ATTRIBUTES AND BARRIERS THAT INFLUENCE THE ADOPTION AND DIFFUSION OF A LEARNING MANAGEMENT SYSTEM

A Dissertation

by

DARRELL SCOTT WALKER

Submitted to the Office of Graduate and Professional Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Chair of Committee,	James R. Lindner
Committee Members,	Kim E. Dooley
	Timothy H. Murphy
	James R. Snell
Head of Department,	John F. Elliot

May 2014

Major Subject: Agricultural Leadership, Education, and Communications

ABSTRACT

Several theories and technology acceptance models have been developed over the last several decades to predict user adoption. Most all of the models and theories have a foundation based from psychological and environmental factors that affect behavior intention, perception, and attitude towards accepting or rejecting a new innovation or technology. This study will examine such factors of influence towards adoption of a learning management system (LMS) at a large-scale university.

The population for the study included participants from the three user groups: faculty (4,014), staff (5,997), and students (48,460). A stratified random sample from each group was determined using Cochran's correction formula for categorical data. Sample size calculations assumed a confidence level a priori at .05 and an acceptable level of sampling error at 5% with a degree of variability of .5 and yielded sample sizes of faculty (350), staff (360), and students (381).

A conceptual model was used for the study based from the Technology Acceptance and the Unified Theory of Acceptance and Use of Technology models which proved useful in determining the relationships of external factors on user perception and attitude towards adoption and diffusion. Strategies can therefore be formed and implemented to aid in the diffusion process for the LMS at the university. The study used a cross-sectional research design to observe how the different user groups were influenced by the external factors. Data collection was done over a four-week period with data analysis done afterwards using SPSS.

Results revealed 92.1% of the respondents used the LMS with 91.6% agreeing that web based education (e-Learning) is an important delivery strategy used by faculty. Length of use ranged from less than one year to over six years with the level of experience ranging from a low level to a fully online level. The LMS showed widespread representation encompassing all colleges and departments of the university. Results also showed 61.6% of the respondents felt comfortable with using the LMS. Differences were identified between several of the attributes and barriers of adoption. However, one attribute and two barriers showed no statistical significant difference between the user groups.

The study findings support the relationship between behavioral intention and actual behavior as presented by the Theory of Reasoned Action and Theory of Planned Behavior towards adoption of the LMS. As observed, the external factors played a role in user perception and attitude towards adopting and using the LMS, although the results showed no predictability of LMS preference based on university role or the combined factors of influence on user perception and attitude.

DEDICATION

I dedicate this document to all the people who love to learn, strive through life's busy schedule, but make the time to further their education. For my Granddaddy, August Frederick Restmeyer, and my Pappaw, Walter Elbridge "Dutch" Walker, I love you, I miss you, and I hope to make you proud of all that I do.

ACKNOWLEDGEMENTS

My love and my gratitude go to my parents, Joe and Charlotte Walker, for laying the foundation for success in my life. They taught me to have good values, work hard, and have faith in God. They provided a firm foundation for my two brothers, my sister and me, while always encouraging us to explore new places, try new things, and make life commitments and memories, which would eventually shape the type of adults we would become. Most of all, they always believed I could accomplish whatever I set my mind to, and they never let me settle for anything less than achieving my potential. Although my mother is no longer here on earth to share this moment, I know she is smiling in Heaven. Mom, Dad, I love you both.

I was fortunate to have a solid committee of faculty members who understood my desire to research and study using technology for teaching and learning. They really cared about seeing me succeed as a student: Drs. James Lindner, Kim Dooley, Tim Murphy and James Snell. Dr. Lindner, my chair, met with me in the summer of 2008 and listened while I explained why I wanted to get my graduate degree. He offered to take me on as a graduate student and chair my committee, where he has done so much more than what was required of him. He has been a true mentor and friend to me as I journeyed through my graduate program and research. To Drs. Dooley, Murphy and Snell, I thank you for your time, wisdom and inspiration in which you contributed to the completion of my research. Even though you were not on my committee, Dr. Briers, I thank you for helping me get intimate with my data.

I want to thank my two sons and daughter-in-laws, Robert and Kristina, Thomas Joe and Courtney, for family support when I needed it most. Thank you also for giving Jeri and me four beautiful grandchildren, Jordan Ray, Elexis Elizabeth, Gwenevere Grace, and Brylie Rae, Grammy and Poppy love all of you.

Special thanks to my two Labradors, Cassie and Daisy, which have been my faithful companions throughout the entire journey. During late night paper writing, journal readings, and class homework, they often laid by my feet or sat watching patiently as I worked. They always agreed with me and never talked back on any topic that I discussed with them, instead they would just sit at attention and smile. They claimed I did a stellar job practicing my dissertation defense and I promise to repay them with much love and the biggest rawhide bones I can find.

Most of all, I cannot express enough thankfulness to my beautiful wife, Jeri Ruth, for her love and support throughout the years dedicated to my graduate school journey. Your love, support and faith enabled me to achieve something special. This was not always an easy journey and our path together was uneasy at times, but she supported me whole-heartedly through the good times and the bad. This has only strengthened us and I look forward to starting the next phase of our life together.

NOMENCLATURE

ADA	Americans with Disabilities Act
ANOVA	Analysis of Variance
Bb	Blackboard, Inc.
CLE	Collaborative Learning Environment
CMS	Course Management System
EIS	Enterprise Information System
LMS	Learning Management System
IOR	Instructor of Record
IT	Information Technology
ITS	Instructional Technology Services
MOOC	Massive Open Online Course
MOODLE	Modular Object-Oriented Dynamic Learning Environment
SET	Self-efficacy Theory
SIS	Student Information System
SPSS	Statistical Package for Social Sciences
TAM	Technology Acceptance Model
TAM2	Technology Acceptance Model 2
TAM3	Technology Acceptance Model 3
TAMU	Texas A&M University – College Station Campus
TAMUG	Texas A&M University – Galveston Campus

TAMUQ	Texas A&M University – Qatar Campus
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
UIN	University Identification Number
UTAUT	Unified Theory of Acceptance and Use of Technology Model
VM	Virtual Machine
WBT	Web-Based Training
WebCT	Web-Based Course Tool

TABLE OF CONTENTS

Page

Page

Page

LIST OF FIGURES

LIST OF TABLES

CHAPTER I

INTRODUCTION TO THE STUDY

Background Information

Information technology advancements over the last decade have led to an increase in usage of a learning management system (LMS) in business organizations, high schools, and on most university campuses. Today, online teaching and learning using the internet and mobile devices have become the norm, with faculty controlling the teaching methods and students controlling the learning styles.

The advancements of information technology in the educational environment, especially with online learning, have created more uses for the LMS within the university. Distance education programs, non-student certification programs, parental access, financial aid services, campus portals, library resources, research studies, human resources, travel services, staff training, and non-academic organizations are all needing integration with the LMS of today. Can the LMS of yesteryear fulfill these services and survive the advances of technology?

Demski (2012) wrote that new cutting-edge technologies and progressive faculty usage, for those wanting to do all within the LMS, will push the technology of yesterday to the limit when it comes to the older LMS. B. Perez and T. Perez (2011) also noted that it would be hard for faculty, students, and administrators to survive without a robust LMS in the 21st century. This presents a major problem for any organization or university using a LMS based on older technology.

Texas A&M University (TAMU) is a nationally ranked tier one research university and faces such a challenge (U. S. News, 2013). Founded in 1876, Texas A&M University became the first public institution of higher education in the State of Texas and currently serves a student body of 50,000 (TAMU, 2013). The main campus is located in College Station, Texas and supports two remote campuses; Galveston, Texas with 1,870 students and Doha, Qatar with 560 students. The university also supports several distance and continuing education certificate programs for reaching non-credit seeking students and adult learners.

The university began using a commercial LMS provided by Web Course Tools (WebCT), Inc., using the Campus Edition version in 1998 as part of the teaching with technology initiative engagement. In 2002, the university created a department called Instructional Technology Services (ITS) that would centrally support and manage the LMS for faculty, staff, and students of the university. During 2004, the university moved from WebCT CE to WebCT Vista, an enterprise level LMS platform. Since that time, the LMS has solidified as a useful support tool for faculty in delivering instructional content, engaging students in collaborative discussions, empowering students to learn outside of the traditional classroom, and opening other avenues for research and information gathering.

Since 2002, usage of the current LMS has increased every year at the university. As of May 2012, 40% of all course offerings of the university had some presence in the LMS and 95% of the student body utilizes the LMS in some fashion (ITS, 2013). Some

learners simply check grades and download a course syllabus, while others collaborate with online teams, take assessments and quizzes, and complete assignments.

Blackboard, Inc. purchased WebCT in 2006 and announced in June 2009 that the Blackboard Vista LMS application currently in use at the university will become an end-of-life product and be discontinued by December 31, 2013. The announcement prompted the formation of a LMS selection committee by the ITS department, whose task was to evaluate and submit to university officials a ranked-ordered list of possible replacement systems for the current Blackboard Vista LMS application.

The LMS selection committee explored several LMS options and decided on three major LMS platforms for consideration to evaluate: Blackboard Learn, Moodle, and Sakai. These systems are well-known and widely used in the educational sector by several universities and organizations worldwide (Petri, Rangin, Richwine, & Thompson, 2012).

Overview of Learning Management Systems

Blackboard Learn

Founded in 1997 by Michael Chasen and Matthew Pittinsky, Blackboard LLC served only 15 clients (Blackboard, 2013a). Merging with CourseInfo LLC in 1998 to form Blackboard Inc., the company began forming partnerships with other companies with similar interests and vision (Blackboard, 2013b). Over a span of 15 years, Blackboard has acquired other innovations to expand the LMS product line. Today, Blackboard is known around the world as an industry leader for learning management systems and related services. Blackboard currently supports over 30,000 clients

worldwide (Blackboard, 2013c). In 2006, Blackboard merged with WebCT, Inc., and began developing a new concept for a different model of a learning management system (Perez & Perez, 2011). The new LMS named Blackboard Learn (Bb Learn) is modularized for integration with other information technology (IT) systems within the institution infrastructure, thus creating a complete solution for the many needs of an institution in sharing data.

Moodle

Released in 2002 as a modular object-oriented dynamic learning environment (MOODLE) product, Moodle is an open source course management system originally created by Martin Dougiamas to provide collaboration, interaction, and organization of course content for educators (Moodle, 2013a). Moodle originated from the constructivism philosophy of having learners contribute to the learning experience as part of a community system of social learning (Moodle, 2013b). Moodle's high adoption rate for many K-12 schools is due to the simplicity of use and no product cost. However, there is also a strong presence of Moodle in higher education and business environments. Moodle's current user base is approximately 77,194 registered sites worldwide (Moodle, 2013c).

Sakai

In 2005, a community of higher education academic institutions, a small group of individuals, and some commercial organizations formed the Sakai Project, which was tasked to provide a Collaborative Learning Environment (CLE) to be used at higher educational organizations and universities (Sakai, 2013a). Sakai, named after the famous

Iron Chef Hiroyuki Sakai, was born as an open source application provided at no cost for use which led many universities to adopt the Sakai CLE system for distribution of course content, thus making the application operate as a learning management system (Sakai, 2013b). Today, the Sakai Foundation supports and maintains the core product infrastructure and has a current user base of approximately 350 institutions worldwide (Sakai, 2013c).

Problem Statement

The effectiveness of the current LMS at TAMU has been studied because of technological advancements, company mergers, and corporate buy-outs relating to the LMS market that have taken place over the last few years. University administration started to have concerns about the efficiency of the current LMS. Questions such as who is actually using the LMS? How are they using the system? What features are used the most? What features are used the least? Should the university explore purchasing a newer LMS? Can a new LMS integrate with other business units within the university? Do the current users want a new LMS? Given a choice of LMS platforms, which LMS would the current users prefer? How will the users react to change and adopt the new LMS? How will the university initiate the diffusion of the new LMS among the different user groups? (Cantrell, P., & Snell, J., personal communication, October 25, 2010).

The current LMS has been used for some ten years now and is inefficient because of running on older technology hardware. The infrastructure is non-virtualized with a number of single servers racked altogether creating a large footprint in a data center that has limited space. The annual cost of maintaining this older equipment is

more expensive than a one-time purchase of new modern blade type servers that can be virtualized. Newer LMS applications can take advantage of this new technology and hardware with newer processors producing higher performance, more bandwidth, and a smaller footprint that saves data center space (Goldworm, 2006).

Scalability of the current infrastructure to allow for future e-learning initiatives, increased enrollments, and many other demands such as communities, organizations, shared content, and possibly massive open online courses (MOOCs) is another concern. The older servers were not designed with scalability in mind. Newer server technology of today is designed to be scalable, such as virtual machines (VMs) running on blade servers, which can be expanded quickly as the demand warrants.

Features in the current LMS are somewhat limited and built around teaching and learning methods from a decade ago. New features that allow for mobile access, collaboration, alert notification, content sharing, and third-party integration, are also lacking in the current LMS. The current LMS creates unwanted limitations for the university in ways to outreach students, and provide flexibility in teaching and learning methods to meet the anytime-anywhere learning style of students today (Berthold, D., Conway, S., Jasperson, J., Snell, J., & Wilkinson, H., personal communication, March, 11, 2011).

Accordingly, most of the faculty, staff, and students feel that the LMS is just another tool used for teaching and learning. However, this perception is incorrect as newer LMS applications allow for advanced teaching and learning features, while providing external integration with other systems providing new business uses within the

university. It will be the focus of the university, specifically the ITS department, to change this perception of the users in order to achieve a successful diffusion of a new LMS (Henrichs, C., Jasperson, J., & Snell, J., personal communication, March, 11, 2011).

All of these problems and concerns, along with the product end-of-life announcement by the vendor justify the need for this study. To address the problems and concerns, the need to determine an evaluation process, develop selection criteria, and attain successful diffusion of a new LMS through an understanding of current system usage, user perception and attitude, defining of attributes and barriers related to user adoption, and investigating the available LMS products on the market will be of crucial interest.

Purpose of Study

In order to meet the future e-learning needs of the university and provide guidance for determining a replacement LMS, an understanding of how the LMS is used by the different user groups, and how the LMS is perceived psychologically within the university environment is needed. User perception and attitude towards using the LMS is greatly influenced by a number of external stimuli, therefore the understanding of how such factors influence user perception and attitude is vitally important in the diffusion process of a new replacement LMS.

The purpose of the study was to examine the current LMS user base, noting usage characteristics; describe and measure factors (external stimuli) that are known to influence user perception and attitude towards adoption of the LMS across the different

user groups; and observer possible relationships among the user characteristics that could predict a preferred LMS system.

Research Objectives

1. Describe the current user characteristics of the LMS.
2. Describe the attribute of locus of control and determine if differences exist between the user groups that could influence LMS adoption.
3. Describe the attribute of support and training and determine if differences exist between the user groups that could influence LMS adoption.
4. Describe the attribute of trialability and determine if differences exist between the user groups that could influence LMS adoption.
5. Describe the attribute of system integration and determine if differences exist between the user groups that could influence LMS adoption.
6. Describe the attribute of system features and determine if differences exist between the user groups that could influence LMS adoption.
7. Describe the attribute of brand name and reputation and determine if differences exist between the user groups that could influence LMS adoption.
8. Describe the barrier of system cost and determine if differences exist between the user groups that could influence LMS adoption.
9. Describe the barrier of fear of change and new technology and determine if differences exist between the user groups that could influence LMS adoption.
10. Describe the barrier of migration process and determine if differences exist between the user groups that could influence LMS adoption.

11. Describe the barrier of system support and determine if differences exist between the user groups that could influence LMS adoption.
12. Describe the barrier of system complexity and determine if differences exist between the user groups that could influence LMS adoption.
13. Describe the barrier of time concern and determine if differences exist between the user groups that could influence LMS adoption.
14. Determine prediction of LMS preference based on all attributes and barriers.
15. Determine prediction of LMS preference based on university role.

Conceptual Framework

Research in the area of information technology concentrated towards e-learning revolves around LMS adoption and often produces findings that conflict (Betts, 1998; Schifter, 2000; Smylie, 1988). Identifying and focusing on specific variables pertinent to the population is vital to drawing valid conclusions from the study. This is true for the LMS used for e-learning within the university environment. The study focuses on the relationship between external factors and user perception, and will examine how the external factors influence user perception and attitude, therefore affecting user adoption and diffusion of a new LMS at the university.

Six common attributes were identified as having a positive contribution towards usage of the LMS and noted as: Having control and the ability to do things within the LMS (*Locus of Control*), Available support and training (*Support and Training*), Being able to test-drive features or functionality within the LMS (*Trialability*), Being able to use third-party resources or systems (*System Integration*), Having features that are

useful, time saving, and mobile (*System Features*), and product brand name (*Brand Name and Reputation*).

Six common barriers were identified as having a negative contribution towards usage of the LMS and noted as: Cost of the LMS (*Cost Concerns*), Anxiety and fear of change (*Fear of Change*), Being able to use current content in a new LMS (*Migration Process*), Available support of the LMS from the vendor (*System Support Concerns*), Being too hard to use or too complex (*System Complexity and Usability*), and Time constraints to learn the new LMS (*Time Concerns*). (Berthold, D., Conway, S., Henrichs, C., Jasperson, J., Snell, J., & Wilkinson, H., personal communication, March, 11, 2011). The twelve external factors will act as the independent variables for the study and be divided into sets of positive influences (attributes) and negative influences (barriers). User perception and attitude towards ease of use and usefulness will act as the dependent variable for the study.

Adoption of the LMS is dependent on the user's perception and attitude, which causes behavioral reaction to accept or reject using the LMS. Ajzen and Fishbein (1969) developed the Theory of Reasoned Action (TRA) model around individual behavior, looking at the relationship of variables that make a person act a particular way and why. Sheppard, Hartwick, and Warsaw (1988) also theorize that individual behavior is based on attitude and subjective norm. A third variable of behavioral control was then added to the TRA creating the Theory of Planned Behavior (TPB) in the mid-1980s (Ajzen, 1991).

Building on the TRA and TPB models, Davis (1986) developed the Technology Acceptance Model (TAM) as a new theoretical approach to measuring technology

acceptance through external variables that influence the user's cognitive reasoning process concerning the usefulness or ease of use of a new technology or innovation, thus changing attitude and behavioral patterns in a positive or negative manner towards adopting and using the technology.

Through later years of research, the TAM has been redeveloped by adding new variables of interest therefore fitting to a broader range of environments pertaining to technology acceptance. Venkatesh and Davis (2000) identified these new constructs as external determinants of social influences related to personal image, experience, and job relevance, allowing for cognitive processes related to things such as motivation, goals, and personal beliefs for making technology adoption decisions. This became widely known in research as the Technology Acceptance Model 2 (TAM 2).

Venkatesh and Bala (2008) further refined the TAM2 into the development of the Technology Acceptance Model 3 (TAM3) which extended the model for more social and environmental type influences, user experience, and personal preference. Of interest to this study, the TAM 3 address user perceptions and experience with technology, along with user control and fear of change (anxiety) which is a variable of interest for this study. Venkatesh, Morris, Davis, and Davis (2003) attempted to simplify the previous TAM models by including a common set of personal variables that relate to technology acceptance which led to the development of the Unified Theory of Acceptance and Use of Technology (UTAUT) model.

The conceptual framework for the study relies upon an understanding of these models however the main foundation is derived from the TAM (Davis, 1986) and

UTAUT (Venkatesh et al., 2003) models. The study conceptual model is modified to align more properly with the variables identified by faculty, staff, and students and relevant for this study. Figure 1 presents the conceptual diagram of the external factors that influence user perception and attitude towards ease of use and usefulness leading to the adoption of the LMS.

