

The Transformation of Saudi Arabia through Tablet-Based Technology

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Abstract— The aim of this paper is to explore how tablet technology will eventually transform our education system by heightening both student and teacher engagement in a variety of learning contexts. We expect to discern from our research the positive impact that Tablet PCs will have on learning, although the use of this technology is not yet widespread. Preliminary findings clearly demonstrate that exploration by students and teachers alike will be greatly facilitated by using this newest technological innovation. Functionality, cost-effectiveness, and ease of operation of tablet-based technology are also additional factors to be considered when considering the incorporation of tablets into the classroom or workplace.

Index Terms— Tablet, m-learning, learning technology, computer in education

1 INTRODUCTION

PRINTED textbooks are some of the conventional learning tools used by both students and teachers in many educational institutions in the world. However, the era for textbooks may slowly be ending thanks to technology innovations and advancements. According to Gimbert and Cristol in [1], technology is quickly becoming an integral learning tool for promoting, linguistic, social and cognitive development of learners. Today, the question is not whether or to what extent we should use technology in classrooms, but rather how should we use it. With innovations being borne everyday each having greater potential to improve the learning process than its predecessor, the application of technology in classrooms presents educators with many ongoing challenges. Nevertheless, the benefits of technology to both teachers and learners are apparent and the only thing to do is carefully plan out its role in the curriculum [2]. Our current education system is dealing with like most agencies in a down economy crippling budget constraints. Like these other organizations our schools are finding themselves having to do more with less people, less supplies, less help for our students. With tablet computers, we will not only be delivering the most up-to-date information for our students, we will be doing it at a reduced cost.

There are many uses for these efficient cost-effective devices. For example, tablets may be utilized in the classroom (along with a projector) as an electronic blackboard. As such, they have numerous functions including the display of supply and demand curves, drawings of the human body, musical scores, electronic circuit diagrams, and even mathematical expressions (e.g., summation and integral signs) [3-4]. Also text (in any language's alphabet) may be captured and displayed. The tablet computer exhibits a wide range of colors and widths of "ink", and allows for an unlimited number of pages on which to write,

without the need for erasing [5-6]. Students benefit greatly by creating class notes on the tablet, which may then be saved and posted to the Web, where other students can easily retrieve and view them using freely available software (tablets not required). There are instructional opportunities outside of the classroom as well. For example, tablets have the potential to be used for electronic grading; assignments may be emailed to faculty or dropped off in digital drop boxes whereupon faculty members may write their comments on the work and return it to the students the same way. Not surprisingly, there have been some initial reports of faculty use of tablets in the classroom. For instance, Wassgren and Krousgrill in [7] used a tablet-based system to record their pen-annotated, PowerPoint lectures in class for future storage and dissemination via the Web. Anderson in [8] also describes the use of a similar system. In this application, one faculty member, responding to the increased practicality said, "Being able to diagram and spontaneously work examples instead of having to use a pre-scripted PowerPoint slide deck – felt like teaching a real class."

2 THE TABLET'S IMPACT ON LEARNING

Bilen, et al. in [9] reports their findings on the evaluation of Tablet PC technology use and its' impact on learning across a variety of undergraduate and graduate classes from four technology and engineering disciplines at Pennsylvania State University. They measured the process using an assessment model measures to carry the task to the technology used and incorporates social learning theories. This dual approach allows us to evaluate a wide range of variables such as how the tablet's characteristics influence users, its' versatility in the classroom and the role social influence (e.g., classmates, team members) plays in the extent to which the Tablet PC is used. Perhaps most important is the tablet's impact on students' learning. Early results from one undergraduate engineering course and one graduate technology course show that approximately 65% of students in a design-oriented course found that Tablet PC use enhanced their learning experience, while only 35% of students in a non-design-oriented course thought so. In both courses, nearly 50% of students found their classmates were helpful in instructing them on how to use the Tablet PC.

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Preliminary regression results show that the level of task-technology fit seems to positively influence students' use of the Tablet PC and that social influence positively affects students' learning gain as the result of Tablet PC use.

Koile and Singer in [10] describes a strictly controlled study of the impact that Classroom Learning Partner, a Tablet-PC-based classroom interaction system, had on student performance. The goal of their study was to test the hypothesis that the use of such a system improves student learning, especially among the poorest performing students. They also describe the validation of that hypothesis, and the controls, performance metric, and assessment methodology that were developed in the course of their needs.

El-Gayar, Moran and Hawkes in [11] develops and empirically tests a factor model for understanding college students' acceptance of Tablet PC (TPC) as a means to forecast, explain, and improve their usage pattern in education. The analysis involved more than 230 students from a regional Midwestern institution. Overall, the proposed model exhibited a good fit with the data and provided a satisfactory explanation for students' acceptance of TPC in an educational setting. Analysis of the results suggests a number of implications for educational institutions. Most notably among these is the need for programs aimed at influencing students' attitudes toward and perceptions of tablet-based technology. It is highly probable that the creation of such programs will not only enhance the image of the tablet on campus, but also promote the widespread use of TPC.

3 METHOD

To gather comprehensive insights about how tablets are used, we employed a variety of research methods including written diaries and contextual inquiry observations. We selected research methods to help us understand different aspects of tablet usage and triangulate varying insights, while the diaries permitted us to collect a large amount of self-reported data over a longer period of time.

