Web 2.0 technology applications that participants rated as most important virtual learning networks, video sharing, and online event scheduling. Furthermore, these authors reported "administrators, media specialists, and female participants reported a higher overall sum score for the perceived importance of Web 2.0 applications" (p. 37). This brings into question the level of technology development being provided to instructors to equip them to utilize technologies that students grow up using and expect to utilize in educational settings.

The utilization of Web 2.0 technologies is based upon Constructivist pedagogy whereby the technology is a medium for shared meaning and content. "The open, collaborative, and contribution-based nature of the Web 2.0 paradigm and its associated tools hold great promise for the future of education" (Bower, Hedberg, & Kuswar, 2010, p. 178) and has the potential to enable collaboration and promote diversity. Park (2013) suggested, "Web 2.0 technologies share characteristics that accommodate support for autonomy, competence, and relatedness, which promotes student engagement" (p. 50).

A common question asked by higher education instructors teaching in the online environment is, "How can I make my online class as interactive as my face-to-face class?" The problem faced by many online instructors is that they are expected to use a limited set of tools included in the course management system (CMS) or learning management system (LMS) to create opportunities for student interaction, group writing, and individual or group presentations that are equal in rigor and breadth to the opportunities provided students in the face-to-face environment. Sometimes, even sophisticated course management systems do not offer the array of tools needed to provide cooperative, interactive components required for individual student learning or collaborative team editing in writing intensive courses. The limitation of CMS tools is often overlooked by administrators, decision-makers, and other instructors who either choose not to use interactive synchronous or non-synchronous learning tools or whose curriculum does not require group-based writing or business presentations. Though these experiences do present a challenge, this does not mean that these types of activities cannot be completed online; students, for the most part, are comfortable with using technologies not included in the CMS. The question often is whether the instructor is comfortable managing the additional technologies. For some faculty, online instruction itself is a challenge due to lack of technical mastery and teaching-style preference (Schoenberg, 2011).

de Pillis and Furumo (2007) found in a comparative study of 123 male and 78 female upper-division business students in virtual and face-to-face teams that learners in the virtual teams using only the WebCT course management system for collaboration “had lower average performance, less cohesion and satisfaction, more time spent on task, and more free-riders than face-to-face teams” (p. 95). Conversely, Hutchison, Kear, Robertson, and Woodthorpe (2010) conducted a study of students and tutors using wikis in place of formerly used forums for discussion, and the authors concluded that usability and sociability were key requirements of tools for interactivity.

Ubell (2010) wrote, “Education and training that take full advantage of virtual teams not only provides essential skills, but engage learners in one of today’s most advanced workplace practices” (p. 53). The author added, “Opportunities to introduce virtual teaming are no longer limited by clunky technical means….you now have everything you need on your desktop or in your hand to participate in engaged collaboration on the job or in the class” (p. 54). Freely available open-source technologies are commonly used to augment learning management systems and improve information sharing; “teams have adopted wikis as collaborative websites, permitting members to add and edit content” (Ubell, 2010, p. 56).

Schoenberg (2011) suggested collaboration “creates a sense of belonging to an online community, promotes communication, encourages critical thinking and cooperation among students, and reduces or eliminates isolation” (p. 81), and he advocated using collaborative tools or technologies such as Google Documents, Skype, Facebook, wikis, blogs, and video. Furthermore, Dittman, Hawkes, Deokar, and Sarnikar (2010) studied the effect of virtual team collaboration training among selected undergraduate courses at a small Midwest university and found the training was viewed as useful by study participants, and the training increased collaboration and development of relational links with teammates.

Despite the business community’s growing emphasis on collaboration and use of collaborative technology (George, 2011), there are gaps in students’ exposure to, and ability to use, Web 2.0 technologies in higher education settings. Bennett, Bishop, Dalgarno, Waycott, and Kennedy (2012) conducted research across three Australian universities of students’ use of information and communication technologies to support their learning. Results of the study indicated most students had little prior experience with relevant technologies, and many struggled to see the value of using Web 2.0 technologies for learning and teaching.

In another recent study (Shea, Sherer, Quilling, & Blewett, 2012) of graduate students attending one university in the United States and students in their fourth year of study at a university in South Africa, Web 2.0 technologies were used to enable virtual teams to experience tasks similar to "a typically complex task conducted in global virtual teams today – focused and time-bound," (p. 304). The technologies included neXtrovert's discussion forum and wiki for collaborative writing and Skype for desktop video conferencing. Results of the study indicated 64 percent of the students said the project went "very well," while 15 percent said it did not go well. Specifically, the students commented, "The wiki was a great collaboration platform – it's nice to be able to add work, and edit the work of others, slowly molding and shaping text into a final product" (p. 307). Students also recommended more time be allowed for technical training, team introductions, and wiki development. These authors noted many business students will likely be members of global virtual teams and also questioned how schools of business are preparing students to work effectively online, across time zones, and with other cultures (Shea, Sherer, Quilling, & Blewett, 2012).