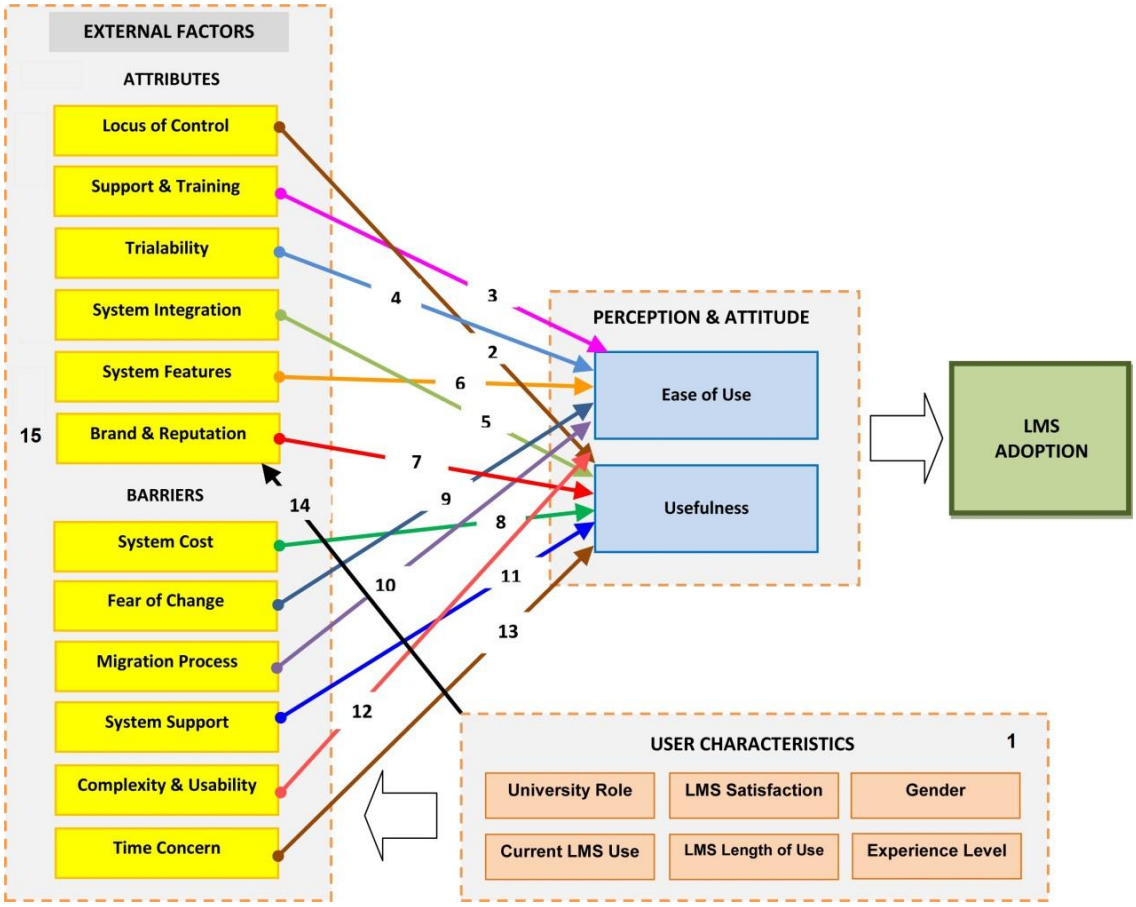

Figure 1. Conceptual Diagram. The block diagram displays the two sets of external factors and the relationships (numbered per objective) on user perception and attitude (See appendix A for enlarged diagram).

Significance of Study

Historically, the overall significance of using a LMS has always been a debate that originates from whether online teaching and learning is equivalent to the face-to-face traditional style of teaching and learning. Many studies have been concluded over the last decade that have shown there is no significant difference between teaching and learning online or at a distance using a LMS as compared to the traditional face-to-face teaching and learning in a classroom (Russell, 2001). Russell (2001) also states that no matter what or who is being taught, there can be more than one type of medium used to produce desired learning results. This is true of using an LMS for teaching and learning.

The research and findings from the study will provide needed direction for the university administration and ITS department in selecting a new LMS platform and provide the best options for diffusion of the new LMS across the user groups. In as such, the significance of understanding the current user base and how they use the current LMS will allow for possible future improvements and enhancements as follows:

- Increase of student outreach through distance education and online courses.
- Incorporate new features and tools for online teaching and learning.
- Improved student engagement and collaboration.
- Provide seamless integration for faculty, students, and staff to other university applications.
- Configuration of preferred tools and features within the LMS.
- Improved system performance, stability and scalability.
- Streamlining of procedures and workflows.

- Identification of training areas for users to be more effective in using the LMS.
- Provide mobile device capabilities.
- Conform to accessibility requirements for users with disabilities.
- Incorporate future use of massive open online courses.

For the university, conclusions and recommendations based from the findings will provide possible direction for university administration and ITS technical staff in promoting usage of the new LMS. This information can also then be used strategically in mitigating user rejection towards adoption of the LMS. The data may also yield invaluable information which could indicate the priority of features used, training deficiencies, and integration services needed to help with the diffusion process and overcome user rejection towards using the LMS. This study will also provide practical knowledge for other universities, organizations, or businesses that are facing the similar challenge of selecting and moving to a new LMS.

Limitations, Assumptions, and Delimitations

Although practical knowledge can be used from the study, results and findings were limited to Texas A&M University, and the environment for which the LMS is used. Recommendations and conclusions may not be generalizable to other universities, organizations, or businesses with different demographics.

The study did not consider the teaching and learning methods or learning objective outcomes from the LMS as a measurement of effectiveness, nor did the study consider user level of experience or length of use as a measure of overall LMS

effectiveness. Length of use and level of experience were examined only as a user demographic characteristic and LMS brand name predictability within the study. Instrument reliability was sufficient for the study however three of the variable scales were considered below the desired level and should be revised, strengthened, and improved for future studies.

In recent months, MOOCs have become a topic of interest and concern for universities. Although this study did not address this latest phenomenon, the LMS may play an important role in the future of MOOCs and future research in this area is potentially relevant, but not included as part of this study.

The study assumes that the participants have; (a) some level of experience with the LMS, (b) willingly took the survey, and (c) completed the survey with honest answers reflecting personal perceptions and preference. The research for the study assumes that the theoretical framework used for the study is grounded on sound foundations, proven accurate as tested over time. The research for the study also assumes a direct relationship between user perception and attitude with ease of use and usefulness as being a determinant of user behavior towards LMS adoption. The researcher assumes the variables defined for the study are valid and accurately measured with the instrument being used and that the instrument is valid and reliable.

Participants in the study were delimited to; (a) active users of the LMS during the 2011 spring semester, (b) from the College Station, Galveston, and Qatar campuses, and (c) not ITS department personnel or members of the LMS selection committee. Participant responses will be recorded and measured using a five-point summated scale

with a specifically designed instrument for the study that was pilot-tested and approved by a panel of university faculty that has expertise in this type of research and members of the committee. LMS trialability and evaluation for the study was restricted to three LMS platforms (a) Blackboard Learn, (b) Moodle, and (c) Sakai as determined by the LMS selection committee.

Definition of Key Terms

Adoption: An individual's acceptance to use an innovation or technology (Rogers, 2003).

Diffusion: The wide-spread usage of an innovation or technology among a culture, social group, or organization (Rogers, 2003).

E-learning: An application or technology used for online instructional teaching and learning purposes.

Fear of Change: The psychological state (anxiety) of an individual, which influences their perception of using a new technology caused by a disruption of a normal routine (a change) and is considered a potential barrier to the adoption of new technology (Speek, 2013; Wu, 1995).

Learning Management System (LMS): An application or platform consisting of software and hardware technology used to deliver course content and material that facilitates teaching and learning.

Locus of Control: Individual control over course presentation, interface, content and teaching tools which leads to a personalized perception considered a potential attribute to the adoption of new technology.

Migration Process: The process related to migrating course content and/or other course related material from one LMS to another considered a potential barrier to the adoption of new technology.

Self-efficacy: An individual's ability to complete a task and reach a particular goal (Ajzen, 2002).

Support and Training: Specialized instruction through hands-on training, workshops, or documentation towards using the LMS considered a potential attribute to the adoption of new technology.

System Complexity and Usability: The level of user friendliness of an e-learning system considered a potential barrier to the adoption of new technology.

System Cost: Items such as consulting, hardware, software licenses, etc…that are cost related and considered a potential barrier to the adoption of the LMS.

System Features: New enhancements or tools for teaching and learning within the LMS that are not currently available considered a potential attribute to the adoption of new technology.

System Integration: The ability to link or integrate to other sources of data or information from the LMS to enhance its value considered a potential barrier to the adoption of new technology.

System Support: Items such as lack of vendor support, training, or technical assistance in implementing, configuration, and operation of a LMS considered as a potential barrier to the adoption of the LMS.

Time Concern: Items that are time consuming such as extended training, course development, content migration, etc… considered a potential barrier to the adoption of the LMS.

Trialability: The degree to which an innovation or new technology can be experimented with by potential adopters (Rogers, 2003).

CHAPTER II

REVIEW OF LITERATURE

Introduction

This literature review will explore prior research related to key areas of the study and provide a framework in order to draw conclusions from the data once analyzed that could possibly be applied (generalized) to other environments. The literature review will describe and explore existing models and theories which relate to the study, and use them as a foundation towards a theoretical framework and conceptual model for the study. In order to determine an effective evaluation and implementation process that will lead to greater user adoption and seamless diffusion of a new LMS at the university, basic knowledge consisting of LMS definition and characteristics; examination of existing theories and models used for technology adoption; classification of users; identification of attributes and barriers which influence adoption; and an overview of the diffusion process; will be vital towards measuring, analyzing, and interpreting the data presented from the study.

Learning Management System

The LMS has become one of the most widespread and highly adopted technologies used today in higher education (Chung, Pasquini, & Koh, 2013; Harrington, Gordon, & Schibik, 2004; Kats, 2010; Piña, 2008; Simonson, 2007). While the LMS was originally used by universities for distance education initiatives, the present-day role of the LMS goes beyond the online outreaching of students and in many cases used as a

supplement for face-to-face courses on many university campuses. The LMS was once thought of as only a web-based content delivery mechanism, but has recently evolved into an integrated system that supports both synchronous (real-time) and asynchronous (anytime) teaching methods, student tracking, collaboration, social media, assignments, grades, knowledge assessment, portfolios, and learning outcomes. The educational industry, as well as other business industries that provide online training, are becoming addicted to the LMS for teaching, learning, and distribution of content.

The definition of the LMS varies greatly across the literature. Simonson (2007) gave a basic definition of a LMS as "a software system designed to assist in the management of educational courses for students, especially by helping teachers and learners with course administration" (p, vii). Brown and Johnson (2007) indicated the LMS is a very successful vehicle when used for training, evaluating, and tracking results of learners and use the LMS definition of "an information system that administers instructor-led e-learning courses and keeps track of student progress, used internally by large enterprises for their employees or by universities for students, an LMS can be used to monitor the effectiveness of the organization's education and training" (p. 1).

White and Larusson (2010) gave the definition as "an online digital environment that allows information to be shared between students and faculty and provides access to content and administrative procedures for specific courses" (p. 2). Yet, Chung, Pasquini, and Koh (2013) wrote the definition of the LMS as "a particular type of software system designed and promoted for instructors and learners to utilize in teaching and learning activities" (p. 27).

Taking into consideration the environment and the historical presence of the LMS at the university, the following operational LMS definition is presented by this researcher and is appropriate for this study: A platform consisting of a software application and a hardware infrastructure designed to enhance learning and teaching through the use of integrated tools and features that provide flexible functionality and services to the users of the system.

The definition of a LMS is inconsistent throughout the literature, and differs according to the type of functionality, environment, and customer base that it serves. With so many different definitions of the LMS, the importance of knowing which user needs are to be met by the LMS is crucial. User needs are most commonly related to LMS characteristics.

Malikowski, Thompson, and Theis (2007) presents five core LMS characteristics as content and course-related information (content and organization), student evaluation (assessments and quizzes), course evaluation (surveys and questionnaires), communication (discussions and forums), and delivery (instructional sequencing). However, Kats (2010) noted that the LMS characteristics presented by Malikowski, Thompson, and Theis lack one important characteristic, that of collaboration and provides a basic definition for the LMS that encompasses these characteristics: "An e-learning platform (LMS) is a system which provides integrated support for the six activities – creation, organization, delivery, communication, collaboration, and assessment – in an educational context" (p. 31).

Yet, Ferriman (2013) wrote that characteristics of a LMS should be simplified, therefore he presents only three characteristics: “Industry support, customization flexibility, and constantly evolving” (para. 6). He also points out that many universities or organizations get caught up in the LMS feature list and functionality as main criteria when making a selection of a new LMS, but a broader overall picture should be more of a concern for university administrators or management, and include the three previously mentioned characteristics, along with user integration. Ferriman makes a valid argument in pointing out that “a solid foundation (user characteristics) is needed before moving forward and selecting a LMS” (para. 2).

How does a university go about in selecting a LMS when the definition and characteristics are so wide-ranging? To address this question, one must take a holistic view of the environment to which the LMS will be used. The literature presents as many best practices for selecting an LMS as there are definitions and characteristics for the LMS, so defining the user base and determining the services needed from the LMS, will be critical in the selection process. To put this concept into perspective, several observations of LMS usage from different business areas can be looked upon for guidance.

Examining a LMS from an organizational training perspective, Kerschenbaum and Biehn (2012) presents fifteen best practices for selecting a LMS as described in a white paper submitted to the MASIE Center Learning Consortium (http://www.masie.com) and are listed below:

- Online registration, delivery, and tracking

- Online training and test authoring capability
- Online testing, certification, and accreditation
- Online evaluation
- Online collaboration and communication
- Integration with legacy system
- Support and training
- Support multiple user roles or classes
- Support for multiple time zones
- Support for mobile devices
- Skill and competency management
- Reporting
- Customization
- Financial tracking

From the educational perspective, the fundamental keys for a LMS implementation according to Kerschenbaum and Biehn (2012) are identifying the stakeholders (users) of the LMS and how the educational organization plans on using the LMS (p. 13). This is consistent with the previous definition and characteristics of the LMS as presented from the literature. In addition to the fore-mentioned educational perspective, Sampathkumar (2013) recommended that any university or organization investing in a LMS in order to make it effective, must considered the following ten core characteristics:

- Interactive Learning Environment

- Administration Capability
- Authoring Tools
- Communication Tools
- Media Support
- Scalability
- Database Capacity
- Inclusiveness (mobility and accessibility)
- Security
- Cost

These characteristics were adequate for the basis of this study, but were expanded upon based on concerns voiced during open forum discussions with faculty, students, and staff. The addition of these new characteristics allow for better alignment and suitably to the environment of the university, as well as providing a conceptual and theoretical framework for the study. The expanded list based from the faculty, students, and staff discussions include:

- Content creation, sharing, and delivery
- Collaboration tools (discussions, chat rooms, wikis, blogs)
- Assessment tools (quizzes, exams, peer review)
- Communication tools (email, chat, notifications, announcements)
- Student tracking and reporting
- Portfolio support
- Social media (video, audio, web links)

- Grade book with SIS integration
- Community area
- Learning outcomes & Retention reporting
- System performance & scalability
- System administration (user accounts, course creation, enrollment)

This list provides the items of focus used within the study, noted as items of importance to the user base. An important part of the user adoption and diffusion process for the LMS is the need to create value, specifically more value with the new system versus the old system. Therefore, consideration of these items is important. Figure 2 shows a visual representation of these characteristics along with the core LMS integration pieces.

User Concerns and Perception

So what makes an individual use an innovation or technology such as a LMS? According to Engsbo and Sandhu (2007) "adoption decisions may be based on the dimensions of adoption initiative and innovation stimulus, making the adoption decision process as pro-active, reactive, forced, or even arbitrary" (p. 292). Research also shows that prior adopters of a technology or innovation can impact the perception of future users in adopting the technology, and that internal and external stimuli are key drivers in user attitude towards adoption. Some of these determinants as defined by Engsbo and Sandhu include technology complexity, economic factors, social associations, and organizational environment (p. 293).

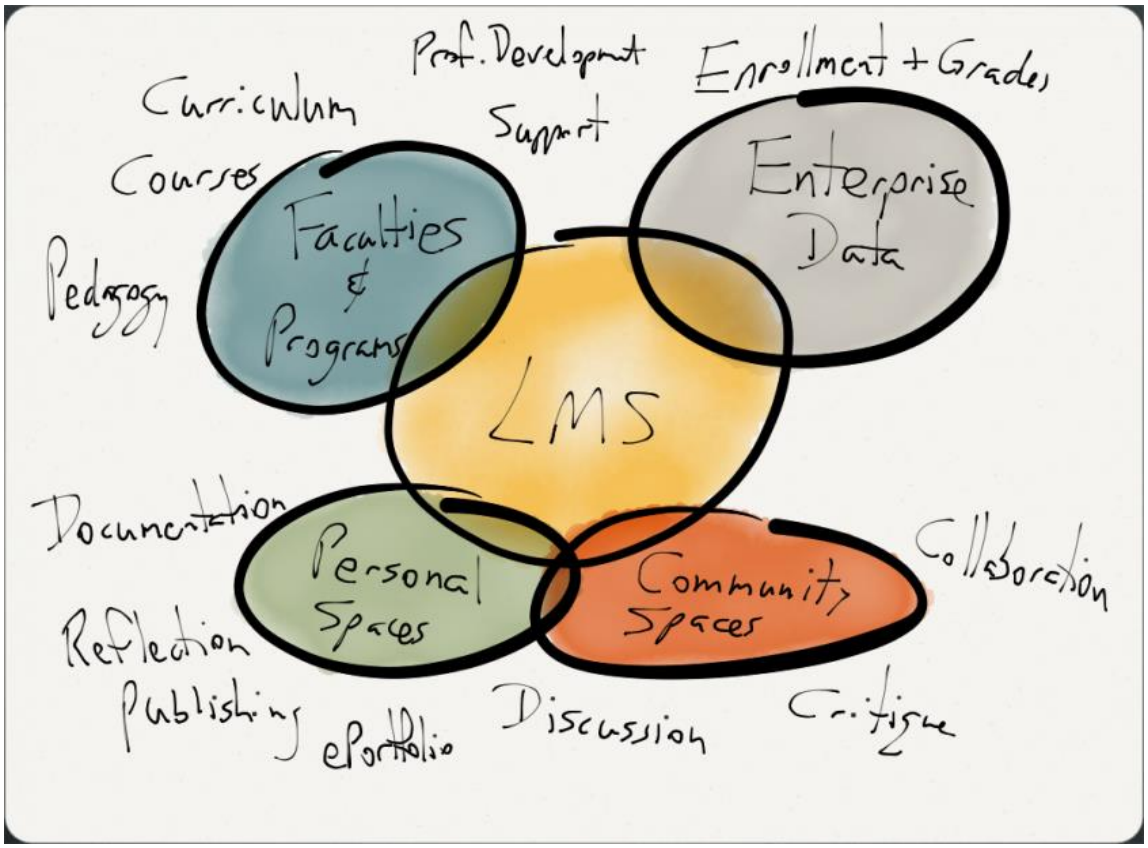

Figure 2. Characteristics of a LMS. The LMS application and integration with the external features and functionality that creates value to the user base. Adapted from "LMS Characteristics" by Norman, 2012.

As technology becomes an increasing role in the life of most individuals, the integration of such causes a change in user attitude and perception. This process also takes time as the adoption process takes place. Recognizing this process, Dirksen and Tharp (1997) noted "the systematic integration of technology requires time and carefully planned strategies to facilitate the adoption process" (p. 1064). They also note that

“change is a process, not an event, and it takes time to institute change in an organization” (p. 1065).

This process of change is built around user perception and attitude based on stimuli that affects the psychological state of a user as to accept or reject the adoption of a technology. The change process for a user is a very personal experience with attitude and perception greatly influencing the overall outcome. Dirksen and Tharp go on to state that “the integration of technology depends upon the faculty and staff receiving training and guidance if the vision [of adoption] is to become reality” and “the adoption of instructional technologies and the movement through the change process requires time and appropriate intervention strategies to be successful” (p. 1067).

The assumption that the adoption of a technology is static in nature is incorrect, in fact, it is a social process taking place over time with users and the organization both going through significant changes such as learning, adaptation, and growth (Chowdhury, 1999; Harris et al., 2004). Individuals must let go of past system perceptions and attitude, experience a change in behavior, and move forward with the adoption of the new technology. Harris, Stanz, Zaaiman, and Groenewald (2004) give a definition of user concern as “the mental activity composed of questioning, analyzing, consideration to alternatives, reactions, state of personal feeling, and perception” (p. 56). To put a picture to this definition, Figure 3 displays individual concerns for adoption based on internal and external stimuli that influence user perception and attitude towards adoption. To observe, attempt to measure, and predict influence on adoption, many theories and models have been developed over the years.

Figure 3. Individual Concerns for Adoption. The image depicts several internal and external stimuli that influence user perception and attitude towards adoption.

Technology Adoption Models and Theories

Many models have been created over the last few decades that try to explain and lend answers to the question of why users adopt a particular technology or innovation. Some of the most well-known models for technology adoption which lend prior knowledge and research to the study are presented here from the literature.

Theory of Reasoned Action

From the social psychology field, Ajzen and Fishbein (1969) studied attitude as a factor of individual behavior, looking at the relationship of why a person acts a particular way and as such, can the behavior be predicted or changed. The study led to the

development of the Theory of Reasoned Action (TRA) in 1975 which examined two independent constructs, attitude (A) towards behavior and subjective norm (SN) to be determinants of two dependent constructs of behavior intention (BI) and actual behavior (AB). The behavior intention is based on the individual's attitude and subjective norms towards the actual behavior (Fishbein & Ajzen, 1975; Sheppard, Hartwick, & Warsaw, 1988). Attitude towards behavior is based upon external influences of a person's beliefs about the associated consequences of the behavior. Subjective norm is based upon the individual's perception of what people think about doing or not doing the behavior. A block diagram of the model is presented in Figure 4.

