



Minnesota State University, Mankato
Cornerstone: A Collection of Scholarly
and Creative Works for Minnesota
State University, Mankato

All Graduate Theses, Dissertations, and Other
Capstone Projects

Graduate Theses, Dissertations, and Other
Capstone Projects

2014

Technology Initiative Assessment through Acceptance and Satisfaction: A Case Study

Virginia Otto
Minnesota State University - Mankato

Follow this and additional works at: <https://cornerstone.lib.mnsu.edu/etds>

 Part of the [Other Computer Sciences Commons](#), and the [Technology and Innovation Commons](#)

Recommended Citation

Otto, V. (2014). Technology Initiative Assessment through Acceptance and Satisfaction: A Case Study [Master's thesis, Minnesota State University, Mankato]. Cornerstone: A Collection of Scholarly and Creative Works for Minnesota State University, Mankato. <https://cornerstone.lib.mnsu.edu/etds/379/>

This Thesis is brought to you for free and open access by the Graduate Theses, Dissertations, and Other Capstone Projects at Cornerstone: A Collection of Scholarly and Creative Works for Minnesota State University, Mankato. It has been accepted for inclusion in All Graduate Theses, Dissertations, and Other Capstone Projects by an authorized administrator of Cornerstone: A Collection of Scholarly and Creative Works for Minnesota State University, Mankato.

Technology Initiative Assessment through Acceptance and Satisfaction: A Case Study

Virginia Otto

Virginia.otto@mnsu.edu

May 6, 2013

Masters of Arts

From the Department of Communication Studies

Minnesota State University, Mankato

Spring 2014

Technology Initiative Assessment through Acceptance and Satisfaction: A Case Study

Virginia Otto

This thesis has been examined and approved by the following members of the student's committee.

Advisor

Committee Member

Committee Member

Author & Affiliation

Virginia Otto is a graduate student at Minnesota State University, Mankato who specializes in communication and technology with a particular focus on use of laptops in universities and perceived normative behaviors with technology.

Abstract

This case study examines a University-wide tablet program to assess the primary users' (students) acceptance and satisfaction of the implemented technology. Technology Acceptance Model (TAM) and *user satisfaction* research acted as the theoretical foundation that directed how to assess students' attitudes and beliefs toward this newly adopted technology. Wixom & Todd's (2005) Integrated Model of User Satisfaction and Technology Acceptance, served as the conceptual model to examine how students' acceptance and satisfaction of the tablet related. Online surveys were distributed to examine if *perceived usefulness* and *ease of use* can predict *user satisfaction*. Multiple regression tests found that the combination of pre-implementation *perceived usefulness* and *ease of use* significantly predict post-implementation *user satisfaction*. Of the two variables; *perceived usefulness* was a stronger predictor of post-implementation *user satisfaction* than ease of use. Measuring technology acceptance and *user satisfaction* serves as a preliminary study to assess technology initiatives and potential technology usage.

(Keywords: Technology Acceptance Model, User Satisfaction, Theory of Reasoned Action, Tablet, and Technology initiatives)

Introduction

Due to newer, smaller, and cheaper technology availability to the public, more technology initiatives have been implemented into university settings. More recently tablets have started to emerge in university settings as a new technology initiative. However, tablets have yet to be investigated by communication researchers in length (Moran, Hawkes & El Gayar, 2010). Moreover, tablet initiatives have been relatively unexplored in assessing users satisfaction after usage. This study explores how users perspectives can be used to predict future usage of newly implemented technology.

Communication studies scholars in the past have explained individuals' reactions to new technology, but the research has lacked connection between usage of and satisfaction with a given technology (Wixom & Todd, 2005; Penuel, 2006). The communication field has primarily investigated information technologies (or IT) with one of two conceptual approaches: technology acceptance (Tseng, Chien-Lung, & Yu-Hao, 2012; Davis, 1989; Ren-Chuen & Hsi-Peng, 2009) and user satisfaction (Ajzen & Fishbein, 1980; Goodhue 1988). Both streams of research hold a different purpose in examining IT usage and understanding, and hold relevant application to understanding the communication process associated with decisions regarding implementations.

Both technology acceptance and satisfaction concepts were adapted from IT research that incorporates the Theory of Reasoned Action (TRA: Ajzen & Fishbein, 1980). TRA explains how an individual's beliefs shape their attitude toward performing an intended behavior, such as using a tablet (Kim, 2011). Kim's (2011) research is an important illustration of how TRA can assess technology usage behavior. Kim's study incorporated TRA to examine what elements would impact individuals to continue

social-networking site usage by studying their responses after using the sites. Therefore TRA may be applied in a situation when the behavioral intention and behavior itself already occurred in order to provide a feedback loop.

Later Wixom & Todd's Integrated Model (2005) extend TRA by explaining what factors form individual attitudes specifically in technology intended behavior. In the model, technology acceptance and user satisfaction are variables that influence technology intended behavior. Technology acceptance (a sub-component of the Integrated Model) is determined by an individual's perception of how useful and easy a technology is to use (Davis, 1989). Both perceived usefulness and ease of use contribute in forming attitudes that factor into behavioral intention to use a certain technology and ultimately can influence overt technology usage. Further, they assert that attitudes toward the technology (such as feelings toward a tablet) form before attitudes of using a technology. This case study focuses on attitudes formed by technology acceptance and user satisfaction that may influence future tablet usage.

Technology acceptance and user satisfaction have been studied separately, rather than as complementary. Research regarding technology acceptance provides a glimpse at how users intend future usage of technology, but lacks consideration of technology system characteristics that influence acceptance and usage (Venkatesh, Morris, Davis, & Davis, 2003). And research regarding user satisfaction is important in reflection of attitudes but holds little predictive power, alone, in determining future technology usage. Goodhue (1988) argued that technology acceptance and user satisfaction should be integrated in order to create a better understanding and prediction of future technology usage.

The literature in both TAM and user satisfaction studies shows predictive power increases when applying technology behavior to a specific time, target, and context (Moore & Benbasat, 1991). The purpose of this study is to explore a specific University setting that implemented a campus-wide tablet program a year ago. A technology post-implementation context, where the technology has already been used can be better understood by using TRA to illustrate a feedback loop. Baker-Eveleth, Eveleth, McCollough, Metlen, & O'Neill (2006) assessed students' attitudes and skills toward a campus laptop program post-implementation in order to gain feedback from the students' usage. Similarly, the current study conducts a pre-and post-implementation examination of Winona State University's technology program to determine if pre-implementation technology acceptance relates to post-implementation satisfaction as inferred from the feedback loop of TRA. This study looks at the context of a specific university technology initiative, targeting the tablet program and students as primary users, and investigates this case at one year since post-implementation. This case study approach provides a preliminary test of linking technology acceptance and user satisfaction in a clear context, target, and time in order to produce greater predictive power.

The results have potential to support later research to determine satisfaction and acceptance with technology programs implemented on university campuses.

Literature Review

Following is a review of relevant research and theory that can be used to illustrate how technology acceptance and user satisfaction can be used to investigate users' perception of tablets distributed at a specific university. First, this review looks at the

Theory of Reasoned Action as a framework to explain how users develop beliefs of technology use. Second, previous research indicates specific context, target, and time are elements that merit the focus of this case study. Third, this review will advance two research questions that investigate how factors of technology acceptance and user satisfaction can be used to assess students' use of tablets in a post-implementation context.

Theory of Reasoned Action

Ajzen & Fishbein (1980) developed the Theory of Reasoned Action (TRA) to illustrate how attitudes and subjective norms shape peoples' intention to perform a behavior. This theory has been applied to numerous situations of behavior such as banking, teaching, business, technology, and more (Gallois, McCamish, & Terry, 1998). For the purpose of this case study, TRA was applied as a model to define individual behavior regarding technology usage (Tseng, Chien-Lung, & Yu-Hao, 2012).

