EXAMINING STUDENTS' ACCEPTANCE OF TABLET PC USING TAM

Omar El-Gayar, Dakota State University, omar.el-gayar@dsu.edu
Mark Moran, Dakota State University, mark.moran@dsu.edu

ABSTRACT

With the proliferation Tablet Personal Computer (TPC) based mobile computing initiatives across campuses; evaluation of such initiatives becomes the logical next step. Yet for such initiatives to improve students' learning and teaching effectiveness, such technology-based initiatives must be accepted by students and faculty alike. This research evaluates students' acceptance of TPC as a means to forecast, explain, and improve usage pattern. The research utilizes the technology acceptance model as an underlying theoretical model and the Partial Least Square (PLS) to estimate the parameters of the causal model. Overall, the findings indicate that TAM is able to provide a reasonable of students' acceptance of TPC with perceived usefulness a significant determinant of attitude and intention, perceived ease of use a significant determinant of usefulness and attitude.

Keywords: Technology acceptance, TAM, Tablet PC.

INTRODUCTION

Colleges and universities have adopted computing initiatives that require every student to acquire their own portable computing device. In excess of fifty colleges and universities have, or are in the process of, implementing various mobile computing initiatives [3]. Tablet Personal Computer (TPC) based mobile computing initiatives have been documented in the literature. For example, the University of Houston conducted a preliminary pilot study investigating TPCs in a mobile learning laboratory used by faculty [20]. A university that integrates the TPC into student teacher interaction is the University of Washington where a Classroom Feedback System (CFS) is being used to give students the ability to provide feedback and ask real time questions during an instructor mediated lecture [16]. Other universities with TPC programs include Purdue, MIT, Temple, Seton Hall, Chatham, and many others [3; 19].

With the proliferation of mobile computing initiatives across campuses, evaluation of such initiatives becomes the logical next step. The evaluation ultimately centers on the students' learning and teaching effectiveness. Yet for such initiatives to improve students' learning and teaching effectiveness, such technology-based initiatives must be accepted by students and faculty alike. The objective of this research is to evaluate the students' acceptance of TPC as a means to forecast, explain, and improve usage pattern. The research uses the technology acceptance model originally proposed by Davis [7] to evaluate acceptance within the context of students' acceptance of TPC technology. The research contributes to the understanding and management of such initiatives in an educational setting. From a theoretical perspective, the research evaluates the technology acceptance model in the context of college students' acceptance of Tablet PCs.

RELATED WORK

A number of theories and models explaining acceptance of technology have been proposed in the literature including the technology acceptance model (TAM) [7]; the theory of reasoned action (TRA) [10]; the theory of planned behavior (TPB) [1] among others which are modifications or developments of these models. Research in this area has generated adoption metrics that can be used to determine the probability of successful implementation of information system initiatives. The context for these models focused primarily on traditional business organization (and business user), yet a number of studies have explored other domains such as healthcare and education. In education, Singletary, Akbulut, and Houston [15] proposed the application of the TAM model to a Geometer's sketchpad. Yuan Gao [12] states that "technology acceptance models can serve the purpose of evaluating competing products such as text books and technology systems" and provide a valuable tool to educators. This study evaluates TPC adoption in an educational setting based on the TAM model proposed by Davis [8]

RESEARCH MODEL AND HYPOTHESES

The TAM model (Figure 1), suggests that when individuals encounter a new IS innovation, two factors that predicts their intention to adopt the technology, namely, attitude and their perceived usefulness the technology under consideration where attitude is a predisposition to respond favorably or unfavorably to a particular technology and perceived usefulness is the degree to which a person believes that using a particular system would enhance his or her job performance [7]. Perceived usefulness together with perceived ease-of-use defined as the degree to which a person believes that using a particular system would be free from effort predicts attitude. Perceived ease of use is also a determinant of perceived usefulness.