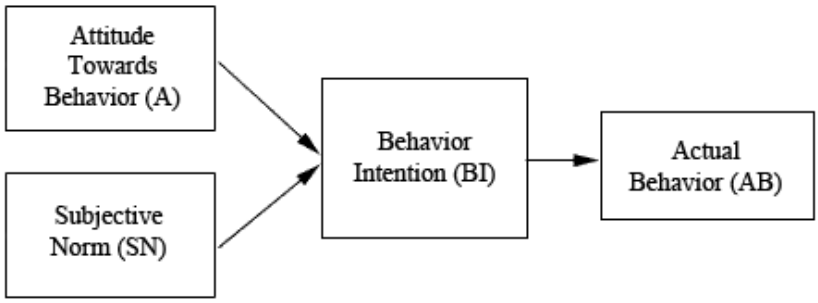

Figure 4. Theory of Reasoned Action Model. The model predicts behavior based on the influence of attitude and subject norm. Adapted from "User acceptance of computer technology: A comparison of two theoretical models" by Davis, Bagozzi, & Warshaw, 1989, p. 984.

This model has been modified through years of research, spanning other scientific fields of study, but remains the core foundation for later adoption models. The

modifications done in the later models spawn from trying to fit the constructs into different environments being studied, such as marketing, corporate training, or information technology. Other modifications for the inclusion of additional influences such as social memberships, personal values, perception, and global environments where also done.

The phenomenon of predicting how a person's behavior can be influenced has long been studied throughout the literature. Businesses want to know how to get customers to buy their products. Companies want to know how to make employees become more productive. The importance of understanding how external variables can influence individual behavior based on attitude and perception is therefore important towards adoption and diffusion of a new innovation or technology.

Theory of Planned Behavior

With criticism of the TRA, Ajzen and Fishbein (1980) redefined the theory and included another construct, perceived behavior control. In 1985, the Theory of Planned Behavior (TPB) was presented publicly based on findings from several studies (Ajzen, 1991). The model now addressed user ability to perform the behavior, the ease or difficulty of change based on the behavior. This new construct was based from the Self-efficacy Theory (SET) by Bandura (1977) and draws the relationship between behavioral intention and actual behavior. The TPB model is shown in Figure 5.

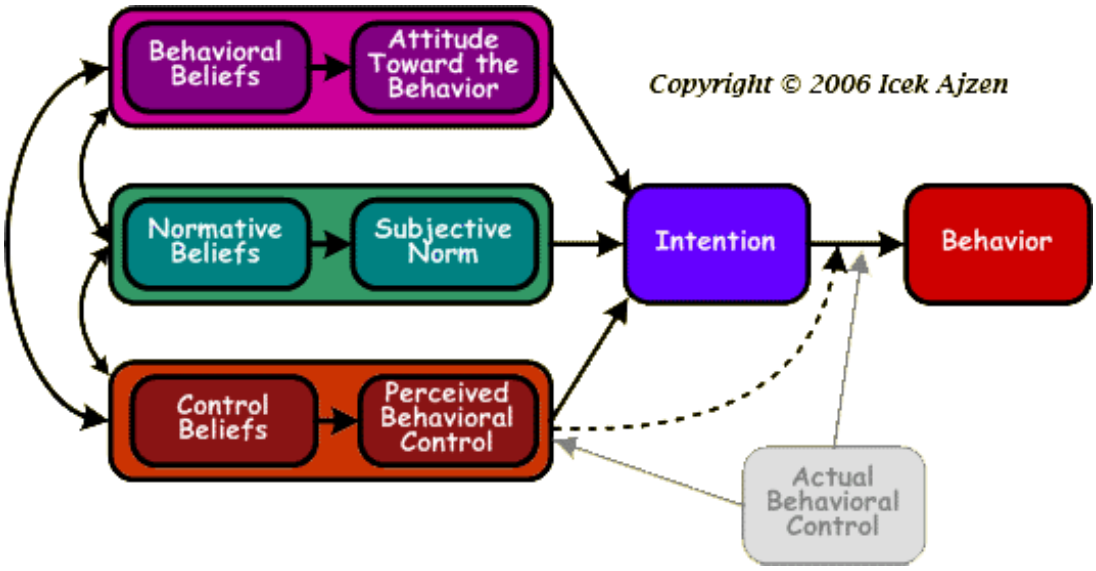

Figure 5. Theory of Planned Behavior Model. The image depicts the TRA model with added construct of perceived behavioral control. Adapted from "TPB Diagram" by Ajzen, 2006.

Technology Acceptance Model

The Technology Acceptance Model (TAM) was developed by Davis (1986) to provide a method for determining user acceptance of technology based on two constructs, perceived usefulness and perceived ease of use. The TAM was derived from the TRA, but presented a new theoretical approach to measuring technology acceptance through external variables that influence the cognitive reasoning process concerning the usefulness or ease of use of the technology or innovation, thus changing attitude and behavioral patterns of users in a positive manner will aid to the adoption process. Today, the TAM is widely accepted in the field of information technology as a well-known

predictor of technology acceptance (Sentosa & Nik Mat, 2012). Figure 6 illustrates the block diagram of the model.

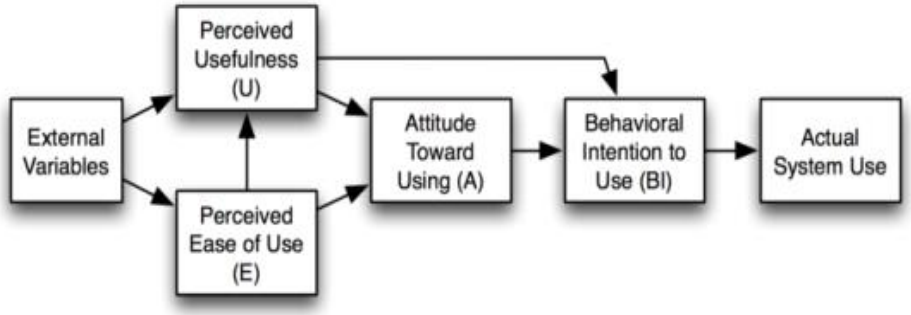

Figure 6. Technology Acceptance Model. External variables influence user perception of usefulness and ease of use in forming attitude towards behavioral intention and actual use. Adapted (as cited by Venkatesh) from "User acceptance of computer technology: A comparison of two theoretical models" by Davis, Bagozzi, & Warshaw, 1989, p. 985.

The TAM examines two independent constructs, ease of use (E) and perceived usefulness (U), as determinants of two dependent constructs of attitude (A) and behavior intention (BI) towards the actual behavior. The model is based on the individual's perception of usefulness and ease of use which influences attitude and behavioral intention towards the actual behavior (Davis, Bagozzi, & Warshaw, 1989). Of interest to this study, the TAM can be used to address concerns about user acceptance or rejection of a technology and how the acceptance or rejection is influenced by external characteristics of the LMS (Davis, 1993). Davis, Bagozzi, and Warshaw (1989) also note

that educational organizations can influence perceived usefulness of potential users by demonstrating an added value from the system. However, the theoretical weakness of this model lies in that of the external variables, how they are defined and how they relate to the users.

Technology Acceptance Model 2

Continuous research in areas related to social influence and cognitive reasoning led to the addition of new external influences or determinants to the original TAM, creating the TAM2. Venkatesh and Davis (2000) identified these two new areas as social influences and cognitive instrumental processes, consisting of determinants related to subjective norm, personal image, experience, voluntariness, job relevance, output quality, and result demonstrability. With the addition of the cognitive process aspect of this new model, influence from the individual's motivation, goals, and adoption decisions can be measured towards technology acceptance and adoption (p. 191). Figure 7 displays the extension of the original TAM that led to the creation of the TAM2 model.

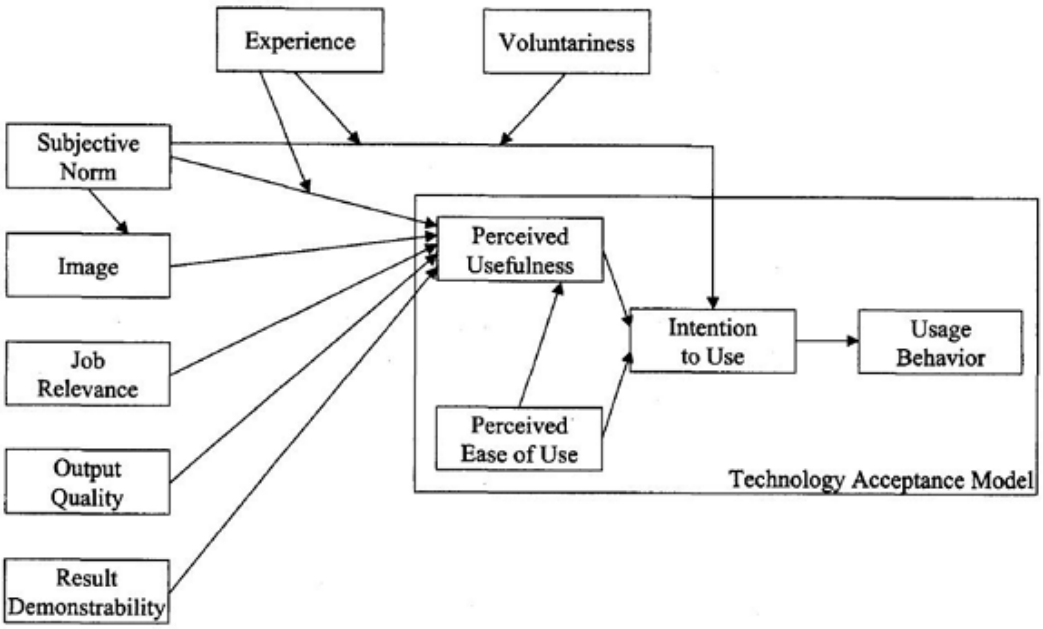

Figure 7. Technology Acceptance Model 2. Social influences and cognitive reasoning processes are related to perceived usefulness and can therefore change usage behavior. Adapted from "A theoretical extension of the technology acceptance model: Four longitudinal field studies" by Venkatesh & Davis, 2000, p. 188.

Technology Acceptance Model 3

Venkatesh and Bala (2008) further refined the TAM2 into the development of the Technology Acceptance Model 3 (TAM3) which again extended the model for more social influences, environmental influences, user experience, and personal preference. For the interest of this study, the TAM3 addresses user perceptions and experience with technology, along with personal control, and fear of change (anxiety). Figure 8 displays the block diagram of the TAM3 with the additional determinants and relationships among the constructs.

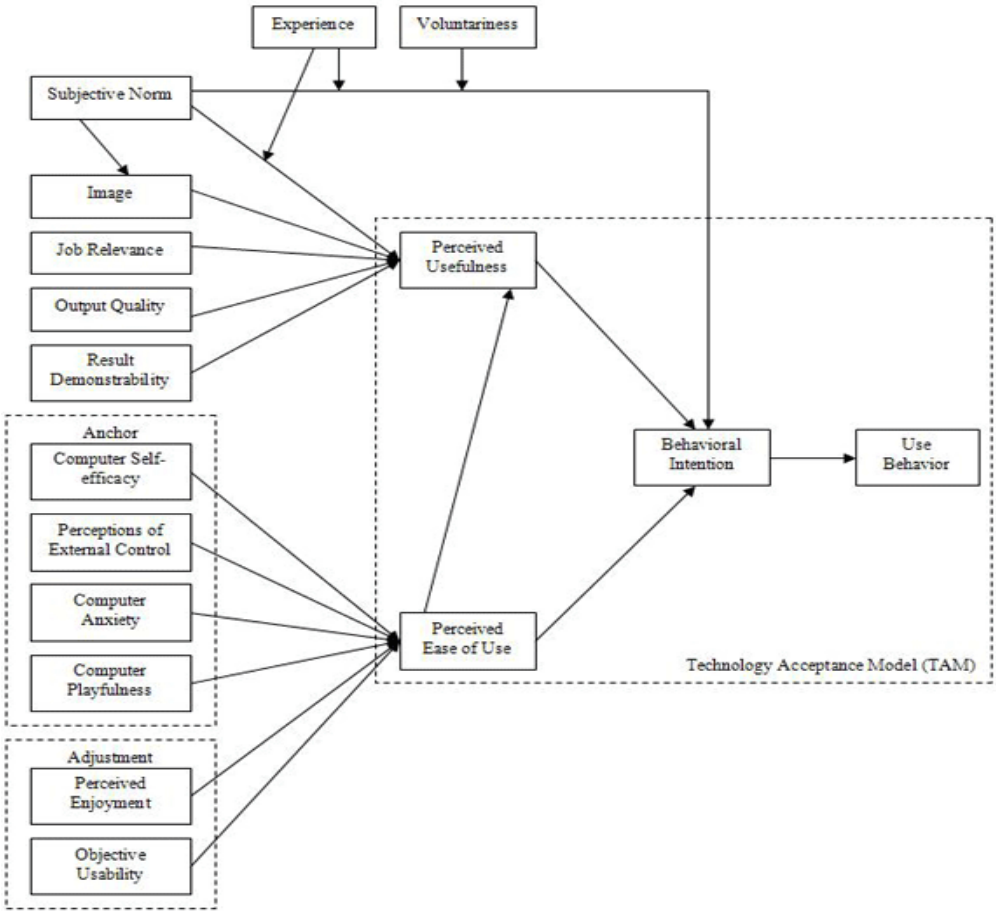

Figure 8. Technology Acceptance Model 3. Further extension of the TAM model to include new determinants that influence behavior. Adapted from "Technology acceptance model 3 and a research agenda on interventions" by Venkatesh & Bala, 2008, p. 280.

Unified Theory of Acceptance and Use of Technology Model

Bagozzi (2007) wrote that all of the TAM versions were too simple and did not take into account the end goals or objectives of the user related to technology acceptance

and usage. Rather, he believed that technology adoption, acceptance, or rejection by the user should be goal oriented, not behavior oriented as with the previous TAM models. During this same time, the creation of the Unified Theory of Acceptance and Use of Technology Model (UTAUT) developed by Venkatesh et al. (2003) in an attempt to also simplify the TAM models with a compilation of several other technology theories and include more technology related constructs.

Psychological aspects such as emotions and attitude can play a role in the decision process of an individual, but are not considered in the TAM models. Many researchers have acknowledged this argument from Bagozzi however, most believe that the psychological aspects are inherent to the overall diffusion process as theorized by Rogers (2003). It is also the opinion of this researcher that emotions, perceptions, and attitude can be influenced through collaboration and communication amongst users, thus acting as the change agent role within Rogers' diffusion of innovation theory. Figure 9 displays the block diagram for the UTAUT model.

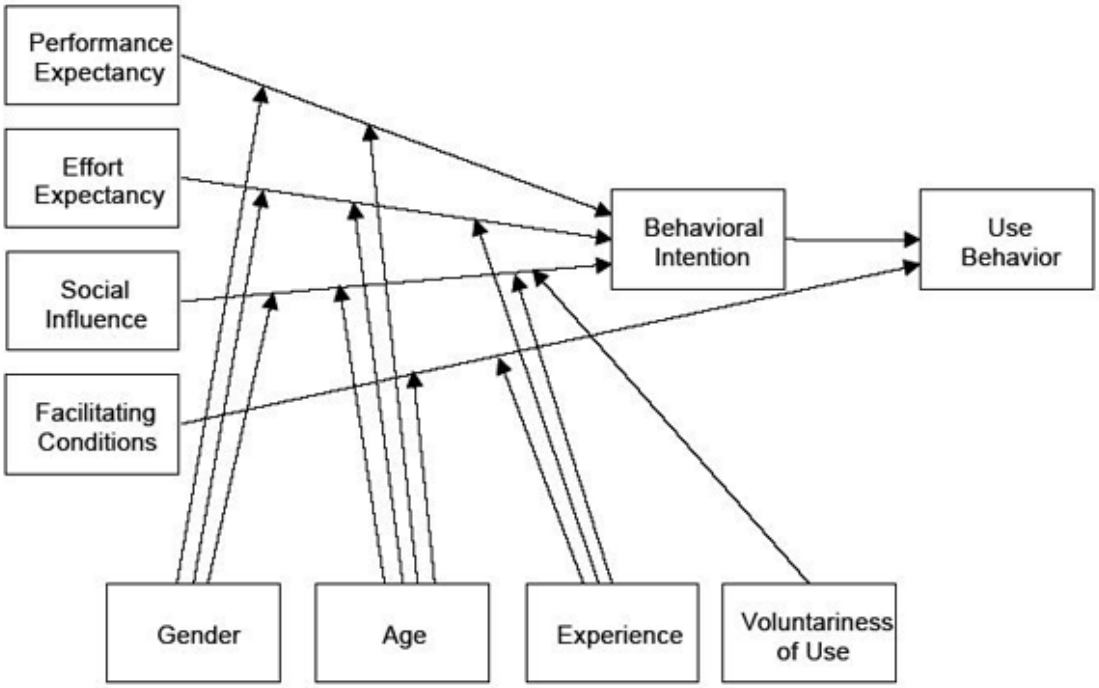

Figure 9. Unified Theory of Acceptance and Use of Technology Model. Adapted from "User acceptance of information technology: Toward a unified view" by Venkatesh, Morris, Davis, & Davis, 2003, p. 447.

Diffusion of the LMS

A new LMS represents a major change for the university and the users. Change is always difficult for the adoption of a new technology. Rogers (2003) defined diffusion as "the process in which an innovation is communicated through certain channels over time among the members of a social system" (p. 5). The goal of the diffusion process is to focus adoption techniques towards the early adopters and early majority users in order to help them persuade the late majority and laggards to adopt the new innovation or

technology. In real-world practice however, 100% adoption of an innovation or technology is rarely met, although the diffusion theory is based on such a goal.

Another major concern after selecting and implementing a new LMS is that of system adoption by the users. Rogers (2003) uses a normal distribution curve to classify users into five categories based on time of adoption. These five categories represent partitions that classify users based on standard deviations from the average user adoption time (center of the normal distribution curve) and an assumed 100% adoption by all users. Descriptions of each user category and corresponding characteristics are as follows:

Innovators: Idealists, daring, risk takers, venturesome individuals. These are the first users to push for adoption of an innovation, generally advocating how the innovation makes something better than before (added value) based on a new vision or idea (p. 282).

Early Adopters: These are the first true users of the innovation from a business perspective by integrating with the innovation in a physical sense. These users will become role models (and change agents) for other users and are crucial to triggering the critical mass adoption of an innovation (p. 283).

Early Majority: Evaluators, deliberators, careful and purposeful thinkers. These users make up the larger portion of the critical mass and rely on evaluation and recommendations from peers (innovators and early adopters) before adopting an innovation (p. 283). These users are accepting to change, but want to know how the change will benefit them in some fashion.

Late Majority: Skeptical, cautious, and slow thinkers. These users postpone adoption until the innovation has been proven, used for some amount of time, and rely on convincing evidence and persuasion from the critical mass to accept the innovation as a necessary change (p. 284).

Laggards: Traditionalists, suspicious, and reluctant to change. These users make up the last portion of the user group categories and are normally forced to change and adopt a new innovation (p. 284).

The relationship between each user category plays a unique role in achieving critical mass. Critical mass is the point at which the adoption of an innovation is self-sustaining, in other words, being continuously adopted by future users (p. 363). The study does not determine the individual users within the three defined groups and how they fit into the adoption categories, instead the literature review information is to expand the knowledge of the researcher and university administration to better prepare for the adoption and diffusion process based on findings from the study.

The concept of critical mass (Rogers, 2003; Schelling, 1978) notes that human behavior of an individual or group often depends on the perceptions and attitudes of other individuals, specifically on technology adoption. Simply stated, people tend to make decisions on trying some new technology (and adopting it) based on how others have perceived the new technology. Therefore, the importance of the study to measure and understand user perceptions and attitude of attributes and barriers within the current LMS, will be vital in determining any diffusion process of a replacement LMS.

User Group Classification

The study defined three distinct user groups that use the LMS on a daily basis. The groups are faculty, students, and staff. The basic definitions for these user groups as related to the study are as follows:

Faculty: Those users that are labeled as instructor of record (IOR) for a course in the student information system (SIS). Faculty primarily use the LMS for creating, uploading, and sharing of course content with students, but also use the grade book, assessment, and assignment features of the LMS to evaluate student learning.

Students: Those users that are labeled as students enrolled in a course in the student information system (SIS). Students primarily use the LMS for consumption of course content, but also use the communication, discussion, assignment, assessment, and grade features of the LMS for collaboration with instructors and other students.

Staff: Those users that are not labeled as an instructor of record (IOR) or a student in the student information system (SIS). Staff employees primarily use the LMS for the sharing of information, creating communities or special interest groups, and collaboration.

Rogers (2003) defined a five-stage adoption decision process of individuals for the diffusion of an innovation. The stages are defined as knowledge, persuasion, decision, implementation, and confirmation (p. 170).