Methods and Procedures

For the purposes of the present study, instructors at a mid-sized, four-year public university, devised assignments requiring students enrolled in writing-intensive business communication courses to use technologies not associated with the campus-supported CMS. Students received guidelines for access to the technologies in the content of the course management system. These additional technologies included Wikispaces, YouSeeU, Dropbox, Blogger, Twitter, Facebook, Ning, and Second Life. For the purposes of this study, the discussion will focus on students' use of Wikispaces and YouSeeU. Students were assigned a username and password and were enrolled in the Wiki by the instructor to streamline the process for participation.

Wikispaces is a free-for-educators, cloud-based technology that enables simultaneous editing of a document. This application was chosen because it was free, it allowed for team-based writing, and it provided course instructors a detailed log of document changes. Instructors must set up the account and certify that it will be used only for educational purposes.

The other technology to be discussed is YouSeeU. YouSeeU was used for individual online student presentations. YouSeeU was developed by a business communication professor to address the scarcity of methods whereby online students could conduct a business presentation that required the same considerations as those of students presenting in the classroom. YouSeeU has unique features that allow for better student presentations of data as well as better feedback from the instructor. This is not, however, a free service. YouSeeU was purchased on a subscription basis only for online students; the university's additional fee for distance education courses covered the cost.

Purpose: The purpose of the study is to determine student perceptions of using web-based tools for interactivity and collaboration, as well as instructor perceptions of the issues encountered to incorporate these tools.

Procedures: A variety of tools are used by professors in the courses included in the study to enhance the interactivity of their web-based offerings. A survey was developed to determine online students' prior familiarity and use of the online learning tools Wikis and YouSeeU. In addition, after requiring students to use these Web 2.0 tools, students were asked through the use of open-ended questions to provide their opinions of the value of these tools for the online class.

Findings: Students in online sections of business communication, administrative communication, and business communication technologies courses were required to use both Wikispaces and YouSeeU. Specific assignments, both individual and group, were created for the students to complete. Brief instructions were provided with the additional suggestion for students to study the online instructions for each platform. Assignments were different for the two courses, but included Wiki assignments for group collaboration on research and writing assignments and YouSeeU assignments for individual introductions, individual presentations, group presentations, and interview questions (the interview questions were set up like an oral exam in YouSeeU).

For this study students were surveyed to determine their prior experience with the two technologies. A total of 72 students responded to the survey. The respondents were 31% male and 69% female. When examining the knowledge and prior experience of students in the use of Wikis and the YouSeeU platform, results indicated that 42 students (58%) had never heard of a Wiki before the class, and 63 (88%) had never heard of YouSeeU. When asked of their prior experience using these tools, 60 students (83%) had never used a Wiki and 63 students (88%) had never used YouSeeU. Of those who had used a Wiki or YouSeeU previously, the majority (67%) had used the tools in another online class.

Students were asked their opinions of the use of these technologies for the online class. The responses were generally very positive.

When discussing the use of Wikispaces, comments included:

- In the beginning it was confusing, but once I figured it out it seemed easy.
- I like how each assignment had its own discussion area so the conversations were kept separate from other assignments.

- I liked how the instructor could see who was posting so people got the grade they deserved.
- It is a good feature to use for classes because it does allow you the ability to get assignments done as a group when it is all online.
- Using the wiki for group work was a good experience and a great learning tool.
- Once familiar with the system, the technology became exceptionally helpful and the group efficiency rose tremendously.
- The site was very easy to use and navigate.
- Not having to email documents back and forth causing confusion on which was the newest version was very helpful.
- Wikis, in my opinion, are the best option for group projects. Last semester I worked on a group project through online chat. It was rather challenging and everyone in the group stated how much they missed not having access to a wiki.
- Wikis can be a very helpful tool to use in business or the classroom. I think the hardest thing is getting each person on the same page of how to use the Wiki effectively.
- They are very convenient and easy to access.
- I thought using the wiki was very convenient! It is a great way to do a group assignment! I have found that using a wiki is the easiest way for online class group projects because it allows for flexibility in schedules and everyone can contribute. It is also a great way for the professor to see who has contributed to the project.
- Wikis are very helpful, but many classes do not allow them as a resource.
- I enjoy and support the use of wikis for group projects. They are very effective when the group is located all over the planet. They are easy to use and being able to review

previous versions helps when editing the work. It is very important for the group to set guidelines and deadlines for the use of the wiki. Posts must be made early so that members have time to review it and make changes.