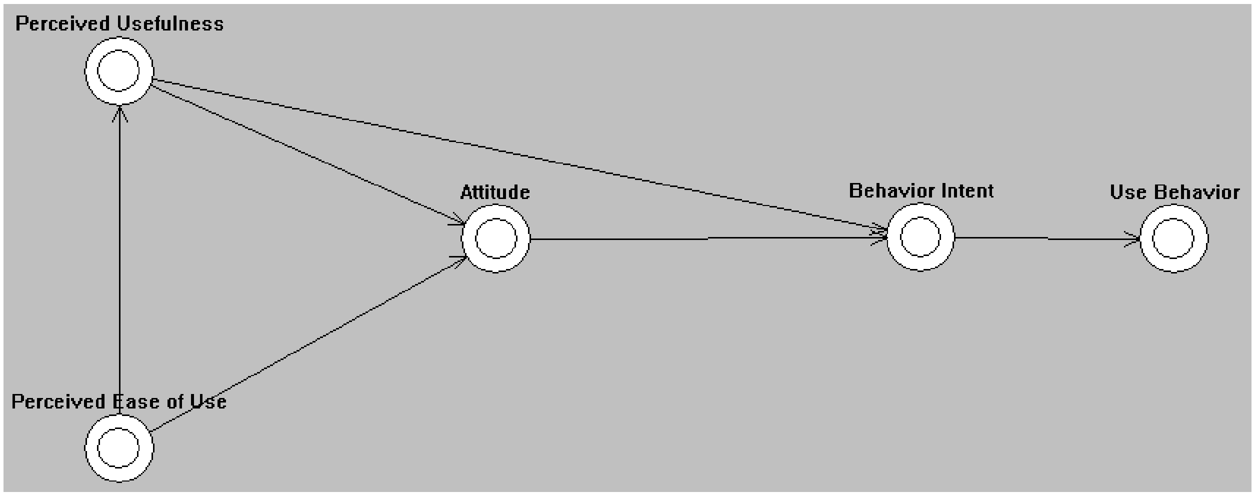

Figure 1. Technology acceptance model (TAM)

In the context of this study, the hypotheses tested in this research are:

H1: The degree of ease of use associated with the use of TPC as perceived by a student has a positive effect on the degree to which a student believes that TPC will help him or her to attain gains in school performance (perceived usefulness).

H2: The degree to which a student believes that TPC will help him or her to attain gains in school performance (perceived usefulness) has a positive effect on his/her attitude towards TPC.

H3: The degree of ease of use associated with the use of TPC as perceived by a student has a positive effect on his/her attitude towards TPC.

H4: The degree to which a student believes that TPC will help him or her to attain gains in school performance (perceived usefulness) has a positive effect on his/her intention to use TPC.

H5: The attitude of a student towards TPC has a positive effect on his/her intention to use TPC.

H6: Behavioral intention will have a significant positive effect on actual system use.

METHODOLOGY

Setting and context

The study was conducted at a Midwest public university. The institution started investigating pen-based mobile computing in 2002 when thirteen wireless access points were installed on campus. In the fall of 2004, the institution evolved the initiative to include all 1st and 2nd year enrolled students. The initiative required each full time student to lease or buy a TPC. The program has been entitled the wireless mobile computing initiative (WMCI). By the spring of 2006 all students at this university would have their own TPC. As a relatively early adopter of the TPC technology and with the pervasiveness of TPC on the campus, the institution provides a unique context for studying students' adoption of TPC

Subjects

The participant pool is students enrolled in a number of computer-related courses within the College of Business and Information Systems (BIS). The courses included students who have been using the TPC since August 2005; all of these students were introduced to the device during the fall semester of 2005. The resulting set resulted in general education computer courses required by all majors as well as major specific courses.

Survey instrument

The survey instrument is based on constructs validated in prior research [7; 18] and adapted to the context of this study. The constructs include; perceived usefulness, perceived ease of use, attitude, behavioral intent, and usage. The survey instrument collects additional information such as gender, age, and number of years at the institution. All questionnaire items were measured using a 7-point Likert scale ranging from "strongly agree" to "strongly disagree". A pilot study was conducted to test the survey instrument with a small group of upper class students enrolled in a one credit computer application class. Based on the students' feedback, several minor revisions in the wording and online format were made to improve the readability and completion rate of the survey. The modified survey tool was re-evaluated by the pilot group in a subsequent class session with discussion following the second trial run.

