The Decision to Adopt Educational Technology in Technical Education: A Multivariate Study

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Approval Page

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Abstract

Since the seminal work of Davis in 1989 produced the Technology Acceptance Model (TAM), researchers have sought to extend the framework and use the resulting models to describe the predictors of technology adoption specific to various populations. Although the TAM has been used to understand the adoption of technology in higher education, most of the studies conducted have focused on traditional college degrees, and many of the past studies have been limited by using students as a sample rather than actual decision makers. In an attempt to address both of these problems, this study collected information from faculty, staff, administrators, and students of Central Georgia Technical College in middle Georgia. In the two-week period allowed for responses from the sample, 525 potential respondents took part producing 240 completed and useable data sets. An a priori analysis using G*Power 3.1.9.2 for an effect size of 0.15, a significance level (α) of 0.05, 8 predictor variables, and desired power of 0.95 calculated the needed number of respondents to be at least 74, by significantly exceeding this number the actual calculated power of the study was found to be 99.99%. Multiple regression analysis was used to test the first hypothesis that no significant relationships existed between the 8 predictor variables intent to use, perceived usefulness, subjective norm, perceived ease of use, self-efficacy, service quality, information quality, system quality and the variable of interest system use. At the desired significance level ($p < 0.005$), the results supported rejecting the hypothesis for all predictor variables. A better understanding of the factors that predict the adoption of technology will allow the stakeholders in technical education – faculty, administration, students, and the college as a financial entity – to realize

maximum growth, competitive advantage, and profit. Paired samples t-tests were used to address the second hypothesis that there was no significant difference between the group of faculty, administrators, and staff that had volitional control and the group of students that possessed no volitional control in the decision to adopt technology. For the sample used, there was not sufficient evidence to support rejecting the proposed hypothesis.

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Chapter 1: Introduction

The decision to adopt technology in technical education affects many stakeholders including the educator, students, and the college (Borrego, Froyd, & Hall, 2010; Murray, 2008). During the decision-making process, an educator considers experiences, feelings of self-efficacy, habits, hearsay, and organizational politics to reach a conclusion (Guinea & Markus, 2009; Kim, 2009; Klein & Stern, 2009). The educator must balance the factors that influence the decision making process while guaranteeing that the adoption rate of a new technology serves the best interest of all stakeholders (Blaskovich, 2008; Soffer, Nachmias, & Ram, 2010). Since the underlying goal of technical education is to prepare students to enter the workforce, the stakeholders group contains instructors, students, employers, and administration within the school (Borrego, et al., 2010; Ivancevich, Konpaske, & Matteson, 2005; Technical College System of Georgia, n.d.)

A technical college is analogous to a living entity that is the sum of many complex relationships and interactions between internal organs and groups of like cells that react to internal and external stimuli (Kanthawongs, 2011; Knowles, 2002). In turn, an individual technical college is one of the many building blocks that comprise a statewide approach or system for providing technical education. An individual instructor or program chair is typically responsible for a unit of a program including the decision to implement new technology (Technical College System of Georgia, n.d.).

To look at the overall adoption of technology at a school or school system level would be akin to viewing the outcome of a war as the accumulation of victories won in individual battles. When popular opinion in favor of or against adopting technology spreads across a school, momentum forms in the same fashion that winning battles create a surge of confidence for one side of opposing forces in a war (Ormerod & Rosewell, 2009; Polites & Karahanna, 2012). From this standpoint it is easy to recognize that positive change can be affected if college leaders successfully identify the factors that lead decision makers to the decision to adopt technology and intervene proactively, but one must also acknowledge that failure to adopt current technology in the classroom will lead to the production of students that are ill-prepared for the workplace (Kanthawongs, 2011; Murray, 2008). Additionally, these same students are in a negative position relative to their counterparts that experienced current technologies in the classroom (Türel & Johnson, 2012).

Background

In order to affect a lasting change in the overall behavior of faculty and administration in technical education, it is necessary to determine the factors that contribute to an instructor's resistance to adopting new technologies (Ivancevich, et al., 2005; Venkatesh & Bala, 2008). To understand the nature of the barriers that exist, leaders must identify the participants, relationships, and goals that are at play in the organization (Elie-Dit-Cosaque, Pallud, & Kalika, 2011/12; Knowles, 2002). Once leaders become aware of the factors that slow the adoption of technology, intervening measures can be taken to reduce resistance and promote the adoption of technology (Venkatesh & Bala, 2008).

The internal factors of interest are contributed by the perception of the decision makers regarding their skills with similar technology, the relative ease with which the technology can be used, and the usefulness of a given technology for performing the daily activities of transacting technical education (Park, 2009; Wang & Wang, 2009; Wu

& Gao, 2011). Many researchers since Davis (1989) have sought to extend the understanding of how a decision maker's personal beliefs affect the decision making process including investigation into the factors that influence the perceptions of ease of use and usefulness (DeLone & McLean, 2003; Guinea & Markus, 2009; Venkatesh, Norris, & Davis, 2003; Wu & Gao, 2011). Additionally, studies have been conducted to determine which factors will drive a decision maker's personal beliefs to favor adoption of a technology (DeLone & McLean, 2004; Favero & Hinson, 2007; Hall, 2010; Hixon & So, 2009; Türel & Johnson, 2012).

External factors of interest in this study will be perceptions of information quality, system quality, service quality, and the opinions of influential individuals in the decision maker's work environment including colleagues, administrators, and students (Mohd, Ahmad, Samsudin, & Sudin, 2011; Venkatesh, Thong, & Xu, 2012; Wang & Wang, 2009). Typically, researchers describe the influence of external factors in terms of subjective norm or the perception of opinions held by influential people in the population (Polites & Karahanna, 2012). Additionally, some external factors such as training, time to practice, and availability of support can create an initial moderating effect on perceived ease of use (Hall, 2010; Hixon & So, 2009).

Studies have been conducted to determine the students' satisfaction with technology, but the influence on the decision making process should come from the decision maker's perception of the students' ability to benefit from the introduction of technology (Kanthawongs, 2011; Yousafi, Foxall, & Pallister, 2010). Although it must be noted that student usage is necessary for successful implementation of technology, faculty are generally reluctant to invest time in developing and using technology that is not believed to be acceptable by students. Additionally, students are more likely to become active learners and benefit from technology when they perceive that faculty opinions of the technology are supportive (Kanthawongs, 2011). It is for these reasons that students are included as stakeholders and members of the group of influential others that comprise the decision maker's subjective norm (Wang & Wang, 2009).

Considerations of the influences exerted by the decision maker, colleagues, and students account for the input of relevant actors in seeking to understand the motivating factors that drive the decision to adopt technology in technical education (Elie-Dit-Cosaque, Pallud, & Kalika, 2011/12). The current literature suggests a significant flaw in many studies examining the usage of the Technology Acceptance Model to describe the factors influencing the adoption of technology in higher education with regards to sample selection (Venkatesh, Morris, Davis, & Davis, 2003; Yousafzi, Foxall, & Pallister, 2012). Many studies of the past have used students as a sample to study the predictive power of the TAM. The choice of non-decision makers as a sample population adds bias to studies that attempt to generalize results to actual decision making populations (Venkatesh, Morris, Davis, & Davis, 2003; Yousafzi, Foxall, & Pallister, 2012).

Statement of the Problem

Although faculty members in higher education follow the adoption trends of industry to ascertain current content for classes, educators do not adopt technology at the same rate as industry which can lead to failure to grow student populations, increases in the cost of education, and reductions in student engagement (Favero & Hinson, 2007; Luppicini, 2012; Murray, 2008). The adoption of technology in higher education promotes improved return on investment (ROI) for colleges, removal of geographic and temporal barriers for students, enhanced content delivery in the classroom, and greater productivity for instructors (Luan & Teo, 2009; Ormerod & Rosewell, 2009; Schulte, 2010; Shoham & Perry, 2009). In light of the reported benefits observed when technology adoption rates in higher education increase, the amount of time required for implementing new technology in higher education exceeds the adoption rates for the same technology in industry by a factor of two (Murray, 2008).

The problem is that college decision makers create a period of reduced competitive advantage when they fail to adopt available technologies for use in the classroom. This reduction in competitive advantage relative to peers can lead to declining enrollment trends and the production of students who are at a disadvantage in the job market relative to their peers from other schools (Keengwe, Kidd, & Kyei-Blankson, 2009; Murray, 2008; Türel & Johnson, 2012). In the field of technical education, technical college instructors bear the responsibility for influencing the adoption rate of technologies used to facilitate the delivery of information, but understanding the determinants of technology adoption allows leaders to intervene in ways that promote increased adoption of technology (Technical College System of Georgia, n.d.; Venkatesh & Bala, 2008). For the purposes of this study, the following determinants will be considered as contributing to the decision making process: perceived ease of use, perceived usefulness, subjective norm, self-efficacy, system quality, information quality, and service quality.

In this quantitative study, I will address the issue of identifying the internal and external factors that lead instructors in a technical college system to adopt new technologies by gathering information via a questionnaire developed by Wang and Wang

(2009) to collect information specific to the technical college system in Georgia. The decision to adopt technology can be described as a combination of beliefs about self, outside entities, and a given technology (Elie-Dit-Cosaque, Pallud, & Kalika, 2011/12). This study will also address the documented problems associated with using sample populations that are composed of students by surveying, instead, the actual professionals (Venkatesh, Norris, & Davis, 2003; Venkatesh, Thong, & Xu, 2012; Yousafzai, Foxall, & Pallister, 2010).

Purpose of the Study

The purpose of this quantitative study was to investigate the internal and external factors that contribute to adoption rates for new technology in the field of technical education and whether students used in technology acceptance studies constitute a valid sample to approximate faculty as decision makers. Specifically, the information quality, service quality, system quality, self-efficacy, perceived usefulness, perceived ease of use, and subjective norm will be explored using a multivariate statistical model to determine their relationship with the decision to adopt technology. Additionally, a comparison of results obtained from students and faculty members was used to investigate the common practice of using students as a sample in Technology Acceptance Model (TAM) studies. The questionnaire was administered to a sample composed of approximately 445 faculty members and 7665 students located within one of twenty-five colleges that compose the technical college system located in a southeastern state of the United States. By identifying the factors that contribute to the choice to adopt technology, it might be possible to promote increased adoptions of technology in technical education by removing the identified barriers (Murray, 2008).

Theoretical Framework

In order to investigate the factors that lead to the adoption or rejection of technology in technical education, it is necessary to evaluate the role of the actors with a vested interest in the decision (Elie-Dit-Cosaque, Pallud, & Kalika, 2011/12). The primary actors of interest were the decision making individual with a level of freedom to make decisions, the colleagues within the decision maker's organization that exercise influence, and the potential students who are subjected to the technology in the classroom (Kanthawongs, 2011; Yousafi, Foxall, & Pallister, 2010; Wu & Gao, 2011; Venkatesh, Morris, Davis, & Davis, 2003). To address this combination of participants, this study used combined aspects of the Technology Acceptance Model (TAM), Theory of Reasoned Action (TRA), Theory of Planned Behavior (TRB) and the Diffusion of Innovation (DoI) theory in the fashion proposed by Wang and Wang (2009) in the extension of TAM. Attempts to combine and modify many such theories to produce a multi-faceted description of technology acceptance and decision making with regards to technology have come to be known by other researchers as the Unified Theory of Acceptance and Use of Technology (UTAUT) (Kanthawongs, 2011; Luan & Teo, 2009; Polites & Karahanna, 2012, Venkatesh, Morris, Davis, & Davis, 2003).

The Technology Acceptance Model stems from the work of Fred Davis (1989) in the mid-1980s. TAM describes the decision to adopt technology as the result of a decision maker's attitude toward computer use (Davis, Bagozzi, & Warsaw, 1989). By drawing on the self-efficacy theory, the Theory of Reasoned Action, and cost-benefit analysis, Davis (1989) reasoned that the variables perceived ease of use and perceived usefulness determined a decision maker's attitude toward computer use. As TAM evolves, researchers have posited many external variables that moderate perceived usefulness and perceived ease of use (Polites & Karahanna, 2012; Venkatesh, Morris, Davis, & Davis, 2003). It is through the addition of specialized moderating variables that TAM can be customized or tailored to describe technology adoption in specific populations (Elie-Dit-Cosaque, Pallud, & Kalika, 2011/12).

The Diffusion of Innovation model describes the diffusion of a technology through a communication medium to reach a social group in a given unit of time (Soffer, Nachmias, & Ram, 2010). The DoI model breaks the decision to adopt a technology into a process that progresses through five steps that range from initial awareness of the technology to the decision to use the technology to satisfy a need (Borrego, Froyd, & Hall, 2010). It is during this diffusion through a communication medium that external factors influence the decision to use technology (Ormerod & Rosewell, 2009; Vannoy & Palvia, 2010). Wang and Wang (2009) express the values that are contributed by the subjective norm in terms of three independent variables system quality, information quality, and service quality as borrowed from Delone and McLean (2003).

The Unified Theory of Acceptance and Use of Technology was created by pioneers such as Davis and Venkatesh in the field of explaining technology adoption to tie together existing theories and extend TAM to be used in organizational contexts (Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh, Thong, & Xu, 2012). UTAUT predicts the adoption of technology in an organization in terms of four factors: performance expectancy, effort expectancy, social influence, and facilitating decisions (Venkatesh, Morris, Davis, & Davis, 2003). Venkatesh, Thong, and Xu (2012) added hedonic motivation to arrive at five factors for predicting technology adoption. Hedonic motivation can be described as the pleasure realized from using a given technology (Venkatesh, Thong, & Xu, 2012).

Since the seminal work of Davis (1989) drew on the Theory of Reasoned Action, Cost-Benefit paradigm, and self-efficacy theory to create the Technology Acceptance Model, researchers have continually sought to extend factors of perceived usefulness and perceived ease of use to create new theories that explain technology adoption in many populations. The independent variable, perceived usefulness, refers to a decision maker's belief that a technology is capable of successfully solving a problem encountered or that the technology has the strength to increase the potential for realizing benefits (Luan & Teo, 2009). While the independent variable perceived usefulness is related to the anticipated outcome of adoption, the independent variable, perceived ease of use, represents a decision maker's perception of the amount of effort that is required to implement a given technology (Park, 2009). Additionally, it should be noted that TAM is most effective when applied to use an amalgamation of theories created and tested by Wang and Wang (2009) to explain the factors that lead to the adoption of technology in technical education. Most subsequent theories of TAM, including works by Davis and other notable TAM scholars such as Venkatesh, have included subjective norm as an additional factor for influencing a decision maker's attitude toward computer use (Holden & Karsh, 2010; Venkatesh & Bala, 2008; Venkatesh Morris, Davis, & Davis, 2003). It is from these origins and subsequent theories that the independent variables perceived ease of use, perceived usefulness, subjective norm, service quality, information quality, system quality, and computer self-efficacy are chosen (Davis, 1989; Venkatesh, Morris, Davis, & Davis, 2003; Park, 2009; Wang & Wang, 2009). This addition of factors related to subjective norm allows the TAM to be expanded to realize greater predictive power for populations where decision makers possess only a limited amount of volitional control (Venkatesh, Morris, Davis, & Davis, 2003; Yoo & Huang, 2011).

The Diffusion of Innovation theory describes the perception and progression of technology from initial awareness through the decision of whether to implement and use a given technology (Borrego, Froyd, & Hall, 2010). People who have experienced a given technology project opinions that influence the perception of those around them (Cavusoglu, Hu, Li, & Ma, 2010). It is in this fashion that DoI theory further supports the need for the independent variable subjective norm that is expressed in the opinion of colleagues, opinion of students, and the support of administration. Additionally, DoI supports the need for variables that can improve a decision-maker's opinion toward a technology such as availability of training and support that is reflected in service quality and system quality (Hall, 2010; Hixon & So, 2009; Türel & Johnson, 2012, Wang & Wang, 2009).

In keeping with the tenets of TAM, it is necessary to use the perception of student self-efficacy with technology rather than the tested values for actual students' technology skills. It is in this way that this proposed study differs from the work of Kanthawongs (2011) which used student satisfaction as a surrogate for perceived usefulness. To measure this perception of student skills, the feedback received by the decision maker from students is used rather than actual test results.

The combined work of Venkatesh, Morris, Davis and Davis (2003) sought to produce a Unified Theory of Technology Acceptance (UTAUT) which combined many theories in an attempt to produce an overall theory of technology acceptance. It is in this fashion that the theoretical framework used in this study seeks to explain the general adoption of technology in the field of technical education. This combination of theoretical constructs contributes to the body of academic knowledge by creating an extension of TAM and testing the extension in a new population (Venkatesh, Thong, & Xu, 2012). Additionally, the study addresses the concerns of past researchers by using a sample population that is composed of actual decision makers in the field of interest (Venkatesh, Norris, & Davis, 2003; Venkatesh, Thong, & Xu, 2012; Yousafzai, Foxall, & Pallister, 2010).

According to Luan and Teo (2009), the Technology Acceptance Model (TAM) describes the adoption of a new technology as the result of an educator's deliberating while considering their attitude toward technology use, perceived usefulness of the technology, and perceived ease of use of the technology. Additionally, it is necessary when analyzing the decision to adopt technology in technical education to consider the educator's level of confidence in successfully demonstrating computer skills (Kanthawongs, 2011). Kanthawongs (2011) explains this needed addition by noting that faculty will not adopt technology that is not expected to be successful when implemented.

The Diffusion of Innovation (DoI) model describes the rate of adoption as the time elapsed between the introduction of an innovation and the time that a specified percentage of the population implements the innovation (Borrego, et al., 2010). The factors that will influence the rate of diffusion of an innovation into a population include: the educator's awareness of the technology, the influence of colleagues and administrators, and the type of technology under consideration (Borrego, et al., 2010). By combining multiple theories, a new model is produced that addresses the problem of describing the factors that influence the decision to adopt technology in technical education by considering the roles played by the stakeholders involved. Interventions that successfully promote and increase the position of factors that promote adoption of technology or reduce the strength of factors that detract from technology adoption can serve to contribute to solving the identified problem of reduced RoI for stakeholders in technical education (Blaskovich, 2008; Soffer, Nachmias, & Ram, 2010).

Research Questions

The primary focus of this research is broken down into two research questions. The first question used to investigate whether the factors established in a previous study by Wang and Wang (2009) are influential in describing the decision to adopt technology in technical education. The second question used to investigate any significant differences that may exist in data collected from sample of decision makers and students using the same survey instrument.

Q1. What are the significant relationships between perceived ease of use, perceived usefulness, subjective norm, self-efficacy, system quality, information quality, service quality, intent to use, and the decision to adopt technology?

Q2. What are the significant differences between survey results obtained from a faculty sample and a student sample within a technical college?

Hypotheses

The null and alternate hypotheses $H1_0$ and $H1_a$ are associated with research question 1, and the null and alternate hypotheses $H2_0$ and $H2_a$ are associated with research question 2.

H1$_0$. There is no significant relationship between perceived ease of use, perceived usefulness, subjective norm, self-efficacy, system quality, information quality, service quality, intent to use, and the decision to adopt technology.

H1$_a$. There is a significant relationship between perceived ease of use, perceived usefulness, subjective norm, self-efficacy, system quality, information quality, service quality, intent to use, and the decision to adopt technology.

H2$_0$. There is no significant difference between survey results obtained from a faculty sample and a student sample within a technical college**.**

H2$_a$. There is a significant difference between survey results obtained from a faculty sample and a student sample within a technical college**.**

Nature of the Study

The purpose of this quantitative study is to investigate the effect that the independent variables perceived usefulness, perceived ease of use, subjective norm, self-efficacy, system quality, information quality, and service quality have in influencing the dependent variable adoption of technology. The selection of variables used for this study was chosen by combining the various evolutions of the Technology Acceptance Model (including Unified Theory of Technology Acceptance and Use), Theory of Reasoned Action, Theory of Planned Behavior, DeLone and McLean model, and the Diffusion of Innovation theory (Polites & Karahanna, 2012; Venkatesh, Morris, Davis, & Davis, 2003; Wang & Wang, 2009). In its original form, TAM required the study of decision makers with complete autonomy to make decisions in order to realize maximum predictive power of the model, but later incarnations account for subjective norm which allows the application of the model to realize improved predictive power when subjects possess only limited amounts of volitional control over the decision making process (Park, 2009; Polites & Karahanna, 2012; Venkatesh, Morris, Davis, & Davis, 2003).