Knowledge – Individual is first exposed to the innovation.

Persuasion – Individual shows interest in learning more about the innovation.

Decision – Individual evaluates the advantages and disadvantages of using the innovation and decides to accept or reject.

Implementation – Individual uses the innovation and determines usefulness.

Confirmation – Individual makes final decision to continue or discontinue usage.

The user decision process starts with the initial stage of gathering knowledge about the technology or innovation where the individual assesses prior practice with the technology, notes barriers to overcome with using the technology, how others are using the technology, how the technology fits into the environment, and starts to define the added value to be gained from using the new technology. The decision process then flows from knowledge gathering stage to the persuasion stage of the process.

In the persuasion stage, the user assesses the added value from the technology by trialability (hands-on usage of the system; pilot or beta user), observing complexity and compatibility with the business usage of the technology within the user's environment. The decision process then flows to the decision stage.

In the decision stage, the user decides on accepting or rejecting the technology based on prior knowledge and persuasion stages. At this point in the decision process, the user eithers accepts the new technology and any associated change by adopting it or rejects the new technology. If the user rejects the new technology, the decision process starts over with the gathering of additional knowledge and different persuasive approaches which are needed to influence change and later adoption of the new technology during the next decision stage.

The implementation stage follows the decision stage if the user accepts the new technology. In this stage, the user begins using the new technology in the day-to-day routine of activities. In the case of an educational setting such as a LMS, the user would begin migrating course content from the older LMS and building new course content and functionality that makes use of new features within the LMS. This stage then flows into the confirmation stage of the decision process.

In the confirmation stage, the user then evaluates how the adoption of the new technology has improved their job, teaching methods, or similar. Continuous improvement and change can also occur during this stage as more responsibility and confidence is gained by the user to expand knowledge and usage of the technology.

Attributes to Adoption

The attributes of the study are theorized and considered as positive influence factors on user perception and attitude towards adoption of the LMS. The assumption is that the existence of these factors will improve and possibly increase user adoption during the diffusion of the new LMS once selected and implemented by the university. Brief overviews of each previously identified attribute are listed below along with the importance of each attribute to the diffusion process.

Brand Name and Reputation. Research has shown that company reputation and product brand name has an effect on the mental aspect of an individual and influences user perception and attitude (Jansen, Zhang, & Schultz, 2009). “In the cognitive area, brand image has been shown to stimulate certain areas of the human brain” (Born, Meindl, Poeppel, Schoenberg, & Reiser, 2006). Since prior research indicates user

perception influence from brand name and reputation of a company, the importance of this attribute to the study will be that of user preference of the three evaluated LMS platforms with the assumption of having a positive influence on user adoption and diffusion of a replacement LMS for the university.

Locus of Control. Based from the field of psychology that deals with personality, locus of control plays a major role in the behavior of an individual and relates to self-esteem and self-efficacy. This factor has importance to the study in that the users of the LMS can control certain elements within the LMS, thus giving a sense of personal achievement, accomplishment, and individuality. Individual control over personal performance is a cause of behavioral intention and action (Ajzen, 2002). The assumption is that this factor will create a positive influence on user attitude and perception towards adoption and diffusion of a new LMS at the university.

Support and Training. Prior studies have shown that individuals evaluate usefulness and ease of use by developing opinions of a technology based from personal interests, needs, and skills being met with adequate support and training (Leonard-Barton & Deschamps, 1988). An individual who has his or her needs met will display higher self-esteem, sense of control, and personal achievement, which leads to a positive behavioral pattern. The importance of this factor is to examine the user perception of current support and training being provided for the LMS and as such, help determine if support and training adjustments need to be made in order to have a more positive influence on user attitude and perception towards adoption and diffusion of a new LMS at the university.

System Features. The provision of features within the LMS to which users perceive as useful and relative to the functionality needed in order to perform a particular task will lead to a positive experience (Petter, DeLone, & McLean, 2008). User perception derived from the added value of wanted features give a positive attitude in adopting a new technology or innovation (Rogers, 2003). This factor has importance to the study in that of understanding what features are most useful in the current LMS coupled with requests of new features wanted in the replacement LMS to create a positive influence on user attitude and perception towards adoption and diffusion of a new LMS at the university.

System Integration. Much like that of system features, system integration with other information technology systems within the university infrastructure provides seamless transition for the user and a positive experience. Again, the idea of adding value with system integration as part of the LMS will create a positive influence on user attitude and perception towards adoption and diffusion of a new LMS at the university.

Trialability. Rogers (2003) defines trialability as "the degree to which an innovation may be experimented with on a limited basis" (p. 16). Trialability has also been proven to be directly related to the rate of adoption of an innovation. Users are more inclined to form a positive perception of a technology if they can try it first on a limited basis. Trialability is believed to be much more important to early adopters than later adopters towards increasing acceptability. Implementation of a new LMS should be done in a phased approach to allow the users to become familiar with the system features (Black, Beck, Dawson, Jinks, & DiPietro, 2007). This factor will be very important in

the evaluation of the three proposed LMS platforms and also during the implementation of the new LMS once selected by the university and will create a positive influence on user attitude and perception towards adoption and diffusion of a new LMS at the university.

Barriers to Adoption

The barriers for the study are theorized and considered as negative influence factors on user perception and attitude towards adoption of an innovation or technology. The assumption is that the limitation or mitigation of these factors will improve, and possibly increase user adoption during the diffusion of the new LMS once selected and implemented by the university. Brief overviews of each previously identified barrier are listed below along with the importance of each barrier to the diffusion process.

Cost Concerns. As with any implementation of a new technology, cost is always a concern. Being a public institution funded by tuition, student fees, state funds, and grants, all major university expenditures such as a LMS must be justified to the stakeholders. State legislature and administrators want to know the system will met the needs of the university before funding. Users want to know that the new system will add value to their needs before giving a positive approval. System costs can include new infrastructure hardware, software licenses, system maintenance fees, customization, development, consulting, and operational expenses which all have to be realized. The debate of open-source platform versus proprietary commercial platform appears on the surface to favor the cost of the open-source platform, however studies have shown that after consulting work for customization of the system and special programming required

for external integration with other university systems actually levels the cost comparison. To overcome this barrier related to system cost, improvements to or replacement of other systems to increase interoperability and create value within the university, along with establishment of user incentive initiatives will play an important role for user adoption and a positive experience (Poon, Blumenthal, Jaggi, Honour, Bates, & Kaushal, 2004).

Fear of Change and New Technology. Fear of change, better known as technology anxiety, creates a negative attitude toward adoption and produces poor behavior (Wu, 1995). Studies have shown that fear of change relates to the user having inadequate training or knowledge, and possibly some loss in locus of control levels. It is important to identify fear of change and technology anxiety as a type of user resistance to technology acceptance in order to develop a training plan to overcome the barrier (Speek, 2013). Hackbarth, Grover, and Yi (2003) believe that increasing user experience and ease of use of the system will dramatically decrease anxiety. Controlling fear of change is an important concept that relates to the study towards lowering user rejection and increasing adoption and diffusion of the LMS.

Migration Process. Migration poses a potential barrier to the adoption of the LMS if users cannot use existing data such as course content, images, and files. Huysmans, Ven, and Verelst (2008) state though not only is the technical aspect a concern, but the importance of the organization to provide a change management process for users to follow with adequate documentation and support mechanisms in place is also a major concern. The moving of data from the existing LMS to the new LMS should be

a simple, seamless, and standardized process. If not, the migration process or lack thereof, increases user rejection towards adoption and diffusion of the LMS.

System Complexity and Usability. A user's decision to adopt a complex system is based upon mental thoughts associated with the benefits and risks of the change (Plsek, 2003). Ease of use, one of the fundamental constructs in the TAM, has a direct relationship to this external factor in the study. The complexity of the new LMS must not impede the user's ability to be successful in using the system, for if it does, then adoption and diffusion will be negatively impacted.

System Support Concerns. One of the more compelling concerns when it comes to the adoption of any technological innovation is that of system support. This also has bearing on the LMS selection process, especially with options of open-systems and commercial proprietary systems. The question of system support for an open system relies upon the university to maintain the LMS whereas a commercial proprietary system is supported by the product vendor. In a white paper presented by Techaisle (2011) on overcoming adoption barriers, it reveals that trusted vendors that are reliable and provide good customer support compel users to adopt the technology. The user concern of knowing that any issue they may face while using the LMS will be addressed reliably and responsibly by the product vendor, affects user perception and attitude towards adoption.

Time Concerns. Time is valuable and can be a barrier to adoption. Users do not want to spend hours, days, or weeks to learn how to reuse a new LMS. Although some learning will be necessary, caution should be taken in how it is addressed and presented

to the users. The requiring of specific training, system complexity, and non-user friendly interfaces creates potential barriers of time loss for the user, and thus, also a barrier towards LMS adoption.

Theoretical Framework

The theoretical framework used for the study is based from a combination of all afore mentioned theories and technology acceptance models. Theoretically, the study will encompass assumptions from the time-proven theories consisting of the theory of reasoned action (TRA), theory of planned behavior (TPB), technology acceptance model (TAM), and the unified theory of technology acceptance (UTAUT) models respectively, with the core theoretical foundation as that of the TAM and UTAUT models, which will be modified to include the external factors of attributes and barriers identified by the current university user base that influence adoption of the LMS.

The external factors will be grouped into attributes (positive influence) and barriers (negative influence) then measured on user perception and attitude. The assumption is made that these factors can and do change behavior patterns and behavioral intention of the user towards accepting or rejecting adoption of the LMS. Other factors could exist which may influence user perception and attitude outside of those identified, however those identified within the study are based upon what the current users perceive as important to them.

Examining the different user groups with external factors as attributes and barriers having influence (positive or negative) on perception and attitude towards technology adoption provides the basis for the conceptual model created for the study as

presented in Chapter I (See appendix A for enlarged version of the conceptual model). Figure 10 shows the theoretical framework diagram.

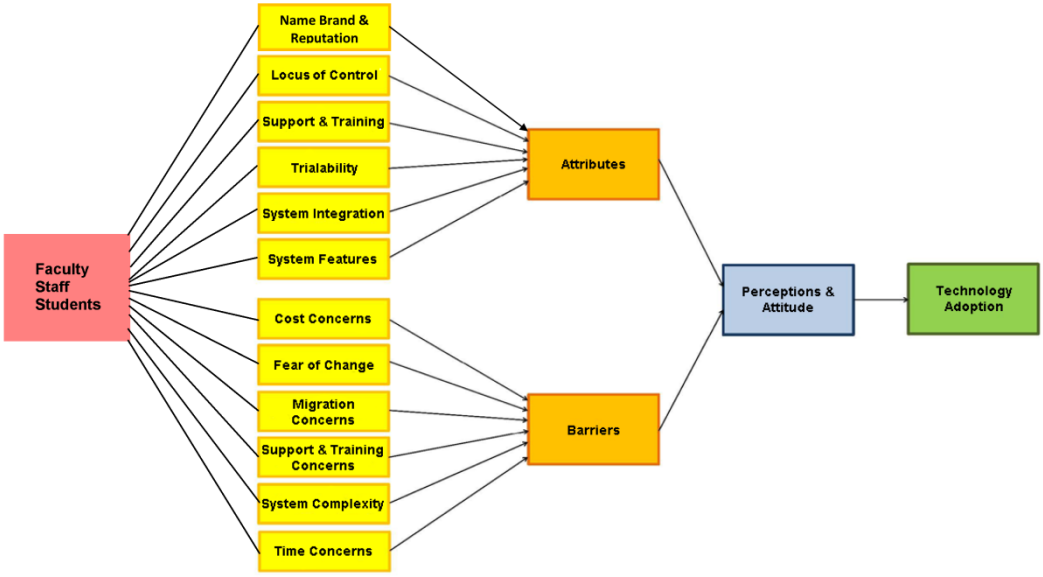

Figure 10. Theoretical Framework Diagram. The diagram shows the theoretical relationships of the user base, external factors as attributes and barriers that influence user perception and attitude towards technology adoption.

CHAPTER III

METHODOLOGY

Design Overview

The descriptive and correlational study was designed to provide an in depth understanding of the attributes and barriers that can influence user perception and attitude towards adopting an LMS. The expectations from the study are to gain and create knowledge in an effort to confirm or negate the assumptions of university administration and members of the LMS selection committee while providing a guide for the LMS selection process and also identify areas of concern that could become potential barriers to LMS adoption by the users which would affect the overall diffusion of the new LMS at the university.

The study was conducted by first examining the user group characteristics and then measuring user perception and attitude towards adoption from several variables identified from discussions with the users prior to the study. A stratified random sample was used with proper sample sizes determined from the population based on Cochran's correction formula for categorical data (1977).

The survey instrument was administered using the Qualtrics online survey application. Data collection was then carried out over a period of time to meet the requirements set by the LMS selection committee. The administering of the instrument included reminder emails sent to respondents periodically in hopes of improving the response rate. Data was then analyzed to address the research objectives of the study to

draw conclusions, make recommendations, and outline potential future research opportunities based from the findings.

Sampling Method

To address the research objectives towards measuring the external factors and determining indifferences between the user subgroups, participants for the study were determined by using a stratified random sample method. In order to prevent sampling bias due to the large population differences in each of the subgroups, the proportionally appropriate sample size for each subgroup was determined using Cochran's (1977) correction formula for categorical data. Sample size calculations assumed a confidence level a priori at .05 and an acceptable level of sampling error at 5% with a degree of variability of .5 and are shown in Table 1.

Table 1

Calculated Sample Sizes Using Cochran's Correction Formula

Subgroup	Population	Sample Size
Faculty	4,014	350
Staff	5,997	360
Students	48,460	381

Note. Confidence level .05, Sampling error 5%, Degree of variability .5.

The population for each subgroup represents the total number of active e-learning users derived from the ITS e-learning database as of April 25, 2011 during the spring semester. Random selection of University Identification Numbers (UINs) from the e-learning database provided the participants for each subgroup. This process repeated until the calculated sample sizes were complete.

Research Instrument

An advisory committee made up of representatives from all the university colleges, departments, student body, and faculty groups provided input on creating the instrument used in the study for data collection. The survey instrument (See appendix C) used in the study for data collection was constructed and based upon the variables of interest using the TAM and UTAUT models as a foundation. The TAM and UTAUT are well-known throughout the industry for measuring user perception and attitude towards technology acceptance levels. The two main constructs of these models are defined as perceived ease of use and perceived usefulness which are influenced by external factors (Davis, Bagozzi, & Warshaw, 1989; Venkatesh, et al., 2003).

Data gathered from initial research, user interviews, discussions, and personal communications prior to the study defined these external factors as variables of interest to be measured with the instrument. In an effort to minimize researcher bias and determine trustworthiness of the supporting instrument questions and construct validity, peer-review and pilot testing of the instrument was completed.

The external factors were measured using a five-point Likert-type scale created around each external factor pertaining to attributes and barriers that influence technology

acceptance. The scale consisted of a range of values defined as: 1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Neither agree nor disagree*, 4 = *Agree*, and 5 = *Strongly agree*. Each external factor was measured by the number of items that were summated to give a scale score. The convention used for interpreting the total scale score for each external factor consists of 1.00 – 1.49 = *Strongly Disagree*, 1.50 – 2.49 = *Disagree*, 2.50 – 3.49 = *Neither Agree nor Disagree*, 3.5 – 4.49 = *Agree*, and 4.50 – 5.00 = *Strongly Agree*.

All members in each sample group had a link to the survey along with a generated message detailing the aspects of the study emailed to them for response. The data collection period was set at four weeks with reminder email messages generated and sent every week in an effort to increase the response rate.

The instrument was pilot tested on a select group of faculty, staff, and students within the population of the study to determine reliability and validity of the instrument. Correlations between the groups of variables measured by the instrument provided internal consistency reliability estimations by calculating Cronbach's alpha reliability coefficient values using the SPSS software (Cronbach, 1951).

The reliability coefficients calculated for each variable were *Locus of control* (r = .79); *Support and training* (r = .88); *Trialability* (r = .82); *System integration* (r = .80); *System features* (r = .87); *Time concerns* (r = .68); *System cost* (r = .77); *Fear of change and new technology* (r = .89); *System Support* (r = .84); *System complexity and usability* (r = .83); *Migration process* (r = .86).

The literature suggests that an acceptable reliability coefficient should be .80 or greater, where a higher coefficient constitutes a more reliable scale (Nunnaly, 1978). The

pilot testing of the instrument demonstrated all but three variables to be acceptable at this level. The LMS selection committee and researcher decided to use the instrument as is however due to the time constraints of the study, but acknowledges that the variable scales for: *Time concerns*, *Locus of control*, and *System integration* need to be reevaluated and strengthened in future versions of the instrument.

Research Method

In an effort to confirm or negate the assumptions of university administration and members of the LMS selection committee, descriptive research using a cross-sectional design will be used for the study. According to Lindell and Whitney (2001), this type of research design allows for the measuring of user perceptions and attitudes at a point in time for a situation or environment that they find themselves, in this case the usage of the LMS. This design method is appropriate to observe how the different user groups are influenced by external factors and how it affects the adoption of the LMS. The results of this type of research design allows for immediate recommendations and can also determine specific areas that may need a more detailed focus study in the future. Figure 11 displays a diagram for the framework of the cross-sectional research study design.

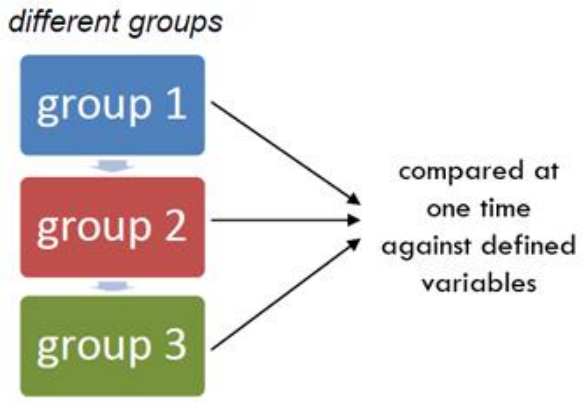

Figure 11. Cross-sectional Research Design. The diagram outlines the framework of the research design used for the study.

Research Threats

With any research study, there is always the possibility of threats which can cause variations in the results of a study and skew the true effectiveness of conclusions drawn from the study. The most common threats to internal validity of a research study design as stated by Bergh, Hanke, Balkundi, Brown, and Chen (2004) are listed along with the impact each has in regards to this study.

History: Since the study was not designed to do any pre-test and post-test measuring, there was not a history threat related to this study.

Maturation: Since the study is a point-in-time observation, there is no dependency on a time frame of measurement of the respondents and therefore, no maturation threat related to this study.

Testing: Since the study was designed as a one-time observation and not to do any pre-test and post-test measurements, no possible variation in outcomes due to exposure to repeated testing will be a threat to the study.

Instrumentation: Commonly associated with instrument decay, the study instrument was designed to do a one-time measurement as to avoid any possible change with the instrument or an increase of user experience over time in regards to using the instrument. As of such, there is no instrumentation threat to the study.

Selection: Being a cross-sectional research design, the study is susceptible to this threat. However, to mitigate this threat, randomization of the respondents within each stratified sample group was done therefore minimizing the differences between the groups.

Mortality: The threat of attrition or mortality is not a factor as the study was designed as a one-time observation and no measuring of test results over time. Therefore, no respondents can drop out of the study and skew the results.

Interactions with selection: This threat is aimed more at cause and effect type studies where differences amongst the respondents in different control groups could skew the results. Since this study is not determining cause and effect of variables on a particular outcome, there is no concern of this threat for this study.

Ambiguity about direction of causal inference: The study is susceptible to this threat since the design is a point-in-time observation, and as such, the cause of the phenomenon being studied cannot be determined by the variable affects over time. However, since the study is an observation and examination type study with no intention

of determining cause and effect of technology acceptance by the respondents, this threat is not a concern for the study.

Data Collection

Data collection from the participants involved the usage of the Qualtrics online survey software. A generated message was sent to each of the email accounts associated with the UINs of each participant within the sample subgroups (See appendix B). The data collection period was set at four weeks for the survey. In an attempt to improve the response rate, the sending of reminder emails occurred every seven days until the data collection period closed.

Data Analysis

Data analysis using SPSS (v16.0) with one-way *ANOVA*, *t*-test, *cross-tabulation*, and *chi-square* tests to describe and identify significant differences between the three user groups and each factor. Post hoc tests using *Tukey's b* were conducted when appropriate to identify the source of the differences between the groups.

CHAPTER IV

FINDINGS

Response Rate

The target population for the study consisted of e-learning users from the April 2011 spring semester distributed across the user subgroups faculty (4,014), staff (5,997), and students (48,460). This data was derived from the student information systems database supported by the Enterprise Information Systems (EIS) department at the university.