TRA was developed as a formulaic method of determining behavior from intended behavior, attitudes, and subjective norms (Kim, 2011, Mario-Driscoll, 1997, Nor, Shanab, & Pearson, 2008). *Intended behavior* refers to an individual's cognitive desire to perform a behavior (Ajzen & Fishbein, 1980). This intended behavior is influenced by the individual's attitude and subjective norm. *Attitudes* refer to the psychological evaluation of a behavior (Ajzen & Fishbein, 1980). TAM is an extension of TRA that further frames attitudes as an evaluation of potentially using a given technology (Chi, Yeh, & Yang, 2011). These evaluations can be positive or negative thoughts towards performing a certain behavior. Further, these evaluations are based on the perception of an individual's thoughts about using the technology and their feelings

about the technology itself. The feelings toward the technology itself that influence attitudes are referred to as *beliefs* (Ajzen, 2012). The Integrated Model illustrates the linear relationship of beliefs impacting individual's attitudes toward using technology and thereby influences intention to use a specified technology. This postulates that if an individual has a positive evaluation of the technology then there is a higher likelihood of using the technology (Nor, Shanab, & Pearson, 2008). The other element that factors into intended behavior is subjective norms.

Subjective norms refer to an individual's perception of how others expect them to behave (Nor, Shanab, & Pearson, 2008). Some research conceptualizes this term as a sense of social or peer pressure to comply with others' expectations (Mario-Discoll, 1997; Kim, 2011). The model suggests that significant others, role models, or general peers can increase the social pressure for an individual to perform in a certain manner. This component was not examined in the current study.

The importance of attitudes can vary depending on the context, target, and time (Mario-Discoll, 1997). Researchers have applied TRA to technology in both pre-implementation and post-implementation contexts. Some studies have applied TRA as a method to understand factors that contribute to an impending decision (such as the decision to use a technology). Sheppard, Hartwich, & Warshaw (1998) applied TRA, in a context where new technology was rolled out to the public, to predict individual's online banking behavior. Other researchers have applied TRA as a means to assess a technology usage behavior that's already occurred. This application of TRA intends to understand why technology usage occurred and whether this behavior would continue. Kim's (2011) research is an important illustration of how TRA can assess technology usage behavior.

Kim's study incorporated TRA to examine what elements would permit individuals to continue social-networking site usage by studying their responses after using the sites. Therefore, TRA may be applied in a situation when the behavioral intention and behavior itself already occurred in order to provide a feedback loop.

A technology post-implementation context, where the technology has already been used can be better understood by using TRA to illustrate a feedback loop and assess the noted behavior. Baker-Eveleth, Eveleth, McCollough, Metlen, & O'Neill (2006) assessed students' attitudes and skills toward the campus laptop program post-implementation in order to gain feedback from the students' usage. Moreover, the factors (attitudes and skills) Baker-Eveleth et al. used to understand the students' response to the laptop program aligned with TRA attitudes and subjective norms. Similar to this research, the current case study applied the Integrated Model (an extension of TRA) to examine Winona State University's tablet program in terms of student's responses to using tablets. The Integrated model explains how attitudes and beliefs develop specifically for technology usage. Within the Integrated Model, Technology Acceptance Model (TAM) is a sub-component that describes factors that form technology acceptance prior to technology usage. The TAM helps us to understand how people process decisions to use technology and provides specific factors to measure behavioral intention to continue using technology.

Behavioral Intention: Modeled in Technology Acceptance Model

Technology Acceptance Model (TAM) is a particular theory constructed to determine behavioral intention of technology use (Tseng, Chien-Lung, & Yu-Hao, 2012). Davis (1989) created TAM as an adaptation of the Theory of Reasoned Action. Both

TRA and TAM aid in predicting human behavior. However, TAM applies specifically to people's intention to use a given technology (Davis, 1989). Thereby, TAM identifies the intention for people to potentially accept and use a specified technology.

Many scholars further shaped the understanding of TAM. Baker-Eveleth, Eveleth, O'Neill, & Stone (2006) further describe TAM as a willingness to accept a specified technology. Several studies define technology acceptance as the cognitive process to decide whether to use a specified technology (Cornell, Fining, & Jen-Hwa, 2011; Tseng, Chien-Lung, & Yu-Hao, 2012). Further, technology acceptance links to intention to use technology. This illustrates the true purpose of TAM, which seeks to understand technology acceptance in order to predict intentional usage of technology.

TAM focuses on the individual's attitudes rather than the subjective norms that impact behavioral intention. Wixom & Todd (2008) extensively reviewed TAM's research application and noted that the theory helped to understand individual's attitudes and beliefs towards a technology. Past research that has applied TAM has focused on an individual's thoughts and feelings that influence intention to use technology (Chin, Johnson, & Schwarz, 2008; Ren-Chuen & His-Peng, 2009; Cornell, Fining, & Jen-Hwa, 2011). Similarly, this case study also focuses on students' attitudes towards technology, more specifically tablet usage.

Technology acceptance considers an individual's attitudes towards using a given technology. The next section will provide deeper understanding of how attitudes influence technology usage.

Attitude towards technology use: Technology acceptance

In TAM, technology acceptance is seen as the process by which an individual's attitude of technology forms. This attitude is based off of the perception of potentially using (or reusing) a technology (Wixom & Todd, 2008; Penuel, 2006). One's attitudes toward using technology are measured through two variables: perceived usefulness and ease of use (Wixom & Todd, 2005).

Perceived usefulness is defined as the amount a person believes a technology will enhance his or her work performance (Ren-Chuen & Hsi-Peng, 2009). The user must logically perceive a given technology as useful in order to intend on using the technology. For instance, Roper (2006) recognized the difficulty for teachers to apply new technology into classroom education because of a lack in understanding the technology's use. In order to increase teacher's application of new technology in the classroom, the study found that it was essential for the teachers to realize the utility of technology in presenting and facilitating learning. Apart from the concept of perceived usefulness, TAM argues that users must also believe the technology is easy to use.

Ease of use is defined as the technology user's belief that using a particular technology will lack effort or difficulty. Particularly in adopting new or innovative technology, it is important for individuals to realize their ability to use it. Norzaidi & Salwami (2009) illustrated this concern in their study of online banking in Malaysia. Norzaidi & Salwami recognized that although their bank wanted to adopt online banking, many Malaysians were not familiar or comfortable with this service. It was not easy for Malaysians to use online banking because they were unfamiliar with previous banking practices and found it difficult for people to transition from face-to-face banking to online accounts. This example illustrates how an individual's perception of how easy a new

technology will be to use can sufficiently factor into their attitude of using the technology.

Collectively, perceived usefulness and ease of use impact the level of acceptance toward a specific technology and further the intention to use that technology in the future. This perception of utility and ease of use of a given technology shapes the individual's attitude about potential future usage (Norzaidi & Salwani, 2009).

TAM provides a glimpse at how users intend future usage of a given technology, but lacks direction of how to influence usage through design and implementation (Wixom & Todd, 2005). Moreover Venkatesh, Morris, Davis, & Davis argued that TAM needed to be extended by considering system characteristics that influence acceptance and usage. One crucial gap in this research is that usefulness and ease of use reflect how an individual thinks about potentially using technology, but technology acceptance neglects to discuss how individuals form beliefs or an impression of how they feel toward the technology itself. Recently Wixom & Todd's (2005) Integrated Model combined technology acceptance and user satisfaction as a means to fully explain beliefs and attitudes towards technology usage. Thereby, TAM is viewed as a sub-component of the Integrated Model. The next section will illustrate how user satisfaction reflects individual feelings toward technology, which forms a feedback loop that shapes their beliefs and ultimately factors into attitudes toward technology use in the future.

Beliefs of technology: User Satisfaction

Satisfaction, as described by Wixom & Todd (2005), is individual's attitudes that shape the impression of a behavior. This definition of satisfaction remains relatively general and nonspecific to a particular context. User satisfaction fixates on the

individual's feelings towards technology (Feldmann, Wess, & Moothart, 2008). User satisfaction studies in the Communication Studies field remain fairly minimal, but user satisfaction research is abundant in the Information Technology (IT) field. It is important for Communication scholars to further understand user satisfaction, or how individuals form feelings towards technology, in order to further an understanding of how people intend to use technology. This current study responds to this gap in the field by linking technology acceptance and user satisfaction to understand future usage.

User satisfaction is perceived as an object-based attitude. Wixom & Todd (2005) describe object-based attitudes as an approach that conceptualizes satisfaction as a means to perceive or judge a single object, in this case a specific technology. This concept aids in predicting behavioral intention by specifically identifying how a person shapes attitudes toward an object (specifically, a given technology). By conceptualizing user satisfaction as object specific, this forms more concrete variables to analyze satisfaction.

