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ENGAGING STUDENTS WITH COURSE CONTENT USING SCHEDULED AND UNSCHEDULED EMAILS AND TEXT MESSAGES

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ABSTRACT

This study addressed college students' acceptance of push communication (i.e., email and SMS messaging) as a means of receiving course-related content, and modified the Unified Theory of Acceptance and Use of Technology by including Scheduled Message as an independent variable. Surveys of 301 students' perceptions of instructor-sent email and SMS texts directing them to materials in six instructors' 10 courses were analyzed by PLS-PM for their impact on the students' intention to use these push communication technologies. In contrast to previous studies on technology acceptance, we evaluated actual usage patterns for both the scheduled and unscheduled push communication. Scheduled emails did not yield higher average duration times or unique visitors than unscheduled ones, yet click-through rates and return visits were higher. Scheduled SMS messages did yield higher average duration times, unique visitors, and click-through rates than unscheduled SMS messages, yet unscheduled SMS messages yielded more return visits. We argue that the differences in the results for email vs. SMS may have been due to email's slower delivery time. We also consider implications for faculty wishing to facilitate distributed learning among students via push communication.

Keywords: Push Communications, Scheduled Emails, Text Messages, Course Content

INTRODUCTION

Educational technology tools for both synchronous and asynchronous environments have been around for quite some time (Sorensen, 2011), and with the proliferation of mobile devices it is now practical for faculty to push scheduled content on demand directly to students (Cheng, 2015). Older push technologies, such as email and Short Message Service (SMS) text messaging, can now be sent by programs that are able to deliver a message within precise time ranges (Spangler, 1997). Pull technologies, such as podcasts or websites, may be a less effective means to provide additional course-related content to students outside of the classroom because the burden is on the students to download or view the material. The purpose of this study was to identify the factors that influence college students' acceptance of push communication (i.e., email and SMS messaging) as a means of receiving course-related content, and to assess whether scheduled or unscheduled delivery was more accepted.

Mobile learning (m-learning) has received more attention in academia since the explosion in smartphones on college campuses. A Ball State University study found that, even nine years ago, 99.8% of college students had cell phones, and that smart phones were accounting for more of their electronic communication and computing needs than ever before (Ziegler, 2010). Despite this, broad use of smart phones in educational contexts has not caught on (O'Bannon & Thomas, 2014), despite research that suggests that mobile devices may be a valuable learning tool (Hoppe, Joiner, Milrad, & Sharples, 2003).

The Unified Theory of Acceptance and Use of Technology (UTAUT) identifies four predictors of technology acceptance, namely performance expectancy, effort expectancy, social influence, and facilitating conditions (see Venkatesh, Morris, Davis, and Davis, 2003, cf. Chen et al., 2013). Venkatesh et al. (2003) further identified four moderating variables: gender, age, experience, and voluntariness of use. In our study, Behavioral Intention and Use Behavior were the two dependent variables.

At the time of this study, there were no known models that analyzed instructor-sent texts and emails with Scheduled Message as an independent variable. Research on memory and learning indicates that information is most effectively stored in long-term memory when distributed in increments as opposed to a single episode (Bjork, 1979, Melton, 1970, Greene 1989). Push technologies provide educators with the tools to do just that. It would be valuable for educators who want to exploit push technology in order to facilitate distributed learning to know whether scheduled or unscheduled distribution of information is more effective.

RESEARCH METHODOLOGY

The research model (see Figure 1) was designed to measure a student's reception of scheduled push communication. It adapts UTAUT theory by substituting facilitating conditions with scheduled message as an independent variable.
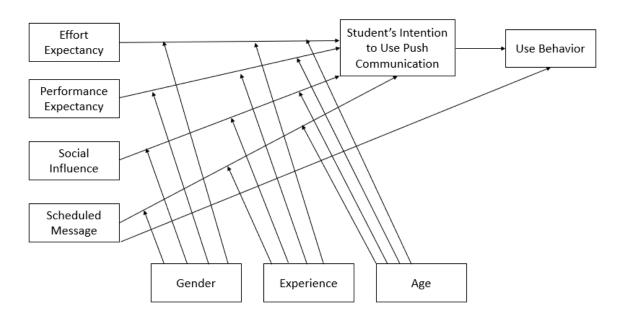

Figure 1. Modified UTAUT model with addition of Scheduled Message

All four independent variables (Effort Expectancy, Performance Expectancy, Social Influence, and Scheduled Message) are expected to influence Student's Intention to Use Push Communication. Gender, Experience, and Age are moderating variables.

The study was guided by four research questions. Students' intentions and their gender, experience, and age were measured using a survey, and their actual usage was measured by Google Analytics. The following section lists research questions; see the appendix for the actual survey questions used to assess research questions 1 and 2.