A stratified random sampling formula was used to select the participants of the study and calculated as faculty (n = 350), staff (n = 360), and students (n = 381) for a total (n = 1,091). Actual responses received were faculty (n = 210), staff (n = 123), and students (n = 350) producing response rates respectively as faculty 60.0%, staff 34.2%, and students 91.9%. Overall response rate for the study was (n = 683) 62.6%. No participants opted out. There were 35 responses removed due to incomplete answers or missing data. Table 2 represents the responses received from the participants.

Table 2

Participant Response Rate

Subgroups	*n*	*f*	%
Faculty	350	210	60.0
Staff	360	123	34.2
Student	381	350	91.9
Total	1,091	683	62.6

Non-Response Error

The response rate assumption for the study was set a priori at 60%. In an effort to minimize non-response error, email reminders were generated and sent periodically during the four-week data collection period. Over sampling techniques were also a possibility, but not needed as the initial response rate met the desired assumption.

Research Objectives

Findings for the research objectives are as follows:

Objective 1

Describe the current LMS usage characteristics of the study participants: The study obtained participant characteristics and related information about the usage of the current LMS in order to understand how users view the current LMS. The survey instrument presented the participants with several questions regarding LMS usage, experience levels, length of use, gender, beliefs, feelings, course responsibility, university affiliation, and role.

The participants were asked to indicate their role at the university. Findings showed that 30.7% of the respondents were faculty, 18.0% were staff, and 51.3% were students. Table 3 represents the user responses received from the participants based on their role with the university.

Table 3

Participant Response by Role

Please indicate your role at the University:	*f*	%	*M*	*SD*
Faculty	210	30.7		
Staff	123	18.0		
Student	350	51.3		
Total	683	100.0	2.72	1.36

Next, participants were asked an ice-breaker question: *Web based education (e-Learning) is an important delivery strategy used by faculty to educate students?* Findings revealed that 91.6% of the respondents agreed with the statement. Results are shown in Table 4.

Table 4

Participant Response to Ice-breaker Question

Web based education (e-Learning) is an important delivery strategy used by faculty to educate students?	*f*	*%*	*M*	*SD*
Agree	625	91.6		
Disagree	57	8.4		
Total	682	100.0	1.08	.28

Participants were then asked if they use the current LMS. Findings from the data revealed 92.1% of the respondents are familiar with and have used the current LMS at the university. Table 5 presents the percentage of respondents using the current LMS.

Table 5

Respondent Usage of Current LMS

Are you currently using or have you previously used the e-Learning LMS platform at the University?	*f*	*%*	*M*	*SD*
Yes	603	92.1		
No	52	7.9		
Total	655	100.0	1.08	.27

For those respondents that answered “No” to using the LMS, three predefined reasons were presented along with an option for writing in other reasons for not using the LMS. Table 6 displays the reasons respondents are not using the LMS.

Table 6

Respondent Reason for Not Using the LMS

Please select the choice that best describes the reason you do not use the e-Learning system:	*f*	*%*	*M*	*SD*
None of my courses are taught in the e-Learning system.	22	44.0		
The e-Learning system is too complex to use.	2	4.0		
I prefer traditional teaching methods over on-line teaching.	12	24.0		
Other reason	14	28.0		
Total	50	100.0	2.64	1.69

Common responses for other reasons for not using the LMS included: “Haven’t found it necessary to use,” “I don’t have courses to teach,” “I don’t see the advantage,” “I have designed my own e-Learning system that is superior to what the university can offer for the courses I teach,” “I use another web product,” “I use lecture tools,” “I use Moodle,” “unfamiliarity with and learning curve,” and “I use another online system.”

Participants were asked how long they have used the current LMS. Table 7 provides a breakdown showing the range for length of use by the respondents. The

findings for length of use by the respondents ranged from less than one year to over six years, with the 3 – 4 year range having the highest percentage of users (31.2%).

Table 7

Respondent Length of Use

How long have you been using the e-learning system?	*f*	*%*	*M*	*SD*
Less than 1 Year	91	15.2		
1 – 2 Years	176	29.5		
3 – 4 Years	186	31.2		
5 – 6 Years	77	12.9		
More than 6 Years	67	11.2		
Total	597	100.0	2.75	1.19

The level of experience findings for the respondents ranged from low level to a fully online level with the medium level of usage having the highest percentage (36.8%). The breakdown for level of experience by the respondents is shown in Table 8.

Table 8

Respondent Level of Experience

Select the choice that best describes your level of experience in using the e-learning system:	*f*	*%*	*M*	*SD*
Low Level – posting syllabus, grade book, email	62	23.8		
Medium Level – course content, links, chat, discussions	96	36.8		
High Level – assessments, assignments, learning modules, portfolio	58	22.2		
Fully Online – Complete course taught online	45	17.2		
Total	261	100.0	2.33	1.02

Participants were then asked who was responsible for requesting and setting up courses in the e-learning system. The findings revealed that 78.0% of courses were created and setup by the faculty (instructor) or staff themselves. Responses are shown in Table 9. Other responses included “me and the instructor,” “me and a staff member,” “Professor,” “department instructional designer,” and “Tech team.”

Table 9

Responsibility of Courses in LMS

Who is primarily responsible for setting up your course(s) in the e-Learning platform?	*f*	*%*	*M*	*SD*
Myself	202	78.0		
Staff Member (Department or College)	33	12.7		
Graduate Student or Teaching Assistant	9	3.5		
Other	15	5.8		
Total	259	100.0	1.37	.81

Participants were asked to select a choice that describes their attitude towards using the LMS. The findings revealed that 59.1% of respondents believe that the LMS helps in educating students and 16.5% of the respondents believe the LMS saves them time in teaching. Findings are shown in Table 10.

Table 10

Respondent Attitude Towards Using the LMS

Select the choice that best describes your attitude towards using an e-Learning platform:	*f*	*%*	*M*	*SD*
Asset for the University	40	15.7		
Helps in educating students	150	59.1		
Saves time in teaching	42	16.5		
Simple to use	16	6.3		
Reliable	6	2.4		
Total	254	100.0	2.20	.87

Participants were presented with a list of LMS platforms currently available from different vendors and asked if they have ever used any of these LMS platforms. Findings suggest that participants had knowledge and experience with several other LMS platforms. WebCT (30.4%), Blackboard Learn (30.2%), and Blackboard Classic (13.1%) were the most used LMS platforms by the participants. Table 11 presents the findings.

Table 11

Respondent Use of Other LMS Platforms

Have you used any of the following e-Learning platforms?	*f*	%
Angel	32	2.7
Blackboard Classic	156	13.1
Blackboard Learn	362	30.2
Canvas	3	.2
Desire 2 Learn	9	.7
Epsilen	3	.2
Moodle	111	9.2
Sakai	9	.7
Web Assign	111	9.2
WebCT	364	30.4
Other	41	3.4
Total	1201	100.0

Participants were asked to indicate their association with the university from a list of colleges and departments. Table 12 represents the responses received from the

participants based on university association. The findings reflected widespread user representation encompassing all colleges and departments of the university with the top five colleges as Agriculture and Life Sciences (23.8%), Engineering (13.3%), Education and Human Development (12.0%), Liberal Arts (11.1%), and Science (10.7%).

Table 12

Participant University Association

What part of the University are you associated with?	*f*	*%*	*M*	*SD*
Agriculture and Life Sciences	131	23.8		
Engineering	73	13.3		
Education and Human Development	66	12.0		
Liberal Arts	61	11.1		
Science	59	10.7		
Mays Business School	35	6.4		
TAMU at Galveston	23	4.2		
Geo Sciences	21	3.8		
Veterinary Medicine & Biomedical Science	20	3.6		
Architecture	18	3.3		
George Bush School of Gov. & Public Serv.	11	2.0		
Graduate Studies	6	1.1		
Administration	5	.9		
Military Science	5	.9		
General Studies	4	.7		
Distance Education	3	.5		
Health Science Center	3	.5		
Qatar Campus	3	.5		
Associate Provost for Undergrad Programs	1	.2		
Center for Academic Enhancement	1	.2		
Interdisciplinary TAMU	1	.2		
English Institute	0	.0		
Library	0	.0		
Medicine	0	.0		
Other	0	.0		
Total	550	100.0	11.90	8.01

Participants were asked to identify with gender with results shown in Table 13 indicating the distribution between female and males.

Table 13

Respondent Gender

What is your gender?	*f*	*%*	*M*	*SD*
Female	300	54.5		
Male	250	45.5		
Total	550	100.0	1.45	.50

Participants were asked to select the choice that best describes their feeling when using the LMS. Table 14 presents the findings.

Table 14

Respondent Feeling with the LMS

Select the choice that describes your feeling when using the e-Learning platform:	*f*	*%*	*M*	*SD*
Angry	10	1.8		
Comfortable	335	61.6		
Confused	14	2.6		
Excited	12	2.2		
Frustrated	63	11.6		
Happy	26	4.8		
Other	84	15.4		
Total	544	100.0	3.36	1.99

The findings resulted in 61.6% of the respondents had a feeling of being comfortable with the current LMS. Other feelings listed by the respondents were reported at 15.4% and included “neutral,” “ambivalent,” “annoyed,” “anxious,” “apathetic,” “bored,” “busy,” “disappointed,” “fascinated,” “focused,” “hassled,” “indifferent,” “nervous,” “restrained,” and “nothing.”

The data findings for research objective two through research objective thirteen are presented in the three tables that follow: Table 15 indicates participant perception of attributes and barriers towards LMS adoption, while Table 16 displays the dispersion of the responses from the participants. Results from performing inferential statistics on the attributes and barriers are shown in Table 17.

Table 15

Participant Perception of Attributes and Barriers Towards LMS Adoption

Attributes and Barriers	*M*	*SD*
Locus of control (n = 572)		
I need the ability to access course material in the e-Learning platform at any time and on any type of device.	4.52	.76
It is important to be able to navigate easily through the course interface in the e-Learning platform.	4.40	.85
It is important that I am able to modify my profile information in the e-Learning platform.	3.92	1.12
The e-Learning platform helps me to better understand the course material by taking advantage of my learning or teaching style.	3.96	1.02
Having my own personal space in the e-Learning platform gives me a sense of ownership.	3.46	1.09
Mean summated *Locus of control* Score	4.05	.67
Support and training (n = 568)		
Training on how to use the e-Learning platform will improve my learning or teaching.	3.35	1.08
Having user support for the e-Learning platform will help me gain knowledge.	3.72	1.00
On-line help in the e-Learning platform helps me resolve issues on my own.	3.68	.94
Specialized training will save me time on learning to use the e-Learning platform.	3.61	1.21
Documentation should be provided for the e-Learning platform for users wanting to learn on their own.	3.98	.82
Mean summated *Support and training* Score	3.66	.77

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree

Table 15 (continued)

Attributes and Barriers	*M*	*SD*
Trialability (n = 558)		
Using the latest technology in the e-Learning platform enhances the learning and teaching experience.	3.64	.99
It is important that content can be shared with other courses in the e-Learning platform.	3.59	.91
The e-Learning platform should be accessible from anywhere to increase learning and teaching potential.	4.02	.92
Having a personal space in the e-Learning platform gives me a sense of ownership.	3.56	1.13
Learning improves with course interaction in the e-Learning platform.	3.35	1.02
Mean summated *Trialability* Score	3.63	.69
System integration (n = 544)		
It is important that social media be part of the e-Learning platform to increase learning and teaching interaction.	3.36	1.03
Third party applications such as Turnitin, publisher epacks, Respondus, response clickers, wikis, blogs, etc... should be part of the e-Learning platform to improve teaching and learning.	3.92	.89
Student grades and course roster data should be exchangeable between the student information system and the e-Learning platform.	4.40	.78
Incorporating new features and tools into the e-Learning platform is beneficial to teaching and learning.	3.91	.87
Other University websites should be accessible from within the e-Learning platform.	4.11	.78
Mean summated *System integration* Score	3.94	.61

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree

Table 15 (continued)

Attributes and Barriers	*M*	*SD*
System features (n = 527)		
The e-Learning platform should have a grade book and automated grading of assignments.	4.20	.84
The e-Learning platform should support a blog or wiki application to share learning experiences with others.	3.73	1.06
The e-Learning platform should have social media tools that allow for interaction with others in the course.	3.88	.94
The e-Learning platform should contain an eportfolio to allow a working history of progress for each student.	3.67	.97
A tracking tool should be part of the e-Learning platform to monitor a student's progress in a course.	3.90	.88
Mean summated *System features* Score	3.88	.73
Time concerns (n = 520)		
Having a course in the e-Learning platform requires more of my time than a traditional course.	3.18	1.00
Training on how to use the e-Learning platform requires extra time out of my schedule.	3.42	1.10
It is important that the e-Learning platform have mobile access so I can get my course content anytime and anywhere.	4.04	.88
Using the e-Learning platform allows me to do other things that a traditional course would not.	3.36	.99
Taking courses in the e-Learning platform helps me manage my time better.	3.45	.94
Mean summated *Time concerns* Score	3.49	.54

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree

Table 15 (continued)

Attributes and Barriers	*M*	*SD*
System cost (n = 514)		
Funding for the e-Learning platform by the University shows a dedication to teaching and learning.	3.74	.94
New components, features or plug-ins should be purchased for the e-Learning platform to enhance teaching and learning.	3.51	.93
A well-known e-Learning platform should be purchased by the University since students are paying for it with associated fees.	3.61	.91
The University should purchase an e-Learning platform regardless of price because of vendor reputation and product support.	3.01	1.03
The quality education provided by a reliable e-Learning platform should be of more concern than the purchase price.	3.77	1.01
Mean summated *System cost* Score	3.53	.72
Fear of change and new technology (n = 512)		
Changes in the e-Learning platform negatively affect teaching and learning.	2.78	.93
I prefer face-to-face courses to on-line courses if the e-Learning platform is too complex to use.	2.71	1.31
Privacy of assignments and course work is threatened when using an e-Learning platform.	2.15	.91
Using an e-Learning platform for teaching and learning creates isolation between the student and instructor.	2.34	1.06
I feel that using new technology such as an e-Learning platform provides a better environment to learn.	3.08	1.08
Mean summated *Fear of change and new technology* Score	2.61	.53

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree

Table 15 (continued)

Attributes and Barriers	*M*	*SD*
System support (n = 510)		
Technical upgrades to the e-Learning platform provide access to new features.	3.69	.73
The University should dedicate consultants to handle my questions concerning the e-Learning platform.	3.60	.96
Making the e-Learning platform reliable and accessible 24/7 provides a quality education to students.	4.13	.71
Having the University maintain the e-Learning platform shows dedication to learning.	3.99	.85
Getting help quickly for an issue I have when using the e-Learning platform makes me more productive.	4.22	.75
Mean summated *System support* Score	3.93	.58
System complexity and usability (n = 505)		
Simple navigation in the e-Learning platform allows material to be found more quickly.	4.26	.73
The e-Learning platform should have the same features and tools I currently use for my teaching.	3.87	.77
Training on how to use the e-Learning platform should be provided by the University.	3.74	.95
Mobile access to content in the e-Learning platform will increase student engagement.	3.87	.95
Having the latest technology available in the e-Learning platform improves teaching and learning.	3.67	.91
Mean summated *System complexity and usability* Score	3.88	.58

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree

Table 15 (continued)

Attributes and Barriers	*M*	*SD*
Migration process (*n* = 244)		
An automated course migration tool should be part of the e-Learning platform.	3.98	.81
Course content should remain the same after migration to a different e-Learning platform.	4.05	.78
Migrating course content to a different e-Learning platform will be time consuming.	3.68	.85
The migration to a different e-Learning platform is a good time to clean up old content.	3.61	.87
The University should dedicate a team to help in the migration process for the e-Learning platform.	3.96	.80
Mean summated *Migration process* Score	3.86	.55

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree

Table 16

Participant Perception of Attributes and Barriers Towards LMS Adoption (Dispersion of Data)

	Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree	
Attributes and Barriers	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Locus of control (n = 572)										
I need the ability to access course material in the eLearning platform at any time and on any type of device.	6	1.0	12	2.1	22	3.8	170	29.7	362	50.4
It is important to be able to navigate easily through the course interface in the eLearning platform.	6	1.0	14	3.5	59	10.3	160	28.0	333	58.2
It is important that I am able to modify my profile information in the eLearning platform.	19	3.3	51	8.9	116	20.4	157	27.5	227	39.8
The eLearning platform helps me to better understand the course material by taking advantage of my learning or teaching style.	10	1.8	44	7.7	114	20.0	191	33.5	212	37.1
Having my own personal space in the eLearning platform gives me a sense of ownership.	25	4.4	76	13.3	197	34.5	159	27.8	114	20.0

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree

Table 16 (continued)

Attributes and Barriers	Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%
Support and training (*n* = 568)										
Training on how to use the eLearning platform will improve my learning or teaching.	26	4.6	104	18.3	169	29.8	184	32.4	85	15.0
Having user support for the eLearning platform will help me gain knowledge.	17	3.0	45	8.0	146	25.8	232	41.0	126	22.3
On-line help in the eLearning platform helps me resolve issues on my own.	15	2.6	42	7.4	154	27.2	254	44.8	102	18.0
Specialized training will save me time on learning to use the eLearning platform.	33	5.8	85	15.0	119	21.0	165	29.1	165	29.1
Documentation should be provided for the eLearning platform for users wanting to learn on their own.	10	1.8	15	2.7	90	16.0	309	54.8	140	24.8

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree

Table 16 (continued)

Attributes and Barriers	Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%
Trialability (*n* = 558)										
Using the latest technology in the eLearning platform enhances the learning and teaching experience.	18	3.2	42	7.6	173	31.1	213	38.3	110	19.8
It is important that content can be shared with other courses in the eLearning platform.	6	1.1	53	9.5	191	34.4	215	38.7	90	16.2
The eLearning platform should be accessible from anywhere to increase learning and teaching potential.	8	1.4	20	3.6	122	21.9	209	37.5	198	35.5
Having a personal space in the eLearning platform gives me a sense of ownership.	21	3.8	85	15.3	147	26.4	168	30.2	136	24.4
Learning improves with course interaction in the eLearning platform.	25	4.5	81	14.6	197	35.4	181	32.6	72	12.9

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree

Table 16 (continued)

Attributes and Barriers	Strongly Disagree *f*	Strongly Disagree %	Disagree *f*	Disagree %	Neither Agree nor Disagree *f*	Neither Agree nor Disagree %	Agree *f*	Agree %	Strongly Agree *f*	Strongly Agree %
System integration (n = 544)										
It is important that social media be part of the eLearning platform to increase learning and teaching interaction.	16	2.9	94	17.3	199	36.6	150	27.6	85	15.6
Third party applications such as Turnitin, publisher epacks, Respondus, response clickers, wikis, blogs, etc... should be part of the eLearning platform to improve teaching and learning.	6	1.1	20	3.7	140	25.7	221	40.6	157	28.9
Student grades and course roster data should be exchangeable between the student information system and the eLearning platform.	5	.9	9	1.7	43	7.9	195	35.8	292	53.7
Incorporating new features and tools into the eLearning platform is beneficial to teaching and learning.	7	1.3	24	4.4	115	21.2	260	47.9	137	25.2
Other University websites should be accessible from within the eLearning platform.	5	.9	10	1.8	77	14.2	278	51.2	173	31.9

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree

Table 16 (continued)

Attributes and Barriers	Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%
System features (*n* = 527)										
The eLearning platform should have a grade book and automated grading of assignments.	6	1.1	15	2.9	64	12.2	226	43.0	215	40.9
The eLearning platform should support a blog or wiki application to share learning experiences with others.	19	3.6	44	8.3	138	26.2	184	34.9	142	26.9
The eLearning platform should have social media tools that allow for interaction with others in the course.	12	2.3	22	4.2	129	24.5	220	41.7	144	27.3
The eLearning platform should contain an eportfolio to allow a working history of progress for each student.	20	3.8	30	5.7	150	28.5	227	43.2	99	18.8
A tracking tool should be part of the eLearning platform to monitor a student's progress in a course.	9	1.7	16	3.0	130	24.7	235	44.7	136	25.9

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree

Table 16 (continued)

Attributes and Barriers	Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%
Time concerns (n = 520)										
Having a course in the eLearning platform requires more of my time than a traditional course.	12	2.3	133	25.6	181	34.8	140	26.9	54	10.4
Training on how to use the eLearning platform requires extra time out of my schedule.	26	5.0	101	19.5	90	17.4	230	44.4	71	13.7
It is important that the eLearning platform have mobile access so I can get my course content anytime and anywhere.	5	1.0	22	4.2	93	18.0	226	43.6	172	33.2
Using the eLearning platform allows me to do other things that a traditional course would not.	22	4.2	64	12.4	198	38.2	173	33.4	61	11.8
Taking courses in the eLearning platform helps me manage my time better.	13	2.5	58	11.2	197	38.1	182	35.2	67	13.0