Research conducted on object-based attitudes has developed core variables to measure satisfaction. Researchers use system and informational satisfaction as sub-components to break down user satisfaction towards a technology and measure feelings towards a technology (Zohoori et. al. 2012, Wixom & Todd, 2005).

System satisfaction refers to an individual's attitude toward the processing of a technology (Zohoori et. al., 2012). Reliability, flexibility, integration, accessibility, and timeliness are elements an individual reflects upon to develop system satisfaction (Wixom & Todd, 2005). For instance, a person attempts to look up something by using the Internet on their cell phone but the connection is severely slow, this would impact a person's system satisfaction.

Information satisfaction refers to an individual's attitude toward the information output from the technology (Zohoori et. al., 2012). Completeness, accuracy, format, and the current state of information provided from a technology are elements that factor into an individual's information satisfaction (Wixom & Todd, 2005). For example, if the layout of a computer desktop is not a desirable format, this can alter an individual's information satisfaction.

By using system and informational satisfaction as means to determine user satisfaction this increases the power to predict intention to use technology (Norzaidi & Salwami, 2009). Separately, technology acceptance and user satisfaction lack a full explanation in how these concepts impact individual's future usage. User satisfaction captures how users develop attitudes toward the system, but lacks power to predict usage of technology. And technology acceptance, as previously mentioned, lacks understanding of feelings towards technology that may influence potential usage. As a result, technology acceptance and user satisfaction are not competing ideas but complementary approaches for assessing user perceptions towards technology.

Until recently the concepts of technology acceptance and user satisfaction separately developed an understanding toward technology usage rather than together. Goodhue (1988) argued that technology acceptance and user satisfaction should be integrated in order to create a better understanding of future usage. This important notion serves as the basis for studying a case study of technology implementation in terms of technology acceptance and user satisfaction.

Wixom & Todd (2005) argued that technology acceptance and user satisfaction could hold a causal relationship. By adopting a technology, an individual would often

form beliefs towards a particular technology (user satisfaction). Those attitudes then shape the attitudes about using the technology (technology acceptance). Moreover, the beliefs about using a technology to accomplish a particular task will be shaped, partially, by the attitudes towards the technology and later the beliefs shape intention towards future technology usage. Therefore user satisfaction influences the technology acceptance, and this acceptance indirectly impacts future technology usage behavior. However, the extent of this relationship between technology acceptance and user satisfaction has not been explored. This leads to the first research question:

RQ1: Can pre-implementation technology acceptance be used to assess student user satisfaction post-implementation?

Moreover if technology acceptance and user satisfaction also act as feedback from the technology usage, as described in TRA, then initial thoughts and feelings toward technology usage may impact feelings or thoughts after technology is used. The concept of a feedback loop connects and extends previous technology theory by explaining how users assess their thoughts and feelings of a technology after usage. This case study conceptualizes the time frame of before and after technology usage as pre- and post-implementation of a campus-wide technology initiative. The next section will further the argument that pre-implementation technology acceptance (attitudes) impact post-implementation user satisfaction (beliefs).

Pre-implementation Attitude impacts on Post-implementation Beliefs

This case study advances the argument that TRA provides a feedback loop. TRA shows that beliefs and attitudes factor into intention to use a technology, and that beliefs and attitudes continue to form after using a technology (Baker-Eveleth, Eveleth,

McCollough, Metlen, & O'Neill, 2006). As a result, it is advantageous to consider beliefs and attitudes when investigating how technology use may relate to beliefs and attitudes after an individual uses the technology.

As a result, examining both pre-implementation and post-implementation technology acceptance and user satisfaction is argued here to aid in predicting future usage of technology. In addition, framing technology acceptance and user satisfaction as factors that contribute to usage provides a basis for predicting continual usage. By relating acceptance and satisfaction to usage, a feedback loop is identified that can serve as a way to identify patterns between perception of technology and actual usage. In the current case study, as university students have had a tablet program for a year; this provides a suitable time to reflect on how their initial perception of the tablets impacted their usage. Furthermore, how their usage of the tablets has now impacted their evolving perceptions of tablets. Therefore, this study looks specifically as what factors of acceptance pre-implementation can impact post-implementation satisfaction levels for the Winona State University Tablet Program. More specifically one of the factors of acceptance, perceived usability or ease of use may hold a stronger impact on satisfaction post-implementation. This leads to the second research question:

RQ2: Using the TAM, does usability or ease of use have a higher association with satisfaction?

University Tablet Initiative Context

This investigation of technology acceptance and user satisfaction as a case study is an essential preliminary test for the feedback loop notion. The reason why this investigation uses a case study approach is to test variable relationships and to see if the

feedback loop works. Although technology acceptance and user satisfaction research exists separately, no constructed study to ensure these variables relate is mentioned in the literature. As a response, this specific case study approach looks to not generalize but test if and how pre-implementation technology acceptance predicts post-implementation satisfaction. For this investigation Winona State University's tablet program served as the case study.

Winona State University, a public Minnesota state school, served as the location for the case study to investigate a specific technology initiative. Technology initiatives are organized technology distribution to specified persons. Several technology initiatives have been studied previously (e.c. Desire2L, smartboards, online banking). In the past, Winona State University implemented a campus-wide laptop initiative. Due to this laptop initiative's success, Winona State University recently implemented a tablet initiative in 2013.

The literature on both technology acceptance and user satisfaction shows predictive power increases when applying technology behavior to a specific time, target, and context (Moore & Benbaset, 1991). Winona State University's tablet program currently serves as a prime combination of clearly defined context, target, and time. Winona State University implemented a tablet program, which supplies iPad mini to select students (incoming freshmen students and current junior students) as a 'test-drive' of the tablet program. The following section defines the context, target, and time frame for Winona State University's tablet program and illustrates why it's an important case to study.

Context: University-wide implementation

Technology initiatives in university settings vary in accessibility and ownership. Some technology initiatives provide public/equal accessibility to technology, such as public computers provided in the university library (Cutshall, Changchit, & Elwood, 2006). Other technology initiatives allow users to borrow technology and return later, such as renting out video cameras from Tech Support. And yet other initiatives provide one-on-one private usage and ownership of technology (Moran, Hawkes, & El Gayar, 2010). Different universities provide various levels of access, rental, and ownership dependent on the nature of the technology initiative in place (Penuel, 2006).

Literature regarding university implementation lacks solid examination of one-on-one initiatives. One-on-one computer initiatives allowed private use of computers to all students at home or school (Moran, Hawkes, & El Gayar, 2010). For example, Baker-Baker-Eveleth et. al. (2006) explored a laptop program implemented among solely business students, and further Feldmann, Wess, & Moothart (2008) investigated an initiative that rented laptops to students. These examples are temporary or selective technology initiatives rather than one-on-one initiatives. Both of these initiatives lack a large-scale implementation across the entire university with equal ownership of these technologies. This study seeks to fill this gap by examining a university-wide technology initiative context. By examining a full university technology initiative the study sought to gain a richer understanding of users' perception towards the given technology.

Target: Students using tablets

The university's creation and assessment of One-on-one initiatives is partially based off of stakeholder's perception of the technology (Baker-Eveleth, Eveleth, McCollough, Metlen & O'Neil, 2006). Stakeholders are the people most invested and

impacted by university technology initiatives. Previous research about one-on-one technology initiatives primarily focused on students as the primary stakeholders. Students are seen as the primary stakeholders due to the fact that, within a university, students utilize the technology more frequently than any other group (Norzaidi & Salwani, 2009). Moreover, unlike faculty and staff, student perceptions of technology are more readily reported in previous research because the university recognizes this group as the end-users of the product. Therefore students are appropriate users to target to investigate their perceptions of a university-wide technology initiative.

Assessment of students' perceptions of technology initiatives can influence other university changes such as future budget spending, teaching styles, or administrative decisions. One factor that shapes intentions to support initiatives is which technology is implemented; various technologies are available (e.c. email, laptop, tablet) for universities to implement. In the past, research has discussed Internet implementation impacting students (Penuel, 2006). Penuel's research synthesis describes how students responded to universities providing Internet access and how this changed classroom interaction and research. Later studies such as Feldman, Wess, & Moothart's (2008) survey of students satisfaction with computer services indicated that students liked having an Internet connection but desired more portable and private usage. So universities responded to student desires with rental laptop programs that allowed students to borrow and privately use computer services.