Research Question 1: What factors affect the students' intention to use push communication as a means to receive course-related content?

Research Question 2: Do gender, experience, and age moderate the effects of effort expectancy, performance expectancy, social influence, and scheduled messages on a student's intention to use push communication in receiving course-related content?

Research Question 3: Does scheduling delivery of push communication at predetermined times influence the students' actual usage of course-related content as measured by average session duration times?

Research Question 4: Does scheduling the delivery of emails and SMS messages at pre-determined times influence the students' use of course-related content regarding unique visitors, click-through rates, and return visits? Research questions 3 and 4 were assessed by Google Analytics.

The study was conducted through two state universities, one in the southeastern U.S. and one in the midwestern U.S., and six professors with a total enrollment of 343 students. Surveys were pushed to each student via email and SMS text messaging, with 301 students opting to participate in the study.

Data were collected by administering an online survey that was pushed to each student's cell phone number and email address. The survey was designed by using preexisting ranges from the UTAUT survey but was modified for the present study through the addition of components of the mobile wireless technology model (MWTAM) (Kim & Garrison, 2009). Responses were scaled using a 7-point ordered-response scale, with 1 representing very strongly disagree and 7 representing very strongly agree. A pilot study tested the validity and reliability of the survey, both of which were found to be acceptable.

The survey was administered via SMS and the results were recorded in iContact®, an application which allowed each student to submit the survey anonymously. Each of the six professors provided the primary investigator with their content for each class, along the approximate dates that they wanted the content to be pushed to the students so that the material was in synch with the class schedule. The professors were asked to relay to their students the days and times when content would be pushed. Reminder emails and SMS messages were sent to each student with exact times and dates that they would receive the course-related content. The unscheduled messages went out Monday through Saturday, at random times from 8 am to 7 pm.

Each SMS message and email sent to the students contained a highlighted URL link that directed the students to their professor's unique landing page, which contained the course material. There were 40 such pages designed for this study. Each landing page was linked to Google Analytics, which allowed for monitoring of unique visitors, click-through rates, and return visits. The six professors in this study, combined, taught a total of ten different courses. Therefore, the total content over the four-week period was comprised of 20 SMS messages and 20 emails, for a total of 40 content webpages.

RESULTS

Of the 343 surveys sent, 301 (88%) were returned. The sample included 170 (56%) males and 131 (44%) females. The ages of the respondents ranged from 18 to 51 years. The mean age was 20.79, with a standard deviation of 2.88. For experience level, a majority of the respondents, 241 (80%), reported that they had used email in the past to receive course-related content. However, most of the respondents, 180 (60%), reported not having any experience in the past with receiving content via SMS messages.

The most common academic major was Management of Information Systems, identified by 97 (32%) of the respondents. The second highest number, 53 (18%), were non-business-related majors. All other majors were business related and accounted for the remaining 151 students (50%).

PLS-PM requires testing of the entire structure in a two-step process (Chin, 1998). The first step examined the outer model, which was found to be both valid and reliable via the uni-dimensionality, AVE, loading, and commonalities tests, with the exception of two survey items. Those items were removed from further analysis.

The inner or structural model was then analyzed. First, a correlation matrix was used to measure the influence each of the four independent variables had on the dependent variable, Intention to Use Push Communication. The matrix indicated that all four independent variables correlated with the dependent variable at a $p < 0.01$ level. Also, PLS-PM demonstrated that the dependent variable indicated $R^2 = .59$, which is a moderate to substantial value (Chin, 1998). This means that 59% of the variance in the dependent variable can be explained by the independent variables. A redundancy test was performed to measure the amount of variance of the dependent variable related to the independent variables. The redundancy value of 0.49 indicated a relatively moderate ability (Sanchez, 2013) of the independent variables to predict the dependent variable. The third metric for testing the quality of the inner and

outer models was goodness of fit. The value of 0.67 indicated that this model has 67% prediction power, a modest predictive value.

In this analysis, PLS-PM bootstrapping was utilized with 500 resamples to obtain the variability of the parameters, giving a total effect with a confidence interval of 95%, which is indicated in values between the percentiles 0.025 and 0.975. When using PLS analysis and bootstrapping techniques, t-values greater than 1.96 are considered significant at the .05 level, t-values of 2.58 at the .01 level, and t-values of 3.34 at the .001 level (Fraenkel & Wallen, 2009).

None of the three moderating variables (Gender, Experience, or Age) were shown to moderate any of the effects of the independent variables on Student's Intention to Use Push Communication to a significant extent. The t-values of the potential moderating relationships for all three variables were below 1.96. Both Effort Expectancy ($\beta = 0.51$, t = 7.29) and Performance Expectancy ($\beta = 0.28$, t = 3.50) had a significant effect on Student's Intention to Use Push Communication. Neither Social Influence ($\beta = 0.06$, t = 1.00) nor Scheduled Message did ($\beta = -0.01$, t = 1.67).