In keeping with the combination of theories, a survey instrument found in Appendix A was borrowed with permission found in Appendix B from Dr. Wang. Each of the questions chosen was answered by respondents using a 7 point Likert scale composed of the responses strongly agree, agree, mildly agree, undecided / not sure, mildly disagree, disagree, and strongly disagree. This scale was chosen primarily due to its prevalence in the literature and instruments reviewed.

The survey was pilot tested using 5 faculty members from a school providing higher education and 2 graduate students as test subjects. The pilot survey was delivered online using Survey Monkey. This allowed the survey to be tested to determine any potential problems in delivery or presentation. Additionally, pilot testing was used to gain understanding of the delivery system's features and behavior, determine approximate time for completion of questions, and to receive feedback concerning interpretation of the questions.

A common observation/comment received by 3 reviewers centered around the original arrangement of delivering all content on a single page. To address this concern, the survey was broken into smaller pieces by grouping questions according to the variable that the question was intended to address. This yielded a survey that had 6-10 items per page which was more consistent with the respondent's recommendations for number of items that led to ease of reading.

The survey was delivered to faculty members and students of a school within the Technical College System of Georgia that is composed of three campuses using Survey

Monkey as a delivery method. Respondents were e-mailed instructions for completing the survey in a specified period of time. The respondents and any concerned parties at the host school were offered access to the data collected and analyzed in this study in aggregate form. The school providing respondents was chosen by convenience sample to overcome limited access and availability restrictions.

Grimm and Yarnold (1995) suggest that it is appropriate to use multiple regression analysis when multiple independent variables create a network of interactions that lead to a single outcome or dependent variable. The model used in this study, hypothesizes that the dependent variable decision to adopt or system usage is influenced by the eight independent or predictor variables: information quality, system quality, service quality, perceived usefulness, perceived ease of use, subjective norm, intention to use, and self-efficacy. Descriptive statistics were applied to the demographic data collected to analyze the composition of the sample population (Jackson, 2005; Norusis, 2008). SPSS was used to analyze and prepare results from the data collected by the questionnaire that was delivered using Survey Monkey.

Significance of the Study

Determining the factors that influence the adoption of technology in technical education might benefit the stakeholders involved in technical education and contribute to the body of academic knowledge in several ways. The successful identification of factors contributing to the adoption of technology will allow administrators charged with college leadership to develop interventions and strategies that promote the successful use of technology. An increase in technology adoption could benefit the school, faculty members, and students.

Increased adoption of technology might benefit students in technical education who embrace the use of technology and use it to become active learners (Borrego, Froyd, & Hall, 2010; Türel & Johnson, 2010; Kanthawongs, 2011). Additionally, technology can serve to benefit students by creating an increased state of connectedness with teachers and fellow students (Blaskovich, 2008). The college as an entity could benefit by being able to use technology to remove spatial and temporal barriers that prevent students from attending conventional classes (Soffer, Nachmias, & Ram, 2010). Faculty members could benefit from increased productivity experienced by utilizing technology to conduct daily activities in a more efficient manner (Luan & Teo, 2009). In general, increasing the adoption rate of technology in technical education serves to increase productivity for students and teachers while improving return on investment for the colleges involved (Blaskovic, 2008; Borrego, Froyd, & Hall, 2010; Luan & Teo, 2009; Türel & Johnson, 2010; Kanthawongs, 2011; Soffer, Nachmias, & Ram, 2010).

From a theoretical perspective, this study extended the body of academic knowledge by illuminating the combination of factors that influence the adoption of technology in technical education, correcting the sample bias introduced in many studies by using students rather than decision makers as respondents, and attempt to validate the predictive power of the combined constructs in a new population. Studies estimate that as many as 40% of the TAM surveys conducted have used students as a sample group which in turn produces results that are difficult to generalize and replicate in actual populations (Ahmad, Madarsha, Zainuddin, Ismail, & Nordin, 2010). Understanding the factors that promote technology adoption in technical education provides a framework for management strategies that can be designed to narrow the gap between technology adoption in industry and fields of higher education (Murray, 2008; Kanthawongs, 2011).

Definition of Key Terms

Adoption. Adoption is defined as an action undertaken when an individual gains awareness of a technology, practices the technology, and implements the technology to accomplish work (Murray, 2008).

Agglomeration. The term agglomeration describes the combination of a group of varied pieces, such as educators representing various fields of study, combining to produce a diverse group (Ormerod & Rosewell, 2009).

Attitudes toward computer use (ATCU). The variable and term attitude toward computer use is the sum of positive and negative experiences acquired by using computers in the workplace (Luan & Teo, 2009). ATCU can change over time given that experiences and mediating factors such as training are accrued on a daily basis (Luan & Teo, 2009).

Availability of training and support (AoTS). The term availability of training and support indicates the presence or absence of training activities, the opportunity of faculty to participate in the activities, and the availability of adequate support staff (Luan & Teo, 2009).

Decision to Adopt (DoA). The decision to adopt a given technology occurs when a decision-maker considers available options, makes a selection, and begins to take steps to utilize the selected technology to affect a desirable outcome (Davis, 1989). This term is used interchangeably with system usage throughout this paper.

Diffusion of Innovation (DoI). The Diffusion of Innovation theory attempts to describe the rate of implementation of an adopted technology into a population (Soffer, et al., 2010). Diffusion of technology will cycle through a process of awareness, deliberation, and implementation (Cavusoglu, Hu, Li, & Ma, 2010).

Digital immigrant. Digital immigrants refer to people who were exposed to technology later in life after methods for accomplishing common task were established (Gao, Dobson, & Petrina, 2008).

Digital native. Digital natives refer to people who grew up exposed to technology (Gao, Dobson, & Petrina, 2008).

Information Quality (IQ). The variable and term information quality comes from the DeLome and McLean model as used to indicate the quality of the output of an information system (Wang & Wang, 2009).

Innovation. An innovation is defined as a concept, individual, or thing that is perceived as new by a group (Murray, 2008; Ormerod & Rosewell, 2009). Innovation is commonly used interchangeably with the term technology (Murray, 2008).

Integrative framework of technology use (IFTU). The integrative technology for computer use postulates that adding post adoption factors such as habit and feedback to the Technology Acceptance Model creates a better explanation of technology use in higher education (Kim, 2009).

Intent to Use (ITU). The term and variable indicate a feeling of favoritism toward a given technology relative to alternative choices (Wang & Wang, 2009).

Organizational Change. Organizational change must proceed through a three step process that begins with unfreezing accepted norms and patterns of activity, implementing the desired change in organization-wide behavior, and re-freezing to create a new organizational culture or status quo (Ivancevich, et al., 2005).

Opinion of colleagues (OoC). The term opinion of colleagues describes the perceived favor or displeasure that an educator's co-workers display toward technology (Borrego, Froyd, & Hall, 2010). This term is used as an integral component of subjective norm.

Perceived ease of use (PEU). The variable and term perceived ease of use describe a respondent's opinion or perception that a technology can be used to solve a problem with a relatively low expenditure of effort and a reasonable chance of success (Luan & Teo, 2009).

Perceived Student Computer Competency Skills. The term perceived student computer competency skills are described by the author of this study as a respondent's perception of the general level of computer skills possessed by average students. This information is based upon feedback gathered from current and former students with respect to other technologies that are similar in nature. This term is used as an integral component of subjective norm.

Perceived usefulness (PU). The variable and term perceived usefulness describe a respondent's opinion or perception that a technology can be useful in accomplishing a desired task (Luan & Teo, 2009).

Rate of Adoption. The rate of adoption of technology is measured in the length of time required for a given percentage of a population to implement a new technology (Murray, 2008).

Self-efficacy (SE). The variable and term self-efficacy refers to an individual's confidence with respect to successfully using a technology (Wang & Wang, 2009).

Service Quality (SeQ). The variable and term service quality comes from the DeLome and McLean model as used to indicate the level of support offered or available to users of an information system (Wang & Wang, 2009). This term includes training, technical support, and time to practice among other things.

State Higher Education Coordinating Boards (SHECB). A statewide higher education coordinating board is defined as a state-level institution that is responsible for overseeing and governing different branches of higher education within a specified state (Murray, 2008).

Subjective norm (SN). The variable and term subjective norm refer to the perceived pressure or influence exerted by significant others in an individual's environment (Wang & Wang, 2009). In the case of the decision maker, the stakeholders and colleagues constitute the subjective norm.

Support of administration. The term support of administration reflects the positive or negative perception of support for a given technology that is accredited to members of administration (Borrego, Froyd, & Hall, 2010). This term is used as an integral component of subjective norm.

System Use (SU). The term and variable indicate the decision to enact the use of a given technology to solve a problem that exists following the weighing of alternative solutions (Davis, 1989; Wang & Wang, 2009). This term is used interchangeably with decision to adopt as the dependent variable of this study.

System Quality (SQ). The variable and term system quality comes from the DeLome and McLean model as used to indicate the performance of an information system (Wang & Wang, 2009).

Technology. A technology is a description of an interaction that explains a cause and effect relationship. Technology is commonly used interchangeably with the term innovation (Murray, 2008). For the purpose of this paper, technology is considered an innovation or computer-generated enhancement to transacting technical education.

Technology Acceptance Model (TAM). The Technology Acceptance Model postulates that a user's decision to utilize a given technology is directly influenced by the perceived ease of use and usefulness of the technology along with the user's attitude toward technology use (Chin, Johnson, & Schwarz, 2008).

Summary

By combining several theories related to adoption and diffusion of technology, it is possible to produce a comprehensive theory that describes the major factors that lead a decision maker to adopt or reject technology as a solution to problems in the classroom. This study proposes to implement a model and questionnaire created by Wang and Wang (2009) to study faculty and student populations within the Technical College System of Georgia in an effort to further the field of technology adoption research. A better understanding of the factors that influence the adoption of technology in the classroom allows steps to be taken that might promote technology adoption and allow stakeholders to recognize maximum benefits (Kanthawongs, 2011; Murray, 2008; Ormerod & Rosewell, 2009). Information relating to the differences of opinions relating to adopting technology between faculty and students in the area of technical education could provide insight to help guide future research endeavors.

Chapter 2: Literature Review

The purpose of this quantitative study is to investigate the internal and external factors that contribute to adoption rates for new technology in the field of technical education. The search strategies used during the course of preparing and executing this study include searching for related articles using Google Scholar, the Northcentral University library, the Central Georgia Technical College library, and the Middle Georgia State College library. While researching in these libraries, the following databases were used Ebscohost, Proquest, LexisNexis, dissertations, and Business Source Complete. During the process of searching for articles, many search strings were used such as: *technical education, higher education faculty, technology acceptance model, diffusion of innovation, content based adoption model, computer self-efficacy, subjective norm, technology adoption,* and *benefits of technology.* During initial research, approximately ninety-five articles were located and reviewed. Over time some articles were removed for various reasons while others were acquired and added.

This review of literature relevant to the study is divided into six major sections describing the Technology Acceptance Model, the Unified Theory of Acceptance and Use of Technology, the Diffusion of Innovation theory, the decision to adopt technology, the benefits of adopting technology in higher education, and the barriers that possibly inhibit the decision to adopt technology. The section related to the Technology Adoption Model is divided into subsections explaining the evolution of TAM over time, perceived usefulness, perceived ease of use, and attitude toward computer use. The section related to the Diffusion of Innovation theory is subdivided in a similar fashion to describe the opinions of colleagues, support of administration, availability of training and support, and feedback collected from students. Following the review of applicable literature and topics, this chapter concludes with a summary.

Technology Acceptance Model

The Technology Acceptance Model (TAM) found its origins in the work of Fred Davis in the mid-1980s while Davis sought to develop a new framework that could be used to address and explain user acceptance of computers (Davis, 1989). Drawing on previous studies, Davis (1989) noted that many benefits could be observed from adopting technology-based solutions, but many users were unwilling to adopt technology in the execution of daily work-related tasks. Following this foundational research by Davis, the Technology Acceptance Model has grown and evolved to become one of the most utilized and studied models in the field of information systems research (Venkatesh, Thong, & Xu, 2012).

In its early conceptions, the TAM framework was inspired by theories from different fields such as the Expectancy theory, cost-benefit paradigm, self-efficacy theory, Adoption of innovations theory, channel disposition theory, Theory of Reasoned Action, and Theory of Planned Behavior (Davis, 1989; Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh, Thong, & Xu, 2012; Yousafzai, Foxall, & Pallister, 2012). Given that the original creation of TAM came from combining work from many fields, it is appropriate that TAM has been extended and used to explain technology adoption in various populations such as the population of interest in this study (Davis, 1989; Venkatesh, Morris, Davis, & Davis, 2003). Two independent variables that are found in the original version of TAM and carried into most subsequent incarnations of the theory are the variables perceived ease of use and perceived usefulness (Davis, 1989; Luan &

Teo, 2009; Venkatesh, Morris, Davis, & Davis, 2003). Most subsequent theories evolve from the addition of consideration of the moderating effects of environmental factors on the perceived usefulness and perceived ease of use (Yousafzai, Foxall, & Pallister, 2010).

When creating the Technology Acceptance Model, Davis (1989) drew on expectancy theory to justify the position for perceived usefulness by concluding that people would not favor or adopt a technology that does not satisfy or facilitate objectives in the workplace. The resulting definition for perceived usefulness describes a decision maker's opinion or perception that a technology can be useful in accomplishing a desired task (Luan & Teo, 2009). This idea is applicable in the field of technical education in light of the observation that teachers are reluctant to invest time developing technology usage that is not perceived to have potential benefit (Kanthawongs, 2011).

The development of the independent variable perceived ease of use came from the theory of self-efficacy (Davis, 1989). Self-efficacy reflects an individual's estimation of the likelihood that they will be able to succeed at a given task (Ivancevich, Konopaske, & Matteson, 2005). Perceived ease of use is further augmented by adding concepts from the cost-benefit paradigm to calculate relative value of adopting a given technology over other available options (Davis, 1989; Laurillard, 2007). Perceived ease of use describes a respondent's opinion or perception that a technology can be used to solve a problem with a relatively low expenditure of effort and a reasonable chance of success (Luan & Teo, 2009).

Many TAM researchers site the Theory of Reasoned Action (TRA) and its successor the Theory of Planned Behavior (TPB) as fundamental supporters of the TAM framework based on perceived ease of use and perceived usefulness (Kanthawongs, 2011; Venkatesh, Morris, Davis, & Davis, 2003). The TRA comes from the work of Ajzen and Fishbein in the 1960s through the 1980s, and it was later refined to produce the TPB by Ajzen in the 1990s (Southey, 2011). TRA posits that a person's intention to carry out an activity or behavior is based on their attitude toward the behavior and the influence of influential people in their environment (Southey, 2011).

The evolution of TRA to form TPB was accomplished by adding the individual's perception of the relative amount of control over the decision making process that the individual thought themselves to possess (Southey, 2011; Venkatesh, Morris, Davis, & Davis, 2003). Southey (2011) asserts that TRA has reasonable success predicting the behavior of individuals in small populations but identifies a literature gap in research applying the TRA and TPB to larger populations and business applications. TPB incorporates the idea of perceived behavioral control which strongly supports the idea of user self-efficacy that gives rise to perceived ease of use (Elie-Dit-Cosaque, Pallud, & Kalika, 2011/12).

In the original TAM studies, Davis (1989) concluded that perceived usefulness was more strongly associated with the decision to adopt a given technology than perceived ease of use, but perceived ease of use influenced the decision to adopt a technology and had a moderating effect on perceived usefulness as well. Later studies by a host of other researchers have verified this conclusion across diverse populations (Holden & Karsh, 2010; Park, 2009; Polites & Karahanna, 2012; Venkatesh, Morris, Davis, & Davis, 2003; Wang & Wang, 2009). The overall conclusion reached by Davis (1989) and others to follow is that perceived ease of use and perceived usefulness contribute to an overall attitude toward computer usage that directly leads to an intent to use technology and ultimately to adoption and usage (Yousafzai, Foxall, & Pallister, 2010; Zhang & Xu, 2011).

As the TAM matures, researchers have used the TAM framework to approach the study of technology adoption from a host of different perspectives such as for the support of business decision making, improved return on technology investment, and as a source for understanding the decisions of individuals who choose to adopt or reject technology in the workplace (Yousafzai, Foxall, & Pallister, 2010). TAM is an excellent choice for studies related to the adoption of technology because it has been shown to exhibit repeated validity in multiple populations and to be highly parsimonious (Wu & Gao, 2011; Zhang & Xu, 2011). The changing perspectives investigated by TAM researchers reflect a change in scope as the framework evolves. Originally, TAM was considered to possess predictive power when the population of interest was composed of individuals that possessed complete control over the decision making process; but with the addition of variables that account for the influence of other actors, TAM gained predictive power in populations where the decision maker possesses only a limited amount of decision making autonomy (Park, 2009). TAM is considered to gain strength when contextual factors are added to subjective norm to tailor the resulting model to a specific population. This expansion increases TAM's predictive power and adds to the existing body of TAM literature (Wang & Wang, 2009).

In many cases, the factors that lead the decision maker to the decision to adopt technology depend on the same or similar factors that are used in shopping for everyday items such as groceries, household items, and clothes. The decision maker must be reasonably certain that a technological solution or innovation will accomplish a desired task and allow the decision maker to successfully fulfill task related objectives. That is to say, that a teacher in the role of decision maker will not invest time and effort into using a technology without a reasonable expectation of a successful outcome (Kanthawongs, 2011). The Technology Acceptance Model describes this concept as the perceived usefulness (PU) of a given technology (Luan & Teo, 2009).

Perceived usefulness can be defined as a decision maker's level of belief that technology will provide a solution for the the decision maker in the execution of his job functions (Kanthawongs, 2011). The technology can be viewed as having a high level of perceived usefulness by simply enhancing the performance of job functions without providing a complete or total solution (Wu & Gao, 2011). Obviously, perceived usefulness can results from a decision maker's firsthand experience with the technology or from using a similar technology in the past, but a new technology will force the decision maker to turn to outside influences and sources of information (Yousafzai, Foxall, & Pallister, 2010).

In the initial stages of awareness when opinions are forming related to a new technology, a decision maker must rely on what is learned from others (Venkatesh, Morris, Davis, & Davis, 2003). In this case, the influence of others in the decision maker's environment is referred to as subjective norm (Park, 2009). At a midpoint in the formation of perceptions about usefulness of the technology, a crossover effect will occur between experience and subjective norm (Venkatesh & Bala, 2008). Given the choice between relying on personal knowledge and accepting the information provided by influential others, personal experience over time will replace external information and influence as the nearly total source for perceived usefulness and its resulting influence on attitude toward computer use (Venkatesh & Bala, 2008; Wang & Wang, 2009).

A decision maker begins the process of developing a perception of usefulness about a technology armed solely with personal beliefs, feelings of self-efficacy regarding technology usage, and memories of experiences with similar or related technology (Kim, 2009; Park, 2009; Yousafzai, Foxall, & Pallister, 2010). Although, it is possible that brand recognition or perceived quality of a technology stemming from the manufacturer's reputation can influence the perception of usefulness, researchers in previous studies have not been able to substantiate this assertion (Wang & Wang, 2009). Personal beliefs reflect an overall attitude or opinion possessed by the decision maker related to the usage of any technology to solve problems or benefit practitioners in the decision maker's field of expertise (Luan & Teo, 2009).

Self-efficacy describes the decision maker's confidence in their own level of skill in relation to a specified activity or usage of a specified technology (Davis, 1989; Park, 2009; Wang & Wang, 2009). A decision maker is more likely to view a technology as useful if the decision maker possesses a relatively high level of self-efficacy related to technology because the decision maker will believe that the technology can be mastered and implemented (Park, 2009; Wang & Wang, 2009). With that being said, the decision maker will also be influenced by any existing bias toward solutions that are currently in place for handling the desired tasks in question (Polites & Karahanna, 2012). This type of status quo bias indicates that replacing an existing technology may present more barriers than simply filling a void in the formation of perceived usefulness (Polites & Karahanna, 2012).

Memories of previous technologies that are similar in nature to the current technology under consideration and events related to similar technologies can pose potential positive and negative influence on the formation of perceived usefulness. As in the case of status quo bias, similarity to a technology that was liked or favored in the past can lead to a net increase in the perceived usefulness of a similar technology (Polites & Karahanna, 2012). Likewise, negative consequences using similar technology in the past can lead to a reluctance to use a new technology and contribute to an overall reduction in perceived usefulness (Kim, 2009). If a decision maker has successfully implemented similar technology in previous situations and realized a favorable outcome, the decision maker's perceived usefulness of similar technology will be higher based on the experience (Zhang & Xu, 2011). Similarly if the decision maker experienced aggravation, embarrassment, or failure when implementing similar technology in the past, the decision maker's reluctance to experience the unpleasant consequences again will result in a lowered perceived usefulness of similar technologies (Keengwe, Kidd, & Kyei-Blankson, 2009; Luan & Teo, 2009).

