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Omar F. El-Gayar  
*Dakota State University*

Mark Moran  
*Dakota State University*

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## COLLEGE STUDENTS' ACCEPTANCE OF TABLET PCS: AN APPLICATION OF THE UTAUT MODEL

Omar F. El-Gayar and Mark Moran

Dakota State University, 820 N. Washington Avenue, Madison, SD 57042

[Omar.El-Gayar@dsu.edu](mailto:Omar.El-Gayar@dsu.edu), [Mark.Moran@dsu.edu](mailto:Mark.Moran@dsu.edu)

### ABSTRACT

Instructional technology can enhance the learning process for post secondary students. Colleges and universities have adopted computing initiatives that require every student to acquire their own portable computing device. Yet for such initiatives to improve students' learning and teaching effectiveness, such technology-based initiatives must be accepted by students and faculty alike.

In that regard, Venkatesh, Morris, Davis, and Davis, (2003) present the "Unified Theory of Acceptance and Use of Technology (UTAUT)" as a unifying model for technology acceptance and show it as outperforming other models. However, few studies to date utilize and evaluate the UTAUT model, particularly in an educational setting.

The objective of the study is to evaluate students' acceptance of Tablet PC (TPC) as a means to forecast, explain, and improve usage pattern of TPC in education. The research contributes to the management of information technology (IT) based initiatives in education and to UTAUT's theoretical validity and empirical applicability.

**Keywords:** Education, Tablet PC, College students, Technology adoption, TAM, UTAUT

### INTRODUCTION

The application of computer technology in collegiate classroom can improve teaching when used appropriately (Surry and Land, 2000). In the past few years many universities have introduced mobile computing to their campus but some faculty have raised concerns about the distractions caused by mobile computer hardware (Groves and Zemel, 2000). However, even with philosophical differences among faculty, many universities including Bentley College (Lowe, 2004), Notre Dame (Abbott, 2004), University of Texas (Mock, 2004), and the University of Washington (Willis and Miertschin, 2004) have implemented, or in the process of starting, mobile computing initiatives.

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. A website implemented by Dr. Ray Brown, of Valley City State University, contains a list of over seventy institutions who are involved in various levels of implementation (Brown, 2000).

Tablet Personal Computer (TPC) based mobile computing initiatives have been documented in the literature with programs ranging from a preliminary pilot study at the University of Houston (Willis and Miertschin, 2004) investigating TPCs in a mobile learning laboratory used by faculty. 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 (Steel, et al., 2003). Every student enrolled in Bentley College gets a TPC (Lowe, 2004). Other universities with TPC programs include Purdue, MIT, Temple, Seton Hall, Chatham, and many others (Brown, 2000; Wachsmuth, 2003).

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 IS research community has actively studied the acceptance of technology with over 400 papers on the subject since Davis's original work in the 1980s (Davis, 1986, 1989). However, Venkatesh et al. (2003) proposed an acceptance model combining eight existing tools into one model called the "Unified Theory of Acceptance and Use of Technology (UTAUT)" which has been shown to outperform other models. However, few studies to date utilize and evaluate the UTAUT model, particularly in an educational setting.

The objective of this research is to evaluate students' acceptance of TPC as a means to forecast, explain, and improve usage pattern. The research also examined the applicability of UTAUT to the TPC as a new innovation and a paradigm shift in using computers in an educational context. From a theoretical perspective, this research extends the UTAUT theoretical validity and empirical applicability by examining the UTAUT within the context of students' acceptance of TPC technology. From a practical perspective, this research contributes to a better understanding of the introduction and management of information technology (IT) based initiatives in education.

## LITERATURE REVIEW

Many information systems (IS) researchers have published on various theories that could be used to explain the adoption of information technology innovations. These theories include; the technology acceptance model (TAM) (Davis, Bagozzi, and Warshaw, 1989); the theory of reasoned action (TRA) (Fishbein and Ajzen, 1975); the theory of planned behavior (TPB) (Ajzen, 1991) among others which are modifications or developments of these models.

The models were developed to help estimate and measure IS innovation success. The estimate of the success rate of new IS projects since the 1980s is about 50 percent (Westland and Clark, 2000). Explaining the adoption of new information technologies has been described as the most mature research area in contemporary information systems research literature (Hu, Chau, Sheng, and Tam, 1999). Research in this area has generated adoption metrics that can be used to determine the probability of successful implementation of information system initiatives. The combination of these metrics into a single model entitled the "Unified Theory of Acceptance and Use of Technology (UTAUT)" has been proposed in a recent publication by several of the fields leading researchers (Venkatesh et al., 2003). The previous models were able to successfully predict the acceptance of an innovation in about 40 percent of the cases (Davis et al., 1989) (Taylor and Todd, 2001; Venkatesh and Davis, 2000). The new proposed model UTAUT was shown to be 70 percent accurate at predicting user acceptance of information technology innovations (Venkatesh et al., 2003). By generating a significantly higher percentage of technology innovation success the UTAUT is deemed a superior metric than the prior metrics

In education the use of technology acceptance prediction models in educational technology acceptance situations would be a useful tool. Singletary, Akbulut, and Houston (2002) proposed the application of the TAM model to a Geometer's sketchpad. Yuan Gao states in his 2005 article that "technology acceptance models can serve the purpose of evaluating competing products such as text books and technology systems" (Gao, 2005, p. 245) and provide a valuable tool to educators. This study evaluates TPC adoption in an educational setting and examines the UTAUT model as a useful predictive tool in this context.