Google Analytics captured the student's usage patterns (average session durations, unique visitors, click through rates, and return visits). A Welch's t-test (Welch, 1947) revealed that scheduled email did not yield higher average duration times than unscheduled email ($p > 0.05$), whereas scheduled SMS did yield higher average duration times than unscheduled SMS ($p < .01$, d = .41). Chi Square (X^2) Goodness of Fit (McHugh, 2013) was used to measure unique visitors, click-through rates, and return visits. We found that scheduled email did not yield higher unique visitors than unscheduled email ($p > .05$). However, scheduled SMS did yield higher unique visitors than unscheduled SMS ($p < .001$, d = .85). Click-through rates, a measure of how many students clicked additional links on the landing page to access further course-related content, were higher for scheduled email than unscheduled email ($p < .001$, d = .34). Similarly, scheduled SMS messages yielded higher click-through rates than unscheduled ones ($p < .001$, d = .73). Finally, scheduled email yielded more return visits than unscheduled email ($p < .001$, d = .55). However, unscheduled SMS yielded more return visits than scheduled SMS ($p < .001$, d = .71).

Research Question 1: What factors affect the students' intention to use push communication as a means to receive course-related content? The survey responses indicated that Effort Expectancy and Performance Expectancy had a significant effect on Student's Intention to Use Push Communication, whereas Social Influence and Scheduled Message did not. Our study suggests that ease of use is correlated with acceptance of push communication, in line with the cognitive load model (Kalyuga & Liu, 2015). If students perceived that a task would require less mental effort if they accepted push communication, it follows that they would accept such communication.

Social influence did not have a significant impact on a student's intention to use push communication, which the theory of reasoned behavior (Fishbein & Ajzen, 1975, p. 17) would predict, since it is unlikely that any student involved in this study was pressured by peers to avoid accepting the pushed content. In fact, the survey results indicate this to be true even of the social influence of professors; students responded to the statement "My professor thinks that I should use email and SMS messages to receive course-related content" in the negative range of the Likert scale. Scheduled Message did not have a significant impact on a student's intention to use push communication. Flexibility, defined as the ability to accommodate "individuals' abilities, preferences, schedules, levels of connectivity, and choices in methods of use" (Elias, 2011, p. 150), was, however, relevant. In this study, the pushed content was accessible because of its format, regardless of whether or not it was scheduled.

Research Question 2: Do gender, experience, and age moderate the effects of effort expectancy, performance expectancy, social influence, and scheduled message on a student's intention to use push communication as a means to receive course-related content? The results from PLS-PM testing indicated that none of the four modifying variables influenced the independent variables. Because 94% of the respondents were between the ages of 18 and 22, age was inconsequential. Experience was also irrelevant, as students of this age range would presumably have similar levels of experience with SMS and email. Because material pushed through email and SMS may be accessed via near-universally owned or available technologies (computers and cell phones), it is not surprising that neither gender nor age would have a significant moderating effect.

Research Question 3: Does scheduling delivery of push communication at predetermined times influence the students' actual usage of course-related content as measured by average session duration times? The data obtained

via Google Analytics indicated that scheduled email did not yield higher average duration times than unscheduled email, whereas scheduled SMS did yield higher average duration times than unscheduled SMS. The fact that the duration times were not significantly different between scheduled and unscheduled email may be attributable to the fact that emails are retrieved through mail servers and email client software, which can drastically increase delivery time, rendering scheduling irrelevant. Further, there is the problem of email overload (Whittaker and Sidner, 1996, p. 277).

Sessions accessed from a scheduled SMS message, on the other hand, had duration times with a mean difference of fifty seconds longer than those accessed from a unscheduled SMS. Because SMS messages are faster, they may function as a conversation between the professor and student, and students may have looked forward to receiving their course-related content via SMS, which was always delivered at the expected, pre-determined time. A random SMS message, however, may have been received at inconvenient times, resulting in a briefer visit to the landing page, accessing the page later, or not accessing it at all.

Research Question 4: Does scheduling the delivery of emails and SMS messages at pre-determined times influence unique visitors, click-through rates, and return visits? Google Analytics measured unique visitors during a 24-hour period after receiving the push communication either by email or SMS, and revealed that scheduled email did not yield more unique visitors than unscheduled email. However, scheduled SMS did yield more – 227 unique visitors compared with 86 for unscheduled SMS. Students receiving scheduled SMS were more likely to access the landing page within the 24-hour period and had longer average session durations.