In the absence of these factors related to personal experience or in conjunction with experience, perceived usefulness is initially formed through the influence and opinions of others that are perceived to be significant to the decision maker (Park, 2009; Wang & Wang, 2009; Yousafzai, Foxall, & Pallister, 2010). When the decision maker comes from the field of higher education, the external influence or subjective norm is generally composed of the opinions expressed by the actors related to transacting higher education – colleagues, administrators, and students (Chen, Li, & Li, 2011; Kanthawongs, 2011; Wu & Gao, 2011). These external factors influence the decision to adopt technology by having a moderating role in influencing perceived usefulness (Mohd, Ahmad, Samsudin, & Sudin, 2011).

Perceived usefulness is further moderated by the variable perceived ease of use which can be thought of as the amount of effort that must be spent to use a given technology successfully (Davis, 1989; Luan & Teo, 2009). A technology that is perceived to be easy to use will have a higher perceived usefulness when compared with technologies that are perceived to be more difficult to use (Zhang & Xu, 2011). Zhang and Xu (2011) justify this assertion by pointing out that any effort that is not expended to successfully master or implement technology can be used to accomplish job related tasks thus increasing productivity and efficiency.

Colleagues tend to influence perceived usefulness through anecdotal stories related to the technology or similar technology (Cavusoglu, Hu, Li, & Ma, 2010). Additionally, colleagues influence perceived usefulness by contributing to the creation of the organizational culture that the decision maker inhabits (Elie-Dit-Cosaque, Pallud, & Kalika, 2011/12). This organizational culture is the foundation for establishing the status quo that exerts pressure on the decision maker to conform to acceptable workplace behavior and decision making (Polites & Karahanna, 2012). Although this method of influence is indirect and lacks formal sanctions, the threat of being ostracized carries significant weight in many organizational cultures (Cavusoglu, Hu, Li, & Ma, 2010).

Originally, TAM studies required that individual decision makers had complete volitional control over the decision making process (Davis, 1989). With the addition of considerations for various aspects of subjective norm, later TAM models demonstrated significant predictive power when the decision maker possesses only limited volitional control (Polites & Karahanna, 2012; Venkatesh, Morris, Davis, & Davis, 2003). In the case of the influence of an administrator, the administrator can still influence perceived usefulness if the administrator's preference for the result of the decision making process is known even if the administrator leaves the decision to adopt a technology at the discretion of individual teachers (Kanthawongs, 2011). This indirect influence on the perception of usefulness is present if the decision maker believes that there is a greater potential for rewards based on aligning opinions with the desired outcomes of a concerned administrator with regards to the decision to adopt a technology (Venkatesh, Morris, Davis, & Davis, 2003).

The largest potential pool of actors in the transaction of education supported by a technology is the body of students that take technology-enhanced classes. If teachers do only invest time in developing and implementing technological enhancements in the classroom when they believe the outcome will be successful, teachers must believe that student skills with technology will support the use of a given technology in the classroom (Kanthawongs, 2011). It is through this application of perceived student skills that student feedback has a moderating effect on perceived usefulness (Luan & Teo, 2009; Wu & Gao, 2011; Venkatesh & Bala, 2008).

Regardless of whether the effects of subjective norm will be overtaken and replaced by actual experiences with a given technology over time, it is easy to identify the roles that the combination of personal beliefs and subjective norm play at different points in the perception of usefulness (Park, 2009; Wang & Wang, 2009). Early analysis of perceived usefulness found that the extrinsic motivation had more influence over male decision makers in forming perceptions of usefulness while intrinsic motivation was more influential in female subjects (Venkatesh, Morris, Davis, & Davis, 2003). Further studies supported the assertion that perceived usefulness does act as a contributing factor to forming an overall attitude toward use on the part of decision makers (Ahmad, Madarsha, Zainuddin, Ismail, & Nordin, 2010; Holden & Karsh, 2010; Kim, 2009; Wu & Gao, 2011).

In conjunction with perceived usefulness, Davis (1989) reasoned that a decision maker must consider a technology reasonably free from effort before the decision maker will decide to adopt the technology as a solution to a given problem or task that must be solved. This assumption was based on two existing constructs – the Theory of Reasoned Action (TRA) and the cost-benefit paradigm (Davis, Bagozzi, & Warsaw, 1989). TRA suggests that a decision maker will consider the effort that must be expended as the result of choosing a solution to solve a problem (Venkatesh, Morris, Davis, & Davis, 2003). While TRA postulates that a decision maker will focus mainly on the projected expenditure of effort and the estimation of reasonable success, the cost-benefit paradigm considers the return on the expended effort to implement a solution and compares the effort to the value of the resulting activity that is accomplished (Yousafzai, Foxall, & Pallister, 2010). According to the tenets of TRA and the cost-benefit paradigm, this comparison of effort expended to resulting productivity drives the decision maker's conclusion to adopt or reject a proposed solution (Venkatesh, Morris, Davis, & Davis, 2003).

Perceived ease of use is best described as a decision maker's belief or estimation that using a given technology will be reasonably free of mental and physical effort compared to other available solutions to the same problem (Kanthawongs, 2011).

Perceived ease of use shares many similarities with perceived usefulness in its formative stages and additionally acts as a moderating factor for perceived usefulness as well as directly influencing attitude toward computer use (Wu & Gao, 2011). Perceived ease of use moderates perceived usefulness because a decision maker will tend to favor or perceive a technology that is easier to use to be more useful compared to a more complicated or challenging alternative (Luan & Teo, 2009).

When a decision maker encounters a new or innovative technology, perceptions of effort required to use the technology form in the same fashion as perceived usefulness (Ahmad, Madarsha, Zainnudin, Ismail, & Nordin, 2010). The decision maker must compare the technology to similar technology that they have previously used, rely on the opinions of trusted others, and experiment with the technology if possible (Kim, 2009; Venkatesh, Morris, Davis, & Davis, 2003). This initial perception is further altered if an existing solution is in place that the decision maker deems to be acceptable for accomplishing the task in question (Polites & Karahanna, 2012). The comfort of habit and a desire to maintain the status quo will make decision makers likely to resist a solution that is more efficient or productive in favor of incumbent solutions that are familiar and comfortable (Murray, 2008; Polites & Karahana, 2012).

The perceptions of ease of use are moderated by internal beliefs and external motivators (Venkatesh & Bala, 2008). It is rare that a decision maker encounters a technology or innovation that is not compared to something from the past or placed in some frame of reference (Keengwe, Kidd, & Kyei-Blankson, 2009). The memories or associations with like technologies contribute to feelings of confidence or apprehension that the decision maker can gain proficiency in a reasonable period of time (Sykes, Venkatesh, & Gosain, 2009; Venkatesh, Thong, & Xu, 2012). Additionally, elevated feelings of self-efficacy with computers and technology will effect perceptions of ease of use with an unknown technology and persist even after firsthand experience is obtained using the technology (Park, 2009; Wang & Wang, 2009). It is interesting to note that self-efficacy is the only internal aspect influencing perceived ease of use that is not expected to dissipate when experience replaces perception (Park, 2009; Yousafzai, Foxall, & Pallister, 2010). If the decision maker perceives that a technology will be overly complicated based on comparison, the resulting perception of ease of use will be lower (Holden & Karsh, 2010).

In the absence of direct experience and relatable comparisons, perceived ease of use is influenced by influential persons in the decision maker's environment referred to collectively as subjective norm (Park, 2009). The subjective norm for a decision maker is composed of students, colleagues, and interested administrators (Elie-Dit-Cosaque, Pallud, & Kalika, 2011/12). These individuals influence the opinions of the decision maker by sharing opinions and anecdotes relating to the technology with the decision maker through various communication channels (Kim, 2009). Depending on the origin of the input from the subjective norm, the decision maker may tie hopes of intrinsic or extrinsic rewards to the resulting perception (Venkatesh, Morris, Davis, & Davis, 2003; Yousafzai, Foxall, & Pallister, 2010).

Decision makers in higher education will consider feedback from students related to a technology or similar technology when forming perceptions of ease of use (Elie-Dit-Cosaque, Pallud, & Kalika, 2011/12; Kanthawongs, 2011). Consideration of student input stems from the desire of educators to expend energy in directions that have a reasonable chance of success and students account for half of the formula for transacting education in the classroom (Elie-Dit-Cosaque, Pallud, & Kalika, 2011/12; Luan & Teo, 2009; Kanthawongs, 2011). In order to progress and advance the transaction of knowledge in higher education, teachers must look for ways to expand the existing educational paradigm of education in the face-to-face classroom (Schulte, 2010).

The opinions of colleagues and trusted influentials effect the formation of perceived ease of use due to a desire to maintain the status quo in the work environment, a desire to comply with social norms, and trust extended to co-workers seeking a common goal (Polites & Karahanna, 2012; Wang & Wang, 2009). Colleagues and influentials generally affect perceived ease of use by exchanging stories related to technology usage or use of similar technologies (Cavusoglu, Hu, Li, & Ma, 2010). In the case of concerned administrators, influence is normally indirect and results from a desire to comply with norms and hope of rewards based on compliance or success (Favero & Hinson, 2007; Kanthawongs, 2011).

While studies have found that perceived usefulness is more influential for males than perceived ease of use, the opposite has been observed for female decision makers (Venkatesh, Morris, Davis, & Davis, 2003). Perceived usefulness remains influential in decision making when deciding to keep a technology after adoption, but the effects of perceived ease of use wane and nearly disappear following adoption when evaluating the continued usage of incumbent systems (Elie-Dit-Cosaque, Paullud, & Kalika, 2011/12; Venkatesh & Bala, 2008; Yousafzai, Foxall, & Pallister, 2010). In general, perceived ease of use has an influence on the attitude toward computer use and the perception of usefulness when a decision maker is empowered with full or partial volitional control of the decision making process (Venkatesh & Bala, 2008).

In early versions of the TAM framework, researchers viewed attitude toward computer use to be a precursor or predictor of behavioral intent toward technology usage and saw attitude toward computer use determined by perceived usefulness and perceived ease of use (Ahmad, Madarsha, Zainnudin, Ismail, & Nordin, 2010; Mohd, Ahmad, Samsudin, & Sudin, 2011). Later extensions and modifications to TAM tended to drop attitude toward computer use from the framework and replace it with intent to use while other studies use the two terms almost synonymously after they are presented (Holden & Karsh, 2010; Venkatesh & Bala, 2009; Venkatesh, Thong, & Xu, 2012; Wu & Gao, 2011). The justification for the combination comes from the theory of Planned Behavior which supports the observation that a decision maker with sufficient autonomy to act will follow a course of action motivated by personal attitudes about a technology (Yousafzai, Foxall, & Pallister, 2010). The resulting attitudes that form subconsciously as a result of evaluating perceived ease of use and perceived usefulness serve to create a mental model that drives behavior to the point of creating habits (Bogner, 2008).

Attitude is a driving force for determining intent, but attitude is not fixed and unchangeable (Venkatesh, Morris, Davis, & Davis, 2003). Attitude can be changed daily as a result of exposure to the influences of subjective norm, cultural changes, and daily activities (Ahmad, Madarsha, Zainnudin, Ismail, & Nordin, 2010). The addition of new actors in the workplace serves to add to or galvanize the attitudes of teachers. A new teacher or administrator can show an existing teacher new ways to transact the education of students, and the teacher will adjust attitude based on the way the new activity is perceived and evaluated (Bogner, 2008). It is in this exposure to new ideas that teachers adjust their attitudes toward technology as a result of training, time to practice, and perception of support (Hall, 2010; Polites & Karahanna, 2012).

Attitude toward use of a technology tends to influence the intent to use a technology to solve a problem until the decision and resulting action become habit (Polites & Karahanna, 2012). Once habits form, attitude gradually ceases to regulate the decision making process. A habit is an accepted way of accomplishing a task or an automatic response that does not require a decision to be made (Guinea & Markus, 2009). Some researchers describe habit as the formation of a mental model that guides behavior (Bogner, 2008; Zhang & Xu, 2011). Aside from the normal modes of forming attitudes in a field of interest, cultural diversity influences attitude toward technology when considering multicultural groups (Wu & Gao, 2011).

Even though it is generally accepted that positive feelings toward perceived usefulness and perceived ease of use have a direct effect of creating positive attitudes, a person can experience cognitive dissonance when actual experiences do not match the attitudes projected by the user (Guinea & Markus, 2009). Conversely, there is a positive correlation between attitudes toward technology usage and actual skills when implementing or using technology (Varank, 2007). Increased usage of technology occurs when decision makers experience an improvement in attitude toward the technology (Holden & Karsh, 2010).

Attitude in the information technology setting can be measured using the Computer Attitude Scale (CAS). The CAS is used to evaluate attitude based on four criteria: anxiety, confidence, like for technology, and perceived usefulness (Varank, 2007). Attitude is further moderated when the decision maker is exposed to others in the environment that go beyond passive influence and actually campaign to influence opinion of a technology. Champions tend to promote the usage of a technology while inhibitors seek to prevent the implementation of a technology that they view as unfavorable (Sykes, Venkatesh, & Gosain, 2009).

Once attitude fuels the formation of habits or norms, habit and experience tend to remove the motivational or influential power of attitude (Ahmad, Madarsha, Zainnudin, Ismail, & Nordin, 2010). While this seems to be completely negative, the strengthening of attitudes supports intervening actions that can change behavior and decisions in an organization (Holden & Karsh, 2010). It is through the introduction of intervening actions that changing attitudes toward a technology allows managers to change or sway technology decisions. Thus, changing attitudes leads to realizing improved returns on capital outlays through adoption of new technology or phasing out stagnant technology that is already in place (Venkatesh & Bala, 2008). Even though attitudes can range from strongly in favor of technology to strongly opposed to technology as a solution, the common component shared by habitual action and intent created from attitude is the decision maker’s satisfaction that results from finding a solution for a problem by implementing a technology (Guinea & Markus, 2009).

Unified Theory of Acceptance and Use of Technology

Given that the original creation of the Technology Acceptance Model sprang from combining aspects of different theories related to decision making from across various fields of study, it is logical to assume that other researchers will seek to enhance the resulting TAM framework by considering constructs from emerging or overlooked theories (Davis, 1989; Holden & Karsh, 2010; Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh, Thong & Xu, 2012). The purpose of most studies seeking to refine TAM lies in increasing the power of predicting outcomes, successfully creating intervening actions that lead to favored outcomes, and expanding TAM to have significance in various contexts (Holden & Karsh, 2010; Venkatesh, Thong, & Xu, 2012). Expanding TAM to support intervening activities directly addresses a primary criticism of TAM as a whole which is the lack of practical guidance offered by the theory that can be placed into action to affect organizational or individual level change (Venkatesh & Bala, 2008).

The first clearly identified evolution of the TAM added subjective norm to perceived usefulness and perceived ease of use as predictors of behavioral intent to use a technology to solve a problem (Holden & Karsh, 2010). The resulting framework, known as TAM 2, was able to account for 60% of the variance in predicting adoption of technology in populations studied which represents an increase from 30-50% explanatory power of TAM alone (Holden & Karsh, 2010; Park, 2009). TAM 3 researchers further modified the TAM 2 framework by considering any crossover effects that could be observed from the interaction of perceived usefulness and perceived ease of use. The consideration that perceived ease of use loses motivational power as the decision maker gains experience with the technology in question leads many to conclude that PEU drops out of the framework following adoption when it is replaced by habit (Venkatesh & Bala, 2008).

When Venkatesh, Morris, Davis, and Davis (2003) originally set out to create a unified theory describing technology acceptance in an organizational context, they began by analyzing the similarities and differences in eight theories related to the acceptance of computers and technology. The eight theories that the researchers analyzed were the Theory of Reasoned Action, Technology Acceptance Model, Motivational model, Theory of Planned Behavior, Combined TAM – TPB, Model of PC Utilization, innovation Diffusion theory, and Social Cognitive Theory (Venkatesh, Norris, Davis, & Davis, 2003). The resulting UTAUT framework has been found to explain up to 70% of the observed variance in predicting behavioral intent (Sykes, Venkatesh, & Gosain, 2009).

Following lengthy comparisons, analysis, and debates the UTAUT originators arrived at a framework that contained four determinants of intent and use and another four moderators that influenced the relationships between the determinants (Venkatesh, Morris, Davis, & Davis, 2003). The four determinants of intent and use were determined to be effort expectancy, performance expectancy, social influence, and facilitating conditions (Venkatesh, Thong, & Xu, 2012). The four moderators added to UTAUT to explain the relationships between the determinants were age, gender, experience, and voluntariness of use of the technology in question (Venkatesh, Morris, Davis, & Davis, 2003). Later, researchers Venkatesh, Thong, and Xu (2012) assert that most UTAUT researchers do not include consideration of the moderators and some only select a subset of the determinants to use in a given study. Another major change that occurred when creating the UTAUT framework was the shift looking solely at the individual decision maker as seen in the TAM framework to looking at the decision maker in an organizational context (Polites & Karahanna, 2012; Sykes, Venkatesh, & Gosain, 2009).

Effort expectancy as defined by UTAUT theorists reflects the relative ease of using a system in the workplace (Venkatesh, Morris, Davis, & Davis, 2003). While researchers such as Holden and Karsh (2010) draw similarities between perceived ease of use and effort expectancy or between performance expectancy and perceived usefulness, UTAUT pioneers such as Venkatesh, Morris, Davis, and Davis (2003) denounce the comparison based on the abundance of criteria used to determine the UTAUT determinants compared to PU and PEU. Venkatesh & Bala (2008) assert that PU and PEU should be evaluated in terms of individual differences possessed by the decision maker, system characteristics of the technology in question, social influence on the decision maker, and the facilitating conditions of the decision maker's organization.

The determinant social influence is very similar to the subjective norm component found in TAM that takes into account other people's opinions that are influential or significant in the decision maker's environment (Holden & Karsh, 2010). Social influence is most pronounced when a user encounters a new technology and is only beginning to form opinions about the technology. This effect is further strengthened if the decision maker believes that the influential other has the ability to reward the decision maker as a result of decision outcomes (Venkatesh, Morris, Davis, & Davis, 2003). In many organizations, co-workers that are more familiar with a technology actually become the trainers of colleagues that are newly experiencing use with the technology (Sykes, Venkatesh, & Gosain, 2009).

In many cases, a decision maker will form initial opinions of a technology by attempting to associate the new innovation with an existing familiar technology (Sykes, Venkatesh, & Gosain, 2009). An extension of UTAUT, UTAUT 2, adds a motivator known as hedonic motivation that describes a user's perception that a technology is fun to use (Venkatesh, Thong, & Xu, 2012). Regardless of the motivating reason, the level to which the decision maker is embedded in the organizational culture ultimately determines the degree of social influence (Sykes, Venkatesh, &Gosain, 2009).

Facilitating conditions such as availability of network infrastructure to support technology, availability of funds, and support from administration have a determining effect on intent to use a given technology (Venkatesh, Thong, & Xu, 2012). Decision makers will often compare a new technology to an incumbent solution as part of the decision making process. If the decision maker perceives the cost of switching technology to be prohibitively high or worries about the sunken cost of an incumbent solution, the effect on the decision to adopt a new technology can be negative (Polites & Karahanna, 2012). Additionally, a decision maker will be reluctant to adopt a solution if the decision maker perceives that the current network infrastructure is insufficient to support the new technology efficiently (Venkatesh, Morris, Davis, & Davis, 2003).

It is in the spirit of extending TAM by picking the strengths of another theory that this researcher in this proposed research study finds inspiration to combine the multiple theories believed to be most the robust in relation to predicting acceptance of technology in technical education. Technology Acceptance Model and Diffusion of Innovation theories are chosen for the amalgamation in this study because they are found to be valid in many populations and account for perception moderated through subjective norm (Borrego, Froyd & Hall, 2010; Venkatesh & Bala, 2008). Additionally, this combination of theories addresses all of the actors involved in the transaction of technical education from the influence of decision maker's environment to experience and personal beliefs.