Data collection

The survey instrument was made available to the participants via the World Wide Web. Survey participants were in a class setting and were guided to the instrument by one of the authors serving as a survey administrator. Participants were assured response anonymity by not being required to provide identifying information on the survey. Students who are enrolled in more than one of the classes surveyed were instructed to not complete the survey by the survey administrator. The survey was conducted during normal class sessions during the last ten minutes of class using each student's TPC.

Data analysis

The statistical analysis method used for this study was partial least squares (PLS), a second generation statistical technique for conducting structural equation modeling (SEM) based analysis. While the utility of PLS is detailed elsewhere [9], a number of recent technology acceptance studies utilized PLS including (but not limited to) [2; 5; 18].

Evaluating the measurement model includes estimating the internal consistency for each block of indicators and evaluating construct validity. Construct validity refers to the degree which a variable measures what it was intended to measure [6; 17]. Construct validity is comprised of convergent and discriminate validity. Following Gefen and Straub [13] convergent validity of the variables is evaluated by examining the t-values of the outer model loadings. Discriminate validity is evaluated by examining item loadings to variable correlations and by examining the ratio of the square root of the AVE of each variable to the correlations of this construct to all other variables [4; 13].

For the structural model, path coefficients are interpreted as regression coefficients with the t-statistic calculated using bootstrapping (200 samples), a nonparametric technique for estimating the precision of the PLS estimates [4]. To determine how well the model fits the hypothesized relationship PLS calculates an R^2 for each dependent construct in the model. Similar to regression analysis, R^2 represents the proportion of variance in the endogenous constructs which can be explained by the antecedents [4].

RESULTS AND DISCUSSION

Sample characteristics

Two hundred and thirty two of the participants correctly completed the survey which asked questions requiring the participants to respond using a seven-point likert scale from "strongly agree" to "strongly disagree". The average age of the participants was 22 with 56% of the individuals being male and 42% indicating they were female.

Assessing measurement validity

Table 2 summarizes the results for the items comprising the model. The results show composite reliability (CR) exceeding 0.8 as recommended by Nunnally [14]. AVE which can also be considered as a measure of reliability exceeds 0.5 as recommended by [11]. Together CR and AVE attest to the reliability of the survey instrument. The t-values of the outer model loadings exceed 1.96 verifying the convergent validity of the instrument [13]. Calculating the correlation between variables' component scores and individual items confirmed that intra-variable (construct) item correlations are very high compared to inter-variable (construct) item correlations attesting to the discriminate validity of the instrument. Discriminate validity is confirmed if the diagonal elements (representing the square root of AVE) are significantly higher than the off-diagonal values (representing correlations between constructs) in the corresponding rows and columns [4]. As shown in Table 3 the instrument demonstrates adequate discriminate validity as the diagonal, in bold, values are greater than the corresponding correlation values in the adjoining columns and rows. Overall, the instrument achieved an acceptable level of reliability and construct validity.

Model testing results

Figure 2 depicts the structural model showing path coefficients and R^2 for dependent variables. The R^2 values for each dependent variable indicate that the model explained variance for behavioral intention and use behavior were 55.3% and 7.5% respectively. Bootstrap method was used in PLS-Graph to assess the statistical significance of the path coefficients. Overall, all structural relationships depicted in the model are significant at 1%.