Context controllability may have been a factor in why scheduled SMS resulted in higher student participation. As Kim, Park, and Oh (2008) explain, "both senders and recipients of messages have self-control" regarding the "time and place to send, read, or respond to SMS messages" (p. 773). If the total number of unique visitors from both scheduled SMS (227) and unscheduled SMS (86) are considered together, then 313 students out of a possible 343— that is, 91%—responded to an SMS.

The fact that scheduled email did not yield higher numbers of unique visitors than unscheduled email communication can be explained by the same set of email-related concerns mentioned for research question 3. Email can be caught up in servers and email client software that delay its arrival. The higher click-through rates for scheduled (as opposed to unscheduled) email may indicate that scheduling emails mitigates against email overload (see Whittaker and Sidner 1996, p. 278). If an email is successfully delivered on a pre-determined schedule, then users might have time to work with the interface, which could result in higher click-through rates.

Scheduled SMS messages received seven times as many clicks on the content links as unscheduled (just as scheduled SMS yielded higher average session duration times). It is no surprise that students' longer interaction with the landing page means higher click-through rates to retrieve the course-related content. Scheduled email yielded more return visits (185) than unscheduled email (94). When considering the total possible number of responses (341), this means that 54% of students returned to the website from a scheduled email, versus 47% for unscheduled. Unscheduled SMS messages, on the other hand, yielded more return visits to the landing page than scheduled ones. This may be explained by the successful scheduled SMS usage rates found for the three metrics previously discussed (i.e., higher average session duration times, higher unique visitor rates, and higher click-through rates). Since those results demonstrated high engagement between the student and the landing page, it could be inferred that students received a timely scheduled SMS, used their cell phones to access the course-related content in a more thorough manner, and therefore did not feel the need to revisit the content.

SUMMARY

This study was rooted in the UTAUT model, which is common both in social sciences and among companies wanting to measure results of the introduction of new technologies. Companies want to gather this information to measure return on their investments, which is normally not the case in nonprofit educational environments. Therefore, perhaps other variables would have been more relevant to college students.

In addition, only 18% of the 301 students surveyed were non-business students. Since business majors utilize technology in their major courses, the results may not be generalizable to all students. Similarly, since the students

were all of similar age and experience, we do not know if those variables would play more of a role in a more heterogeneous population. A larger sample size could address these issues. Furthermore, since the professors asked their students to take the survey, the students could have felt some pressure to answer the survey in ways that they perceived the professor would want them to.

This study was primarily about the effect of scheduled vs. unscheduled push communication in university classes. Although we discussed the effects of both on unique visitors, return visits, click-through rates, and session duration, it remains unclear how these variables relate to student learning (while there is considerable evidence that distributed learning is more effective than cramming, we have not yet demonstrated that distributed content dissemination equates to distributed learning). Thus, a post test of content acquisition to gauge the differences in learning and retention among students who accessed content via traditional course management systems vs. those to whom it was pushed by SMS and email remains an opportunity for future research.

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APPENDIX: RESEARCH QUESTIONS AND SURVEY ITEMS

Research Question 1: What factors affect the students' intention to use push communication as a means to receive course-related content?

Effort Expectancy was measured by recording responses to the following three survey items:
1. Using email and SMS messaging as a means to receive course-related content would not require a lot of technological expertise.
2. I believe that using email and text messaging will be easy for me.
3. Actually using email and text messaging should be easy for me to do.

Performance Expectancy was measured by recording responses to the following two survey items:
1. I believe that communication such as email and text messages would be useful for receiving course-related content.
2. Receiving emails and text messages from my professor should enable me to learn from the material better.

Social Influence was measured by recording responses to the following three survey items:
1. People who influence my behavior think I should use email and text messages sent from my professor.
2. People who I perceive as important to me think I should use email and text messages sent from my professor as additional learning material.
3. My professor thinks that I should use email and text messages to receive course-related content.

Scheduled Message was measured by recording responses to the following five survey items:
1. Knowing that my professor will utilize email and text messages to push out course-related content at pre-determined times would allow me to better use the technology.
2. Knowing that my professor will utilize email and text messages to push out course-related content at random times could deter me from using the technology.
3. Knowing what times an email or text message will be sent from my professor could better prepare me to utilize the course-related content.
4. I like the idea of knowing when I would receive an email and text message.
5. I do not care when my professor communicates with me via an email or text message.

Research Question 2: Do gender, experience, and age moderate the effects of effort expectancy, performance expectancy, social influence, and scheduled messages on a student's intention to use push communication in receiving course-related content?

The moderating variable Experience was defined as the familiarity a student has with receiving and utilizing SMS messages and email to view content, and was measured by recording responses to the following four survey items:
1. I have received scheduled emails from my professors in the past.
2. I have received scheduled text messages from my professors in the past.
3. In the past, my professors have utilized emails to send course-related content.