More recently tablets have started to emerge in educational settings. This new, smaller, and cheaper technology remains relatively unexplored in terms of user acceptance and satisfaction. Tablets have yet to be investigated by communication

researchers in length (Moran, Hawkes, & El Gayar, 2010). As a response, this technology target is the focus of this case study. Therefore this study used tablets as the technology to analyze regarding student's attitudes and beliefs.

Time: 1 year post-implementation

In order to adequately capture technology acceptance and user satisfaction in university technology initiatives in universities it is important to focus on what time during the implementation process research takes place. Many studies have focused on either pre-implementation or post-implementation. Pre-implementation includes universities that have considered but not yet implemented a technology initiative (Cutshall, Changchit, & Elwood, 2006). Post-implementation involves a university that has already implemented a technology initiative and is reflecting on the experience (Baker-Eveleth et. al., 2006). More research has been conducted on pre- rather than post-implementation (Baker-Eveleth et. al., 2006, Cutshall, Changchit, & Elwood, 2006, Penuel, 2006). Therefore this study seeks to further understanding of post-implementation of tablets at a university. An examination of post-implementation was conducted to provide a greater understanding of the students' experience and the application of the Integrated Model to the university as a means of assessing student satisfaction in relation to acceptance.

Both pre-implementation and post-implementation times have remained vaguely defined as to how close they are in relation to the actual implementation. For instance, post-implementation applies to both a university that implemented 2 years ago and a university that implemented 10 years ago. In order to more accurately address a specified time, this study conducted a case study to subjectively determine a time in relation to

implementation. Winona State University's tablet program serves as the ideal case to study because it holds a clear time frame of examination: one year since implementation. Therefore, this case exemplifies the desired context, target, and time to study user satisfaction in relation to technology acceptance. Winona State University's tablet program is in a state of maintenance and reflects on the recent adoption of tablets as it assesses the effects of the tablets that were implemented only a year ago.

By conceptually combining technology acceptance and user satisfaction in the same study, this project holds the potential to assess a recent technology initiative post-implementation. Individual students may hold varied levels of acceptance toward tablets that may impact their later satisfaction of tablet usage. However, the extent to which students' acceptance of tablets relates to their satisfaction has yet to be established.

Therefore, this study focuses on the case of Winona State University's recent tablet implementation to investigate how students' technology acceptance potentially influences their satisfaction. In order to adequately reflect on the tablet usage at this university, it is important to investigate what influences students' usage of tablets. The Integrated Model is used to describe how beliefs and attitudes regarding tablet usage relate to intentional tablet usage, and to provide the framework to measure technology acceptance and user satisfaction in this case study.

Methods

Participants

One-thousand Winona State University students were emailed a recruitment message to participate in the case study. A total of seventy-nine ($n=79$) completed the survey, resulting in an overall response rate of approximately 8%. There were 28

participants who consented to participate in the study, but didn't continue answering questions, thus they were deleted from the sample. Participants were of freshman (n=44) and junior (n=35) status and were studying a variety of disciplines (Science: 28%; Liberal arts: 21%; Business: 20 %; Medical: 19%; Education: 9%; and Undecided: 1%).

One hundred percent of participants reported possession of a tablet supplied by the university. This indicates that the participants accurately represented the intended target—university tablet users. The respondents reported varied levels of tablet usage per week with a majority reporting use ranging from 1-5 hours per week (M= 1.39; SD= .724; Range= 1-5 hours to 17+ hours). Eighty-four percent reported they used their tablet 1-5 hours, 10% used their tablet 6-10 hours, 6% used their tablets 11-16 hours, and none reported using tablets for 17+ hours per week. See Table I for an illustration of the demographic data.

Procedure

Participants completed an online survey that instructed them to recall their individual perceptions of tablets during pre-implementation and post-implementation of tablet use. Participants were recruited through assistance of the university's Institutional Planning, Assessment & Research (IPAR) staff. IPAR staff supplied a random sample of 1,000 university students of Freshman and Junior status (identified as the first wave of students who received and used iPad Mini's or tablets implemented by the university as an initial phase of the new Winona State University tablet program). Direct emails to recruit students for the study were sent to the 1,000 students, and participation in the online survey was available to students for approximately two weeks. This survey was voluntary and no compensation was offered.

Survey Design

This study used a repeated-measured design that gathered data on variables regarding pre-implementation and post-implementation of the Winona State University tablet program. The online survey held a total of 55 questions: four open ended questions and 51 close-ended questions. Four closed-ended questions collected demographic information about participants' major, year in school, if they held a tablet, and how often they use the tablet. Forty-seven closed-ended questions collected interval data using a Likert-scale response set to gain information from each student regarding technology acceptance and satisfaction. Likert scales, which are most commonly used in technology acceptance and implementation studies, were used to measure variables (Chin, Johnson, & Schwarz, 2008). Each question was measured using a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Lastly, four open-ended questions gathered qualitative data that offered a deeper understanding of students' impressions and perspectives about the tablet program. See Appendix I for an illustration of the full survey.

Variables

The variables of this study derive from both technology acceptance and satisfaction research. This study looks at two variables of technology acceptance (*perceived usefulness* and *ease of use*), and a third variable of *user satisfaction*. User satisfaction served as the dependent variable while perceived usefulness and ease of use were both independent variables. Variables were measured twice to establish two categories: pre-implementation and post-implementation (represented as 'Pre' or 'Post' listed before the variable name).

Technology Acceptance Variables

Based off of Davis's (1989) Technology Acceptance Model, the concept of technology acceptance was broken down into the variables of *perceived usefulness* (PU) and *ease of use* (E). Davis created the original scale by which to measure *perceived usefulness* and *ease of use*, which was later adapted for use in university technology settings by Baker-Eveleth et al. (2006). Baker-Eveleth et. al. (2006) used Confirmatory Factor Analysis to ensure validity of technology acceptance variables (PU=0.77 and E=0.8). Baker-Eveleth et. al.'s tests on validity illustrated that convergent validity, discriminant validity, and construct validity were achieved. Baker-Eveleth's refined scale was used as the basis for the survey questions regarding technology acceptance in this study. Baker-Eveleth's operationalization was both reliable (Cronbach's alpha: PU, $\alpha = 0.97$, E, $\alpha = 0.87$). See Table II for more detail. The current survey measured the variable *perceived usefulness* in pre-implementation ($\alpha = 0.87$; 4 items; item example: "I expected iPad mini's to improve my overall grades") and in post-implementation context ($\alpha = 0.92$; 4 items; item example: "iPad mini's have improved my quality of work"). Additionally the survey measured the variable *ease of use* in pre-implementation ($\alpha = 0.58$; 3 items; item example: "I expected iPad mini's to be confusing to use") and in post-implementation context ($\alpha = 0.64$; 3 items; item example: "iPad mini's have been difficult to use"). In the current study, ease of use was slightly under the significant level (PreE $\alpha = 0.58$, PostE $\alpha = 0.64$), however still acceptable to continue analysis.

Satisfaction Variable

Items relating to *user satisfaction* (S) were conceptualized from Ajzen & Fishbein's (1980) object-based attitudes, identified within the Theory of Reasoned

Action. A scale to measure user satisfaction was originally derived from an instrument adapted by Moore & Banbasat's (1999), which exceeded an internal consistency level ($\alpha > .70$). Later, Wixom & Todd (2005) formatted these questions to accommodate technology targets. Their *user satisfaction* scale was composed of two sub-scales: information satisfaction and system satisfaction, which were combine into one satisfaction variable for this study. The *user satisfaction* scale items used in the study were adapted from Wixom & Todd's (2005) original version. Wixom & Todd's concept of *user satisfaction* served as the dependent variable in the current study. Validity has been assured for the measurement of survey items by adapting items from previous scales and instrument constructs (Lee, Hsieh, Hsu, 2011). Adapted from Wixom & Todd's user satisfaction scale, the current survey operationalized *user satisfaction* in pre-implementation ($\alpha = 0.88$; 10 items; item example: "I expected iPad mini's to be current or up to date") and in post-implementation context ($\alpha = 0.92$; 10 items; item example: "iPad mini's have been efficient").