Diffusion of Innovation

The Diffusion of Innovation (DoI) theory or Innovation Diffusion Theory first came to the attention of researchers in Roger's work the *Diffusion of Innovations* (Soffer, Nachmias, & Ram, 2010). Rogers (1995) explains the adoption and usage of a technology in terms of the diffusion of an innovation through a communication medium to reach a social group in a given unit of time. The DoI framework for looking at technology usage traces a technology through five phases: awareness, interest, evaluation, trial, and adoption (Borrego, Froyd, & Hall, 2010).

An innovation is considered to be a concept, way of doing things, or object that can produce a successful outcome to a task that is new to an individual or unit capable of exercising decision making (Rogers, 1995). It is important to note that innovation does not have to be new chronologically to satisfy this definition. The qualification for innovation being considered new comes from the potential adopter obtaining knowledge of the innovation recently (Soffer, Nachmias, & Ram, 2010). Diffusion is a process that facilitates information about an innovation spreading through a social unit in a given period of time (Rogers, 1995). This diffusion process can be described in terms of the progression from awareness to adoption (Borrego, Froyd, & Hall, 2010). Ormerod and Rosewell (2009) described innovation as a necessary ingredient for growth of an organization and as a tool for improving productivity.

In general, a group of adopters are heterogeneous in their approach to making decisions concerning adopting technology. Adoption is a social phenomenon that is comprised of decision makers who actually make a decision and another group who wait, watch, and then imitate an individual in the group of actual decision makers (Cavusoglu, Hu, Li, & Ma, 2010). A heterogeneous group does produce original and novel ideas, but groups composed of decision makers that are more homogeneous tend to have better communication (Borrego, Froyd, & Hall, 2010). Adopters can be further broken down into five distinct classes: innovators, early adopters, early majority, late majority, and laggards (Soffer, Nachmias, & Ram, 2010). The imitators that wait and watch are subject to the influence of those in favor of adoption that are known as promoters and those opposed to adoption that are known as inhibitors (Cavusoglu, Hu, Li, & Ma, 2010).

There are identifiable characteristics of innovations that lead to an improvement in perceived ease of use and perceived usefulness for the decision maker (Li, Hsieh, & Hsu, 2011). If PU and PEU are improved by characteristics of an innovation, then these same characteristics in turn promote increased adoption rates (Murray, 2008). The favorable characteristic that is most likely to promote adoption is relative advantage. If an innovation is considered better than the competition or incumbent technologies, it is favored for adoption (Li, Hsieh, & Hsu, 2011).

An innovation that is considered to be compatible with existing technologies, network infrastructure, and user understanding is favored in relation to competing innovations that are less compatible (Li, Hsieh, & Hsu, 2011; Venkatesh, Morris, Davis, & Davis, 2003). Murray (2008) considers simplicity or ease of use to be a characteristic that causes a technology to be favored. Additionally, simplicity directly contributes to PEU (Yousafzai, Foxall, & Pallister, 2010). The remaining two characteristics go together. Trialability allows a decision maker to experiment with technology which leads to observability of results (Murray, 2008; Li, Hsieh, & Hsu, 2011).

To define the communication channels that facilitate the diffusion of innovation in a technical college system, it is necessary to consider the professional development activities, exchange of information with colleagues, and research interests of technical college faculty (Klein & Stern, 2009). Faculty members in various fields throughout higher education read journals and attend conferences to learn about new and emerging technologies (Klein & Stern, 2009). Additionally, technical college faculty members learn about emerging technologies by interacting with colleagues during statewide consortium meetings. Each person that a decision maker encounters has the potential to influence the decision making process (Cavusolgu, Hu, Li, & Ma, 2010).

Opinion of Colleagues

When new employees enter the workplace, they are often trained by existing employees. This on-the-job training does more than prepare the employee to adhere to sanctioned policy; it also serves to indoctrinate or initiate the new hire into the organizational culture (Guinea & Markus, 2009). Even though this influence from a unit of the subjective norm is subconscious, the employee's peer group will influence the opinions of the potential decision maker (Guinea & Markus, 2009; Vannoy & Palvia, 2010). Past studies have supported the assertion that teachers are more likely to adopt technology that is perceived to possess the support of peers (Keengwe, Kidd, & Kyei-Blankson, 2009). Murray (2008) further supports this assertion with the observation that collectivism is higher among faculty members employed in higher education.

The colleagues of faculty members constitute a group that is encountered as frequently as students, and colleagues represent a piece of the subjective norm that influences an educator that becomes a decision maker (Elie-Dit-Cosaqhue, Pallud, &

Kalika, 2011/12). The extent to which the influence of colleagues extends is dependent upon the decision maker's level of embedment in the social network (Vannoy & Palvia, 2010). The effect of social influence is also mediated by the centrality and density of the network or social group. That is to say the involvement of the individual and connectedness of the network can strengthen or weaken the influence of the social group on the decision maker (Sykes, Venkatesh, & Gosain, 2009).

The influence of the decision maker's social group normally consists of communicating with group members, cooperatively participating in group behavior, complying with the group's position on matters, and embracing the group's opinion (Vannoy & Palvia, 2010). Social influence is generally accepted by employees because of compliance, identification, and internalization. A decision maker that is motivated to comply generally does so in hope of receiving rewards – tangible and image related (Mohd, Ahmad, Samsudin, & Sudin, 2011). Vannoy and Palvia (2010) point out that sometimes the will of the group is sufficiently enough to supersede legitimate authority for some group members that exhibit strong group identification. Internalization refers to the consideration of the decision maker's value system when evaluating decisions (Mohd, Ahmad, Samsudin, & Sudin, 2011).

Support of Administration

The original Technology Acceptance Model proposed by Davis (1989) required that the decision maker in question possessed complete volitional control over the decision making process and the resulting decision. Later version of TAM that followed the creation of TAM 2 contained subjective norm as a variable and required that the decision maker possessed partial volitional control (Venkatesh, Morris, Davis, & Davis, 2003). It is difficult to imagine that a technology acceptance decision would have any chance of success when concerned people in authority are in opposition to adopting the given technology. In fact, Elie-Dit-Cosaque, Pallud, and Kalika (2011/12) list the support of management as a pre-requisite of successful technology adoption and implementation.

In the field of higher education, many managers and administrators have risen through the ranks from instructor to a position of authority over a period of time. As a result most college administrators are highly educated because they come from initial positions that require a higher level of education than many other job fields (Murray, 2008). This fact is of interest because a higher level of education observed in management indicates that there is a likely bias toward supporting the adoption of technology (Murray, 2008). Managerial support is crucial to the establishment of a framework and sanctioning of the use of technology to perform job duties in higher education (Keengwe, Kidd, Kyei-Blankson, 2009).

The degree to which the influence of subjective norm, which includes the perception of leadership opinions, is dependent upon the factors present in the network (Sykes, Venkatesh, & Gosain, 2009). In the same fashion that administrators can potentially support technology adoption, an oppressive leader that is not in favor of adopting a technology can pose a barrier that stalls or ultimately prevents adopting a technology (Keengwe, Kidd, Kyei-Blankson, 2009). In some cases, the concerned administrators' opinions may be irrelevant if the decision to adopt a technology is promoted or discouraged by state boards or local boards with influence over the administrators (Murray, 2008).

Initial introduction to a technology in the field of higher education comes in the form of on-the-job training (Guinea & Markus, 2009). This type of training gives the perception of using technology in an established way that is sanctioned (Guinea & Markus, 2009; Keengwe, Kidd, & Kyei-Blankson, 2009). This type of training and student teaching gives the perception of administrative support to a technology or similar technology. The initial socialization of the instructor and desire to follow goal-oriented behavior will lead to post-adoption use, habit and commitment to a technology (Guinea & Markus, 2009; Kanthawongs, 2011).

Most external influence is not actively deliberated when a decision maker considers the decision to adopt a technology (Guinea & Markus, 2009). The support of administration is a concern when deciding to adopt a technology, but it is a subconscious observation in most cases (Elie-Dit-Cosaque, Pallud, & Kalika, 2011/12; Guinea & Markus, 2009). The commitment to a technology results from the socialization with colleagues and superiors, and commitment is the result of habits and established behavior that is developed and learned over time (Kanthawongs, 2011).

Availability of Training and Support

The Technology Acceptance Model and Diffusion of Innovation theory both posit that external variables have a moderating effect on the perceived ease of use or effort expectancy associated with a given technology (Polites & Karahanna, 2012; Wang & Wang, 2009; Yousafzai, Foxall, & Pallister, 2010). In this study, the two are combined into a single variable because both represent the availability of someone to provide support to the user of a specified technology. In many cases customer support or helpdesk can solve a problem by training the customer rather than correcting a flaw in the implementation or configuration of technology. Additionally, tech support can be viewed as instant training or feedback (Favero & Hinson, 2007; Wang & Wang, 2009).

Training and support reduce the effort expectancy and increase the perceived ease of use for a given technology by increasing the decision maker's confidence in their ability to implement and use the technology and similar technologies (Favero & Hinson, 2007; Keengwe, Kidd, & Kyei-Blankson, 2009). This is particularly helpful in cases where faculty members are left to their own devices to develop skills and implement a required technology (Favero & Hinson, 2007). Support of faculty implementing technology and skill maintenance and development through training is considered to be a critical factor to successfully adopting and implementing technology in higher education (Keengwe, Kidd, Kyei-Blankson, 2009).

In some organizations, training is used to reduce the inequity of skills when comparing teachers (Favero & Hinson, 2007). While creating a level playing field is beneficial in some situations, other schools devote training to a selected group of power users that are then used as trainers and mentors of other faculty members (Sykes, Venkatesh, & Gosain, 2009). This power user / trainer model also provides readily accessible support as well as training to the technology novice that is building skills to use in the classroom or virtual environment (Keengwe, Kidd, & Kyei-Blankson, 2009).

Two other aspects of training and support that must be considered are the availability of technology for practice and the available time to practice. It is not reasonable to expect that teachers will adopt and implement technology if the supporting infrastructure is not available and the instructor does not have access to the technology (Keengwe, Kidd, & Kyei-Blankson 2009, Venkatesh, Morris, Davis, & Davis, 2003).

Instructors master technology skills by actually using the technology during training, practice, and classroom experience. In many cases, potential teachers are first exposed to teaching technologies during student teaching exercises (Favero & Hinson, 2007; Hixon & So, 2009). Favero and Hinson (2007) do note that there is a field specific bias toward using technology in the classroom that stems from the fact that certain fields tend to be more technology intensive when compared to other fields of study.

Feedback from Students

Following a review of the current literature relating to technology adoption in higher education, it is observed that consideration for student feedback is missing in many studies found in the current literature. Without considering this piece of the puzzle for using technology to facilitate higher education, an assumption is made that a decision maker does not take into account the increased chance of failure of a technology implementation if students do not embrace the technology (Wang & Wang, 2009). This study seeks to acknowledge and study the perception of student technology skills from the point of view of the decision maker. Aside from merely understanding how to use a technology that is implemented in higher education, students must understand how the technology is used to facilitate the class and embrace the technology as an educational tool (Park, 2009).

When looking at the stakeholders for a class in higher education that implements technology, students constitute the largest group by far (Wang & Wang, 2009). Additionally, a group of students is a heterogeneous mixture of different personalities, goals, and skills levels with regard to technology (Schulte, 2010). Given the heterogeneous mixture, it is likely that instructors will receive more feedback from groups of students that possess personalities that are more communicative than members of other groups. This would mean that some subsets of students are more likely to influence the perception of the decision maker than other groups who remain silent. Regardless of how the opinion is formed, instructors believe that students in online and hybrid classes require more communication between the student and teacher than what is required in traditional face-to-face classes (Schulte, 2010).

In general, teachers assume that college students possess high levels of skills with technology (Mohd, Ahmad, Samsudin, & Sudin, 2011). This assumption may or may not be correct. Given that students as a group are a heterogeneous mix this is an approximation or generalization at best (Schulte, 2010). Hall (2010) found that a gap is present between the way students embrace and utilize technology skills in their personal life when compared to how students use technology in college classes. Students do have high expectations for how technology will be implemented to facilitate learning (Favero & Hinson, 2007). This expectation leads to frustration when students do not feel that technology is implemented appropriately or efficiently in transacting education. Students must understand how technology is to be used in the classroom to realize the potential benefits of technology adoption (Park, 2009).

If students and teachers have high expectations of technology implementation in the classroom, it is because competence with technology is required for all actors in the transaction of higher education when technology is involved (Favero & Hinson, 2007). Teachers will not invest time in implementing a technology that is not perceived to have a chance of success (Kanthawongs, 2011). Students must understand the implementation of a technology to benefit from using the technology, and students represent the customer group of stakeholders in higher education (Kanthawongs, 2011; Park, 2009).

Decision to Adopt

In some studies, adoption is considered to occur when a decision maker reaches a favorable attitude toward using a technology, but this definition becomes problematic if the decision maker never implements the favored solution (Holden & Karsh, 2010; Venkatesh, Morris, Davis, & Davis, 2003). According to Murray (2008), adoption requires that a decision maker knows that a technology exists, takes time to learn to use the technology, and uses the technology to solve a problem or task at hand. As this definition and many models concerned with technology predict, there are many influential and determining factors that occur between knowledge of a technology's existence and actual use of the technology (Polites & Karahanna, 2012).

The decision making process that leads to the adoption of a technology can take two distinct forms. In the first form, an organization experiences or identifies a new problem, and the decision maker must decide whether to adopt a given technology as a solution (Zhang & Xu, 2011). This first situation is simple compared to the second situation which involves the decision maker determining whether to replace an existing solution (Guinea & Markus, 2009). The challenges associated with reaching adoption when replacing an incumbent system are breaking habit, inertia, and commitment (Polites & Karahanna, 2012).

Status quo bias indicates the ease or tendency to maintain stasis within a culture or unit (Davis, 1989). In terms of status quo bias, any changes in operating procedures represent a disruption that can cause dissonance within the environment (Polites &

Karahanna, 2012). Many technology studies express the comfort with what is familiar in terms of habit or action that is free from requiring reason to be applied (Guinea & Markus, 2009). Additionally, dealing with an accepted way of accomplishing tasks requires changing the adoption decision of multiple people rather than just a single person. When a group of people collectively lean toward a decision, inertia is created that must be overcome if the group decision is to turn in the opposite direction (Polites & Karahanna, 2012).

Venkatesh and Bala (2008) identify a technology paradox that results when low productivity is observed relative to large capital outlays to procure a new technology. A decision maker that fears losing time and money invested in an incumbent technology is less likely to replace a technology with something new (Polites & Karahanna, 2012). This aversion to making a change may be the result of the decision maker hoping to protect an existing investment or simply wanting to stay a course that is already started. In either case, the resulting inertia swings against the decision to implement a new technology (Polites & Karahanna, 2012).

The earliest stages of concern leading to adoption begin when the user is initially made aware of a technology that can solve a problem. Following this initial introduction to a technology, the decision maker will evaluate the technology with respect to personal beliefs, subjective norm, and consequences cycling through the adoption model to reach use or avoidance of a given technology (Favero & Hinson, 2007). Even though these initial influential factors dissipate in the face of experience with the given technology, the wave of organizational opinion still effects the decision maker’s decision to use a technology (Elie-Dit-Cosaque, Pallud, & Kalika, 2011/12).

Benefits of Technology Adoption

When considering the benefits of adopting technology in the field of technical education, there are several perspectives that must be considered. Benefits are realized by the businesses affected by technical education, the students receiving technical education, and the teacher employed in technical education that becomes the decision maker of interest in this study (Favero & Hinson, 2007; Laurillard, 2007; Kanthawongs, 2011). The observed benefits can range from things such as an increased number of students or increased profits to being able to overcome spatial and temporal barriers to attend class (Kim, Mims, & Holmes, 2006; Luppicini, 2012). The most valuable asset in technical education is considered to be the time of the students and teachers. According to Laurillard (2007), anything that promotes successful utilization of these resources should be considered a benefit.

Career and technical education instructors are charged with educating potential employees to enter the workforce with an employable set of skills (Technical College System of Georgia, n.d.). Most businesses are looking for employees that are well versed in multiple types of technology (Favero & Hinson, 2007). It is in this consideration that instructors are directly responsible for producing benefits by exposing students to technology (Wang & Wang, 2009). Aside from the businesses that will employ graduating students, the college as a business entity can potentially realize many benefits from the utilization of technology (Laurillard, 2007).

If the goal of colleges is to grow in the number of students served, technology can be used to attract students (Favero & Hinson, 2007). Technology produces a learning environment that students can access from any location whenever the student has available time. This aspect of technology enhanced learning draws students to attend the college by offering access and convenience to students that otherwise may not have the opportunity to attend classes (Kanthawongs, 2011).

As technology represents a potential benefit for a college as a business entity, this exchange must be investigated at the college level to determine if an acceptable return on investment is being realized (Laurillard, 2007). As a general rule, the cost of technology in the classroom is dropping each year (Luppicini, 2012). In many cases, technology enhanced learning is less costly than traditional brick-and-mortar classroom scenarios (Laurillard, 2007).

A teacher will benefit from technology utilization when the time taken to accomplish tasks without technology is reduced by the addition of technology solutions that accomplish the same tasks (Hall, 2010). In terms of content delivery, utilizing technology allows teachers to cross a gap into the world and format that many younger students have grown accustomed to using for communication (Grant, Malloy, & Murphy, 2009; Kim, Mims, & Holmes, 2006). This entry into the technology-driven communication environment can accomplish more than putting students at ease. In many cases, technology enhanced communication can be used to span cultural barriers when delivering educational content (Popa, Stegaroiu, Georgescu, & Popescu, 2010).

Students benefit most directly from technology adoption in higher education by realizing greater convenience attending classes, ease of communication, and increased learning (Hall, 2010; Kim, Mims, & Holmes, 2006). Online or web-enhanced classes allow students to attend from anywhere that is convenient and to work when the time is best for them (Kanthawongs, 2011). Communicating through technology in technical education allows students to receive rapid feedback and help from instructors while potentially removing the fear of embarrassment from participating in class if students are anonymous to each other (Wu & Gao, 2011). The most obvious benefit to students from technology adoption is the improvement in student learning outcomes that are observed when teachers adopt technology in the classroom (Hall, 2010).

Barriers to Technology Adoption

To go along with and potentially offset the facilitating factors and opinions that promote the adoption of technology in technical education, there are also many corresponding or unique barriers that slow or prevent the adoption of technology (Ahmad, Madarsha, Zainuddin, Ismail, & Nordin, 2010; Elie-Dit-Cosaque, Pallud, & Kalika, 2011/12). Even something that seems pro-adoption like preparation to use a technology can ultimately become a barrier if it delays implementation for a prolonged period of time (Luan & Teo, 2009). A decision maker who applies purely rational thinking during this period of prolonged preparation would conclude that if the company exists and profits during preparation for the new technology, then the company can survive and profit without the technology (Polites & Karahanna, 2012). Although this is a rational line of logic, the conclusion does not take into account that adoption in many cases is designed to reach maximum potential rather than avoiding extinction (Davis, 1989; Ormerod & Rosewell, 2009; Polites & Karahanna, 2012).

Barriers that slow or prevent the adoption of technology in technical education can take many forms including personal beliefs and opinions of the decision maker, influential people in the culture that oppose a technology, the lack of supporting infrastructure, the nature of technology itself, and financial considerations (Luan & Teo, 2009; Murray, 2008; Park, 2009; Venkatesh, Morris, Davis, & Davis, 2003). As a group, faculty members in higher education exhibit a wide range of diversity, but they are not likely to adopt a technology with being subjective to external influence (Ahmad, Madarsha, Zainuddin, Ismail, & Nordin, 2010). In addition to tangible and perceived barriers, the failure to provide support and plan the adoption of technology can constitute a barrier to adoption and diffusion of an adopted technology (Park, 2009).

The decision maker that must choose a course of action to replace an existing technology or select whether to use a technology to solve a problem that currently is not solved through technological means, brings experience and beliefs to the decision making process (Yousafzai, Foxall, & Pallister, 2010). These beliefs will eventually be replaced with first hand evidence and experience, but initially the decision is subject to the opinions of others (Sykes, Venkatesh, & Gosain, 2009). Additionally, decisions will continue to be influenced beyond the formative stages of intent by influential others that are believed to be able to reward the decision maker (Borrego, Froyd, & Hall, 2010; Murray, 2008).

Before a decision maker can develop intent to use or decide to adopt a technology, an existing network and computer infrastructure must be in place to support and facilitate the use of the technology (Park, 2009; Venkatesh, Morris, Davis, & Davis, 2003). Besides supporting the technology, the users must be supported as well. Availability of technology and training influences a decision maker to favor using a technology (Türel & Johnson, 2012). If the decision maker perceives that inadequate technological support exists to facilitate using the technology or that available support is not present to help the user succeed, a barrier to promoting adoption is created (Hall, 2010; Park, 2009).