3.1 Sample

A total of 30 participants were recruited from two locations in Saudi Arabia: Jeddah and Abha. This allowed us to draw participants from urban, suburban, and rural areas. Participants were recruited according to a number of criteria including gender, age, education, occupation, family situation, commuting habits, length of tablet ownership, and characteristics of their tablet. These criteria were guided by previous research by Fischer [12], to target a sample of participants that was as representative of the current Malaysian population of tablet users as possible. Participants comprised 30 individuals who took part in the diary study of which 80% (24) were women and 20% (6) were men. They ranged in age from 18 to 70, with the following distribution across the different age ranges: 18-23 (13%), 24-30 (27%), 31-40 (40%), 41-70 (20%). All participants owned a tablet: 84% owned an Apple iPad and 16% owned an Android-based tablet. For 39% of those users, the tablet they used during the time of the study was the first tablet they had ever owned. At the time of the study, while 43% of all those surveyed were still new

to using their tablet PCs (ownership of less than three months), 18% had possessed their tablet for more than three months. To gain further insights into tablet usage, we conducted contextual information sessions with four of the study participants.

3.2 Diary study methodology

To uncover all of the activities carried out on tablets, participants were asked to complete a written diary entry whenever they used their tablet over the two-week study period. We used Google Forms to collect written diary entries, accessible to the participants through the browser of their desktop computers. The diary questions were designed to capture details about each activity, including an explanation of the activity itself, the time and length of the activity, the context in which that activity was conducted (e.g. location, secondary activity, other people), as well as information about transitions to and from other connected devices or the real world. The diary questions included a set of open-ended as well as several closed-ended questions. Researchers periodically called on participants to verify their involvement, reminding them to complete the question set every time they used their tablets. The latter were not able to review their previous diary submissions. A major limitation of this diary study research method is the self-reported nature of the data gathering technique. For example, participants may forget to record some activities, resulting in under-reported activity frequencies. Overall, though, the diary study methodology allowed us to collect in-depth information about each instance of tablet usage, when it occurred naturally, without us having to be present for observation.

3.3 Personal Interviews

To broaden our understanding of the function of the tablet in the participants' lives, we also interviewed several individuals. We wanted to understand how it is used alongside other devices they own, learn about and observe the context in which they are using the tablet, and follow up with questions about specific use cases described in their diary entries. Each interview lasted 10 minutes, and we used a semi-structured guide in the interview process. Contextual Inquiry was essential both when we reviewed the diary submissions and when we conducted the follow-up interviews. As researchers, we identified areas in which we would be able to collect more in-depth data, thus allowing for unique insights.

After the initial interviews, researchers followed up with four participants previously interviewed. There were three contextual inquiries lasting 10 minutes each. During each inquiry, we observed our subjects' activities, recorded their interactions with the tablet and other devices, and periodically asked follow-up questions for clarification. The activities that we observed included looking up recipes and cooking, family use before, during and after dinner, and productivity tasks in a workplace environment.

3.4 Most Frequent Tablet Activities

Across all reports of tablet use, the most frequent activities were found to be: Checking emails (with light responding), playing games, social networking, searching for information, listening to music, shopping (browsing and purchasing), reading a book,

checking the weather, and watching movies. These results are similar to those in a Nielsen report which found that email, social networking, and watching videos were the top three activities, although we found that playing games, information-seeking, and listening to music were more common than watching videos. It is important to discern whether the reported tablet activities are common among all participants, or if they can be accounted for by just a few participants' more frequent engagement. To determine this, we divided the activities into four distinct groups: Activities reported 1) by few participants with low frequency, 2) by few participants with high frequency, 3) by a high number of participants with low frequency, and 4) by a high number of participants with high frequency. Clearly, email checking, playing games, social networking, looking up information, and watching videos are distinct among activities, as they are common to all participants and represent activities that are done frequently.

4. OVERALL RESULTS OF OUR RESEARCH

Once the research was completed, we had collected 120 written diary entries, 11 detailed participant profile write-ups from the field visits, and observations from five contextual inquiries. We conducted the analysis in two stages: 1) quantitative analysis of the written diaries; and 2) triangulation of insights to develop a set of conclusions.

Over a two-week period, our participants reported 120 incidences of tablet use, with an average of 4 incidences per participant.

These numbers clearly indicate a range in the number of tablet uses reported by each participant since 80% of all diary entries were submitted by only 12 out of the 30 participants. It is important to note that due to limitations of the diary study approach, it is unlikely that these numbers reflect the exact volume of actual tablet use, but rather a lower-range estimate. We coded all open-ended responses to diary questions using a bottom-up approach; similar activities were grouped and then turned into frequency distributions. Finally, we reviewed the diary study analysis to triangulate its findings. This analysis resulted in a set of insights about the overall distribution of tablet activities and correlations of tablet activities to contextual factors.

5. CONCLUSION

During the course of this paper, we have explored the diverse uses of tablet technology in both the classroom and the workplace. We have seen that the tablet's versatility, functionality and ease of usage not only enhance learner engagement, but also greatly facilitate the learning process itself. Research methods such as diary studies and personal interviews also proved essential in collecting in-depth information about tablet usage, and personal interviews we conducted allowed us to gather unique insights into the potential benefits of Tablet PCs. Delivering up-to-date information in an interesting way at a reduced cost is the implicit mandate of tablet-based technology. Unfortunately while it is true that Tablet PCs are beginning to revolutionize learning for students and learners

worldwide, it is evident from our research that their usage is still very limited among Saudi Arabian students. This paper, then, should serve as the impetus for exploring the reasons behind this limited use of such a life-changing technology.

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