Analyses

Before testing RQ1 and RQ2, some preliminary diagnostics were used to examine the variables. *A priori* tests included correlation and t-tests.

A priori

Before using regression to test the relationship between PreE and PrePU as a predictor of reported PostS with tablets, a correlation was run to establish that a relationship did exist. Correlation analysis supported that positive relationships existed between the pre- and post- measurement of technology acceptance and satisfaction. Both PrePU ($r=0.48$, $p<.0001$) and PreE ($r=0.37$, $p<.01$) were found to hold a strong

relationship with PostS (Wrench et al., 2008). Before testing the relationship between PostPU and PostE compared to reported PostS with tablets, a correlation was run to establish that a relationship did exist. A positive, strong correlation was identified between PostPU and PostS ($r(73)=0.499, p<.0001$), as well as between PostE and PostS ($r(73)=.38, p<.01$). From these *A priori* tests, a relationship was found to exist between technology acceptance variables and post-implementation satisfaction with tablets. These correlations results confirm the necessity to run regression to explore the answers to RQ1 and RQ2.

In addition, due to the repeated measures design, a dependent t-test was run to confirm that a difference in means between Pre and Post variables also existed. This test indicated that the variables (S, PU, and E) changed over time. The paired sample tests indicated all variables held significant variance ($p<0.05$). Difference in means existed from pre- and post- *ease of use* $t: (77)=2.362, p<0.05$; and *user satisfaction* $t: (64)=2.013, p<0.05$. However, variance could not be assumed from pre- and post- *perceived usefulness* $t: (78)= -1.087, p>0.05$. The results indicate a significant difference between repeated measurements of E and S over time. Additionally there was a difference, although not significant, between repeated measurements of PU.

Testing RQ1 and RQ2 used two multiple regression analyses to directly answer the two research questions and to indicate if the independent variables (PU and E) could predict the dependent variable (S).

RQ1: Can pre-implementation technology acceptance be used to assess student user satisfaction post-implementation?

The first multiple regression test was conducted to confirm the feedback model and evaluate how well the PrePU and PreE could predict PostS (RQ1). The linear combination of PrePU and PreE was significantly related to PostS: $R^2=.262$, $F(2, 69)=12.22$, $p<.0001$. The sample multiple correlation coefficient, R^2 , indicates approximately 25.5% of variance of PostS can be accounted for by the linear combination of PrePU and PreE. Both PrePU ($\beta=0.38$, $t=3.38$, $p<0.01$) and PreE ($\beta=0.22$, $t=2.12$, $p>0.05$) held predictive power of PostS. However, PreE's predictive power of PostS was not significant and didn't account for the variance. See Table III for more information.

RQ2: Using the TAM, does usability or ease of use have a higher association with satisfaction?

The second multiple regression test was conducted to expand an understanding of whether or not one of the technology acceptance variables were a stronger prediction of satisfaction, and used PostPU and PostE to predict PostS (RQ2). Together PostPU and PostE significantly predicted PostS, $R^2=0.294$, $F(2, 70)=14.598$, $p<0.0001$. The sample multiple correlation coefficient, R^2 , was 0.29, indicated that approximately 29% of variance of PostS can be accounted for by the linear combination of PostPU and PostE. Both PostPU ($\beta=0.41$, $t=3.38$, $p<0.0001$) and PostE ($\beta=0.23$, $t=2.12$, $p<0.05$) significantly predicted PostS. Cohen and Cohen (1983) argue that Beta weights for variables represent unique effects of the variable within the regression. Given this, between the two variables the Beta weights imply that PostPU bears a larger effect on PostS than PostE. See Table III for more information.

Post Hoc

After analysis of the research questions was conducted, responses to the three open-ended questions were examined. The researcher analyzed the content of the open-ended question by creating categories of response themes that rendered similar words or phrases. The analysis of open-ended questions was done to provide deeper understanding of participants' perspective. These three questions asked about the participants' positive outcomes from the tablet program, the negative outcomes from the tablet program, and what would be a desired change for the program. These three questions are labeled as *positive*, *negative*, and *change*. The responses were grouped into categories as themes emerged.

Positive. Fifty-two respondents described a total of 80 positive aspects about the tablet program. There were a total of eight categories that emerged from the positive open-ended responses. The three most common themes reported were the use of apps (23 responses), portability of tablets (13 responses), and usability in class (18 responses). See Table IV for greater detail on the categorization of open-ended responses.

Negative. Fifty-six respondents described a total of 92 negative aspects about the tablet program. There were a total of ten categories that emerged from the negative open-ended question. The three most common themes reported were the inability to use tablets in class (18 responses), unawareness of the need for tablets instead of other technology devices (14 response), and connection issues (11 responses). See Table IV for greater detail on the categorization of open-ended responses.

Change. Fifty-one respondents described a total of 66 suggestions for changes/improvements on the tablet program. There were a total of ten categories that emerged from the change open-ended question. The three most common themes reported

were the desire to implement tablets into the classroom (12 responses), improve professors knowledge of how to use tablets (10 responses), and improve students knowledge of how to use tablets (9 responses). See Table IV for greater detail on the categorization of open-ended responses.

Across all three questions, similar responses expressed an importance of implementing tablets into the classroom and a desire to understand the usefulness of tablets was consistent. These trends in open-ended responses may reaffirm that perceived usefulness contributes attributes more to user satisfaction with technology.

Discussion

The purpose of this study was to investigate how technology acceptance and user satisfaction may be used to assess a campus-wide tablet program implemented a year ago at a specific university. The initial correlations indicated there was a positive relationship between technology acceptance variables (*perceived usefulness* and *ease of use*) and satisfaction. These results affirm Wixom & Todd's Integrated Model that asserts that technology acceptance and satisfaction are related. And the t-tests also confirmed that there was a difference in means between pre- and post- measurements of variables, which confirms the pre- and post- design was effective in measuring a difference in student perceptions. After indicating the variables related and a clear difference existed between reported pre/post variables, regression analyses to directly investigate the research questions were conducted.

The first research question investigated if technology acceptance could assess post-implementation satisfaction of tablets. The findings indicate that technology

acceptance variables measured pre-implementation predict post-implementation satisfaction levels. However, both technology acceptance variables did not yield the same results in predicting satisfaction. Unlike prePU, preE ($t=1.98$, $p<0.1$, $\beta=0.22$) was slightly under the statistical significance level $p<0.05$. This result may indicate that *perceived usability* may be more strongly associated with *user satisfaction*. Or, the insignificant preE result could be attributed to the lower reliability scores from the survey's *ease of use* variable. Nevertheless, these preliminary results indicate that technology acceptance before technology implementation can predict satisfaction after implementation.

The second research question investigated whether *perceived usefulness* or *ease of use* held a stronger association with satisfaction. In post-implementation, just as in the first regression, the linear combination of PostPU and PostE was statistically significant with PostS. Both PostPU and PostE individually held statistical significance in predicting PostS. The β weights indicated that PostPU ($\beta=0.41$) had a stronger relationship with satisfaction, and that Post E has a significant but weaker relationship.

The qualitative (open-ended) questions further verified the strong link between *perceived usefulness* and *satisfaction*. One of the top responses to all three open-ended questions indicated the participants desire to see the tablets implemented into the classroom. Responses such as “encourage professors to integrate [tablets] in courses”, “have more professors implement technology into the class”, and “use them in class or for any school purpose” indicate students desire to experience tablets as usefully applied into classroom settings. Although there was several categories formed that relate to *ease of use* factors such as portability, far more categories emerged that related to students value of *perceived usefulness* of tablets (e.g. note taking, books, email, apps). These

responses indicate that students more readily express that the tablet's function, or *perceived usefulness* in their education, related to their satisfaction with using a tablet. Even though some students suggested, "the entire program be cancelled", students that noted suggestions for the program all offered ideas to either apply or understand tablet's use in the classroom. Suggestions include "short programs", "online videos [for] students and staff", or holding "information session(s) teaching [students] tips and tricks to get the most helpful apps for school/organization". These qualitative responses further verify the strong association of *perceived usefulness* and *user satisfaction*.