The qualities of a technology can provide barriers that are difficult to overcome when seeking to promote adoption of the technology. A technology that is perceived to be overly complicated will not be likely to garner as much support as comparable alternatives that are perceived to be less challenging to use (Borrego, Froyd, & Hall, 2010; Wang & Wang, 2009). In this same fashion, cost can become a prohibitive barrier if a technology is significantly more costly to implement or use when compared to alternative solutions regardless of the quality in some cases (Murray, 2008; Park, 2009). The cost sunk into incumbent technologies can create a barrier when decision makers feel an obligation to realize a return on a previous investment (Polites & Karahanna, 2012).

A central criticism for many adoption frameworks in technology is that the frameworks describe the decision maker’s intent or provide a rationale for decision but offer no solution that can be enacted to influence an actual outcome (Venkatesh & Bala, 2008). Identifying barriers are central to addressing this criticism. In order to successfully implement intervention aimed at influencing the decision making process, the manager staging the intervention must identify the actual barrier to address to stimulate adoption (Polites & Karahanna, 2012; Venkatesh, Morris, Davis, & Davis, 2003). In the case of replacing incumbent technologies, the intervention needed may go further than influencing the opinion of individual technology in question to require a redefining of the habit and the status quo (Matesic, 2009; Polites & Karahanna, 2012). Some decision makers will avoid making a change by adopting a technology simply as a mechanism for avoiding uncertainty (Yoo & Huang, 2011). It is easy for a teacher to dismiss a technology as being potentially disruptive in the classroom when the teacher does not want to use the technology (Mohd, Ahmad, Samsudin, & Sudin, 2011).

Summary

This chapter begins by presenting the historical origins of theories explaining the adoption and implementation of technology and traces the theories to current frameworks employed by researchers today. In the case of the Technology Acceptance Model, the review begins with the seminal work of Davis (1989) and traces the evolution of the theory through various incarnations to the Unified Theory of Technology Acceptance (Venkatesh, Morris, Davis, & Davis, 2003). Davis (1989) originally synthesized TAM from existing theories and concluded that an overall attitude toward computer use could be reached by examining the perceived usefulness and perceived ease of use of a technology. After scrutinizing Davis' work, researchers including Davis began to postulate that subjective norm played a role in moderating the perceived ease of use and perceived usefulness of a given technology (Venkatesh & Bala, 2008). Resulting extensions of the original TAM framework, such as TAM 2, UTAUT, and TAM 3, were created to increase the predictive power of TAM (Park, 2009).

In the Diffusion of Innovation theory, Rogers' (1995) views the decision to adopt a technology and the infiltration of that technology into the workplace as the result of social pressures and experiences encountered by the decision maker. The subjective norm aspect of TAM extensions can be expressed in terms of Rogers' (1995) social interactions in an organizational culture to create a combined theory for describing technology adoption in a population (Elie-Dit-Cosaque, Pallud, & Kalika, 2011/12; Venkatesh, Morris, Davis, and Davis, 2003). TAM researchers have found that many TAM variables are valid across diverse populations studied and suggest that research frameworks can be further customized to include specific factors in a business culture to match a given population (Holden & Karsh, 2010).

Following the presentation of applicable theories related to technology adoption, the decision to adopt, the benefits of adopting technology, and the barriers that potentially block the adoption of technology are examined. Identifying the factors that facilitate adoption of technology allows college administrators to take intervening measures to promote increased adoption of technology in the classroom (Kanthawongs, 2011). Successfully implemented interventions that promote technology adoption might allow students, faculty members, and the college as an entity to benefit from the addition of technology in facilitating the transaction of technical education (Blaskovich, 2008; Soffer, Nachmias, & Ram, 2010).

Chapter 3: Research Method

The research design used was a quantitative, descriptive study intended to address the adoption of technology in the Technical College System of Georgia. The problem is that while faculty members in higher education follow the adoption trends of industry to ascertain current content for classes, educators do not adopt technology at the same rate as industry which can lead to failure to grow student populations, increases in the cost of education, and reductions in student engagement (Favero & Hinson, 2007; Luppicini, 2012; Murray, 2008). This reduction in competitive advantage relative to peers can lead to declining enrollment trends and the production of students who are at a disadvantage in the job market relative to their peers from other schools (Keengwe, Kidd, & Kyei-Blankson, 2009; Murray, 2008; Türel & Johnson, 2012).

The purpose of this quantitative study was to investigate the internal and external factors that contribute to adoption rates for new technology in the field of technical education. Specifically, the perceived usefulness, perceived ease of use, subject norm, self-efficacy, information quality, system quality, intent to use, and service quality were explored using a multivariate statistical model to determine their relationship with the decision to adopt technology. Identifying the factors that favorably influence the decision to adopt a given technology could allow college leaders to stage intervening actions that will promote the adoption of technology (Venkatesh & Bala, 2008). The study went a step further to determine if students and faculty significantly differed in their responses to the survey. This difference or lack thereof could have an impact for future studies with respect to how sample populations are selected for studies.

This chapter is used to explain how the researcher investigated the research questions by collecting data from two different sample populations that are representative of the faculty and student populations of interest and then analyzing that data by employing multivariate and descriptive statistical techniques. Following a re-statement of the problem statement, purpose statement, research questions, and associated hypotheses, the research design and methods to be employed in the study will be explained. The population of interest will be discussed in terms of typical make-up, coverage area, and an explanation of the sample selection process with accompanying justification. After explaining the methodology, a discussion of how the model and questionnaire were created is presented and tied to existing theories reviewed in the literature. This chapter concludes with a presentation of the operational definitions of variables, a description of how data was collected and analyzed, a discussion of limitations and delimitations, and explanation of ethical assurances, this chapter is summarized and concluded.

The primary focus of this research is broken down into two research questions. The first question was used to investigate whether factors established in previous studies from various fields are influential in describing the decision to adopt technology in technical education. The second question was used to examine whether student populations offer appropriate insight into the factors that influence decision makers to adopt technology in technical education.

Q1. What are the significant relationships between perceived ease of use, perceived usefulness, subjective norm, self-efficacy, system quality, information quality, service quality, intent to use, and the decision to adopt technology?

Q2. What are the significant differences between survey results obtained from a faculty sample and a student sample within a technical college?

Hypotheses

The null and alternate hypotheses $H1_0$ and $H1_a$ are associated with research question 1, and the null and alternate hypotheses $H2_0$ and $H2_a$ are associated with research question 2

$H1_0$. There is no significant relationship between perceived ease of use, perceived usefulness, subjective norm, self-efficacy, system quality, information quality, service quality, intent to use, and the decision to adopt technology.

$H1_a$. There is a significant relationship between perceived ease of use, perceived usefulness, subjective norm, self-efficacy, system quality, information quality, service quality, intent to use, and the decision to adopt technology.

$H2_0$. There is no significant difference between survey results obtained from a faculty sample and a student sample within a technical college**.**

$H2_a$. There is a significant difference between survey results obtained from a faculty sample and a student sample within a technical college**.**

Research Methods and Design

A quantitative, descriptive methodology was selected for this study to examine the presence of relationships between subjective norm, perceived usefulness, perceived ease of use, self-efficacy, information quality, system quality, service quality, the intention to use and the decision to adopt technology in technical education. Additionally, the study went a step further to determine if results based on data collected from faculty varies significantly from the data collected using the same questionnaire to survey students. Data was collected by means of a survey instrument created and demonstrated to exhibit construct validity by Wang and Wang (2009). The survey was administered online over a two-week period in early October 2015 using Survey Monkey as the delivery method.

A pilot study was conducted using 5 faculty members from a school providing higher education and 2 graduate students as test subjects. The pilot, like the actual survey, was delivered using Survey Monkey. Using the actual survey and delivery system allowed the instrument to be tested for clarity and presentation, time needed for completion, and to obtain feedback regarding typographical or presentation errors. Following review of the data collected during the pilot testing, it was necessary to revise the presentation of questions. Several respondents in the pilot group noted that the survey should be broken into manageable chunks rather than a long list of questions. As a result, the survey was broken into smaller groups of questions based on groupings of questions that correspond to the same variable in the study.

After the grouping of questions, the survey was sent from the researchers Northcentral University e-mail account to 8,110 potential respondents at the sample school. The school of interest, Central Georgia Technical College (CGTC), is comprised of three campus locations at least 30 miles apart and a number of satellite campuses. The selection of CGTC as the sample population was chosen because of the availability of the sample population, and the selection will allow access to a large pool of faculty members that exhibit the diversity found in most TCSG colleges and possess at a minimum a level of volitional control in the decision making process for adopting technology.

Grimm and Yarnold (1995) suggest that the appropriate statistical analysis for investigating the effect of independent variables on a single dependent variable is multiple regression analysis. Accordingly, SPSS was used to implement the regression analysis to test for the presence of significant relationships between perceived ease of use, perceived usefulness, self-efficacy, subjective norm, service quality, information quality, system quality, intent to use, and the decision to adopt technology. The analysis to determine if the two sample populations are significantly different was accomplished using an independent group t-test (Jackson, 2005; Norusis, 2008).

Wang and Wang (2009) using elements of TAM, DoI, UTAUT, TRA, TPB, and the DeLone and McLean model created the theoretical framework and questionnaire for this study; and the research instrument was created by combining appropriate pieces from instruments obtained from reviewing available literature. The use of a framework that is an amalgamation of existing theories found in literature and a corresponding questionnaire demonstrates that this approach is consistent with methods employed by other researchers in the field, and permission was obtained to re-use the questionnaire and framework as seen in Appendix B prior to the beginning of any work involving survey participants.

Population

A review of available literature yields very little information specifically dealing with career and technical education (CTE) populations and the role of the instructor. Bazile and Walter (2009) attribute a decrease in performance in technical education in some areas to a lack of education programs catering to educating technical instructors and a research gap across the field of career and technical education. Within the literature that is available three central factors emerge that are agreed upon across studies. The agreed upon factors are that the student population of CTE is increasing, the number of instructors entering the field is less than what is required to staff available positions, and that critical thinking skills are a primary necessity for emerging graduates (Bazile & Walter, 2009; Ediger, 2009; Morgan & Parr, 2009; Nicholls, Charon, & Hutkin, 2010).

In order to accurately describe the adoption of technology in technical education, it is necessary to first understand the group of people who have chosen the field of instruction in technical education as a profession. Most instructors involved in CTE are subject matter experts that have worked in a given field for a period of time (Bazile & Walter, 2009; Bogner, 2008). In many cases, CTE instructors are retired from their field of expertise and come to education later in life as a second profession possessing little formal training in education or learning models (Olson & Spidell, 2008). This lack of formal training in the discipline of education leaves many CTE instructors to draw on personal experience, shared experiences of colleagues, and a knowledge gained from a trial and error approach to teaching to develop appropriate methods of delivering content and evaluating students (Bogner, 2008; Morgan & Parr, 2009).

The success of new CTE faculty and the quality of the education that is facilitated by the new instructor is directly related to the individual instructor's ability to adapt and accommodate multiple learning styles (Olson & Spidell, 2008). An instructor that can quickly identify a student's preferred learning style is capable of removing communication barriers and moving on to facilitate learning (Nicholls, Charon, & Hutkin, 2010). In many cases, facilitating the students learning style may involve embracing digital technology that is familiar to the student such as making use of web technologies, Wikis, blogs, and social networking sites (Guo, Dobson, & Petrina, 2008; Morgan & Parr, 2009). In some cases, this integration of digital technologies into education may be challenging for instructors that received their formal education prior to the emergence of widespread digital technology (Guo, Dobson, & Petrina, 2008).

Learning to be an educator in this way can have advantages and disadvantages. The instructor is building mental models to guide the pathway to educating students (Bogner, 2008). If the instructor develops habits that adhere to sound principles the process is good, but the development of poor habits can lead to resisting innovations in education (Bogner, 2008; Guinea & Markus, 2009). It is in this observation that the acquisition of mental models and teaching ideology for CTE instructors becomes a factor in the decision to adopt technology.

Studies of sample populations composed of students changing programs following one or more classes involving the presentation of information by a subject matter expert have reported percentages as high as 90.2% of respondents that indicate poor teaching as a reason for changing majors (Olson & Spidell, 2008). Given that student satisfaction is critical to marketing higher education to potential students, failure to adapt to student learning styles can negatively affect the number of students that are enrolled at a college (Kanthawongs, 2011; Olson & Spidell, 2008). In contrast, instructors that adopt and implement technology to facilitate learning help students to make the transition from passive by-stander to active learner (Kanthawongs, 2011).

Two-year colleges, community colleges, and technical colleges have typically been viewed as specializing in a path leading directly toward a career or as an entry way into more advanced educational programs (Oslon & Spidell, 2008). Although most of the states in the United States are consistent in the role that CTE and two-year colleges play, there is a vast range of qualifications required to be employed in the field that spans the gap from work experience to graduate school degrees (Bazile & Walter, 2009; Olson & Spidell, 2008). This range is somewhat understandable based on the widespread goals of the students and schools. Teachers that are retraining students to enter the local workforce in a new career path are generally required to possess vast experience employed in the field of study or a minimum of 18 graduate semester hours. Faculty preparing students to transition to bachelor's programs at larger schools are generally required to possess master's degrees in field (Bogner, 2008; Olson & Spidell, 2008).

The average time of employment for a teacher in the field of CTE is approximately 14.5 years (Olson & Spidell, 2008). In light of the fact that many of these CTE faculty have spent time working in field or even retired from a previous job, it is not surprising to learn that estimates predict the number of CTE faculty members retiring between 2006 and 2016 to be as high as 50% (Bazile & Walter, 2009; Olson& Spidell, 2008). This gap is incredible since faculty in CTE and two-year colleges account for 40% of the population of higher education faculty in the United States (Bazile & Walter, 2009; Olson& Spidell, 2008). Although studies differ in the actual amount, estimates agree that the available number of CTE instructors falls short of the estimated number of available job openings (Oslon & Spidell, 2008). This problem finding instructors qualified and interested in careers in CTE is further exacerbated by a starting pay deficit relative to jobs in industry using the same skill set (Bazile & Walter, 2009).

While the number of potential faculty members in CTE falls short of available job openings in the field, the number of students applying to receive CTE is steadily increasing (Bazile & Walter, 2009; Olson& Spidell, 2008). Although students are entering the field for a diverse range of reasons such as initial career training, skill maintenance, and re-training for a new career, the technical abilities of new students are estimated to be on the rise. This increase in students with technological skills increases the potential benefits of implementing technology in the classroom to accommodate a tech-savvy student body (Favero & Hinson, 2007).

The largest growing fields in technical education, allied health, engineering and science technology, and computer information systems, all utilize technology in industry when applied (Olson & Spidell, 2008). The combination of an increasingly technology dependent student body with subject matter that requires computer usage creates an expectation to receive technology enhanced learning that must be addressed (Laurillard, 2007). The future of CTE will require a buy-in to technology enhanced education by all players involved – faculty, students, and administration (Favero & Hinson, 2007).

The Technical College System of Georgia (TCSG) is a system engaged in providing CTE by educating and re-training participants to enter the workforce in an individual college's coverage area. The network of colleges within TCSG forms a coverage area that spans the entire state of Georgia. TCSG has recently undergone several substantial changes to strengthen their position and enhance coverage and transferability. The first of these changes involves the change from a quarter system of scheduling to a semester system of scheduling in an attempt to better align with four-year colleges and universities within the state (Technical College System of Georgia, n.d.). Additionally, a number of schools have undergone or will undergo consolidation processes to reduce the total number of colleges from 33 to 25 in an effort to strengthen coverage and better utilize available resources (Technical College System of Georgia, n.d.).

Sample

The sample selected for this study, Central Georgia Technical College, was chosen for a number of reasons. Stratified random sampling of an entire school system such as the Technical College System of Georgia was easily facilitated by considering the individual schools to be subgroups of the overall population. This assertion is further strengthened by the fact that recent mergers and realignments have sought to create relatively uniform size and homogeneous composition across the resulting schools (Cozby, 2009). As a result, the three campuses of this school along with satellite campuses offer the majority of the programs found throughout the entire parent system (Technical College System of Georgia, n.d.). The choice of this sample also corrects a gap found in the literature for technology adoption by using faculty members with at least partial volitional control over the decision making process for adopting technology rather than surveying students (Venkatesh, Morris, Davis, & Davis, 2003; Yousafzai, Foxall, & Pallister, 2010).

Additionally, the sample selection could be viewed as a convenience sample due the proximity and familiarity of the researcher with the given school and school system, it is asserted that this familiarity led to judgment sampling technique because the researcher believes that this school is a fair approximation of the other 24 schools within the population of interest (Cozby, 2009). Although commonly used in research, the results of convenience samples are often limited in their generalizability to the overall population. It is in this observation that the potential risks of sample selection are somewhat offset by current usefulness and future research plans. The results obtained in this study hold useful information for administrators at the school studied for managing and promoting technology adoption (Polites & Karahanna, 2012). Also, proposed future research will be conducted to compare the results of this study to data collected from a university located in the same city, technical colleges in other regions of the United States, and universities in other regions of the United States.

To refine the composition of the pool of respondents further, the researcher defined students and faculty at Central Georgia Technical College, and only received e-mail addresses of respondents based on this criterion. A student was defined as anyone enrolled in at least one class for credit at CGTC during the fall semester of 2015. An instructor or faculty member was defined as anyone full time or adjunct teaching at least one class that awarded students credit during the fall semester of 2015.

Since it is possible that someone could have met both criterion and been considered both a student and faculty member, it was determined by the researcher that the true distinction sought was the possession of volitional control in the decision making process. As a result, anyone meeting the criteria of both faculty and student were deemed faculty. Additionally, the first question of the survey asks the respondent to confirm that they are 18 years of age before proceeding to the survey. This further refines the pool of respondents by eliminating minors from completing the survey.

In terms of actual sample size, Grimm and Yarnold (1995) suggest that the minimum sample size for multiple regression analysis be a minimum of 200 - 300 respondents. This assertion for needed sample size is further supported by using the calculation from G*Power 3.1.9.2 for power analysis that is seen in Appendix C. A priori analysis based on desired power of 0.95 and an alpha value of 0.05, suggests that a minimum sample size of 74 respondents will be needed when G*Power is calculated for two-tailed linear multiple regression as suggested by Memon, Rahman, Aziz, and Abdullah (2012).

Materials/Instruments

The creators of the questionnaire and hypothesized research framework, Wang and Wang, were contacted via e-mail and the expressed consent of the owners of the questionnaire used was obtained prior to reproducing the survey instrument seen in Appendix A. The e-mail response containing permission to use the questionnaire along with any imposed conditions can be seen in Appendix B. During the review of literature it was noted that majority of the TAM and related studies employed a 7 point Likert scale for collecting responses from respondents. To remain consistent with existing studies, the Likert scale implemented by Wang and Wang (2009) ranging from strongly disagree being set as 1 to strongly agree being set as 7 was used for the survey instrument. Respondents could effectively opt out of a question or express neutrality by selecting a response with a value of 4. In keeping with the recommendations of Salant and Dillman (1994), the demographic questions were placed last, and the survey began with the simplest, least threatening questions.

Operational Definition of Variables

The purpose of this quantitative study was to employ a framework that explains the adoption of technology in terms of intrinsic and extrinsic forms of motivation (Ivancevich, et al., 2005). TAM theory suggests variables such as perceived ease of use, perceived usefulness, and attitude toward computer use to predict a decision maker's choice of whether to adopt a technology (Ahmad, Madarsha, Zainuddin, Ismail, & Nordon, 2010). On the other hand, DoI explains the influence on a decision maker in terms of the influence of administration and the opinions of colleagues (Keengwe, Kidd, & Kyei-Blankson, 2009). Additionally, variables such as time to practice, availability of training, and feedback from students must be considered (Creasy, 2008; Keengwe, et al., 2009; Venkatesh & Bala, 2008). Wang and Wang (2009) created a composite framework from several models that uses the variables: information quality, intention to use, perceived ease of use, perceived usefulness, self-efficacy, service quality, subjective norm, system quality, and system use.