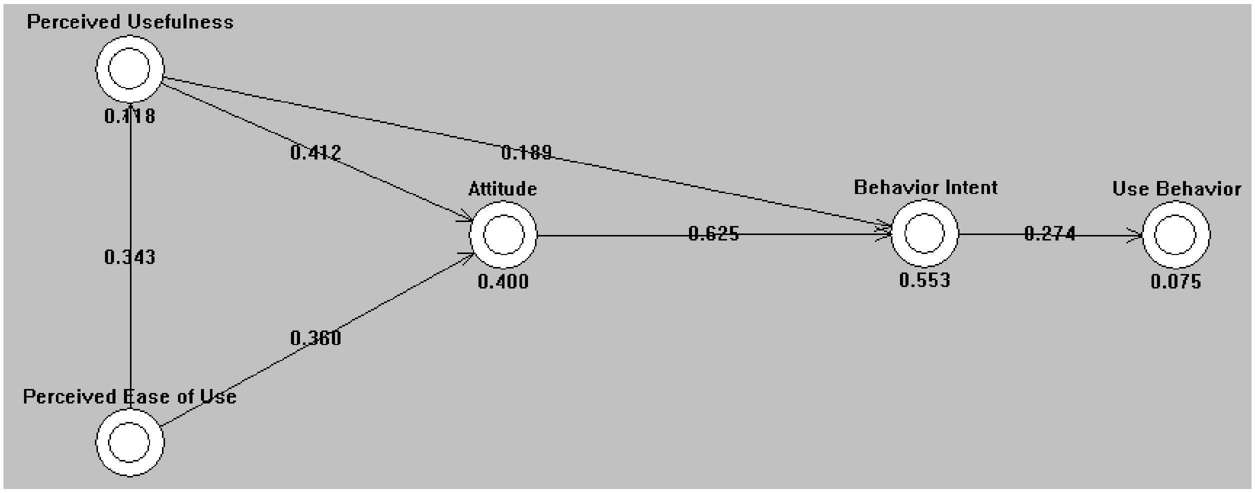

Figure 2. Model testing results

Consistent with prior research, perceived usefulness has a greater effect on intention (directly and indirectly) than perceived ease of use. Moreover, perceived usefulness and perceived ease of use appear to be important determinants of students' attitudes towards TPC and together seem to explain a significant portion (40%) of the variance of attitude. Likewise, attitude and perceived usefulness explain 55% of students' intention to use TPC. However, attitude has a stronger direct positive effect on students' intention than perceived usefulness indicating the importance of ensuring that students' have a positive disposition towards TPC. While students' intention is a significant determinant of actual use of TPC features, it only explains 7.5% of the variance in actual use. In effect, students' intention to continue to use TPC is not reflected in their actual behavior. A possible explanation is that other factor such as mobility (afforded by the wireless enabled devices) drives their intention to continue to use TPC, yet not the TPC specific features.

CONCLUSIONS

The study examined student's acceptance of Tablet PCs (TPC) using the Technology Acceptance Model. Overall, the results suggest that the TAM was able to provide a reasonable explanation of students' acceptance of TPC. With the proliferation of technology-based initiatives in education, studies evaluating the adoption of such IT-based initiatives in education provide insight regarding the factors behind the success or failure (measured in students' learning and teaching effectiveness) of such initiatives. These results can be used for diagnostic purposes and for the planning and management for technology-based initiatives in education. From a theoretical perspective, the research contributes to the general adoption literature by studying the theoretical validity and empirical applicability of the TAM model. Future research is aimed at evaluating students' acceptance over time as well as by individual groups (e.g., freshman versus seniors, or information systems majors versus arts and sciences majors).

Table 2. Individual Loadings, composite reliabilities (CR) and AVE.

Construct	Individual Items	Item Loading	Construct CR	Construct AVE
Perceived Usefulness	PU1	0.784	0.882	0.651
	PU3	0.806		
	PU5	0.784		
	PU10	0.847		
Perceived Ease of Use	PEOU1	0.823	0.946	0.744
	PEOU2	0.903		
	PEOU3	0.910		
	PEOU4	0.868		
	PEOU5	0.838		
	PEOU6	0.843		
Attitude	ATUT1	0.827	0.887	0.614
	ATUT2	0.638		
	ATUT3	0.843		
	ATUT4	0.756		
	ATUT5	0.848		
Behavioral Intent	BI1	0.856	0.922	0.748
	BI3	0.782		
	BI4	0.899		
	BI5	0.915		
Use	USE1	0.807	0.869	0.689
	USE2	0.830		
	USE4	0.839		

Table 3: AVE Scores and Correlation of Latent Variables.

	PU	PEOU	BI	USE	ATUT
PU	**0.651**				
PEOU	0.343	**0.744**			
BI	0.524	0.464	**0.748**		
USE	0.264	0.204	0.274	**0.689**	
ATUT	0.535	0.501	0.726	0.239	**0.614**

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