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree

Table 16 (continued)

Attributes and Barriers	Strongly Disagree *f*	Strongly Disagree %	Disagree *f*	Disagree %	Neither Agree nor Disagree *f*	Neither Agree nor Disagree %	Agree *f*	Agree %	Strongly Agree *f*	Strongly Agree %
System cost (*n* = 514)										
Funding for the eLearning platform by the University shows a dedication to teaching and learning.	14	2.7	30	5.8	135	26.3	232	45.2	102	19.9
New components, features or plug-ins should be purchased for the eLearning platform to enhance teaching and learning.	15	2.9	37	7.2	211	41.1	173	33.7	77	15.0
A well-known eLearning platform should be purchased by the University since students are paying for it with associated fees.	9	1.8	29	5.7	208	40.5	174	33.9	93	18.1
The University should purchase an eLearning platform regardless of price because of vendor reputation and product support.	41	8.0	102	19.9	222	43.4	105	20.5	42	8.2
The quality education provided by a reliable eLearning platform should be of more concern than the purchase price.	14	2.7	44	8.6	115	22.4	213	41.5	127	24.8

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree

Table 16 (continued)

Attributes and Barriers	Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%
Fear of change and new technology (n = 512)										
Changes in the eLearning platform negatively affect teaching and learning.	37	7.2	153	29.9	226	44.2	73	14.3	22	4.3
I prefer face-to-face courses to on-line courses if the eLearning platform is too complex to use.	108	21.2	149	29.2	92	18.0	103	20.2	58	11.4
Privacy of assignments and course work is threatened when using an eLearning platform.	127	24.8	225	43.9	124	24.2	29	5.7	7	1.4
Using an eLearning platform for teaching and learning creates isolation between the student and instructor.	120	23.5	192	37.6	117	22.9	66	12.9	15	2.9
I feel that using new technology such as an eLearning platform provides a better environment to learn.	46	9.0	93	18.2	194	37.9	133	26.0	46	9.0

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree

Table 16 (continued)

Attributes and Barriers	Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%
System support (n = 510)										
Technical upgrades to the eLearning platform provide access to new features.	3	.6	10	2.0	191	37.5	244	47.9	61	12.0
The University should dedicate consultants to handle my questions concerning the eLearning platform.	13	2.5	44	8.6	163	32.0	202	39.6	88	17.3
Making the eLearning platform reliable and accessible 24/7 provides a quality education to students.	1	.2	7	1.4	70	13.8	277	54.4	154	30.3
Having the University maintain the eLearning platform shows dedication to learning.	6	1.2	15	2.9	103	20.2	237	46.6	148	29.1
Getting help quickly for an issue I have when using the eLearning platform makes me more productive.	4	.8	3	.6	65	12.8	242	47.5	195	38.3

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree

Table 16 (continued)

Attributes and Barriers	Strongly Disagree		Disagree		Neither Agree nor Disagree		Agree		Strongly Agree	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%
System complexity and usability (*n* = 505)										
Simple navigation in the eLearning platform allows material to be found more quickly.	3	.6	9	1.8	40	7.9	257	50.9	196	38.8
The eLearning platform should have the same features and tools I currently use for my teaching.	2	.4	15	3.0	132	26.1	256	50.7	100	19.8
Training on how to use the eLearning platform should be provided by the University.	13	2.6	38	7.5	117	23.2	234	46.3	103	20.4
Mobile access to content in the eLearning platform will increase student engagement.	12	2.4	27	5.4	110	21.8	223	44.2	132	26.2
Having the latest technology available in the eLearning platform improves teaching and learning.	8	1.6	32	6.3	177	35.1	190	37.7	97	19.2

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree

Table 16 (continued)

Attributes and Barriers	Strongly Disagree *f*	Strongly Disagree %	Disagree *f*	Disagree %	Neither Agree nor Disagree *f*	Neither Agree nor Disagree %	Agree *f*	Agree %	Strongly Agree *f*	Strongly Agree %
Migration process (n = 244)										
An automated course migration tool should be part of the eLearning platform.	1	.4	2	.8	69	28.3	100	41.0	72	29.5
Course content should remain the same after migration to a different eLearning platform.	1	.4	1	.4	60	24.6	105	43.0	77	31.6
Migrating course content to a different eLearning platform will be time consuming.	2	.8	10	4.1	96	39.3	91	37.3	45	18.4
The migration to a different eLearning platform is a good time to clean up old content.	4	1.7	17	7.0	82	33.9	106	43.8	33	13.6
The University should dedicate a team to help in the migration process for the eLearning platform.	1	.4	5	2.0	62	25.4	111	45.5	65	26.6

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree

Table 17

Attributes and Barriers Inferential Statistics

Attributes and Barriers		*n*	*M*	*SD*	*F*	*p*
Locus of control						
Faculty		176	4.32	.56	62.54	.00*
Staff		81	4.46	.52		
Student		315	3.80	.65		
	Mean Summated Score	572	4.05	.67		
Support and training						
Faculty		176	4.02	.60	74.65	.00*
Staff		81	4.11	.70		
Student		311	3.35	.72		
	Mean Summated Score	568	3.66	.77		
Trialability						
Faculty		175	3.70	.67	6.88	.00*
Staff		80	3.83	.79		
Student		303	3.54	.66		
	Mean Summated Score	558	3.66	.69		
System integration						
Faculty		173	3.81	.59	9.94	.00*
Staff		79	3.84	.66		
Student		292	4.05	.59		
	Mean Summated Score	544	3.94	.61		
System features						
Faculty		171	3.97	.62	12.59	.00*
Staff		75	4.17	.70		
Student		281	3.74	.77		
	Mean Summated Score	527	3.88	.73		

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree; *$p < .05$

Table 17 (continued)

Attributes and Barriers		*n*	*M*	*SD*	*F*	*p*
Time concerns						
Faculty		171	3.55	.52	4.43	.01*
Staff		75	3.58	.56		
Student		274	3.42	.53		
	Mean Summated Score	520	3.49	.54		
System cost						
Faculty		170	3.56	.63	1.30	.27
Staff		74	3.41	.87		
Student		270	3.54	.72		
	Mean Summated Score	514	3.53	.72		
Fear of change and new technology						
Faculty		171	2.53	.50	4.74	.00*
Staff		74	2.55	.53		
Student		267	2.68	.54		
	Mean Summated Score	512	2.61	.53		
System support						
Faculty		171	4.01	.51	17.19	.00*
Staff		74	4.19	.55		
Student		265	3.80	.59		
	Mean Summated Score	510	3.93	.58		
System complexity and usability						
Faculty		171	3.97	.51	5.30	.00*
Staff		74	3.94	.64		
Student		260	3.80	.58		
	Mean Summated Score	505	3.88	.57		
Migration process						
Faculty		170	3.85	.51	1.92	.17
Staff		74	3.88	.63		
	Mean Summated Score	244	3.86	.55		

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree; *$p < .05$

Objective 2

Examine and measure locus of control influence across the user groups: Faculty, staff, and students tended to agree with the attribute *Locus of control* as being a factor of perceived usefulness and having a positive influence on LMS adoption. A one-way *ANOVA* was used to analyze the participant response rating of *Locus of control*. There was a statistical and significant difference in *Locus of control*: $F(2, 569) = 62.54$, $p < .05$. A post hoc *Tukey's b* test showed that students had lower *Locus of control* scores than faculty and staff; Faculty ($M = 4.32$, $SD = .56$), Staff ($M = 4.46$, $SD = .52$), and Students ($M = 3.80$, $SD = .65$).

Objective 3

Examine and measure support and training influence across the user groups: Faculty, staff, and students tended to agree with the attribute of *Support and training* as being a factor of perceived ease of use and having a positive influence on LMS adoption. A one-way *ANOVA* was used to analyze the participant response rating of *Support and training*. There was a statistical and significant difference in *Support and training*: $F(2, 565) = 74.65$, $p < .05$. A post hoc *Tukey's b* test showed that students had lower *Support and training* scores than faculty and staff; Faculty ($M = 4.02$, $SD = .60$), Staff ($M = 4.11$, $SD = .70$), and Students ($M = 3.35$, $SD = .72$).

Objective 4

Examine and measure trialability influence across the user groups: Faculty, staff, and students tended to agree with the attribute *Trialability* as being a factor of perceived ease of use and having a positive influence on LMS adoption. A one-way *ANOVA* was

used to analyze the participant response rating of *Trialability*. There was a statistical and significant difference in *Trialability*: $F(2, 555) = 6.88$, $p < .05$. A post hoc *Tukey's b* test showed that students had lower *Trialability* scores than faculty and staff; Faculty (M = 3.70, SD = .67), Staff (M = 3.83, SD = .79), and Students (M = 3.54, SD = .66).

Objective 5

Examine and measure system integration influence across the user groups: Faculty, staff, and students tended to agree with the attribute *System integration* as being a factor of perceived usefulness and having a positive influence on LMS adoption. A one-way *ANOVA* was used to analyze the participant response rating of *System integration*. There was a statistical and significant difference in *System integration*: $F(2, 541) = 9.94$, $p < .05$. A post hoc *Tukey's b* test showed that students had lower *System integration* scores than faculty and staff; Faculty (M = 3.81, SD = .59), Staff (M = 3.84, SD = .66), and Students (M = 4.05, SD = .59).

Objective 6

Examine and measure system features influence across the user groups: Faculty, staff, and students tended to agree with the attribute *System features* as being a factor of perceived ease of use and having a positive influence on LMS adoption. A one-way *ANOVA* was used to analyze the participant response rating of *System features*. There was a statistical and significant difference in *System features*: $F(2, 524) = 12.59$, $p < .05$. A post hoc *Tukey's b* test showed that students had lower *System features* scores than faculty and staff; Faculty (M = 3.97, SD = .62), Staff (M = 4.17, SD = .70), and Students (M = 3.74, SD = .77).

Objective 7

Examine and measure brand name and reputation influence across the user groups: Participants were given a choice of three major LMS platforms (Blackboard, Moodle, and Sakai) and asked which LMS they preferred. Responses from the study showed that 66.7% of the respondents indicated no preference of a LMS, followed by Blackboard Learn (26.7%), Moodle (5.5%), and Sakai (1.1%). Table 18 displays the results.

Table 18

Respondent Preferred Choice for LMS

Of the choices below, which e-Learning platform would you prefer the University to use?	*f*	*%*	*M*	*SD*
Blackboard Learn	147	26.7		
Moodle	30	5.5		
Sakai	6	1.1		
No Preference	366	66.7		
Total	549	100.0	3.08	1.34

Participants tended to agree that if similar functionality, tools, integration, and features are available in the new LMS and if current course content can be migrated to the new LMS with minimal effort, then there is no preference of LMS *Brand name and reputation*. A comparison of participant responses based on university role is shown in Figure 12.

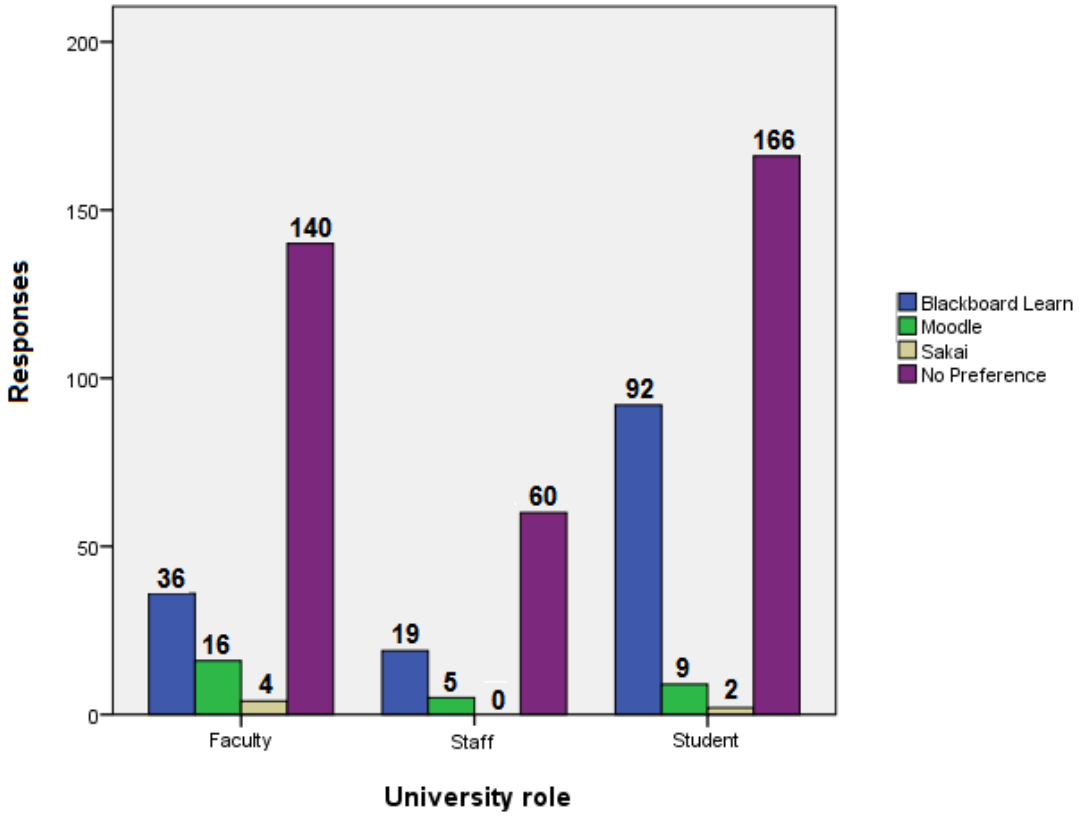

Figure 12. Brand Name and Reputation Response by University Role. Graph reflects participant responses to LMS preference based on vendor brand name and reputation.

Objective 8

Examine and measure system cost influence across the user groups: Faculty, staff, and students tended to agree with the barrier *System cost* as being a factor of perceived usefulness, findings indicate there is no influence on LMS adoption. A one-way *ANOVA* was used to analyze the participant response rating of *System cost*. There was no statistical and significant difference in *System cost*: $F(2, 511) = 1.30$, $p < .05$.

Objective 9

Examine and measure fear of change and new technology influence across the user groups: Faculty, staff, and students tended to agree with the barrier of *Fear of change and new technology* as being a factor of perceived ease of use and having a negative influence on LMS adoption. A one-way *ANOVA* was used to analyze the participant response rating of *Fear of change and new technology*. There was a statistical and significant difference in *Fear of change and new technology*: $F(2, 509) = 4.74$, $p < .05$. A post hoc *Tukey's b* test showed that students had lower *Fear of change and new technology* scores than faculty and staff; Faculty ($M = 2.53$, $SD = .50$), Staff ($M = 2.55$, $SD = .53$), and Students ($M = 2.68$, $SD = .54$).

Objective 10

Examine and measure migration process influence across the user groups: Faculty, staff, and students tended to agree with the barrier of *Migration process* as being a factor of perceived ease of use and having a negative influence on LMS adoption. A *t-test* was used to analyze the participant response rating of *Migration process*. There was no statistical and significant difference in *Migration process*: $F(242) = 1.92$, $p < .05$.

Objective 11

Examine and measure system support influence across the user groups: Faculty, staff, and students tended to agree with the barrier *System support* as being a factor of perceived usefulness and having a negative influence on LMS adoption. A one-way *ANOVA* was used to analyze the participant response rating of *System support*. There

was a statistical and significant difference in *System support*: $F(2, 507) = 17.19$, $p < .05$. A post hoc *Tukey's b* test showed that students had lower *System support* scores than faculty and staff; Faculty ($M = 4.01$, $SD = .51$), Staff ($M = 4.19$, $SD = .55$), and Students ($M = 3.80$, $SD = .59$).

Objective 12

Examine and measure system complexity and usability influence across the user groups: Faculty, staff, and students tended to agree with the barrier of *System complexity and usability* as being a factor of perceived ease of use and having a negative influence on LMS adoption. A one-way *ANOVA* was used to analyze the participant response rating of *System complexity and usability*. There was a statistical and significant difference in *System complexity and usability*: $F(2, 502) = 5.30$, $p < .05$. A post hoc *Tukey's b* test showed that students had lower *System complexity and usability* scores than faculty and staff; Faculty ($M = 3.97$, $SD = .51$), Staff ($M = 3.94$, $SD = .64$), and Students ($M = 3.80$, $SD = .58$).

Objective 13

Examine and measure time concern influence across the user group: Faculty, staff, and students tended to agree with the barrier *Time concern* as being a factor of perceived usefulness and having a negative influence on LMS adoption. A one-way *ANOVA* was used to analyze the participant response rating of *Time concern*. There was a statistical and significant difference in *Time concern*: $F(2, 517) = 4.43$, $p < .05$. A post hoc *Tukey's b* test showed that faculty had higher *Time concern* scores than staff and

students; Faculty (M = 3.55, SD = .52), Staff (M = 3.58, SD = .56), and Students (M = 3.42, SD = .53).

The data findings for research objectives fourteen and fifteen are presented in Table 19.

Objective 14

Determine prediction of LMS preference based on all attributes and barriers: A one-way *ANOVA* was used to analyze all of the attributes and barriers with LMS preference. There was a statistical and significant difference in attributes of *Trialability:* $F(3, 499) = 3.49$, $p < .05$ and *Support and training:* $F(3, 500) = 4.04$, $p < .05$; and the barrier *Time concern*: $F(3, 498) = 3.77$, $p < .05$. Although differences were determined from the statistical test, there was no predictability of LMS preference from the data.

Objective 15

Determine prediction of LMS preference based on university role: A cross-tabulation analysis using a *chi-square test* was done to explore the relationship between LMS preference and university role. Results showed a statistical and significant relationship between university roles and LMS preference: X^2 (6, 549) = 20.89, $p < .05$. Test results suggest faculty, staff, and students differ in in LMS preference. Students preferred Blackboard Learn more than faculty and staff, (62.6%, 24.5%, and 12.9% respectively). Faculty preferred Sakai more than staff and students, (66.7%, 0.0%, and 33.3% respectively). Similarly, faculty also preferred Moodle more than staff and students, (53.3%, 16.7%, and 30.0% respectively). Interestingly, there is almost no difference between faculty and students on no preference of an LMS (38.3%, and 45.4%

respectively). Although relationships were determined from the statistical test, there was no predictability of LMS preference from the data.

Table 19

LMS Preference Predictability from Attributes and Barriers

Attributes and Barriers	*n*	*M*	*SD*	*F*	*p*
Locus of control					
Blackboard Learn	144	4.09	.66	2.28	.08
Moodle	27	4.39	.49		
Sakai	6	4.03	.69		
No Preference	327	4.04	.67		
Mean Summated Score	504	4.07	.66		
Support and training					
Blackboard Learn	143	3.66	.82	4.04	.01*
Moodle	27	3.93	.59		
Sakai	6	2.80	1.03		
No Preference	328	3.72	.71		
Mean Summated Score	504	3.70	.75		
Trialability					
Blackboard Learn	143	3.79	.68	3.49	.02*
Moodle	27	3.76	.86		
Sakai	5	3.36	.67		
No Preference	328	3.58	.67		
Mean Summated Score	503	3.65	.69		
System integration					
Blackboard Learn	143	4.01	.65	1.45	.23
Moodle	27	4.07	.80		
Sakai	5	3.96	.36		
No Preference	328	3.91	.56		
Mean Summated Score	503	3.95	.60		

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree; *$p < .05$

Table 19 (continued)

Attributes and Barriers	*n*	*M*	*SD*	*F*	*p*
System features					
Blackboard Learn	142	3.96	.76	2.28	.08
Moodle	26	4.02	.53		
Sakai	5	4.28	.64		
No Preference	327	3.83	.73		
Mean Summated Score	500	3.88	.74		
Time concerns					
Blackboard Learn	143	3.54	.56	3.77	.01*
Moodle	26	3.77	.48		
Sakai	5	3.16	.41		
No Preference	328	3.46	.52		
Mean Summated Score	502	3.50	.54		
System cost					
Blackboard Learn	141	3.63	.70	1.70	.17
Moodle	27	3.64	.70		
Sakai	5	3.28	.23		
No Preference	328	3.49	.73		
Mean Summated Score	501	3.53	.72		
Fear of change and new technology					
Blackboard Learn	142	2.62	.56	1.91	.13
Moodle	26	2.60	.50		
Sakai	6	2.10	.65		
No Preference	328	2.61	.51		
Mean Summated Score	502	2.61	.53		
System support					
Blackboard Learn	142	3.96	.55	.54	.65
Moodle	27	3.93	.53		
Sakai	5	3.64	.57		
No Preference	328	3.93	.59		
Mean Summated Score	502	3.93	.58		

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree; *$p < .05$

Table 19 (continued)

Attributes and Barriers	*n*	*M*	*SD*	*F*	*p*
System complexity and usability					
Blackboard Learn	142	3.94	.59	1.68	.17
Moodle	27	3.99	.40		
Sakai	5	3.60	.51		
No Preference	326	3.85	.58		
Mean Summated Score	500	3.88	.57		
Migration process					
Blackboard Learn	54	4.03	.64	2.43	.07
Moodle	18	3.89	.62		
Sakai	3	3.60	.53		
No Preference	167	3.81	.50		
Mean Summated Score	242	3.86	.55		

Note. Scale, 1 = strongly disagree; 2 = disagree; 3 = Neither agree nor disagree; 4 = agree; 5 = strongly agree; *$p < .05$

CHAPTER V

CONCLUSION, IMPLICATIONS, AND RECOMMENDATIONS

Purpose of Study

In order to meet the future e-learning needs of the university and provide guidance for determining a replacement LMS, an understanding of how the LMS is used by the different user groups, and how the LMS is perceived psychologically within the university environment is needed. User perception and attitude towards using the LMS is greatly influenced by a number of external stimuli, therefore the understanding of how such factors influence user perception and attitude is vitally important in the diffusion process of a new replacement LMS.