Information Quality (IQ). The independent variable information quality reflects the quality of the results produced by a technology (Wang & Wang, 2009). The questionnaire used in this study evaluated this variable by including five questions that probe the respondent's perception of availability and accuracy of information provided by white board learning systems. The survey data was collected in the form of 5 questions answered by selecting ordinal values ranging from 1 to 7 with a value of 4 indicating that the participant indicated having no opinion. The resulting answers were averaged to produce a single interval value ranging from 1 to 7 representing the respondent's value for IQ.

Intent To Use (ITU). The independent variable ITU accounts for the perceived behavior of system use (Wang & Wang, 2009). ITU can be conceptualized as the decision maker's disposition toward using a system. ITU is surveyed by asking respondent's to provide information based on three questions that relate to future intentions to use a white board learning system. The survey data was collected in the form of 3 questions answered by selecting ordinal values ranging from 1 to 7 with a value of 4 indicating that the participant indicated having no opinion. The resulting answers were averaged to produce a single interval value ranging from 1 to 7 representing the respondent's value for ITU.

Perceived Ease Of Use (PEOU). The independent variable PEU reflects the decision maker's perceived comfort level when utilizing a given technology (Ahmad, et al., 2010). The fact that this variable denotes the decision maker's perception of ease of use allowed for the collection of data related to the user's sense of self-efficacy with regard to a given technology (Ahmad, et al., 2010). The survey data was collected in the form of 6 questions answered by selecting ordinal values ranging from 1 to 7 with a value of 4 indicating that the participant indicated having no opinion. The resulting answers were averaged to produce a single interval value ranging from 1 to 7 representing the respondent's value for PEOU.

Perceived Usefulness (PU). The independent variable PU indicates the decision maker's perception of a technology's potential usefulness when applied to a specified situation (Ahmad, et al., 2010). Since this value is based on decision maker's perception, results will be the combination of the user's attitudes toward technology in general, the decision maker's past experience with the technology, and hearsay (Ahmad, et al., 2010). The survey data was collected in the form of 8 questions answered by selecting ordinal values ranging from 1 to 7 with a value of 4 indicating that the participant indicated having no opinion. The resulting answers were averaged to produce a single interval value ranging from 1 to 7 representing the respondent's value for PU.

Self-efficacy (SE). The independent variable SE accounts for the perceived success rate that a respondent anticipates when using a technology (Wang & Wang, 2009). ITU can be conceptualized as the decision maker's level of confidence in projecting success for a given technology. The survey data was collected in the form of 6 questions answered by selecting ordinal values ranging from 1 to 7 with a value of 4 indicating that the participant indicated having no opinion. The resulting answers were averaged to produce a single interval value ranging from 1 to 7 representing the respondent's value for SE.

Service Quality (SEQ). The independent variable SEQ accounts for the perceived level of support available to users of a given technology (Wang & Wang, 2009). SEQ can be conceptualized as the decision maker's opinion of how much help is available if problems are encountered when using a technology. The survey data was collected in the form of 6 questions answered by selecting ordinal values ranging from 1 to 7 with a value of 4 indicating that the participant indicated having no opinion. The resulting answers were averaged to produce a single interval value ranging from 1 to 7 representing the respondent's value for SEQ.

Subjective Norm (SN). The independent variable SN accounts for the level of influence exerted on a decision maker by influential persons or stakeholders within the decision maker's environment (Wang & Wang, 2009). ITU can be conceptualized as the decision maker's perceived peer pressure relative to the opinion of a technology. The survey data was collected in the form of 6 questions answered by selecting ordinal values ranging from 1 to 7 with a value of 4 indicating that the participant indicated having no opinion

opinion. The resulting answers were averaged to produce a single interval value ranging from 1 to 7 representing the respondent's value for SN.

System Quality (SQ). The independent variable SQ accounts for the perceived performance of an information system or technology (Wang & Wang, 2009). SEQ can be conceptualized as the decision maker's opinion of how well a technology functions in accomplishing a task. The survey data was collected in the form of 6 questions answered by selecting ordinal values ranging from 1 to 7 with a value of 4 indicating that the participant indicated having no opinion. The resulting answers were averaged to produce a single interval value ranging from 1 to 7 representing the respondent's value for SQ.

System Use (SU). The dependent variable decision to adopt or system use is defined by the researcher as the decision maker's implementation of a technology to solve a problem. Davis (1989) asserts that the adoption of a given technology occurs when a decision maker considers alternative solutions and selects a course of action based on influential factors (Davis, 1989). The survey data was collected in the form of 4 questions answered by selecting ordinal values ranging from 1 to 7 with a value of 4 indicating that the participant indicated having no opinion. The resulting answers were averaged to produce a single interval value ranging from 1 to 7 representing the respondent's value for SU.

Data Collection, Processing, and Analysis

Prior to collecting any data for this study, the researcher submitted request to the Northcentral University Institutional Review Board (IRB) and the IRB at Central Georgia Technical College. The letter of approval from CGTC was communicated by their Vice President for Institutional Effectiveness Deborah Burks via e-mail and later in writing as seen in Appendix D. Following the approval from the CGTC IRB, the researcher was e-mailed a spreadsheet containing the email addresses of 7,665 CGTC students and 445 CGTC faculty based on the definitions provided by the researcher. Final approval from the NCU IRB was obtained a few weeks later as seen in Appendix E. No data was collected until the IRB approval process was completed at both institutions.

The pilot study was conducted in one week. Pilot respondents received the e-mail containing a link to the survey on a Monday. A follow-up e-mail was sent on Thursday advising that three days remain to complete the pilot survey. The only comment collected involved suggestions from two respondents that questions should be broken into manageable pages rather than presented as a long list. The survey questions were then grouped using variable assignment as grouping for the questions.

Following the one mentioned modification resulting from the pilot survey, the survey process began by the researcher sending the e-mail contained in Appendix F from his NCU student e-mail to all 8,110 e-mail addresses provided by CGTC. The e-mail contained a link to the survey located in Survey Monkey. An explanation of the study, assurances of anonymity, explanation that the respondent may stop the survey at any time, and contact information for the researcher and the dissertation chair. In an effort to guarantee that all potential respondents understood the wording and content of the solicitation e-mail, an analysis of the writing statistics and reading level were conducted as seen in Appendix G.

Once the potential respondent clicks the link to proceed to the survey, the first information that is presented is a notification of informed consent as seen in Appendix H. The letter of informed consent was evaluated for reading level and the results are seen in

Appendix I. Following the informed consent, the user is given three options: a. to agree that they are 18 years of age and want to continue with the survey b. to declare they are not 18 years of age and the survey ends or c. to declare they do not wish to take the survey. At the close of the survey, 525 potential respondents had responded to one of these three options on the informed consent page. Of the 525 respondents, 458 (87.24%) agreed to being 18 years of age and proceeded to begin the survey, 25 (4.65%) selected that they were under 18 years of age and were taken to the end of the survey, and 42 (8.00%) did not wish to take the survey and were taken to the end of the survey. Following the initial e-mail soliciting respondents to complete the survey, two additional reminders were sent to potential respondents during a two-week period. The first reminder e-mail was sent at a one-week interval. The e-mail thanked those who had already completed the survey and invited others to participate. The second reminder was sent with three days remaining and contained the same message as the first reminder. Following the conclusion of the survey, all potential respondents were e-mailed thanking them for their time and participation in the study. Following the close of the survey period, the CGTC IRB and NCU IRB were notified that the survey had been conducted and was closed.

The survey instrument consisted of 53 questions created by adding 4 demographic questions specific to the sample to the 49 questions contained within the questionnaire created by Wang and Wang (2009). All questions except demographic information were answered by selecting a value on a Likert scale: 1 – strongly disagree, 2 – disagree, 3 – somewhat disagree, 4 – neutral, 5 – somewhat agree, 6 – agree, 7 – strongly agree as seen in Table 1.

Table 1. Likert scale rankings used in survey instrument.

Ranking Number	Description of ranking
1	Strongly disagree
2	Disagree
3	Mildly disagree
4	Neutral / undecided
5	Mildly agree
6	Agree
7	Strongly agree

In terms of demographic data, the data was recorded as seen in Table 2. The question of gender will be coded as 0 – male and 1- female. The college functional units are recorded as 0 – Allied Health, 1- Computer Information Systems, 2 – Trade / Industrial, 3 – Business Office Technology, 4 – Public Services, and 5 – Technical. Years of employment with the college will be coded as 0 – 0-4 years, 1 – 5-9 years, 2 – 10-14 years, 3 – 15-19 years, 4 – 20-24 years, and 5 – 25 years or more. Years of education will be coded as 0 – high school / GED, 1 – Associates, 2 – Bachelors, 3 – Masters, and 4 – Doctorate.

Table 2. Demographic information collected during survey.

Demographic Variable	Coding for Responses
Gender	0 – male, 1- female
Functional Unit	0-student, 1-faculty, 2-staff, 3-administrator

Years of employment at college	0-0 through 4 years, 1-4 through 9 years, 2-10 through 14 years, 3-15 through 19 years, 4-20 through 24 years, 5-25 or more years
Years of education	0-high school diploma / GED, 1- Associate's degree, 2-Bachelor's degree, 3-Master's degree, 4-Doctoral degree

The questions on the survey instrument were broken down into ten categories reflecting the associated independent variables, dependent variable, and demographic information: demographic information, perceived usefulness, perceived ease of use, self-efficacy, intent to use, system use, system quality, service quality, information quality, and subjective norm. Permission was obtained from the owners of the survey instrument used prior to using the questionnaire for the current study as seen in Appendix B. Any researcher developed demographic questions were collected for the purposes of providing descriptive statistics explaining the composition of the sample populations.

All statistical analysis including descriptive statistics and multiple regression analysis was calculated using SPSS version 23, and power analysis was calculated using G*Power 3.1.9.2. for Windows operating systems . To test the hypothesis generated from the first research question, multiple regression analysis was used. Grimm and Yarnold (1995) suggest that this type of analysis is appropriate when multiple predictors create a network with multiple interactions that influence the outcome of a single continuous dependent variable. Demographic information was analyzed using descriptive statistics to describe the composition of the sample population. A grouped independent sample t-test was used to test the hypothesis that there is no difference between the data collected from the student and faculty samples. This proposed analysis considered the responses for each variable to see if the student and faculty groups differ significantly in their responses (Norusis, 2008).

Assumptions

The design and preparation of this study contains several assumptions. The first and most significant of these assumptions concerns the selection of a sample population. This research assumed that using a sample population comprised of the faculty of a single college within the Technical College System of Georgia provided information that was generalizable to the entire population. The researcher accepts this assumption because the school offers similar programs and requirements to other schools within the parent system. Additionally, faculty members must meet the same employment requirements as faculty members at other schools within the system.

The second assumption was that faculty member's possessed enough volitional control to determine whether they chose to use technology in their individual classes. Although a larger decision such as a school wide delivery system may be beyond the scope of an individual instructor, each instructor should possess the academic freedom to select which technology to implement in facilitating an individual class. While the original TAM framework assumed that subjects possess complete volitional control in the decision making process, later modifications to the theory and the addition of other theories allow for the sampling of participants with limited volitional control in the decision making process (Davis, 1989; Venkatesh & Bala, 2008). This is further justified when one considers that a decision is not an isolated event. A decision is a combination of influence, opinion, and multiple factors (Elie-Dit-Cosaque, Pallud, & Kalika, 2011/12).

A third assumption involved assuming that respondents provided honest and unbiased answers to survey questions. In an effort to promote honesty and remove bias, respondents were guaranteed anonymity when completing the survey. The only demographic information collected was age range, department, level of education, and years of service. This information is present in results in aggregate form and should not be sufficient to identify an individual respondent.

The fourth assumption of interest involved the selection and size of the sample population. It was assumed that the sample was sufficient to generalize results obtained to the population of interest. The sample population was chosen based on convenience and availability. G*Power software was used to calculate the appropriateness of the sample's size and the resulting power. A fifth assumption was included in this same line of thought pertaining to the veracity of results and integrity of reporting techniques. This assumption was that data was analyzed correctly and reported appropriately to avoid misleading the reader. It assumes that the respondents took the survey only once and the variables were mutually exclusive and exhaustive (Cozby, 2009; Norusis, 2008).

Limitations

One possible limitation of this study was in the sampling technique and whether programs with outlying sizes are represented adequately or overrepresented. Certain programs such as metrology or truck driving exist within TCSG, but these programs are only present at one or a limited number of schools. If the school chosen for the sample, CGTC, contains one of these programs (metrology) or is missing one of these programs (truck driving), this program is either underrepresented or overrepresented in the study. Additionally, if the sample school contains an abnormally large or small population in a program area the number of sample respondents may vary slightly from the host population percentages.

The limitation imposed by representation of programs is somewhat mitigated by the fact that individual programs have been aggregated at the department level. This creates a system of checks and balances for underrepresented and overrepresented groups. Additionally, the use of logistic regression for analysis creates analysis by probabilities which somewhat scales the individual voice and looks at the collective result (Grimm & Yarnold, 1995).

Another possible limitation arises from the problem of people trying to guess the affect that study results might have on future outcomes in the workplace. For instance, if a respondent assumes that survey results may be used to allocate future funding or support it may influence the respondents answers toward pro-technology responses. Additionally, those who wish to produce results consistent with the opinions of administrators may inflate or deflate responses to produce desired results.

The final limitation of interest lies in the appropriateness of members within the sample itself and how much control those individuals perceive to possess in the decision making process. The issue of volitional control or the ability to actively perform the function of a decision maker is central to early adoption literature and the choice of sample populations in technology adoption studies (Davis, 1989; Venkatesh, et al., 2003). Initially, Davis (1989) postulated that the decision maker must possess complete volitional control in the decision making process. Over time, subsequent theories of technology adoption that evolved from TAM began to incorporate subjective norm and the effects of influential others within the workplace as predictor variables. As a result, volitional control in the decision making process became more accurately expressed as possessing a vested interest as a stakeholder (Venkatesh, et al., 2003).

The severity of this potential limitation can be estimated based on the results obtained for research question 2. Out of the 240 respondents participating in this study, students in the pool of respondents outnumbered instructors by a ratio of 5:1. If the analysis of the data obtained with respect to research question 2 led the researcher to conclude that the opinion of students and instructors differed significantly, the potential limitation of limited volitional control by some respondents would be pronounced. Since the evaluation of data with respect to research question 2 supports the conclusion that students and instructors do not differ significantly in responses to the technology adoption survey in this sample population, the potential limitation of respondents with limited volitional control is less pronounced and potentially offset by subjective norm.

Delimitations

The first delimitation comes from the theoretical framework itself. Since, the framework involves the assessment of an individual respondent's perception of the individual factors (independent variables) of interest. Although it is necessary to assign values to perception in order to apply the theories and resultant models, an individual's perception can be completely erroneous yet still exhibit an effect on the decision making process. This can cause a problem if management intends to use results from a study to successfully launch an intervention to guide behavior in the decision making process. This delimitation may be further exaggerated for some variables such as feedback from students. It is possible that the feedback elicited from students does not represent a cross section of the student population and students may have an additional agenda that guides the feedback provided.

A second delimitation occurs by generically making reference to “technology” and “computers” in the survey instrument to represent an innovation. The generic terminology is necessary to create an instrument that has enough breadth to be used to survey a sample with the diversity of the faculty of an entire school. For example, it is unlikely that a nursing instructor would have an accurate or relevant opinion on specialized software used to support an electronics program.

Ethical Assurances

This study was created in adherence to accepted policies governing research within the academic community. The guidelines set forth by the graduate school at Northcentral University were followed and no data was collected prior to obtaining the approval of the Northcentral University Institutional Review Board (IRB). Additionally, standards set forth in the Collaborative Institutional Training Initiative (CITI) were employed to provide reasonable assurances that no individuals were harmed during the study, ethical practices for research with human subjects were followed, and that results were reported accurately (Collaborative Institutional Training Initiative, n.d.).

By definition, this study does constitute research because data was gathered from a pilot and sample population, statistical procedures and techniques were applied to give meaning to the data, and generalization were made about the larger parent population based on the results obtained from the sample (Collaborative Institutional Training Initiative, n.d.). No individual or specific identifiers were collected from the respondents.

Although the combination of demographic information might in some cases have allowed a respondent to be identified by process of elimination, survey results were made available in aggregate form to eliminate the possibility of unintentionally identifying an individual. Additionally, no vulnerable subjects exist to be surveyed in the sample population. Since the study does qualify as research, it was subject to IRB review and approval; but in light of the anonymity of respondents and the absence of vulnerable participants, the study was considered exempt from the Common Rule (Collaborative Institutional Training Initiative, n.d.).

The cover page briefly explained the purpose of the survey. Respondents were advised that individuals were not uniquely identified in the study, and that all participants should feel free to answer honestly with no fear of individual reprisal. Additionally, no coercive behavior was employed to force respondent completed the survey on a completely voluntary basis. If any respondent chooses not to answer a question, the respondent could opt out of answering the question by selecting a neutral (4) response. Any respondent is could terminate the completion of the survey at any time.

Since all classes are available using the English language in the sample population, English has been chosen as the delivery format for the survey. The level of the language used in the questionnaire should be adequately simple to interpret by individuals possessing a minimum of a high school diploma or college degree. The aggregate results will be made available to all schools involved in the study, and any respondent can request a copy of aggregate results. The data collected will not be sold to any parties, but the data may be used freely by the researcher in future studies adhering to guarantees made to the initial respondents.

Summary

This chapter begins by acknowledging that the problem of interest occurs when technical colleges as an entity lose competitive advantage relative to competitors when their faculty members fail to adopt and use technology in the classroom. To understand this problem, this study investigated the internal and external factors that lead decision makers to adopt technology in technical education. Specifically, the first research question investigates whether there is a relationship between the support of administration, opinion of colleagues, availability of training and support, feedback from students, perceived ease of use, perceived usefulness, and the attitude toward computer use on the decision to adopt technology in the technical college classroom. Additionally, a second research question further investigates the applicability of students as sample participants in predicting the behavior of college faculty.

Data for this study was collected by means of an online questionnaire that was delivered using Survey Monkey. Respondents received an e-mail with information and a link to the survey via their work/school e-mail address. The survey was composed of items used on a previous survey instrument within the field of interest. Permission was obtained from the owners of the items to re-use and modify the items for this instrument. Additionally, IRB approval was obtained from NCU and CGTC before any respondents were surveyed in the pilot or actual study.

A description of the coding techniques for answering all questions is explained using a 7-point Likert scale with the exception of demographic questions which require other types of answers. Multiple regression analysis will be employed to analyze the results of this study that has multiple independent variables hypothesized to influence a single continuous dependent variable (Grimm & Yarnold, 1995). SPSS v23 software will be utilized to analyze and report results obtained from the information collected.

Following a brief background explanation describing individuals who choose CTE as a profession, the selection of an appropriate sample is discussed. CGTC is chosen as a sample out of convenience, availability, and applicability to the study. A priori analysis suggests that 74 respondents will be needed to achieve a power of 0.95, which is considerably lower than the number of respondents suggested, by Grimm and Yarnold (1995). It is noted that accuracy and the predictive power of the model will be increased as the sample number approaches the higher suggested sample size.

The chapter is concluded with a discussion of assumptions, limitations, delimitations, and ethical assurances. Although this study does constitute research using human subjects, means have been taken to assure the anonymity of respondents and prevent any acts that would cause mental or psychological harm to respondents. Respondents are also allowed to effectively opt out of answering any questions by simply choosing an option of neutrality during the questionnaire. No form of coercion or manipulation will be used to obtain respondents or influence the outcome of any respondent's survey.

Chapter 4: Findings

The purpose of this quantitative study was to investigate the internal and external factors that contribute to adoption rates for new technology in the field of technical education. Specifically, the perceived usefulness, perceived ease of use, subject norm, self-efficacy, information quality, system quality, intent to use, and service quality will be explored using a multivariate statistical model to determine their relationship with the decision to adopt technology. Identifying the factors that favorably influence the decision to adopt a given technology will allow college leaders to stage intervening actions that will promote the adoption of technology (Venkatesh & Bala, 2008). The study goes a step further to determine if students and faculty significantly differ in their responses to the survey. This difference or lack thereof could have an impact for future studies with respect to how sample populations are selected for studies.

Following the description of the sample pool used in the study, statistical analysis is presented showing a comparison of a priori and post hoc power calculations. Research question 1 is addressed by examining the presence or absence of any relationships between the independent variables and the dependent variables. Research question 2 is addressed by comparing responses obtained from students to those obtained from the instructor group to determine if the criticism of using students as samples in TAM research is warranted for the population of interest. After the data related to the two research questions are presented, a discussion of the assumptions made while using multiple regression analysis is presented. The chapter is then concluded with an evaluation of the findings as presented and a summary.

