The Effectiveness of Mobile Technology in A University E-Learning Environment

Abstract
After many years of applying information technologies in education innovations in mobile technologies are starting to be explored in educational settings. In order to effectively use and adopt mobile technologies in education, research needs to be conducted in this area. The purpose of this study is to investigate and empirically test the factors that contribute to the effectiveness of mobile technologies in a university-learning environment among a diverse set of users. The researcher also investigates whether there are any differences among different user groups and different mobile technologies. The results showed that TAM was partially applicable in the new domain of mobile technology. This research fills a gap in research knowledge about the implementation of mobile technology and provides more guidance future work in this area.

Introduction
During the past decade, the introduction, adoption and use of information technologies has influenced every area of society. In the educational and training area, the potential of information technologies is of great value since it can enable high quality learning. With the development of new information technologies, many tentative research studies have proposed that “the next revolution in technology to affect education and training will be mobile communication devices and palmtop/handheld computers” (Lockitt, 2005, p.3). While there appears to be many research studies focused on the potential of mobile technologies, research on the motivations and circumstances of using and adopting mobile technologies is sparse.

Conceptual Model
After reviewing the literature, it is found there are many theoretical models proposed for studying technology use and adoption. Lewis et al. (2003) first used a graphic representation of the conceptual frame to indicate that individual's beliefs about technology use will be influenced by three dominant sources of influence: institutional factors, social factors and individual factors. Then, by reviewing key literature, the research model and the hypotheses were generated.

![Conceptual Model Diagram](image)

Figure 1: Research Model of Lewis et al. (2003)
Factor analysis showed the internal consistency among items of each construct, while discriminate validity is also assured. The conceptual model was empirically tested and the results are presented in the following figure.

In order to encourage student participation in large classroom settings, Griswold et al. (2004) deployed a simple application named ActiveClass on 350 PDAs, which were given to students enrolled in two sections of second-year programming courses and one section of a third-year programming course. By using personal mobile wireless computing devices, students could ask questions anonymously through a text interface, answer polls related to the questions, and give the professor feedback on the class. Students could vote the questions that they thought more important so that the lecturer could see the list and choose the more popular questions to answer.

For the political aspect, the level of participation seems low. The researchers thought it was mainly because the lecturer took verbal questions in preference to ActiveClass questions. Moreover, the lecturer found that the participation quality was higher and could benefit students even if they didn’t use ActiveClass. At the same time, the anonymity of the questioner made the range of questions broader and also filtered the spoken discourse by giving the lecturer an ability to pick questions rather than the people that asked the questions. Moreover, ActiveClass allowed not only lecturers but also teaching assistants and students to answer questions. Finally, it also mentioned the ‘unapproved’ uses of the PDAs (such as instant messaging and game playing) and the lecturer’s tolerance about these applications. The researchers concluded that although one-third of students used ActiveClass voluntarily on a regular basis and lecturers said they would use it again, it was difficult to know how ActiveClass helped students to learn because of two reasons: the research didn’t have the control of selection bias; the learning outcomes might not be apparent in measures, such as test scores.
Among these models, “substantial theoretical and empirical support has accumulated in favour of the Technology Acceptance Model (TAM)”, which is the most widely applied model of user adoption and usage. Therefore, this model was applied in this study to get better understanding of how mobile technologies can be best used.

The first seven research questions were included in a questionnaire and examined by quantitative methods. Meanwhile, a qualitative analysis of comments, which are provided by participants, was conducted to verify the last research question (RQ8).

**Research Method**

All the constructs of the questionnaire are separated as two parts and then put into two different surveys. Each semester is treated as a single trial, while in each trial two surveys were given to participants at different periods of time. Survey One is administrated at the start of the usage period, which is before the participants use the provided mobile devices. During the usage period (one semester, around 12 to 15 weeks), participants are free to use the provided mobile devices whenever they want. After one semester of using the provided mobile devices, participants filled in Survey Two to give their perception about effectiveness of mobile technologies. Besides discussing the current usage situations, participants were allowed to provide comments about any potential problems regarding the research.

**Verified Conceptual Model**

In order to test our conceptual model, the model-testing analysis is conducted, which focuses on two further types of analysis: a correlation analysis of the constructs, and regression analysis that is used to compare to the expected relationships in the conceptual model with hypothesis. After that, a number of ANOVA (Analysis of Variance) analyses are performed to determine significant differences between different mobile technologies and different student groups. Finally, comments are sorted and then categorized to test the final hypothesis about the relationships between Technology Infrastructure and the effectiveness of mobile technologies. After statistically analysis for the questionnaire and quantitative analysis for the comments, the verified conceptual model is shown below.
This study showed that:
1) RQ4, RQ6, RQ7 were supported;
2) RQ1 and RQ2 were partially supported;
3) RQ8 was verified by qualitative analysis.

**Conclusion**
In this study, our interest is in specifically looking at the role that mobile technologies can play in helping users in the learning process be more productive. The value of this research lies in a better understanding of how mobile technologies can be best used in a university environment. In this research, a well-accepted model, TAM, was adapted to study the new domain of mobile technologies. This model has identified some factors that have statistically significant effects on the effectiveness of mobile technologies. Therefore, this research adds value to the literature in this area by testing TAM in a new domain of mobile technologies. Moreover, the findings of this research will provide valuable implications for both researchers and practitioners, and offer insights for future research.

**Reference**