Limitations

There are several limitations that should be considered in reflecting on the results of this study. This may link with both the implications of this research and also can guide future research efforts in understanding technology acceptance and satisfaction within post-implementation contexts. This study is limited in its reliability and validity, density of scope, and complexity of scope.

Most notably, the validity of the current study measuring both pre-implementation and post-implementation attitudes is limited since these perspectives were collected at the same time. The accuracy of participants adequately recalling their perceptions prior to tablet implementation is questionable. However, the practicality of this study in measuring perceptions of primary users prior to technology implementation may be difficult to acquire if the initiative doesn't have a trial phase or extensive contemplation prior to rollout. Since this case study was conducted one year post-implementation, it was impossible to genuinely collect pre-implementation attitudes. Collecting at different

times, ideally pre- and post-implementation, in future studies would improve validity of measurements.

As shown from the Cronbach's alpha, *ease of use* as a variable is somewhat questionable in reliability. Both pre- and post- reliability tests for ease of use were below the discipline standards of 0.7. This diminished reliability should be considered when reflecting on the results of this study. The lack of reliability may be attributed to question how item adaptations in this study that strayed from the previous scale (Baker-Eveleth et al., 2006). Ease of use questions on the survey should be worded more closely to the original scale created by Baker-Eveleth et al.'s original scale that was proven reliable and valid, so future studies should strive to use similar wording or phrasing as found in the original scale for ease of use.

The scope of this case study is specific to Winona State University's tablet program and cannot be generalized or directly connected to other university implementations, other organizational implementations, or other technology implementations. Additionally, since this project was a specific case study, it is difficult to replicate precisely and reproduce the same results. However, this was a preliminary study to investigate technology initiative assessment through technology acceptance and user satisfaction that provided an important test of the feedback loop of reasoned action. Future studies should strive to develop future institutionalized approaches to assessment (such as pre-, post- standardized assessments) of technology initiatives that may be applied to a variety of contexts.

The applicability of this case study is also limited since it took place during its pilot phase, during which only a select number of users held tablets. This case study does

not represent all university users' perspectives on tablets. The choice of only surveying students is a limitation. Students were perceived as the primary user of the technology and thereby were the primary participants of this study. However, in future years as more students, faculty, and staff have access and use of these tablets the stakeholder perception and satisfaction of tablets could be further explored.

Future Research Suggestions

Future research should address these limitations and expand understanding of technology implementations. Some areas for future research include varied contexts, advancing theory, and exploring assessment for technology initiatives.

A number of future studies can be expanded by altering either the context, target, or time of this case study. The University level is just one option for context, other levels of education such as high school or elementary school open new educational contexts for studying technology acceptance and satisfaction. Moreover, the target of either the technology (such as smartboards or desire2learn) or participants (such as faculty or staff) can be areas of focus to develop in future investigations. And gathering data at different times (pre-, during, post-implementation), or running a longitudinal study, could possibly gain greater understanding of assessing satisfaction rates post-implementation.

Advancing the theory by which to understand technology initiative assessment is another area for future investigators to explore. This study used TRA as the basis to predict technology usage by understanding attitudes, but left out the concept of subjective norm. Future studies should strive to measure subjective norm in technology initiatives to more accurately represent TRA. More scholars should also investigate the combination of TRA and TAM, which may serve as a valuable link in understanding factors that

contribute to technology usage. The findings of this study provide preliminary results to indicate the reliability of applying TAM to determine user satisfaction. Further this study contributes to the research in technology acceptance in general by connecting theory, intentional behavior, and user satisfaction.

This method of assessing technology initiatives should be tested and critiqued in future studies. Measuring technology acceptance and user satisfaction is one suggested method of assessment but others may exist. Other scholars should apply this assessment methodology to other studies to further test the reliability and validity of these variables of assessment. Moreover, future studies should challenge these assessment variables. Additional concepts should be developed and investigated to evaluate technology implementations. Only by observing and critiquing this approach can a more credible assessment of technology initiatives develop. Future studies should consider additional factors that may impact *user satisfaction* such as technology exposure, expertise, or peers' perspective toward technology use.

Understanding how students' reflect on their satisfaction toward technology initiatives, can impact further the communication process associated with decisions regarding implementations. This study used a repeated measure design to conduct students' acceptance and satisfaction, but ideally these variables can be measured prior to a technology implementation. By gathering preliminary information about users' perceived usefulness, ease of use, and user satisfaction toward a technology, research can inform the administrative decision to ultimately implement. By gathering information about users' perspectives toward the technology, research can contribute to multiple

communication aspects such as branding, rollout, or discussion of how to implement a new technology.

Practical Implications

This case study holds a pragmatic approach for university administrators to consider in assessing technology initiatives. The measurement of technology acceptance and user satisfaction during pre- and post-implementation is the method of assessment examined in this case study. This section clarifies why administrators might consider this assessment method.

What is the purpose of this assessment method?

The purpose of this assessment method is to identify and understand object-based attitudes. More specifically this assessment surveys technology acceptance and user satisfaction in order to describe users' attitudes toward using a specific technology. Additionally, these attitudes are compared with reported usage of the technology to more comprehensively understand how attitudes relate to usage rates.

Administrators may find this assessment useful because it identifies the users' perspective toward the technology initiative. Technology acceptance variables, including perceived usefulness and ease of use, describe how users view usage of the technology. This can help to identify if and how the users perceive the technology as useful and easily adopted. Additionally this can help to identify potential resistance of users adopting the technology either based on perceived usefulness or ease of use. In contrast, user satisfaction describes how users view the technology itself in terms of system and information quality. Information about user satisfaction can identify why users do or do not favor the technology.

The assessment of technology acceptance and user satisfaction is suggested for administrators seeking to survey the usage of implemented technology and attitudes toward this technology usage. Since this is an object-based attitude assessment method it is most helpful to apply when the goal is to understand attitudes toward technology usage. This assessment may be used to identify if users are willing to adopt a new technology and/or what users believe is most important about the technology (perceived usefulness, ease of use, or user satisfaction elements). However, this suggested assessment does not focus on the users' ability to use the technology or their satisfaction with the technology program itself. This assessment method may be used in addition to other assessment tools if the purpose for assessing goes beyond understanding users' attitudes toward using a technology.

Why might one assess both pre- and post-implementation of a technology initiative?

This study argues that assessing both pre- and post- implementation is essential to indicate that the technology implementation has been successfully adopted. Assessing both pre- and post-implementation hold greater predictive power in determining usage rates, technology acceptance, and user satisfaction over time. By assessing pre- and post-implementation administrators can identify increases, decreases or consistency in attitudes toward usage of the implemented technology. If there's no difference between pre- and post-implementation user rates, technology acceptance, or user satisfaction then these results indicate that users did not adequately adopt the implementation. However, if there's a clear increase of user rates, technology acceptance, or user satisfaction over time (between pre- and post-implementation) than this data documents that users are adopting the implemented technology.

Additionally, there are specific benefits from assessing technology acceptance and satisfaction pre-implementation and post-implementation. Pre-implementation assessment provides initial reactions users hold toward the technology. These reactions include users' attitudes toward the technology itself, attitudes toward using the technology, and potential resistance toward using the technology. Post-implementation assessment aids reflection of the technology implementation. More specifically assessment post-implementation can indicate success of the program (or of users adopting the technology), chart attitudes after using the implemented technology, document progression of the roll out, and indicate any user problems with using the technology.

What information do you get from using this assessment method?

This assessment method gathers information about potential resistance to technology usage, users' attitudes toward the technology, and technology usage rates. Resistance to technology usage is determined from surveying behavioral intention and linking this with perceived usefulness and ease of use. Attitudes toward the technology are gathered from questions pertaining to technology acceptance and user satisfaction. And usage rates are identified from reporting usage frequency and behavioral intention.

What would you do with this information?

There are several things administrators can do with information about users' resistance, attitudes, and usage rates. This information can help administrators to promote the technology initiative to users, to identify areas for improvement in the technology initiative, and to chart if users are actually adopting the technology. For example, if the survey assessment indicates that users value using tablet apps to study for class, then

administrators could use this information to market (such as email, posters, or program representatives) the technology initiative as a helpful study tool. Using the language that users describe in the survey shows that their needs are heard and people are responding to them.