Results

Data analyzed in this study were collected as the result of sending an e-mail soliciting participation to 8,110 addresses provided by the Central Georgia Technical College Office of institutional Effectiveness. The e-mail list was compiled based on filter criteria established by the researcher for establishing who should be considered as a student or instructor from the college for the period of fall semester 2015. Anyone enrolled at CGTC and taken at least 1 semester hour for credit during the time period was considered to be a student. Anyone engaged in teaching or evaluating students pursuing at least one credit hour was to be considered as an instructor. Additionally, anyone meeting both criteria was considered to be instructors based on the level of volitional control possessed in their capacity as an instructor.

During the time allotted for people to participate in the survey, 525 respondents replied to the e-mail and answered the first question of the survey. Of the 525 potential participants, 396 (75.4%) respondents agreed to being 18 years of age or older and willing to participate, 24 (4.6%) respondents were not 18 years of age and not allowed to proceed to the survey, and 105 (20.0%) respondents did not wish to participate in the survey. The total response rate calculated based on 525 respondents out of a pool of 8,110 potential candidates was 6.5%. Of the 525 respondents who began the survey, only 240 completed the entire survey for a completed response rate of 45.7%.

An a priori analysis using G*Power 3.1.9.2 for an effect size of 0.15, a significance level (α) of 0.05, 8 predictor variables, and desired power of 0.95 calculated the needed number of respondents to be at least 74 as seen in Appendix C. Post hoc power calculations using the same significance level, effect size, and actual number of respondents deemed usable yielded a calculated power of 99.99 as seen in Appendix J. The statistical tests selected for the power analysis a priori and post hoc is based on the hypothesis testing involving multiple variables contributing to portions of observed variance (Faul, Erdfelder, & Lang, 2009).

Table 3 contains the demographic data describing the composition of the sample population used in this study (see Appendix G). Of the 240 completed surveys, 62 (25.8%) respondents were male and 178 (74.2%) of the respondents were female. In regards to the position held at the school, the researcher remained consistent with previous decisions and grouped positions according to those possessing a level of volitional control and those possessing no direct control in the decision making process. The student group was composed of 186 (77.5%) respondents while the instructor group composed of faculty, administrators, and support staff contained 54 (22.5%) respondents. The level of education reported by those completing the survey was distributed as: GED or high school diploma - 142 (59.2%), Associate's Degree – 47 (19.6%), Bachelor's Degree – 15 (6.3%), Master's Degree 34 (14.2%), Doctoral Degree - 2 (0.08%). Appendix K contains the frequency counts and percentages describing the demographic responses provided by 240 respondents that completed the survey.

Q1. What are the significant relationships between perceived ease of use, perceived usefulness, subjective norm, self-efficacy, system quality, information quality, service quality, intent to use, and the decision to adopt technology?

When considering the direct correlation between each of the 8 independent variables and the dependent variable as expressed in Hypothesis 1, Table 3 displays a tabular compilation of Pearson correlation coefficients. The results ranged from an observed low value of 0.50 for the variable information quality to an observed high value of 0.79 for the variable intent to use. As a result of this observation, it is justified to reject the null hypothesis and conclude that all correlations are significant at the $p < 0.05$level.

Table 3. Correlation matrix for H_1 (N = 240)

	SU	IQ	SQ	SeQ	SE	SN	PeOU	PU	ITU
SU	1.00	.50	.64	.68	.58	.73	.70	.69	.79
IQ	.50	1.00	.71	.60	.61	.59	.63	.67	.63
SQ	.64	.71	1.00	.77	.79	.81	.80	.78	.71
SeQ	.68	.60	.77	1.00	.72	.73	.77	.74	.71
SE	.58	.61	.79	.72	1.00	.78	.86	.78	.70
SN	.70	.59	.81	.73	.78	1.00	.84	.81	.84
PEoU	.70	.63	.80	.77	.86	.84	1.00	.92	.85
PU	.69	.67	.78	.74	.78	.81	.92	1.00	.87
ITU	.79	.63	.71	.71	.70	.84	.85	.87	1.00

After determining that the null hypothesis should be rejected, a regression analysis was performed to determine the constant and slope values for the regression line. Table 4 shows the obtained results from multiple regression analysis. Given a calculated R^2 value of .668 for the regression model, the equation produced has a goodness of fit indicating that 66.8% of the variance in the dependent variable is described by the independent variables.

Table 4. Multiple regression coefficients for H_1 (N = 240)

	B	Standard Error of B	β
Constant	-0.265	0.288	
Information Quality	-0.066	0.070	-0.054
System Quality	0.072	0.103	0.059
Service Quality	0.302	0.084	0.238
Self-Efficacy	-0.161	0.095	-0.134
Subjective Norm	0.235	0.109	0.191
Perceived Ease of Use	0.090	0.153	0.072
Perceived Usefulness	-0.179	0.137	-0.144
Intent to Use	0.709	0.106	0.612

Q2. What are the significant differences between survey results obtained from a faculty sample and a student sample within a technical college?

Table 5 displays a tabular compilation of mean values, standard deviation, and standard error of the mean for the instructor and student groups. Table 6 displays a tabular version of the independent sample t-test values using instructor (instructor, support staff, and administration) represented by >= 2 and student for grouping represented by < 2. There was not a significant difference in the values obtained for the two groups for any of the independent variables. According to the evidence obtained from the survey respondents, there is not sufficient evidence to support rejecting the null hypothesis at the $p < 0.05$ level.

Table 6. Results of independent samples t-test related to H_2

	Sig.	df	Sig. (2-tailed)
Information Quality	0.07	238	0.29
System Quality	0.08	238	0.63
Service Quality	0.63	238	0.13
Self-Efficacy	0.02	105.67	0.35
Subjective Norm	0.96	238	0.10
Perceived Ease of Use	0.11	238	0.29
Perceived Usefulness	0.29	238	0.48
Intent to Use	0.86	238	0.48

To perform multiple regression analysis two conditions or assumptions must be satisfied: a.) The relationship between the dependent variable and the independent variables must be linear which is verified by visual inspection of a scatterplot in SPSS. b.) The distribution of the dependent variable must be normal with constant variance for all possible combinations of the independent variables (Norusis, 2008). Box plots for the each independent variable demonstrates a symmetrical distribution for the variables system quality, service quality, self-efficacy, subjective norm, intent to use, perceived ease of use, and perceived usefulness. Information quality was positively skewed but still somewhat symmetrical within the box plot (Norusis, 2008).

Evaluation of Findings

The findings obtained while investigating research question 1 are in agreement with information found in the literature review (Holden & Karsh, 2010; Sykes, Venkatesh, & Gossain, 2009; Vannoy & Palvia, 2010; Venkatesh, Thong, & Xu, 2012; Wang & Wang, 2009; Yousafzai, Foxall, & Pallister, 2010). There is support for rejecting the null hypothesis that no relationship exists between the independent or predictor variables information quality, system quality, service quality, subjective norm, self-efficacy, perceived ease of use, perceived usefulness, and intent to use with respect to predicting the adoption of technology as observed through system usage. However, findings related to research question 2, do not support the opinion found in the literature regarding the appropriateness of students in sample populations for technology adoption research (Ahmad, et al., 2010;Grant, Malloy, & Murphy, 2009; Venkatesh, Thong, & Xu,2012). There is not sufficient evidence obtained in this study to reject the assertion that students and teachers engaged in technical education essentially answer in the same or similar fashion when taking surveys related to technology adoption.

Beginning with the Technology Adoption Model, researchers have sought to use the variables perceived usefulness, perceived ease of use, and attitude toward technology usage as a means of predicting the adoption of technology by individuals in various situations (Davis, 1989). While perceived ease of use and perceived usefulness have remained relatively unchanged with the exception of acknowledging some potential interactions between the two variables, countless researchers have sought to refine attitude toward technology use into granular components specific to a field of study or a specific population of interest (Vannoy & Palvia, 2010; Venkatesh, Morris, Davis, & Davis, 2003). In this spirit, Wang and Wang (2009) propose a model that retains perceived ease of use and perceived usefulness while considering the decision maker’s evaluation of their own skills in the form of self-efficacy and the influence of others in the decision maker's environment in the form of subjective norm. Wang and Wang (2009) also add a consideration of system quality, service quality, information quality, and intent to use in an attempt to create a model reflecting a more complete representation of decision maker's perceptions.

Q1. What are the significant relationships between perceived ease of use, perceived usefulness, subjective norm, self-efficacy, system quality, information quality, service quality, intent to use, and the decision to adopt technology?

The results of the multiple linear regression tests using system quality, information quality, service quality, perceived ease of use, perceived usefulness, self-efficacy, subjective norm, and intent to use as independent variables partially contributing to the prediction of the independent variable system use representing the adoption of a technology in question were sufficient at a 95% confidence interval to reject the null hypothesis. System quality refers to the user's opinion of the merits and performance of a technology in question with respect to available alternative solutions and information quality represents the status of information produced relative to that produced by competing technologies (Wang & Wang, 2009). Service technology is the decision maker's opinion of how well a user efforts are supported in a given work environment as exampled by availability of technical support, training, time to practice, and peer mentoring (Hall, 2010; Hixon & So, 2009; Wang & Wang, 2009).

As a result of this action, the researcher is compelled to conclude that within the sample population surveyed there is a significant relationship between the 8 independent variables and the decision to adopt technology. An R^2 value of 0.668, indicates that the model tested implementing a direct relationship between all 8 independent variables and the decision to adopt a technology explains 66.8% of the variance in the dependent variable.

Perceived ease of use reflects a decision maker's beliefs that a technology is relatively free from effort when attempting to achieve a desired outcome, and perceived usefulness reflects the decision maker's level of agreement that a technology will be a suitable solution for a task in question (Davis, 1989). Subjective norm represents the overall influence that others within the work environment have over the decision maker with respect to a given technology (Holden & Karsh, 2010). Self-efficacy is a reflection of a decision maker's overall confidence in self when using technology to solve a problem and intent to use reflects a willingness or predisposition to use technology as a solution to challenges in a work environment (Kanthawongs, 2011; Vannoy & Palvia, 2010).

Q2. What are the significant differences between survey results obtained from a faculty sample and a student sample within a technical college?

Several recent articles related to technology adoption have criticized previous studies where researchers used students as a sample for predicting the behavior of a group of decisions makers. The principle argument against this behavior centers around the lack of volitional control possessed by students as a group in the decision making process for technology adoption (Venkatesh, Morris, Davis, & Davis, 2003; Yousafzai, Foxall, & Pallister, 2010). To address this concern regarding sample selection, the answers obtained from students were compared to the answers obtained from respondents possessing volitional control to determine if there was a significant difference in mean values for variables between the groups. At a 95% confidence level, there was insufficient evidence to reject the null hypothesis for any potential independent variables. The resulting inability to reject the null hypothesis leads to the conclusion that sampling students or faculty in the TCSG does not produce significantly different results.

Summary

The purpose of this quantitative study was to investigate the internal and external factors that predict the decision to adopt technology in technical education. Additionally, the answers provide by students were compared with results obtained from instructors to determine if there was a significant difference in responses between the two groups. An e-mail soliciting survey participation was sent to 8,110 potential respondents with 525 participants proceeding to the survey and producing 240 completed surveys that were usable for analysis and hypothesis testing. The actual calculated power for the study using 8 independent variables and 240 respondents was 99.99%.

After determining that there was a significant correlation between the independent variables service quality, system quality, information quality, subjective norm, self-efficacy, perceived usefulness, perceived ease of use, and intent to use and the dependent variable system use, multiple regression analysis was performed. The results ranged from an observed low value of 0.50 for the variable information quality to an observed high value of 0.79 for the variable intent to use. It was determined that this model directly relating the independent variables to the dependent could account for 66.9% of the variance in the dependent variable.

Independent sample t-tests were used to compare the mean values for the variables obtained from the groups indicated as students and instructors. None of the independent variables used were found to differ significantly between the two groups:

information quality $t(238) = -1.05$, $p = 0.29$, system quality $t(238) = -0.49$, $p = 0.63$, service quality $t(238) = -1.52$, $p = 0.13$, self-efficacy $t(106) = -0.94$, $p = 0.35$, subjective norm $t(238) = -1.67$, $p = 0.10$, perceived ease of use $t(238) = -1.07$, $p = 0.29$, perceived usefulness $t(238) = -0.70$, $p = 0.48$, and intent to use $t(238) = -0.72$, $p = 0.48$. As a result, the test did not support rejecting the null hypothesis and it was concluded that responses by students and instructors in the TCSG sample were not significantly different.

Chapter 5: Implications, Recommendations, and Conclusions

The first problem addressed in this study was the lack of technology adoption in technical education. Reduced rates of technology adoption in technical education leads to decreased competitive advantage, limited potential coverage areas, and reduced return on investment for stakeholders. To address this problem it was necessary to understand the relationship between technology adoption (system use) and eight predictor variables: intent to use, perceived usefulness, perceived ease of use, subjective norm, self-efficacy, system quality, information quality, and service quality. The purpose of understanding the predictors of adoption is to allow administrators to stage successful interventions that lead to adoption of technology. In turn, increasing the adoption rate of technology in technical education should produce an increase in return on investment for stakeholders.

The second problem addressed was the large quantity of past studies that used only students as a sample population. The TAM research of Davis (1989) and others stressed that sample populations must be composed of respondents that possessed or believed that they possessed volitional control in the decision making process. Later studies began to consider that a limited perception of volitional control was sufficient to qualify as a potential respondent (Venkatesh, Morris, Davis, & Davis, 2003). The sample of respondents was separated into two groups: a.) students – composed of respondents who indicated their position as student b.) faculty – respondents who indicated their position as either faculty, staff, or administrator. By comparing the responses of these two groups with respect to the predictor variables, it could be determined if students represent an adequate sample population for TAM research in technical education.

To guarantee that any findings obtained in the study were statistically significant and generalizable to the Technical College System of Georgia; an a priori analysis was conducted to determine the minimum number of respondents needed for the study. An a priori analysis using G*Power 3.1.9.2 for an effect size of 0.15, a significance level (α) of 0.05, 8 predictor variables, and desired power of 0.95 calculated the needed number of respondents to be at least 74. Since the study used 240 respondents, the actual power of the study was calculated to be 99.99%.

The researcher selected one of the schools within the Technical College System of Georgia located in the center of the system. The school selected for sampling, Central Georgia Technical College, was selected because of potential sample size, wide variety of offerings covering many of the disciplines within the system, researcher interest, and availability. The researcher contacted the Vice President of Institutional Effectiveness for Central Georgia Technical College, Deborah Burks, to begin the formal process for permission and CGTC IRB approval. After downloading and completing the necessary forms, addressing questions concerning the nature of survey delivery, and making needed adjustments; permission was obtained to survey CGTC faculty, students, staff, and administrators as seen in Appendix C.

Based on researcher defined criteria submitted to Central Georgia Technical College a list of e-mails was provided to the researcher that contained addresses for 7,665 students and 445 faculty, staff, and administrators. The survey e-mails were sent to the sample over a two week period with two reminders sent at intervals. Based on participation, completion, and agreement, 240 usable surveys were collected. The survey, as seen in Appendix A, contained 4 demographic questions and 49 questions from the survey of Dr. Wang for a total of 53 questions. Respondents were required to be at least 18 years of age, provide consent, and all instructions were evaluated to be at a seventh grade reading level to avoid potential confusion or misunderstanding.

To begin the process of creating the research study, the researcher needed to select an appropriate survey instrument and determine appropriate hypotheses that addressed the research questions. After extensive review of the available literature with the field of technology adoption, the researcher decided that the instrument used by Wang and Wang (2009) was most aligned with the objectives and theories espoused by the researcher. As seen in Appendix B, the owner of the survey, Dr. Wang, was contacted via e-mail to obtain permission to use and modify the survey if needed. A pilot study was then conducted to check the survey instruments delivery and accuracy before submitting to respondents. Based on feedback, adjustments were made to the surveys overall visual presentation before proceeding. Survey Monkey was used as the online delivery system for the survey, and e-mails soliciting participation were sent through the researcher's NCU student e-mail account.

The researcher employed a 7-point Likert scale to collect responses for the 49 non-demographic questions found on the survey. Respondents were allowed to indicate no opinion or opt out of a question by selecting a value of 4 in the middle of the scale. Since a number of questions were used to represent the value of each variable a mean score per variable was calculated and used for analysis. The 8 independent or predictor variables perceived ease of use, perceived usefulness, subjective norm, self-efficacy, system quality, information quality, service quality, and intent to use were employed in multiple regression analysis with system use as the dependent variable.

A number of limitations may have affected the response rate obtained for this survey. Many students fail to check student e-mail accounts in a timely manner. There are many reasons for this behavior including faculty use of learning management systems for communication rather than student e-mail. Students may have a lack of interest in participating in surveys, more than double the number of participants started the survey compared to the number that completed the survey. Even though the instructions clearly explained that respondents were not being identified and there should be no anticipated reprisals, it is possible that potential respondents could have feared a hidden agenda or possible reprisals from faculty or administrators.

All guidelines set forth in Collaborative Institutional Training Initiative training and recommendations of ethical procedures in research were followed to the best of the researcher's ability. The research should have posed no threat or potential harm to respondents, and all efforts were taken to explain the respondent's right to quit at any time with no fear or threat or reprisal of any kind. The language used in instructions and consent form was evaluated to be at seventh grade reading level and well within the reading skill level of participants. Following an explanation of problem, the research to address the problem, the nature of the study, and the limitations the implications of the responses collected and analyzed are explained. Since there are two research questions, the implications regarding the appropriateness of the selection of predictor variables and the sample population are discussed with conclusions and assertions by statistical analysis using multiple regression analysis and paired samples t-tests procedures. Then a discussion of recommendations for future research and potential intervention strategies for improving technology adoption is explored.

Implications

This research study was designed to determine if there were significant relationships between eight predictor variables and the decision to use technology in technical education which is represented by the dependent variable system use. A second problem was investigated in an attempt to determine if responses collected from students differed significantly from the responses collected from faculty when using the same survey instrument. Given that an a priori assessment of power predicted that to achieve a power of 95% for an effect size of 0.15, and a significance level (α) of 0.05, the researcher would need to collect at least 74 completed and valid surveys to generalize results obtained to the overall population of the Technical College System of Georgia. Since the study produced 240 complete and valid surveys, the researcher feels confident suggesting that results can be generalized to the population with the calculated power of 99.99%.

Q1. What are the significant relationships between perceived ease of use, perceived usefulness, subjective norm, self-efficacy, system quality, information quality, service quality, intent to use, and the decision to adopt technology?

$H1_0$. There is no significant relationship between perceived ease of use, perceived usefulness, subjective norm, self-efficacy, system quality, information quality, service quality, intent to use, and the decision to adopt technology.

$H1_a$. There is a significant relationship between perceived ease of use, perceived usefulness, subjective norm, self-efficacy, system quality, information quality, service quality, intent to use, and the decision to adopt technology.

Based on the results of the multiple regression analysis found in Table 4, there was significant evidence to reject the null hypothesis and conclude that there are significant relationships between all eight predictor variables and system usage or adoption at the level $p > 0.005$. This result is not surprising considering that that same results have been obtained in samples from similar populations around the world when considering all or some of these variables as predictor for adoption (Ahmad, et al, 2010; Borrego, Froyd, & Hall, 2010; Favero & Hinson, 2007; Wang & Wang, 2009). This extends the body of scholastic knowledge to include additional information about the specific population and the appropriateness of sample selections. The information also supports the areas that can be promoted or encouraged by managers and administrators to increase favorable opinions of technology leading to increased adoption of technology in the technical college classroom (Favero & Hinson, 2007).

It is important to note that all predictor variables are based on the decision maker's perception of a given situation including their individual level of skill and motivation with respect to the technology in question. This is of interest because simply forcing technology on a population in no way guarantees a successful implementation or adoption of the technology. Perceived ease of use reflects the decision maker's opinion that the technology in question will be relatively free from effort when used (Ahmad, et al, 2010). Finding this variable to be significantly related to system use indicates that decision maker's tend to adopt technology that they perceived to be easy to use.
Aside from the perception that a technology is easy to use, the decision maker's belief that a technology will satisfy favorable performance outcomes is expressed as perceived usefulness (Ahmad, et al, 2010). Finding perceived usefulness to significantly relate to

system use indicates that a decision maker's belief that technology satisfies a need will lead to increased rates of adoption for that technology. It is also important that decision makers have a sense of self-confidence when utilizing technology which is expressed as self-efficacy. A decision maker with a high sense of self-efficacy expects to succeed when using technology (Wang & Wang, 2009). Finding self-efficacy to significantly relate to system use indicates that a decision maker's belief that they will succeed when using the technology will lead to increased rates of favorable decisions to adopt a technology.