The purpose of the study was to examine the current LMS user base, noting usage characteristics; describe and measure factors (external stimuli) that are known to influence user perception and attitude towards adoption of the LMS across the different user groups; and observer possible relationships among the user characteristics that could predict a preferred LMS system.

Research Objectives

1. Describe the current user characteristics of the LMS.
2. Describe the attribute of locus of control and determine if differences exist between the user groups that could influence LMS adoption.
3. Describe the attribute of support and training and determine if differences exist between the user groups that could influence LMS adoption.

4. Describe the attribute of trialability and determine if differences exist between the user groups that could influence LMS adoption.
5. Describe the attribute of system integration and determine if differences exist between the user groups that could influence LMS adoption.
6. Describe the attribute of system features and determine if differences exist between the user groups that could influence LMS adoption.
7. Describe the attribute of brand name and reputation and determine if differences exist between the user groups that could influence LMS adoption.
8. Describe the barrier of system cost and determine if differences exist between the user groups that could influence LMS adoption.
9. Describe the barrier of fear of change and new technology and determine if differences exist between the user groups that could influence LMS adoption.
10. Describe the barrier of migration process and determine if differences exist between the user groups that could influence LMS adoption.
11. Describe the barrier of system support and determine if differences exist between the user groups that could influence LMS adoption.
12. Describe the barrier of system complexity and determine if differences exist between the user groups that could influence LMS adoption.
13. Describe the barrier of time concern and determine if differences exist between the user groups that could influence LMS adoption.
14. Determine prediction of LMS preference based on all attributes and barriers.
15. Determine prediction of LMS preference based on university role.

Summary of Limitations

Although practical knowledge can be used from the study, results and findings were limited to Texas A&M University, and the environment for which the LMS is used. Recommendations and conclusions may not be fully generalizable to other universities, organizations, or businesses with different demographics.

The study did not consider the teaching and learning methods or learning objective outcomes from the LMS as a measurement of effectiveness, nor did the study consider user level of experience or length of use as a measure of overall LMS effectiveness. Length of use and level of experience were examined only as a user demographic characteristic.

Instrument reliability was sufficient for the study however three of the scales (*Time concerns*, *Locus of control*, and *System integration*) were considered below the desired level of $r = .80$ and should be revised, strengthened, and improved for future studies. Also, MOOCs were not included as a topic of interest and concern for the study.

It was not the intention of the study to predict or modify any of the factors in order to create a change in behavior but instead, the study will examine and observe such factors of the current LMS to gain knowledge and direction in the implementation, adoption, and diffusion of a new LMS.

Summary of Literature Review

Learning Management System

Several research studies (Chung, Pasquini, & Koh, 2013; Harrington, Gordon, & Schibik, 2004; Kats, 2010; Piña, 2008; Simonson, 2007) point out that the LMS has

become one of the most widespread and highly adopted technologies used today in higher education. Originally used by universities for distance education initiatives, the present-day role of the LMS goes beyond the online outreaching of students to integration with other business units within the university campus. The LMS was once thought of as only a web-based content delivery mechanism, but has recently evolved into an integrated system that supports all types of teaching and learning.

The definition of a LMS is inconsistent throughout the literature, and differs according to the type of functionality, environment, and customer base that it serves. The definition used for the study is: A platform consisting of a software application and a hardware infrastructure designed to enhance learning and teaching through the use of integrated tools and features that provide flexible functionality and services to the users of the system.

User Concerns and Perception

Engsbo and Sandhu (2007) state "user adoption decisions may be based on the dimensions of adoption initiative and innovation stimulus, making the adoption decision process as pro-active, reactive, forced, or even arbitrary" (p. 292). Research also shows that internal and external stimuli are key drivers in user attitude towards adoption.

As technology becomes an increasing role in the life of most individuals, the integration of such causes a change in user attitude and perception. Dirksen and Tharp (1997) noted "the systematic integration of technology requires time and carefully planned strategies to facilitate the adoption process" (p. 1064). They also note that

“change is a process, not an event, and it takes time to institute change in an organization” (p. 1065).

This process of change is built around user perception and attitude based on stimuli that affects the psychological state of a user as to accept or reject the adoption of a technology. The change process for a user is a very personal experience with attitude and perception greatly influencing the overall outcome. Harris, Stanz, Zaaiman, and Groenewald (2004) give a definition of user concern as “the mental activity composed of questioning, analyzing, consideration to alternatives, reactions, state of personal feeling, and perception” (p. 56).

Technology Adoption Models and Theories

Many models have been created over the last few decades that try to explain and lend answers to the question of why users adopt a particular technology or innovation. Some of the most well-known models for technology adoption which lend prior knowledge and research to the study are the Theory of Reasoned Action (TRA), the Theory of Planned Behavior (TPB), the Technology Acceptance Model (TAM), and the Unified Theory of Acceptance and Use of Technology Model (UTAUT).

Diffusion of the LMS

Rogers (2003) defined diffusion as “the process in which an innovation is communicated through certain channels over time among the members of a social system” (p. 5). The goal of the diffusion process is to focus adoption techniques towards the early adopters and early majority users in order to help them persuade the late majority and laggards to adopt the new innovation or technology. A normal distribution

curve classifies users into five categories based on time of adoption. The five categories are *Innovators, Early adopters, Early majority, Late majority, and Laggards.* The relationship between each user category plays a unique role in achieving critical mass. Critical mass is the point at which the adoption of an innovation is self-sustaining, in other words, being continuously adopted by future users (p. 363).

User Group Classification

The study defined three distinct user groups that use the LMS on a daily basis. The groups are faculty, students, and staff. All users go through a five-stage decision process for technology adoption. Rogers (2003) defines the five stages as knowledge, persuasion, decision, implementation, and confirmation (p. 170). The decision process flows from one stage to the next and is influenced by user perception and attitude of external factors.

Attributes to Adoption

The attributes of the study are theorized and considered as positive influence factors on user perception and attitude towards adoption of the LMS. The assumption is that the existence of these factors will improve and possibly increase user adoption during the diffusion of the new LMS once selected and implemented by the university. The attributes for the study include *Locus of control, Support and training, System features, System integration, Trialability,* and *Brand name and reputation.*

Barriers to Adoption

The barriers for the study are theorized and considered as negative influence factors on user perception and attitude towards adoption of an innovation or technology.

The assumption is that the limitation or mitigation of these factors will improve, and possibly increase user adoption during the diffusion of the new LMS once selected and implemented by the university. The barriers for the study include *System cost, Fear of change and new technology, Migration process, System complexity and usability, System support,* and *Time Concerns*.

Problem Statement

The effectiveness of the current LMS at TAMU has been studied because of technological advancements, company mergers, and corporate buy-outs relating to the LMS market that have taken place over the last few years. University administration started to have concerns about the efficiency of the current LMS. Questions such as who is actually using the LMS? How are they using the system? What features are used the most? What features are used the least? Should the university explore purchasing a newer LMS? Can a new LMS integrate with other business units within the university? Do the current users want a new LMS? Given a choice of LMS platforms, which LMS would the current users prefer? How will the users react to change and adopt the new LMS? How will the university initiate the diffusion of the new LMS among the different user groups? (Cantrell, P., & Snell, J., personal communication, October 25, 2010).

The current LMS has been used for some ten years now and is inefficient because of running on older technology hardware. The infrastructure is non-virtualized with a number of single servers racked altogether creating a large footprint in a data center that has limited space. The annual cost of maintaining this older equipment is more expensive than a one-time purchase of new modern blade type servers that can be

virtualized. Newer LMS applications can take advantage of this new technology and hardware with newer processors producing higher performance, more bandwidth, and a smaller footprint that saves data center space (Goldworm, 2006).

Scalability of the current infrastructure to allow for future e-learning initiatives, increased enrollments, and many other demands such as communities, organizations, shared content, and possibly massive open online courses (MOOCs) is another concern. The older servers were not designed with scalability in mind. Newer server technology of today is designed to be scalable, such as virtual machines (VMs) running on blade servers, which can be expanded quickly as the demand warrants.

Features in the current LMS are somewhat limited and built around teaching and learning methods from a decade ago. New features that allow for mobile access, collaboration, alert notification, content sharing, and third-party integration, are also lacking in the current LMS. The current LMS creates unwanted limitations for the university in ways to outreach students, and provide flexibility in teaching and learning methods to meet the anytime-anywhere learning style of students today (Berthold, D., Conway, S., Jasperson, J., Snell, J., & Wilkinson, H., personal communication, March, 11, 2011).

Accordingly, most of the faculty, staff, and students feel that the LMS is just another tool used for teaching and learning. However, this perception is incorrect as newer LMS applications allow for advanced teaching and learning features, while providing external integration with other systems providing new business uses within the

university (Henrichs, C., Jasperson, J., & Snell, J., personal communication, March, 11, 2011).

All of these problems and concerns, along with the product end-of-life announcement by the vendor justify the need for this study. To address the problems and concerns, the need to determine an evaluation process, develop selection criteria, and attain successful diffusion of a new LMS through an understanding of current system usage, user perception and attitude, defining of attributes and barriers related to user adoption, and investigating the available LMS products on the market will be of crucial interest.

Summary of Methodology

The study used a stratified random sample approach with a survey instrument created with the Qualtrics survey application. The instrument was administered to respondents using the university email system and was aimed at measuring user perception and attitude towards ease of use and usefulness of the LMS. Instrument reliability and construct validity was accomplished through a pilot study and calculating Cronbach's alpha coefficient for each scale.

The study used a cross-sectional design for observing how the different user groups were influenced by external factors and how it affected adoption. Data collection was done over a four-week period. Data analysis using SPSS (v16.0) with one-way *ANOVA*, *t*-test, *cross-tabulation*, and *chi-square* tests to describe and identify significant differences between the three user groups and each factor. Post hoc tests using *Tukey's b*

were conducted when appropriate to identify the source of the differences between the groups.

Summary of Findings for Each Research Objective

The findings from the study provided crucial information and suggestions to establish LMS adoption strategies for university administration and the LMS selection committee. A summary of the findings for each research object follows:

Objective 1

Describe the current user characteristics of the LMS: Findings revealed that 30.7% of the respondents were faculty, 18.0% were staff, and 51.3% were students. Respondent distribution by gender showed 54.5% female and 45.5% male. When asked to agree or disagree with the statement: "*Web based education (e-Learning) is an important delivery strategy used by faculty to educate students,"* 91.6% of the respondents agreed with the statement. The data also showed that 92.1% of the respondents are familiar with and have used the current LMS and 61.6% had a feeling of being comfortable with using the current. The top reason for those users not using the LMS was *"None of my courses are taught in the e-Learning system"* (44.0%).

The findings for length of use by the respondents ranged from less than one year to over six years, with the 3 – 4 year range having the highest percentage of users (31.2%). The level of experience findings for the respondents ranged from low level to a fully online level with the medium level of usage having the highest percentage (36.8%).

When asked who was responsible for requesting and setting up courses in the e-learning system. The findings revealed that 78.0% of courses were created and setup by

the faculty (instructor) or staff themselves. Participants were also asked to select a choice that describes their attitude towards using the LMS with results indicating that 59.1% of respondents believe that the LMS helps in educating students and 16.5% of the respondents believe the LMS saves them time in teaching. Findings suggest that participants had knowledge and experience with several other LMS platforms commonly used in the educational environment as follows: WebCT (30.4%), Blackboard Learn (30.2%), and Blackboard Classic (13.1%).

The findings reflected widespread user representation across the university encompassing all colleges and departments of the university. The top five colleges from the results are Agriculture and Life Sciences (23.8%), Engineering (13.3%), Education and Human Development (12.0%), Liberal Arts (11.1%), and Science (10.7%).

Objective 2

Describe the attribute of locus of control and determine if differences exist between the user groups that could influence LMS adoption: *Locus of Control* was found to be a factor of perceived usefulness and have a positive influence on adoption. Although all user groups revealed a positive influence of this attribute, faculty and staff showed a higher *Locus of Control* score which was expected since they are the users responsible for course structure, content delivery, and teaching methods within the LMS. This requires a higher level of control within the LMS, whereas students are mainly consumers of the information, thus a lesser level of control.

Objective 3

Describe the attribute of support and training and determine if differences exist between the user groups that could influence LMS adoption: *Support and training* was found to be a factor of perceived ease of use and have a positive influence on adoption. Faculty and staff showed a higher *Support and training* score which was expected. The involvement of faculty and staff within the LMS for the creation of course structure and content, building assignments and assessments, setting up student goals, grading, and linking to external resources to help in teaching requires a deeper knowledge on how to use the LMS. Therefore, *Support and training* is needed on a higher level for faculty and staff than students.

Objective 4

Describe the attribute of trialability and determine if differences exist between the user groups that could influence LMS adoption: *Trialability* was found to be a factor of perceived ease of use and have a positive influence on adoption. Faculty and staff showed a higher *Trialability* score which was expected. The fact that faculty and staff have more functionality in the LMS, having the ability to test-drive the new LMS will help in the adoption of the LMS. Students will get *Trialability* by virtue of normal course enrollment in the new LMS during the beta phase.

Objective 5

Describe the attribute of system integration and determine if differences exist between the user groups that could influence LMS adoption: *System Integration* was found to be a factor of perceived usefulness and have a positive influence on adoption.

Faculty and staff showed a higher *System integration* score which was expected since interfacing course content with publisher content and other digital type media, submission of grades to the student information system, and links to outside resources used for teaching. Application tools for faculty and staff to do course creation and enrollment also contributes to having a higher score for the faculty and staff. For students, having mobile access is the most noted *System integration* need.

Objective 6

Describe the attribute of system features and determine if differences exist between the user groups that could influence LMS adoption: *System features* were found to be a factor of perceived ease of use and will have a positive influence on adoption. Faculty and staff showed a higher *System features* score which was expected since creating of courses, delivering content, creating links to other resources for learning (videos, discussions, third-party tools…). This is not to say that *System features* are not as important to students as well. However, students are mainly consumers of information from such features by direct access or participation.

Objective 7

Describe the attribute of brand name and reputation and determine if differences exist between the user groups that could influence LMS adoption: *Brand name and reputation* was found to be a factor of perceived usefulness, but findings suggest that *Brand name and reputation* has no influence on the adoption of a new LMS as long as the new LMS can provide the same functionality as the current LMS since there was no difference among the three user groups for this attribute.

Objective 8

Describe the barrier of system cost and determine if differences exist between the user groups that could influence LMS adoption: *System cost* was found to be a factor of perceived usefulness, but findings suggest that *System cost* has no influence on the adoption of a new LMS since there was no difference among the three user groups for this barrier. This suggests that system cost of a LMS is a factor of the university administrative business decision rather than a user adoption decision.

Objective 9

Describe the barrier of fear of change and new technology and determine if differences exist between the user groups that could influence LMS adoption: *Fear of change and new technology* was found to be a factor of perceived ease of use and has a negative influence on adoption. This barrier reflects similarities to the time concern barrier where faculty has a much higher score over staff and students.

Objective 10

Describe the barrier of migration process and determine if differences exist between the user groups that could influence LMS adoption: *Migration Process* was found to be a factor of perceived ease of use, but findings suggest that *Migration process* has no influence on the adoption of a new based on no significant difference in scores between faculty and staff, which are the two groups associated with this factor. This suggests that although things would be easier and less time consuming if a migration process or tool was used with the new LMS, the decision on using the LMS is inherent.

Objective 11

Describe the barrier of system support and determine if differences exist between the user groups that could influence LMS adoption: *System support* was found to be a factor of perceived usefulness and have a negative influence on adoption. Faculty and staff had a higher *System support* than students. This is expected as faculty and staff, are more likely to have issues when using the LMS when dealing with course creation and delivery. Knowing that the LMS vendor will provide timely support is a greater concern for faculty and staff.

Objective 12

Describe the barrier of system complexity and determine if differences exist between the user groups that could influence LMS adoption: *System complexity and usability* was found to be a factor of perceived ease of use and have a negative influence on adoption of the LMS. This barrier reflects similarities to the time concern barrier where faculty has a much higher score over staff and students. Possible relationships to *Time concern* and *Support and training* factors for this barrier exist making the support and training offered by the ITS staff towards use of the new LMS vitally important to the diffusion process.

Objective 13

Describe the barrier of time concern and determine if differences exist between the user groups that could influence LMS adoption: *Time concern* was found to be a factor of perceived usefulness and have a negative influence on adoption. Being of the utmost importance to faculty, *Time concern* had a much higher score than that of staff

and students. Depending on how the LMS is implemented, how complex of a system, etc…will greatly affect the time to learn how to use the new LMS efficiently and effectively. This factor has possible relationships to *Training and support*, *System complexity*, *System features*, *System integration*, and *Migration process*, which will be very important for the university administration in the decision making process.

Objective 14

Determine prediction of LMS preference based on all attributes and barriers: Results indicated that attributes *Trialability* and *Support and training*, along with the barrier *Time concern* had differences towards LMS preference. This was expected as these three factors appear to be the main adoption influencers, especially for faculty. However, no predictability of LMS preference was determined from the data due to most respondents having no preference of LMS brand name (See findings for research objective 7).

Objective 15

Determine prediction of LMS preference based on university role: Results showed a statistical and significant relationship between university roles and LMS preference and suggest faculty, staff, and students differ in in LMS preference. Faculty preferred Sakai and Moodle more than staff and students, whereas students preferred Blackboard Learn more than faculty and staff. There is almost no difference between faculty and students on no preference of an LMS. Although relationships were determined from the statistical test, there was no predictability of LMS preference determined from the data.

Conclusions and Implications

The understanding of behavioral and technology acceptance models currently used in research today also provide insight towards user adoption and diffusion of the LMS. Many of the theories and models relate to user perception and attitude towards the process of change. User acceptance of an innovation and change is influenced by external stimuli factors, defined for this study as the attributes and barriers. The influence of these factors on the user causes a psychological concern that plays a role in the decision process of accepting a new technology (Harris, Stanz, Zaaiman, & Groenewald, 2004).

Data analysis and results from the study confirmed nine of the twelve factors to be as expected behavioral influence, although somewhat differently across the individual user groups, meaning for example the factor may be more of an influence for faculty and staff rather than students. However, the overall affect would be either positive or negative towards adoption of the LMS. The three factors that did not show expected results were *System cost*, *Migration process*, and *Brand name and reputation*.

The study findings support the relationship between behavioral intention and actual behavior as presented in the Theory of Reasoned Action (Ajzen & Fishbein, 1975) and Theory of Planned Behavior (Ajzen, 1991). As observed, the external factors played a role in the user perception and attitude towards adopting and using the LMS.

The conceptual model for the study based on a foundation from the Technology Acceptance Model (Davis, 1986) and the Unified Theory of Acceptance and Use of Technology Model (Venkatesh et al., 2003) proved useful in determining the

relationship of the factors on user perception and attitude. As a result, factors have been identified that have major influence on the adoption process. Strategies can therefore be implemented to aid in the diffusion process for the LMS at the university.

Although the results showed no predictability of LMS preference based on university role or the combined factors of influence, the information gained from the study will prove to be important for the university and ITS department in the selection and implementation of a new LMS.

The following conclusions can be drawn from the study findings:

- The LMS is highly used tool for teaching and learning initiatives at the university with a wide-spread exposure.
- Current users are highly knowledgeable and familiar with the LMS.
- Users expect the ability to have control of functionality and personalization in the LMS.
- Users expect to have proper support and training in regards to the LMS.
- System trialability is a major factor in the user adoption and diffusion process.
- System features that add flexibility and value to the LMS are required by the users.
- System integration with other university business functions (financial aid, student tracking and retention, etc…) is an important aspect of the LMS.
- Time concern is the most important factor for faculty.
- System cost is of no real concern for the users.