## CONCEPTUAL MODEL AND RESEARCH HYPOTHESES

The acceptance of TPC was evaluated using a modified UTAUT model that was originally proposed by Venkatesh et al. (2003). The research model postulates six constructs (performance expectancy, effort expectancy, social influence, self efficacy, anxiety, and attitude toward using technology) that determine the behavioral intent and two constructs influencing usage behavior (behavioral intent and facilitating conditions). The research examines four moderating variables (gender, age, experience, and voluntariness) that have varying influence on the primary constructs.

In the context of this study, performance expectancy is defined as the degree to which students believe that using the system will help them improve their performance. The model hypothesizes that the degree of which performance expectancy influence behavioral intention is moderated by gender and age. Effort expectancy is defined as the degree of ease associated with the use of the TPC. Some researchers suggest that there are gender differences related to roles in life (Lynott and McCandless, 2000). Researchers in technology acceptance have addressed this criteria (Venkatesh and Davis, 2000) thus we expect there to be a gender effect in this study. The degree of which effort expectancy influences behavioral intention will also be moderated age, and experience (Venkatesh et al., 2003). Social influence is defined as the degree to which a student perceives that important others believe he or she should use the TPC. All moderators have an affect on this variable, gender, age, experience, and voluntariness of use. Venkatesh et al (2003) suggest that social influence is an important construct in mandatory use environments such as this study. This variable is important in the early stages of experience with technology, with the effect diminishing over time. Facilitating conditions, anxiety, self efficacy, and attitude toward technology are not included in the UTAUT but are included in this research model to provide a more complete analysis of the research environment (Taylor and Todd, 1995). Venkatesh et al. (2003) found that these variables to not be significant as a determinant of intention.

## RESEARCH METHODOLOGY

### Setting and participants

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. Approximately twenty students were given TPC devices and given the assignment to investigate the device as a learning instrument. The initial project was found to be beneficial resulting in an expansion of both the wireless network infrastructure and the number of students

using Tablet PCs. In the fall of 2004, the institution evolved the initiative to include all 1<sup>st</sup> and 2<sup>nd</sup> year enrolled students. The initiative required each full time student to lease or buy a wireless, mobile tablet personal computing device. 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, the institution provides a unique context for the student of adoption of technological innovations because of the pervasive presence of TPCs on the campus.

Data for this study was collected using a web based survey instrument. University students introduced to the tablet PC in the Fall semester of 2005 participated in the survey during class sessions at the university. Each student completed one instance of the questionnaire. Two hundred and sixty three students participated in the study.

### **Survey instrument**

The survey instrument is based on the constructs defined in the UTAUT model (Venkatesh et al., 2003) with some additional constructs included. The question domains include; performance expectancy, effort expectancy, attitude toward using technology, social influence, facilitating conditions, self efficacy, anxiety, behavioral intent, and usage. The survey instrument collected additional information such as gender, age, and the participant's class status at the institution.

The survey instrument is a web-based multi-screened tool linked to a database for data capture. Initially the survey was deemed to be too long and several questions were removed in an attempt to eliminate fatigue from adversely affecting survey results. The survey layout was changed to minimize the number of screens. The survey instrument was pilot tested to twenty five students with their feedback incorporated in the final instrument.

### **Data analysis**

The researchers used Partial Least Squares (PLS) to examine the data with PLS-Graph version 3.00. PLS is a second-generation multivariate technique that can be used to evaluate the model constructs and to estimate the relationships between the variables. The convergent and discriminate validity of the research instrument were analyzed with PLS-Graph. The constructs had high loading factors with most greater than 0.80 demonstrating convergent validity. Next, we evaluate the research model by evaluating the strength of the underlying relationship.

## **RESULTS**

Two hundred and sixty seven college students were surveyed of which 263 represent complete responses. These students were enrolled in courses indicative of tablet use of between one month and one year. The basic analysis of this sample is shown in Table 1. All construct pasted reliability and internal validity test.

The general demographics of the survey participants for gender showed that 119 survey participants were female (45 percent) and one hundred and forty two identified themselves as male (54 percent), three participants did not indicate a gender. The mean age of the participants was twenty two with ninety four percent (94) being younger than twenty four. One hundred and twenty seven (48 percent) reported themselves as freshman students, sixty-six (25 percent)

reported themselves as sophomore students, forty-nine (18 percent) reported themselves as junior students, sixteen (6 percent) reported themselves as senior students, and five did not indicate any student classification.

In this mandatory adoption scenario the modified UTAUT model was found to successfully predict the acceptance of Tablet PCs. Performance expectancy, effort expectancy, social influence, self efficacy, attitude towards using technology, and anxiety explained 55% of the variance of behavioral intent. Attitude towards using technology had the strongest effect with a path coefficient of 0.47. Anxiety was found to not contribute to the construct with a path coefficient of -0.07. The constructs of performance expectancy, effort expectancy, and self efficacy were found to contribute to behavior intent with path coefficients of 0.19, 0.12, and 0.12 respectively. In this study social influence does not have a large contribution at 0.06.

Behavior intent and facilitating conditions explained 11% of the variance of use behavior with facilitation conditions having a path coefficient of 0.19 and behavior intent having a path coefficient of 0.10. It was found that a significant difference existed in the participant population between freshman and upper level student that will be studied in future publications.

## CONCLUSION

We believe this study has both theoretical and practical contributions. With the proliferation of technology-based initiatives in education, studies analyzing the adoption of such initiatives complement existing attempts to evaluate students' learning and teaching effectiveness. Specifically, 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. Based on the findings of this study, we have identified factors that induce students to adopt (buy-into) such initiative. Such insight can be used for diagnostic purposes and for the planning and management for technology-based initiatives in education. From a theoretical perspective, the research will add to the literature dealing with mandatory adoption of technical innovations. The research also contributes to the general adoption literature by studying the theoretical validity and empirical applicability of the relatively recently proposed UTAUT model.

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