Employees tend to conform and become part of the organizational culture that they inhabit. The opinions of influential others in the work place is described as subjective norm. This subjective norm can encourage or discourage behavior and decision depending on the prevailing attitude in the work place (Wang & Wang, 2009). Finding subjective norm to significantly relate to system use indicates that a decision maker's environment directly affects the resulting decision maker's decision relative to a technology in question.

A decision maker's overall opinion related to the quality of a technology relative to alternative technologies can be described through the variable system quality (Wang & Wang, 2009). Finding system quality to significantly relate to system use indicates that a decision maker's opinion of the overall quality of a system can influence the decision to adopt the given technology. By that same token, the quality of the technology's output relative to alternative technology can be viewed as information quality (Davis, 1989). Finding information quality to significantly relate to system use indicates that a decision maker's belief in the quality of results obtained can favorably influence the decision to adopt a technology.

A user's belief that support and training are available to prepare for using a technology will have a positive influence on decision making as expressed by service quality (Wang & Wang, 2009).Finding service quality to significantly relate to system use indicates that a decision maker's decision to adopt can be moved in a favorable direction by providing support. The decision to implement a technology given the opportunity is expressed as intent to use (Wang & Wang, 2009). Finding intent to use significantly related to system use indicates that a decision maker's will tend to adopt a technology that possesses a strong intent to use on the part of the decision maker.

Q2. What are the significant differences between survey results obtained from a faculty sample and a student sample within a technical college?

$H2_0$. There is no significant difference between survey results obtained from a faculty sample and a student sample within a technical college**.**

$H2_a$. There is a significant difference between survey results obtained from a faculty sample and a student sample within a technical college**.**

Based on the results of the independent samples t-tests found in Table 6, there is insufficient evidence to reject the null hypothesis and conclude that the opinions or strength of convictions related to these predictor variables significantly differ between the student and faculty population. This is a little surprising because although both populations report a desire for increased engagement and connectedness, the other underlying goals and motivation is different. The limitation that either group may fear reprisal or question the presence of underlying purposes for the survey may prevent certain respondents with strong opinions in the sample group from completing the survey. However, the prevalence of using students as a captive audience or surrogate sample for teachers seems to indicate that these results are not a surprise for all researchers in the field of technology adoption. Both groups express a desire to use technology when they feel that support is available and the results produced by the technology are of sufficient quality. Availability of support and training is represented by service quality while system quality and information quality represents an overall opinion of how well the technology performs at accomplishing job related tasks.

The consensus of both groups is that technology adoption is fostered when the user feels that they are capable of accomplishing requisite tasks with the technology in question as represent by perceived ease of use, perceived usefulness, and a sense of self-efficacy. An underlying desire to use technology to accomplish daily or routine tasks is described and expressed by self-efficacy and intent to use. The perception that other individuals in the decision maker's sphere of influence support the technology in question is represented by subjective norm. It is interesting to note that this inclusive category subjective norm includes subordinates, managers, and employees of lateral status.

Recommendations

The recommendations that arise from this study find support in the statistical analysis found in table 5 that suggests that a significant relationship exists between each predictor variable and the dependent variable system use. This observation suggests that managers and leaders of technical education can manipulate the perception of various predictor variables to improve favorable decisions toward adopting technology. An increase in the rate of technology adoption in technical education will result in increased return on investment and stakeholder benefits throughout the entire system. The interventions do not have to be overly dramatic. Empowering employees to act as champions of a technology can contribute greatly to increased adoption by increasing the overall influence of subjective norm. Additional support and time for training can be used to increase perceived usefulness, perceived ease of use, self-efficacy, and intent to use. This does lead to a suggestion of future research to investigate the overall effect of treatments related to altering the predictor variables and observing related changes in outcomes.

Since the paired samples t-test did not provide significant statistical values to reject the null hypothesis that students and faculty differed in opinions and answers to technology adoption surveys as seen in table 6, future research will be needed to further understand the nature of this relationship and pool of potential respondents in technology adoption research. In this study, there seemed to be little variation between the responses of the two groups, but a larger population and more in depth survey may be able to provide additional insight. If there is no significant difference between the opinion of the faculty and student groups, then there is evidence to debunk the assertion that a perception of volitional control is required for respondents to populate the sample group.

Conclusions

The purpose of this quantitative research study was to address two identified problems: 1.) Decision makers in technical education fail to maximize return on investment for stakeholders when they hesitate or fail to adopt technology for use in the classroom 2.) Many studies use students as respondents when investigating technology adoption and this may not be an acceptable sample. In order to allow managers and leaders to promote increased technology adoption through interventions, it is necessary to understand the factors that influence the decision to adopt technology. It is also necessary for researchers in future studies to decide if students or persons with little to no volitional control in decision making constitute a viable pool for respondents in a survey.

For the purposes of this study, the factors considered for potentially influencing technology adoption were perceived ease of use, perceived usefulness, subjective norm, intent to use, self-efficacy, system quality, service quality, and intent to use. Since all eight predictors were found to be significantly related to the decision to adopt technology represented as system use, all of these predictors are identified as potential sources for focusing intervening activities to promote technology adoption. Students were determined to be any one registered for 1 credit hour of class during the fall 2015 semester. Faculty was deemed anyone engaged in teaching at least one credit hour for fall 2015 semester along with administration and support staff. Based on the data obtained, it was not possible to reject the null hypothesis that students and faculty groups do not differ in their answers to the same technology adoption survey. As a result, it is not possible to assert that students are not a satisfactory group of respondents for technology adoption surveys with the Technical College System of Georgia. Further research is recommended on this topic before condoning using sample population with no volitional control or possessing a predisposition to please as a respondent.

Since the number of respondents produced usable surveys more than trebled the amount calculated in a priori power test, the researcher fills relatively confident in asserting that the value obtained in this study can be generalized to the overall population of the Technical College System of Georgia. This study contributed to the body of academic knowledge in the field of technology adoption by providing insight into factors related to technology adoption in the field of technical education and the appropriateness of using students as technology adoption respondents. Future research is suggested to evaluate the effects of interventions that promote technology adoption by changing the position of these predictor variables that have been identified and found to be significantly related to system use.

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Appendixes

Appendix A:

Survey Instrument

Num	Question	Topic	Source of Item
1	Which best describes your position at the college?	demo	investigator-developed item
2	Gender	demo	investigator-developed item
3	How long have you been at the college?	demo	investigator-developed item
4	Level of Education	demo	investigator-developed item
5	WBLS can provide me accurate information.	IQ1	Wang & Wang (2009)
6	WBLS can provide me sufficient information to enable me to do my tasks.	IQ2	Wang & Wang (2009)
7	WBLS can provide the precise information that I need.	IQ3	Wang & Wang (2009)
8	I am satisfied with the accuracy of WBLS.	IQ4	Wang & Wang (2009)

9	WBLS can provide helpful information regarding my tasks.	IQ5	Wang & Wang (2009)
10	WBLS allows me control over my teaching activities.	SQ1	Wang & Wang (2009)
11	WBLS offers flexibility as to time and place of use.	SQ2	Wang & Wang (2009)
12	WBLS provides functions that I need to successfully conduct my teaching activities.	SQ3	Wang & Wang (2009)
13	I have appropriate and sufficient software and hardware on my personal computer to use WBLS.	SQ4	Wang & Wang (2009)
15	I can easily access the WBLS anytime I need to use it.	SQ5	Wang & Wang (2009)
15	WBLS has well-designed user interfaces.	SQ6	Wang & Wang (2009)
16	Training on the operation of WBLS is sufficient.	SEQ1	Wang & Wang (2009)
17	Employees of the information service department have sufficient professional knowledge.	SEQ2	Wang & Wang (2009)

18	I can communicate with the members of the information service department through multiple channels when I encounter technical problems and require quick responses.	SEQ3	Wang & Wang (2009)
19	Employees of the information service department can quickly fix my technical problems.	SEQ4	Wang & Wang (2009)
20	The training provided by the information service department can enhance my abilities to use information technologies.	SEQ5	Wang & Wang (2009)
21	Employees of the information service department can provide sufficient support regarding the use of the WBLS.	SEQ6	Wang & Wang (2009)
22	I am confident that I can use WBLS even if I have no prior experience with online teaching.	SE1	Wang & Wang (2009)
23	I am confident that I can use WBLS even if there is no one around to show me how to use it.	SE2	Wang & Wang (2009)

24	I am confident that I can use WBLS even if I have only the user manual for reference.	SE3	Wang & Wang (2009)
25	I am confident that I can integrate the functions of WBLS with my teaching plan.	SE4	Wang & Wang, 2009
26	I am confident that I have adequate ability to operate WBLS.	SE5	Wang & Wang, 2009
27	The authorities of my institution support the use of WBLS in my teaching.	SN1	Wang & Wang, 2009
28	My students support the use of WBLS in my teaching.	SN2	Wang & Wang, 2009
29	The teaching environment of my institution is adequate for me to use WBLS in my teaching.	SN3	Wang & Wang (2009)
30	My students are capable of using WBLS to facilitate their learning in my class.	SN4	Wang & Wang (2009)
31	It is easy for me to integrate the functions of WBLS with my teaching plan.	PEOU1	Wang & Wang, 2009

32	It is easy for me to become skilled at using WBLS.	PEOU2	Wang & Wang, 2009
33	WBLS is easy to use.	PEOU3	Wang & Wang (2009)
34	I find it easy to get WBLS to do what I want it to do corresponding to the way that I teach.	PEOU4	Wang & Wang (2009)
35	It is easy for me to understand how to perform tasks using WBLS.	PEOU5	Wang & Wang, 2009
36	It is easy for me to recover from errors encountered while using WBLS.	PEOU6	Wang & Wang, 2009
37	Using WBLS improves my teaching performance.	PU1	Wang & Wang, 2009
38	Using WBLS improves my working efficiency.	PU2	Wang & Wang, 2009
39	Using WBLS enhances my interactions with the students.	PU3	Wang & Wang (2009)
40	Using WBLS can help students enhance their learning effectiveness.	PU4	Wang & Wang (2009)
41	Using WBLS saves me time.	PU5	Wang & Wang, 2009
42	Using WBLS gives me greater control over my work.	PU6	Wang & Wang, 2009
43	Using WBLS increases the reuse rate	PU7	Wang & Wang (2009)

	of course materials.		
44	Overall, I find WBLS useful in my job.	PU8	Wang & Wang (2009)
45	I intend to use WBLS to perform teaching-related activities and to communicate with my students.	ITU1	Wang & Wang, 2009
46	I intend to increase my use of WBLS in the future.	ITU2	Wang & Wang, 2009
47	I would use WBLS to perform different teaching-related activities.	ITU3	Wang & Wang, 2009
48	I use WBLS to communicate with my students.	SU1	Wang & Wang, 2009
49	I use WBLS to distribute course assignments to my students.	SU2	Wang & Wang (2009)
50	I allow my students to submit their assignments using WBLS.	SU3	Wang & Wang (2009)
51	I use WBLS to distribute course materials to my students.	SU4	Wang & Wang, 2009
52	I use WBLS to issue the grades of my students.	SU5	Wang & Wang, 2009
53	I allow my students to discuss the course with one another through WBLS.	SU6	Wang & Wang, 2009

Appendix B:

Permission to use survey questions owned by Dr. W. Wang

From: Wei-Tsong Wang <wtwang@mail.ndu.edu.tw>
To: Beasley, Shannon W.
Cc:
Subject: Re: request to use/modify survey questions

Dear Shannon

I am happy to hear that our work has helped in some ways. Please feel free to use or modify the survey items included in the paper and let me know if you need more information. Good luck with your research.

Sincerely,

Wei-Tsong Wang
Associate Professor
Department of Industrial and Information Management
National Cheng Kung University
1 University Road, Tainan 701, Taiwan
Tel: +886-6-2757575 ext. 53122
Fax: +886-6-2362162

---------- **Original Message** ----------
From: "Beasley, Shannon W." <shannon.beasley@maconstate.edu>
To: <wtwang@mail.ncku.edu.tw>
Cc: "Beasley, Shannon W." <shannon.beasley@maconstate.edu>
Sent: Tue, 9 Jul 2013 15:34:42 -0400
Subject: request to use/modify survey questions

>Dear Dr. Wang,
>My name is Shannon Beasley, and I am currently a doctoral student at Northcentral University in Prescott Valley, Az. I am in the process of preparing my dissertation for the completion of a PhD degree. My dissertation is concerned with identifying and explaining the factors that influence the *Adoption and diffusion of technology in technical education.*
>During the course of my research and studies, your work has contributed to my knowledge and understanding in the my area of interest. I am contacting you to obtain your permission to use or modify questions from the *survey instrument* used in your *research study An empirical study of instructor adoption of web-based learning systems.*
> If you consent to the use or adaptation of your material, please acknowledge consent using this e-mail address.
>Thank you for your time and your help,
>Shannon
>
>
>**Shannon Beasley, MMIS**
>Assistant Professor of Information Technology
>Middle Georgia State College
>Office: PSC 308
>Phone: 478-757-2582
>E-mail: **shannon.beasley@maconstate.edu**

Appendix C:

Central Georgia Technical College IRB approval

CENTRAL GEORGIA CGTC TECHNICAL COLLEGE

Office of Institutional Effectiveness
3300 Macon Tech Drive • Macon, GA 31206
(478)757-3424 • Fax: (478)757-3518
www.centralgatech.edu

September 10, 2015

Shannon W. Beasley
Northcentral University Doctoral Student
478-550-0844
s.beasley7556@email.ncu.edu

Dear Shannon:

Thank you for choosing Central Georgia Technical College (CGTC) as a site to conduct your research concerning factors which lead faculty to adopt technology in transacting technical education and to investigate the differences in results produced between faculty and student respondents. This work towards your doctorate degree has been approved by Northcentral University's IRB. On behalf of President Ivan H. Allen Ed.D., your request to use CGTC as a research site is approved. This approval is provided for up to six months from the date of this letter. If your research extends beyond that period, please contact my office for IRB reconsideration.

In your request you expressed a need for CGTC to provide you with pre-screened filtering of email addresses. We request that you work directly with our Knowledge Management Unit Assistant Vice President, Mr. Brian Snelgrove to accomplish your request. Please know that the burden and complexity of process for your research bears upon you as the researcher and not Central Georgia Technical College.

CGTC is a public not-for-profit post-secondary higher education institution with a workforce mission providing traditional and distance education to a diverse population of students. The results of your study could possibly inform the College's operational effectiveness plans. I have attached a copy of the approved CGTC IRB consent forms that you completed. Please keep the Office of Institutional Effectiveness apprised of your progress towards completion of your research. When available, we would be interested in your findings.

Sincerely,

Deborah Josey Burks
Vice President for Institutional Effectiveness

Appendix D:

Northcentral University IRB approval

Date: September 22, 2015

PI Name: Shannon Beasley

Chair Name (if applicable): Dr. Diane Blyler

Application Type (Initial, Modification, Continuing, Pilot): Initial

Review Level (Exempt, Expedited, Full Board): Exempt, Category 2

Study Title: The Decision to Adopt Technology in Technical Education

Approval Date:	September 22, 2015
Continuing Review Due Date: N/A	
Expiration Date:	September 22, 2016

Dear Andrew:

Congratulations! The purpose of this letter is to inform you that your IRB application has been approved. Your responsibilities include the following:

1. Follow the protocol as approved. If you need to make changes, please submit a modification form requesting approval of any proposed changes before you make them.
2. If there is a consent process in your research, you must use the consent form approved with your final application. Please make sure all participants receive a copy of the consent form.

3. Continuing review is required as long as you are in data collection or if data have not been de-identified. Failure to receive approval of the continuing review before the expiration date means the research must stop immediately.
4. If there are any injuries, problems, or complaints from participants, you must notify the IRB at IRB@ncu.edu within 24 hours.
5. IRB audit of procedures may occur. The IRB will notify you if your study will be audited.
6. When data are collected and de-identified, please submit a study closure form to the IRB.
7. You must maintain current CITI certification until you have submitted a study closure form.
8. If you are a student, please be aware that you must be enrolled in an active dissertation course with NCU in order to collect data.

Congratulations from the NCU IRB. Best wishes as you conduct your research!

Respectfully,

Northcentral University Institutional Review Board

Email: irb@ncu.edu

Appendix E:

E-mail soliciting study participation

Dear participant,

This e-mail is sent to ask that you participate in a research study. This study is used to better understand why teachers choose to use technology in the classroom. Also, the study will compare answers from students and teachers. This comparison will be used to understand the nature of various participants.

To begin the survey, please click the link below for further instructions:

https://www.surveymonkey.com/r/RPV99G2

If you have any questions, you may contact the researchers involved:

Shannon W. Beasley

s.beasley7556@email.ncu.edu

478-550-0844

Diane Blyler

dblyler@ncu.edu

888-327-2877

It should take between 15 and 20 minutes to complete the survey. You will not be asked to identify yourself. The questions asked will not allow anyone to determine your identity. You must be at least 18 years old to participate.

Thank you for your participation.

Shannon

Appendix F:

Informed Consent Notification

<u>What is the study about?</u> I am studying the factors that influence teachers to use technology in the classroom. Surveying students and teachers will allow the opinions of the two groups to be compared.

<u>What will be asked of me?</u> You will be asked to answer questions regarding the use of technology in the classroom. You will answer each question by ranking your level of agreement with a statement.

<u>Who is involved?</u> The following people are involved in this project and may be contacted at any time:

Shannon W. Beasley

s.beasley7556@email.ncu.edu

478-550-0844

Diane Blyler

dblyler@ncu.edu

888-327-2877

<u>Are there any risks?</u> Completing the survey should pose no threat to you. The questions contained in the survey are not sensitive in nature. You are asked to rate your level of agreement with statements about technology use. You may stop taking the survey at any time.

<u>What are some benefits?</u> Schools and students will benefit from increased use of technology. Students and teachers can attend class anywhere or at any time.

<u>Is the study confidential/will I be anonymous?</u> You will not be asked to provide your name. No attempt will be made to identify individuals. Results will be reported as a group.

<u>Can I stop participating in the study?</u> Yes, you have the right to leave the study at any time.

What if I have questions about my rights as a research participant or complaints?

You may contact either researcher listed in this form with questions. If you would rather talk to someone else, contact: Northcentral University's Institutional Review Board at irb@ncu.edu or 1-888-327-2877, extension 8014.

We would be happy to answer any questions that you might have. Please send questions to: **Shannon Beasley** s.beasley7556@email.ncu.edu or **Diane Blyler** dblyler@ncu.edu **.**

Agreement

I have read the above description for **The Decision to Adopt Educational Technology in Technical Education** study. I understand the description of the study provided. By clicking to continue, I agree that I am at least 18 years old and agree to participate in the study.

Appendix G:

Table 3 Frequencies for demographic variables (N = 240)

Demographic Variable	Value	n	%
Position			
	Student	186	77.5
	Instructor	47	19.58
	Administrator	3	1.25
	Support staff	4	1.66
Gender			
	Male	62	25.83
	Female	178	74.16
Education			
	GED/High School	142	59.17
	Associate’s degree	47	19.58
	Bachelor’s degree	15	6.25
	Master’s degree	34	14.16
	Doctoral degree	2	0.08

Appendix H:

Table 5 Group Statistics for H_2 (N = 240)

Which best describes your position at the college?		N	Mean	Standard Deviation	Standard Error Mean
Information Quality	instructor	54	5.16	1.00	0.14
	student	186	5.35	1.18	0.09
System Quality	instructor	54	4.98	1.01	0.14
	student	186	5.07	1.20	0.09
Service Quality	instructor	54	4.88	1.10	0.15
	student	186	5.14	1.12	0.08
Self-efficacy	instructor	54	4.97	0.99	0.13
	student	186	5.12	1.23	0.09
Subjective Norm	instructor	54	4.77	1.13	0.15
	student	186	5.06	1.15	0.08
Perceived Ease of Use	instructor	54	4.93	1.03	0.14
	student	186	5.12	1.17	0.09
Perceived Usefulness	instructor	54	4.98	1.26	0.15
	student	186	5.11	1.16	0.08
Intent to Use	instructor	54	4.96	1.26	0.17
	student	186	5.10	1.22	0.09