First, information collected about users' attitudes toward the technology can be used to develop the language to promote the technology initiative. The information about users' attitudes provides information regarding what users value from the technology. The results of this assessment can indicate users' values that may be incorporated into campus campaigns to educate users, encourage faculty to integrate the technology into classes, and potentially diffuse confusion over the purpose of the technology. Further, this case study identified that perceived usefulness held a higher association with user satisfaction; so, marketing the technology initiative in terms of usefulness may be effective. Wording in promotional messages such as 'helpful study apps' or a 'can be used for labs' highlights the usefulness of technology and could be used to describe the technology initiative to students and faculty. Customizing the marketing according to users' values may help with transitioning, enrolling, and reinforcing a culture of using the technology.

Second, information about technology resistance can help identify areas for improvement in the technology initiative. This assessment of user satisfaction identifies users' perspectives on the technology quality (in terms of system and information quality). Questions related to user satisfaction can help identify technology factors that users dislike. Additionally, questions related to ease of use can help identify if the technology is difficult to adopt (potentially causing resistance). Once these factors are

identified then appropriate adjustments, such as technical support or upgrades, can be made.

Third, information about usage rates can indicate if users' are actually adopting the technology (survey item 4). Additionally the usage rates may be attributed, in part, to the success of the technology initiative, particularly if usage rates increase over time post-implementation. Then administrators can document this information as evidence that technology adoption is successful.

Conclusion

The importance of this case study was to examine if technology acceptance and user satisfaction can assess technology initiatives post-implementation. By linking TRA and TAM to examine attitudes that impact technology usage, this case study surveyed students' about their attitudes toward recently implemented tablets. This study provides preliminary results that indicate the importance of perceived usefulness and ease of use in determining post-implementation user satisfaction. Additional research is needed to provide a refined understanding of technology initiatives, linking TRA and TAM, and exploring this approach to assessing technology initiatives.

References

- Ajzen, I. & Fishbein, M. (1980). *Understanding Attitudes and Predicting Social Behavior*. Prentice-Hall, Englewood Cliffs, NJ.
- Ajzen. (2012). Martin fishbein's legacy: The reasoned action approach. *The annal of the American academy*. DOI: 10. 1177/0002716211423363.
- Baker-Eveleth, L. Eveleth, D. M. O'Neill, M. & Stone, R. W. (2006). Enabling laptop exams using secure software: applying the technology acceptance model. *Journal of information systems education*, 17(4) 413-420.
- Chi, Yeh, & Yang. (2011). Applying theory of reasoned action and technology acceptance model to investigate purchase behavior on smartphones. *Journal of international management studies*. 6(3). Retrieved from:
<http://www.jimsjournal.org/14%20Huery%20Ren%20Yeh.pdf>
- Cohen, J., & Cohen, P. (1983). *Applied multiple regression/correlation analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: LEA.
- Cornell, R. M. Fining, M. M. & Jen-Hwa, P. (2011). The effects of process accountability on individuals' use of familiar technology. *Journal of information systems*, 25(1) 109-128.
- Cutshall, R., Changchit, C., & Elwood, S. (2006). Campus Laptops: What Logistical and Technological Factors are Perceived Critical? *Educational Technology & Society*, 9 (3) 112-121.
- Davis, F.D., 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(1) 319-339.

- Feldmann, L. Wess, L. & Moothart, T. (2008). An assessment of student satisfaction with a circulating laptop services. *Information technology and libraries*. 27 (2) 20-25.
- Gallois, C., McCamish, M., & Terry, D. J. (1998). *The theory of reasoned action: Its application to aids-preventive behavior*. Garland science: Reissue edition.
- Goodhue, D. L. (1998). IS attitudes: Toward theoretical and definitional clarity. *Database Advanced Information Systems*. 19(3) 6-15.
- Kim, B. (2011). Understanding Antecedents of Continuance Intention in Social-Networking Services. *Cyberpsychology, Behavior & Social Networking*, 14(4), 199-205. doi:10.1089/cyber.2010.0009
- Mario-Driscoll, M. T. (1997). A comparison of the theory of reasoned action and planned behavior theory in predicting teachers willingness to teach a special needs child in a regular education classroom. (Doctoral dissertation). Retrieved from A bell & howell information company.
- Moran, M., Hawkes, M., & El Gayar, O. (2010). Tablet Personal Computer Integration in Higher Education: Applying the Unified Theory of Acceptance and Use Technology Model to Understand Supporting Factors. *Journal Of Educational Computing Research*, 42(1) 79-101.
- Moore G. I., & Benbasat. (1991). Development of an instrument to measure the perceptions of adopting and information technology innovation. *Inform Systems Res*, 2(3) 192-222.
- Nor, Shanab, & Pearson. (2008). Internet banking acceptance in malaysia based on the theory of reasoned action. *Journal of information systems and technology management*, 5(1) 3-14.

- Norzaidi, M. D. & Salwami, M. I. (2009). Evaluating technology resistance and technology satisfaction on students' performance. *Campus wide information systems, 26(4)* 298-312.
- Penuel, W. R. (2006) Implementation and Effects Of One-to-One Computing Initiatives: A Research Synthesis. *Journal of Research on Technology in Education, 38(3)*.
- Ren-Chuen, T., & Hsi-Peng, L. (2009). Exploring the emotional, aesthetic, and ergonomic facets of innovative product on fashion technology acceptance model. *Behaviour & Information Technology, 28(4)* 311-322.
doi:10.1080/01449290701763454
- Roper, K. (2006). The relationship between faculty use of technology as a teaching tool and student satisfaction in higher education. (Doctoral dissertation). Retrieved from Proquest dissertations and theses.
- Sheppard, Hartwick, & Warshaw. (1998). The theory of reasoned action: A meta-analysis of past research with recommendations for modification and future research. *Journal of consumer research, 15(3)* 325-343.
- Tseng, K. C., Chien-Lung, H., & Yu-Hao, C. (2012). Acceptance of information technology and the internet by people aged over fifty in taiwan. *Social Behavior & Personality: An International Journal, 40(4)* 613-622.
- Venkatesh, V., M, Morris, G., Davis, F, Davis. (2003). User acceptance of information technology: Toward a unified view. *MIS Quart. 27(3)* 425-478.
- Wixom, B. H. & Todd, P. A. (2005). A Theoretical Integration of User Satisfaction and Technology Acceptance. *Information Systems Research. 16(1)* 85-102.

Zohoori, Mahmood; Nabuzadeh, Danial; Asgharian, Reza; Bekheirnia, Neginsadat.

(2012). User Satisfaction in Green Technology/Processes. *Interdisciplinary Journal of Contemporary Research In Bussiness*, 4(7) 842-848.

Figures

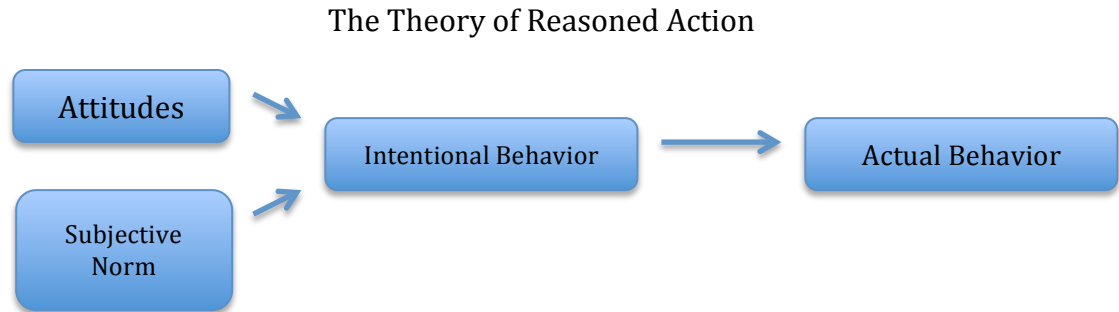


Figure 1: This figure illustrates TRA created by Ajzen & Fishbein (1980) that describes what elements influence behavior

The Integrated Model (Wixom & Todd, 2005)