- They are pretty neat and allow professors to see how much work each person has done, which is valuable in group work where one person sometimes has to do more than others.
- Wikis are a great tool as long as all members do their share. Unfortunately in group assignments this doesn't always happen.

There were a few negative comments as well. These, however, referred more to team members' lack of participation.

When discussing the use of YouSeeU, comments included:

- It was exciting to visually do an assignment.
- It prepared us for future employment.
- The YouSeeU video was great practice for the interview question and practicing presentation skills.
- A benefit from using the YouSeeU technology was that we could see the other people in our class and know a little bit about them as well as the teacher.
- I am not a fan of making speeches in front of a class, so being able to record my presentation and then upload it was a better option for me.
- I enjoyed making the PowerPoints to go along with the videos.
- The interview question was a really good way to practice for an interview. The set-up of that oral exam was really good and even though I was nervous, I really liked that assignment.

- I have only used YouSeeU once, but it was simple to use and I felt better about having my video on a site only certain individuals could view.
- YouSeeU is a great way to utilize video and to record yourself for projects or presentations.
- I really enjoyed using YouSee U to make a speech for one of my classes.
- YouSeeU was a great tool for a group video project. The platform (and tutorials) were a little difficult to get through, but once we did, the project came out great. I think this is a valuable tool for online classes.
- I think their instructions could have more details in instructions on how to set up. I had to get help from my kids, but together we got it.
- The program was easy to use after a brief learning curve.

The negative comments on the YouSeeU also had to do with the problems of group work in an online class. In the question asking students about ease of use of YouSeeU (YouSeeU was relatively easy to learn to use) only 6% indicated they somewhat did not agree with the ease of use. No students selected that they disagreed that it was easy to use.

For the instructors there were also pros and cons. Setting up the courses in a separate platform takes additional time. Fielding questions on software that the instructor does not have expertise in can be somewhat intimidating. There was some confusion on the part of the students on exactly how to initially log in to each technology. For both of the applications discussed in this paper, however, instructors did find that students were, for the most part, self-sufficient once they initially accessed the technology's website.

In looking at student performance while using the tools, instructors felt they had more control in terms of understanding the amount of work performed by each student. In addition, some instructors commented that they felt the work submitted was of better quality than they had previously experienced with similar assignments in the same classes. All of the instructors who tried the two applications (Wikispaces and YouSeeU) who reported in the study have continued to use the tools in their courses.

Students were also asked, ”When thinking of your online courses, what other technology applications have you used or feel you would find beneficial in enhancing online courses?” Surprisingly, they didn’t add too many additional suggestions. The ones mentioned were:

- I use WebEx for work and have good results with this product and it’s useful when you need to have a live meeting.
- I really enjoy the use of Prezi as a new way to prepare presentations. I also feel that the use of Evernote, Dropbox, and GoogleDocs would be useful tools to learn to use.
- I really enjoyed using blogs, wikis, chat, and YouSeeU. Also the virtual world where we created avatars was very fun too!
- Youtube
- I used Prezi in one of my classes. What a great tool! I can’t wait to use it for sales presentations or training. It makes the content fun and memorable. I would have enjoyed an in-depth training on all the features that are offered.

The comments about both Wikis and YouSeeU were very positive. Despite this, as shown in the above list, there were very few additional items suggested by students. In addition to those listed, all other items mentioned were textbook specific sites provided by publishers such as McGraw-Hill and Cengage Learning.

Conclusions and Recommendations

Based on the review of literature and the results of the current study, evidence seems to point to the advantages of adding additional avenues of interactivity to CLMs to add additional interactivity from both the point of view of the students and the professors. It should be reiterated that not every CLM has the exact same features. In the case of the present study, Desire to Learn (D2L) was the class management system.

The addition of outside tools, such as YouSeeU and Wikispaces included in the present study, may provide enhanced interactivity not otherwise available for the course. Companies who design, manage, and sell various CLM products may not be aware of the needs for such interactive components.

The recommendation based on the results of the study is for educators to consider adding an additional tool to their current online course that will enhance interactivity. An educator using Web 2.0 tools "needs to recognize that each tool is not an end unto itself" (Bajt, 2011, p. 61). It is also recommended that faculty use the technology in cohort fashion to provide peer support when questions arise. Furthermore, it is recommended that those responsible for working with the CLM companies discuss the various additional tools that are being used by their faculty. Having this conversation with the representatives who serve the campuses might be a step toward adding additional features to the traditional CLM.

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End Notes

When the Course Management System Isn't Enough: Using Technology to Enhance the Online Learning Experience

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