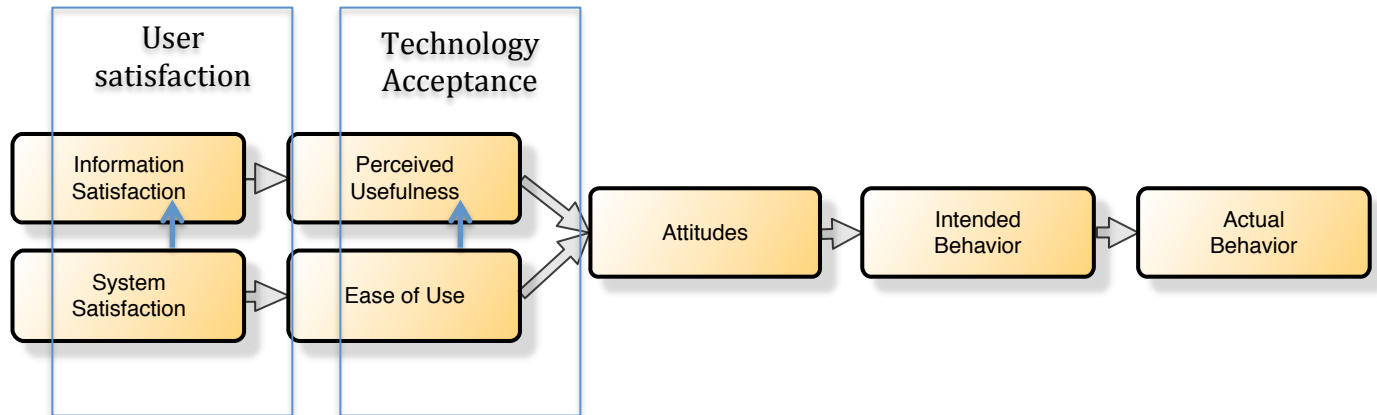


Figure 2: This figure illustrates Wixom & Todd's (2005) Integrated Model that contributes user satisfaction as a factor that impacts attitude, and ultimately technology behavior.

Technology Feedback Loop

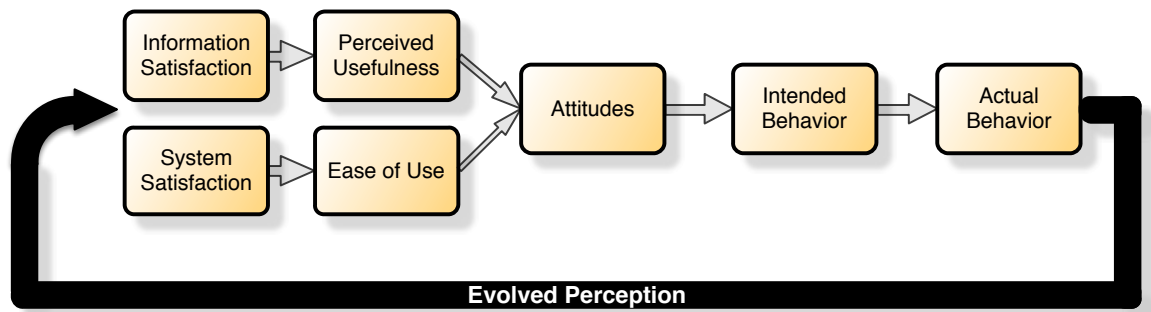


Figure 3: This figure illustrates a feedback loop in TRA. This feedback loop depicts that actual technology behavior will shape personal beliefs and ultimately factors into attitudes toward technology use in the future.

Tables

<u>Demographic info</u>	<u>Respondents</u>	<u>Percentage</u>
Year		
Freshman	44	56%
Junior	35	44%
In the Tablet Program	79	100%
Usage (per week)		
1-5 hours	57	72%
6-10 hours	15	19%
11-16 hours	5	6%
17+ hours	2	3%
Major		
Science	22	28%
Business	16	20%
Medical	15	19%
Liberal Arts	17	22%
Education	7	10%
Undecided	1	1%

N=79 students.

Table III

Multiple Regression Table

RQ1	B	SE B	β
prePU	0.253	0.075	0.380
preE	0.195	0.099	0.223

RQ2	B	SE B	β
PostPU	0.264	0.069	0.414
PostE	0.202	0.095	0.229

Notes: RQ1: $R^2=0.262$, ($p<0.05$) and RQ2: $R^2=0.294$, $p<0.001$

Table II		
<i>A priori Correlation</i>		
<u>Variables</u>	<u>r</u>	<u>Sig. (2-tailed)</u>
prePU-PostS	.478	.000
preE-PostS	.373	.001

Comparing pre-implementation technology acceptance variables (perceived usefulness and ease of use) to post-implementation user satisfaction. Significant at the $p < 0.001$ level.

<u>Question</u>	<u>Themes</u>	<u>Responses</u>	<u>Percent</u>
Positive	Apps	23	29%
	Class use	18	23%
	Portable	13	16%
	Alternative to computer	7	9%
	Email	5	6%
	Other	5	6%
	Not applicable	5	6%
	Books	4	5%
	Negative	Not used in class	18
Other tech devices		14	15%
Connection		11	12%
Not encouraged		10	11%
Money		9	10%
Function		6	7%
Unnecessary		7	8%
Don't use		7	8%
Distraction		6	7%
Access		4	2%
Change	Implement in class	12	18%
	Prof knowledge	10	15%
	Student knowledge	9	14%
	Improve quality	9	14%
	Choice for tablets	7	11%
	Get rid of program	6	9%
	Newer tablets	4	6%
	Don't use	3	5%
	Better wifi	3	5%
	Encourage use	2	3%

Responses to open-ended questions at the end of the survey. Three questions (positive, negative, and change) were categorized into emergent themes from common phrases or wording in responses.

Appendix: Survey

1. Consent to the survey (Y/N)
2. What year are you in school (F/So/J/Se)
3. Do you currently have a tablet provided by Winona State University? (Y/N)
4. How often do you use your tablet? (1-5, 6-10, 11-16, 17+ hours per week)
5. What is your major? (Open-ended)

Before you started using iPad minis on campus, did you believe or if you were to have been included in the decision to implement this technology, would you have expected the iPad minis to...

- ~~6. Improve your overall grades~~
7. Improve your overall grades
8. Improve your quality of work
9. Improve you productivity
10. Be a tool to complete homework assignments
11. Be confusing to use
12. Be difficult to learn/apply
13. Be easily adapted to school
14. Be easily accessible for you
15. Be timely in performing tasks
16. Be flexible to your needs
17. Be efficient at doing your work
18. Be integrated well with the campus

Did you believe or expect, before to the tablet program implementation in Fall 2013, that the **iPad minis would be...**

19. Current or up to date
20. Accurate
21. Presented in an understandable format
22. Comprehensive
23. Displayed in it's entirety

For the following questions describe your current perceptions on tablets **after** the Winona tablet program was implemented in the fall of 2013.

Do you **currently feel** that the **iPad minis** are...

- ~~24. Improved your exam performance~~
25. Improved your overall grades
26. Improved your quality of work
27. Improved your productivity
28. Been a tool to complete homework assignments
29. Seemed confusing to use
30. Been difficult to learn/apply
31. Easy to adapt to school
32. Easily accessible for you
33. Timely in performing tasks
34. Flexible in your needs
35. Efficient at doing work
36. Integrated well with the campus

37. Current or up to date
38. Accurate
39. Presented in an understandable format
40. Comprehensive
41. Displayed in it's entirety

Before you started using iPad minis on campus, did you agree with the following statements?

42. I thought the Winona State tablet program would be positive
43. I encouraged others to consider using tablets
44. I wanted to use my tablets for school purposes
45. I wanted to use my tablet for recreational purposes
46. I wanted to avoid using the tablet

After having used iPad minis on campus, how much do you agree with the following statements now?

47. I have said positive things about the Winona State tablet program
48. I have recommended others to use their tablets
49. I have used my tablet for school purposes
50. I have used my tablet for recreational purposes
51. I have avoided using my tablet

Optional open-ended questions

52. What are some of the positive outcomes you have experienced from having an iPad mini?
53. What are some of the negative outcomes you have experienced from having an iPad mini?
54. In the future, how would you like updates/changes in the program to be communicated to you?
55. What do you want to change or improve about the tablet program?