- System complexity and usability must be negated by proper support and training.
- Fear of change and new technology (anxiety) must be mitigated by keeping users informed about the LMS through communication channels and marketing campaigns.
- Vendor system support is expected by faculty and staff.
- LMS brand name and reputation is not a factor of concern for users if similar functionality exists.
- The migration process is not a concern for faculty and staff.
- LMS preference cannot be determined by university role or a total combination of all identified factors of the study.

Implications exist for the university if findings and information from the study is not considered. Mitigation of potential barriers for adoption is crucial for the diffusion process to be successful. Support of the known attributes will help users to adopt the LMS. Decisions pertaining to the new LMS should be made with the mindset of added value to the users and the university. Users will turn away from using the LMS if their needs are not met; if they feel that the new LMS does not meet their expectations; and if the new LMS impedes current job functions and performance.

Recommendations for Practice

Locus of control – Faculty and staff need the ability to have a personal look and feel, do customization of courses, and be able to select tools and functionality, having enough control within the LMS to be productive. For students, the ability to have access

at any time to course material and consume the course information (grades, syllabus, assignments, etc…) however is meaningful (iPad, laptop, mobile phone, etc…). The new LMS will need this type of functionality. Basically, if a new LMS limits the ability or personal control they have in the LMS, then this factor easily becomes a barrier to adoption (Ajzen, 2002).

Support and training – It is important that faculty and staff learn how to use the new LMS efficiently and effectively. Providing quality and timely support and training in a format easily consumed with possible incentives to motivate users to get the necessary training. Attention must be paid to the training length or requirement to not impede the users time. Proper support and training creates perceived ease of use and positive opinions of using the LMS by the individual (Leonard-Barton & Deschamps, 1988).

Trialability – Implementation of the LMS must have a hands-on experience for the users. This will require a phase implementation with a beta system that has limited users. Using a phased implementation approach to give early adopters a hands-on experience will have a positive influence on user adoption (Black, Beck, Dawson, Jinks, & DiPietro, 2007; Rogers, 2003). Practice courses should be created for faculty to test-drive the new LMS system.

System integration – Integration needs should be determined prior to the selection of a LMS. At a minimum, the integration should include current integrations to keep similar functionality. Initial development can then be done for adding new integrations such publisher content, submitting grades to the SIS, links to other digital

type media resources outside of the LMS, and application modules (powerlinks, building blocks, ePacks, etc…). Customized tools for course creation and enrollment can add value for faculty and staff. Attention should be given to services that users have requested in the discussions such as mobile access. Kerschenbaum and Biehn (2012) believe that system integration is a major factor in selecting and using a LMS. ITS technical staff will have to evaluate business cases for such integration and determine the best choice for doing the integration.

System features – ITS technical staff will need to evaluate business cases for current and future developed features to determine the best choice of features and what value it brings to the LMS. New feature requests and procedures to handle them will need to be created by the ITS staff. Initially, system features should allow for similar functionality as the current LMS. Attention should be given to features that users have requested in the discussions such grade center and inline grading.

Time concern – The study noted this as one of the main concerns of users, especially faculty. It will be important to keep this in mind with anything that directly involves the users. Depending on how the LMS is implemented, how complex of a system it is, and gauging how much support and training will be needed by faculty and staff; all will greatly affect the time to learn how to use the new LMS efficiently and effectively. If any of those areas become too time consuming for faculty and staff, then this will decrease the adoption rate of the LMS.

System cost – Tagged as an excuse in most cases when users are frustrated with the LMS, especially in the area of system performance, system cost always comes into

question. Since the data suggests that price is no concern of the users, system cost is basically a business decision of the university. Users expect a reliable, well-functioning LMS which meets their teaching and learning needs over cost concern. Reasonable costs should be associated with improvements of system interoperability to create value for the users and give them a positive experience in using the LMS (Poon, Blumenthal, Jaggi, Honour, Bates, & Kaushal, 2004).

Fear of change and new technology – The idea of a major change or interruption to normal routines that are highly familiar can cause anxiety and make a user resistant to trying something new or different, which becomes a barrier to adoption of the LMS. Hackbarth, Grover, and Yi (2003) believe that increasing user experience and ease of use of the system will dramatically decrease anxiety. This can be addressed by the university by making support and training available to users, marketing initiatives, and communication channels that will persuade users to adopt the new LMS. Providing an understanding of added value and how the new LMS will be more useful to their job as mentioned in the diffusion process by Rogers (2003) will help aid the adoption process.

System support – Faculty and staff need assurance from the vendor to provide quality customer support and address reported issues in a timely manner. A strong relationship will need to be built with the vendor. As part of the selection criteria for the LMS, a vendor that provides a partnership and willingness to work with the university to achieve common goals should be included. A proven customer support history and customer service record with possible reference schools should be of importance to the university as well.

System complexity and usability – With similarities to time concern and fear of change, this can be addressed by the university by making support and training available to users and providing demonstrations. Having individual practice courses created for all faculty to test-drive the system should also help in user adoption of the LMS. A user's decision to adopt a complex system is based upon mental thoughts associated with the benefits and risks of the change (Plsek, 2003). Therefore, allowing for usability of the new system without constraints of any kind should allow for user exploration of benefits.

Migration Process – Procedures and workflows on migrating course data from the old LMS to the new LMS should be created for faculty and staff. Pros and Cons of migrating versus starting new with course data should be offered by ITS. Giving the options of either to faculty and staff should prove beneficial.

Given that the current LMS has been used from some ten years now, running on older technology which is inefficient. The new LMS infrastructure should be scalable and consist of virtual machines (VMs) running on blade servers, that can just be added to as the demand warrants should be considered.

New features (mobile access, collaboration, alert notification, content sharing, integration, etc…) should also be considered as this increases user confidence and self-efficacy. Individuals that have a high level of LMS self-efficacy form more positive perceptions of a LMS than those that have a low level of computer self-efficacy, which can help the user adoption and diffusion of the LMS at the university. New tools and features in the LMS can lead to new ways to outreach students, provide flexibility in teaching, and allow for anytime-anywhere learning.

The selection of an LMS should also consider users with disabilities. Software that has been tested for accessibility and is ADA (Americans with Disabilities Act) compliant should be a focus point of the LMS selection criteria and process. Other criteria for adding value and meeting user needs should be considered. Familiarity with current standards and laws will also play a crucial role in the selection of a new LMS.

A thorough understanding of the diffusion of innovation theory should be considered by university administration and ITS technical staff that will have a role in the implementation of the new LMS after the selection process. The study has presented data for determination of user classification into the diffusion cycle which is important to target initial pilot test users and the creation of change agents that will advocate LMS adoption to other users within their respective college or department.

A project plan with a project manager should be developed by the ITS department to oversee the implementation efforts of the new LMS. The initial plan would encompass all infrastructure aspects, timeline of events, targeted pilot users, training, product support, vendor support, product communication, and marketing efforts to promote the new LMS. The project should be done in a phased approach with a minimum of three phases before fully reaching an operational status. Recommended phases to include:

- Phase One – Pilot users only access to verify infrastructure and software configuration.
- Phase Two – Additional users to verify migration of content and feature usage.

- Phase Three – Additional users that continue to verify migration of content and examination of system performance.

The migration portion of the project will eventually lead into the operational portion of the project at which that point in time may warrant the remaining migration efforts to become a separate project to deal with the late adopters and laggards. This will possibly require special training and support efforts outside of the normal operations practices. Once a decided upon percentage of users have migrated to the new LMS, the system will transition into the operational portion of the product life-cycle and the project will come to closure.

Recommendations for Future Research

The researcher recommends that this study be done for any university or business organization who wants to select and implement a LMS. External variables will need to be determined and will be unique to that environment. However, the underlying theories and models will be the same for the foundation of the conceptual and theoretical frameworks. The researcher highly recommends that a separate instrument be created and used to fit the environment and user base.

A post study should be done to collect data from the new LMS user base once implemented. Comparisons could then be done to examine the positive and negative aspects of user adoption and diffusion of the new LMS. Repeated studies can be done to monitor the population and enforce continuous improvement through data findings on regular intervals. New feature evaluation and possible future studies targeted at feature usage and added value could also be of interest.

This study could also be repeated with more emphasis on the relationships between the factors themselves. A number of potential relationships were seen through this study such as support and training relationships to time concern, system usability, and reducing fear of technology. Possible unseen relationships could exist that could explain other influences on user adoption.

As MOOCs become better defined and structured over time, opportunities for new studies in that regard will become present. What will be the true function for a MOOC in the future? Currently, MOOCs seem to represent a “marketing tool” in hopes of finding those brilliant and self-motivated students which can then be recruited by the sponsoring university.

Future studies based from technology advancement over time will become evident as well, with new uses or improvements in online and distance education by using a LMS, all of which could lead to future research.

REFERENCES

Ajzen, I. (2006). *Theory of planned behavior model* [image]. Retrieved from http://people.umass.edu/ajzen/tpb.diag.html

Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology, 32*(4), 665–683.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179–211. doi: 10.1016/0749-5978(91)90020-T

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior.* Englewood Cliffs, NJ: Prentice-Hall.

Ajzen, I., & Fishbein, M. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research.* Reading, MA: Addison-Wiley.

Ajzen, I., & Fishbein, M. (1969). The prediction of behavioral intentions in a choice situation. *Journal of Experimental Social Psychology, 5*(4), 400–416.

Bagozzi, R. P. (2007). The legacy of the technology acceptance model and a proposal for a paradigm shift. *Journal of the Association for Information Systems, 8*(4), 244–254.

Bandura, A. (1977). *Self-efficacy: The exercise of control.* New York, NY: Freeman.

Bergh, D., Hanke, R., Balkundi, P., Brown, M., & Chen, X. (2004). An assessment of research designs in strategic management research: The frequency of threats to internal validity. *Research Methodology in Strategy and Management, 1*(1), 349–371. doi: 10.1016/S1479-8387(04)01112-9

Betts, K. S. (1998). *Factors influencing faculty participation in distance education in postsecondary education in the United States: An institutional study*. (Doctoral dissertation, The George Washington University). Available from ProQuest Dissertations and Theses. (Order No. 9900013).

Black, E. W., Beck, D., Dawson, K., Jinks, S., & DiPietro, M. (2007). Considering implementation and use in the adoption of an LMS in online and blended learning environments. *TechTrends, 51*(2), 35–39.

Blackboard. (2013a). *Our story*. [Website]. Retrieved from http://www.blackboard.com/About-Bb/Our-Story.aspx

Blackboard. (2013b). *Overview*. [Website]. Retrieved from http://www.blackboard.com/About-Bb/Overview.aspx

Blackboard. (2013c). *Who we are.* [Website]. Retrieved from http://www.blackboard.com/About-Bb/Who-We-Are/At-a-glance.aspx

Born, C., Meindl, T., Poeppel, E., Schoenberg, S., & Reiser, M. (2006). Brand perception-evaluation of cortical activation using fMRI. *Proceedings of the Annual Meeting of the Radiological Society of North America, Chicago, IL*. Retrieved from http://rsna2006.rsna.org/rsna2006/V2006/conference/event_display.cfm?em_id=4429416

Brown, A., & Johnson, J. (2007). *Five advantages of using a learning management system.* [Brochure]. Columbia, SC: Microburst Learning.

Chowdhury, S. (1999). *Management 21C: Someday we'll all manage this way.* London: Prentice Hall.

Chung, C., Pasquini, L., & Koh, C. (2013). Web-based learning management system considerations for higher education. *Learning and Performance Quarterly. 1*(4), 24-37.

Cochran, G. (1977). *Sampling techniques.* New York, NY: Wiley and Sons.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika. 16*, 297–334.

Davis, F. D. (1993). User acceptance of computer technology: System characteristics, user perceptions and behavioral impacts. *International Journal of Man-Machine Studies, 38*(3), 475–487. doi: 10.1006/IMMS.1993.1022

Davis, F. D. (1986). *The technology acceptance model for empirically testing new end-user information systems: Theory and results.* (Doctoral dissertation). Cambridge, MA: Massachusetts Institute of Technology.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science, 35*(8), 982–1003. doi: 10.1287/MNSC.35.8.982

Demski, J. (2012). Rebuilding the LMS for the 21st century. *Campus Technology*, *25*(8). Retrieved from http://campustechnology.com/articles/2012/03/29/rebuilding-the-lms-for-the-21st-century.aspx

Dirksen, D., & Tharp, D. (1997). Utilizing the concerns-based adoption model to facilitate system change. *Technology and Teacher Education Annual, 1997*(1), 1064–1067.

Engsbo, M., & Sandhu, M. (2007). Emerging e-communication technologies and their usage in project-based organizations. *Management, 2*(4), 285–301.

Ferriman, J. (2013, June 13). *3 Characteristics every LMS should have* [Web log comment]. Retrieved from http://www.learndash.com/3-characteristics-every-lms-should-have/

Goldworm, B. (2006, November 21). *Why you should use blade servers for server virtualization and server consolidation.* Retrieved from serachservervirtualization.techtarget.com

Hackbarth, G., Groverb, V., & Yi, M. (2003). Computer playfulness and anxiety: Positive and negative mediators of the system experience effect on perceived ease of use. *Information & Management, 40*(3), 221–232.

Harrington, C. F., Gordon, S. A., & Schibik, T. J. (2004). Course management system utilization and implications for practice: A national survey of department chairpersons. *Online Journal of Distance Learning Administration, 7*(4).

Harris, E., Stanz, K., Zaaiman, J., & Groenewald, T. (2004). The stages of users' concern when adopting new technology. *SA Journal of Human Resource Management, 2*(3), 54–61.

Huysmans, P., Ven, K., & Verelst, J. (2008). Reasons for the non-adoption of the openoffice.org in a data-intensive public administration. *First Monday Peer-Reviewed Journal on the Internet, 13*(10).

ITS. (2013). *LMS project history.* [Website]. Retrieved from http://its.tamu.edu/LMS_Project/History.php

Jansen, B. J., Zhang, M., & Schultz, C. D. (2009). Brand and its effect on user perception of search engine performance. *Journal of the American Society for Information Science and Technology, 60*(8), 1572–1595. doi: 10.1002/asi.21081

Kats, Y. (2010). *Learning management system technologies and software solutions for online teaching: Tools and applications.* Hersey, PA: IGI Global.

Kerschenbaum, S., & Biehn, B. (2012). *LMS selection best practices* [White paper]. Retrieved from http://www.trainingindustry.com/media/2068137/lmsselection_full.pdf

Leonard-Barton, D., & Deschamps, I. (1988). Managerial influence in the implementation of a new technology. *Management Science, 34*(10), 1252–1265.

Lindell, M. K., & Whitney, D. J. (2001). Accounting for Common Method Variance in Cross-Sectional Research Designs. *Journal of Applied Psychology, 86*(1), 114–121.

Malikowski, S. R., Thompson, M. E., & Theis, J. G. (2007). A model for research into course management systems: Bridging technology and learning theory. *Journal of Educational Computing Research, 36*(2), 149–173. doi: 10.2190/1002-1T50-27G2-H3V7

Moodle. (2013a). *About Moodle*. [Website]. Retrieved from http://docs.moodle.org/26/en/About_Moodle

Moodle. (2013b). *About Moodle: Philosophy*. [Website]. Retrieved from http://docs.moodle.org/25/en/Philosophy

Moodle. (2013c). *Registered Moodle sites*. [Website]. Retrieved from https://moodle.org/sites/

Norman, D. (2012). *LMS characteristics* [image]. Retrieved from http://darcynorman.net/2012/04/02/on-the-role-of-the-lms-in-higher-education/

Nulty, D. (2008). The adequacy of response rates to online and paper surveys: What can be done? *Assessment & Evaluation in Higher Education, 33*(3), 301–314. doi: 10.1080/02602930701293231

Nunnaly, J. (1978). *Psychometric theory*. New York: McGraw-Hill.

Perez, B., & Perez, T. (2011). *Choosing the right learning management system.* North Charleston, SC: CreateSpace.

Petri, K., Rangin, H., Richwine, B., & Thompson, M. (2012). A comparison of learning management systems accessibility. Retrieved from http://www.educause.edu/midwest-regional-conference/2012/comparison-learning-management-systems-accessibility

Petter, S., DeLone, W., & McLean, E. (2008). Measuring information systems success: Models, dimensions, measures, and interrelationships. *European Journal of Information Systems, 17,* 236–263. doi:10.1057/ejis.2008.15

Piña, A. A. (2008). *Distance learning and the institution: Foundations, importance and implementation.* Saarbrucken, Germany: VDM Publishing.

Plsek, P. (2003). Complexity and the adoption of innovation in health care. In *Accelerating quality improvement in health care strategies to speed the diffusion of evidence-based innovations.* Proceedings of the National Institute for Health Care Management Foundation Conference. Washington, D.C.: Plsek & Associates, Inc.

Poon, E., Blumenthal, D., Jaggi, T., Honour, M., Bates, D., & Kaushal, R. (2004). Overcoming barriers to adopting and implementing computerized physician order entry systems in U. S. hospitals. *Health Affairs, 23*(4), 184–190. DOI 10.1377/hlthaff.23.4.184

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York, NY: The Free Press.

Russell, T. L. (2001). The no significant difference phenomenon. In *A comparative research annotated bibliography on technology for distance education.* North Carolina State University. Raleigh, NC: IDEC.

Sakai. (2013a). *About Sakai.* Retrieved from http://www.sakaiproject.org/about-sakai

Sakai. (2013b). *Sakai CLE.* Retrieved from http://www.sakaiproject.org/sakai-cle

Sakai. (2013c). *Sakai Collaboration and Learning Environment.* [Website]. Gilbert, AZ: Unicon. Retrieved from http://www.unicon.net/opensource/sakai

Sampathkumar, M. (2013). Top 10 characteristics of a good learning management system (LMS) [Web log comment]. Retrieved from http://triumphindia.net/blog/?p=325

Schelling, T. C. (1978). *Micromotives and macrobehavior*. New York, NY: W. W. Norton & Company, Inc.

Sentosa, I., & Nik Mat, N. K. (2012). Examining a theory of planned behavior (TPB) and technology acceptance model (TAM) in internet purchasing using structural equation modeling. *Journal of Arts, Science & Commerce, 3*(2), 62–77.

Sheppard, B. H., Hartwick J., & Warsaw. P. R. (1988). The theory of reasoned action: A meta-analysis of past research with recommendations for modifications and future research. *Journal of Consumer Research, 15*(3), 325–343. doi: 10.2307/2489467

Shifter, C. C. (2000). Faculty participation in asynchronous learning networks: A case study of motivating and inhibiting factors. *Journal of Asynchronous Learning Networks, 4*(1), 15–22.

Simonson, M. (2007). Course management systems. *Quarterly Review of Distance Education, 8*(1), vii–ix.

Smylie, M. A. (1988). The enhancement function of staff development: Organizational and psychological antecedents to individual teacher change. *American Educational Research Journal, 25*(1), 1–30. doi: 10.3102/00028312025001001

Speek, L. (2013). *Resistance to health IT adoption: Neutralizing the fear factor.* Retrieved from http://healthbizdecoded.com/

TAMU. (2013). *History of the university*. [Website]. Retrived from http://www.tamu.edu/about/facts/history.html

Techasile. (2011). *Vendor actions needed for overcoming SMB cloud computing adoption barriers* [White paper]. Retrieved from http://techaisle.com/blog/2011/09/vendor-actions-needed-to-overcome-smb-cloud-adoption-barriers/

U. S. News. (2013, May 28). *National university rankings*. Retrieved from http://colleges.usnews.rankingsandreviews.com/best-colleges/rankings/national-universities/page+7

Venkatesh, V. (2008). *Technology Acceptance Model 3* [image]. Retrieved from http://www.vvenkatesh.com/organizations/Theoretical_Models.asp

Venkatesh, V. (2003). *Unified Theory of Acceptance and Use of Technology Model (UTAUT)* [image]. Retrieved from http://www.vvenkatesh.com/organizations/Theoretical_Models.asp

Venkatesh, V. (2000). *Technology Acceptance Model 2* [image]. Retrieved from http://www.vvenkatesh.com/organizations/Theoretical_Models.asp

Venkatesh, V. (1989). *Technology Acceptance Model* [image]. Retrieved from http://www.vvenkatesh.com/organizations/Theoretical_Models.asp

Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences, 39*(2), 273–315. doi: 10.1111/j.1540-5915.2008.00192.x

Venkatesh, V., & Davis, F. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46*(2), 186–204. doi: 10.1287/mnsc.46.2.186.11926

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425–478.

White, B., & Larusson, J. (2010). *Strategic directives for learning management system planning* [Research Bulletin]. Boulder, CO: EDUCAUSE Center for Applied Research. Retrieved from http://net.educause.edu/ir/library/pdf/ERB1019.pdf

Wu, T. (1995). *Management concerns on computer fear syndrome: An empirical study of a publishing company.* Proceedings of the 11th International Conference on Advanced Science and Technology: University of Chicago. Chicago, IL: CAPAMA.

APPENDIX A

CONCEPTUAL DIAGRAM (ENLARGED)

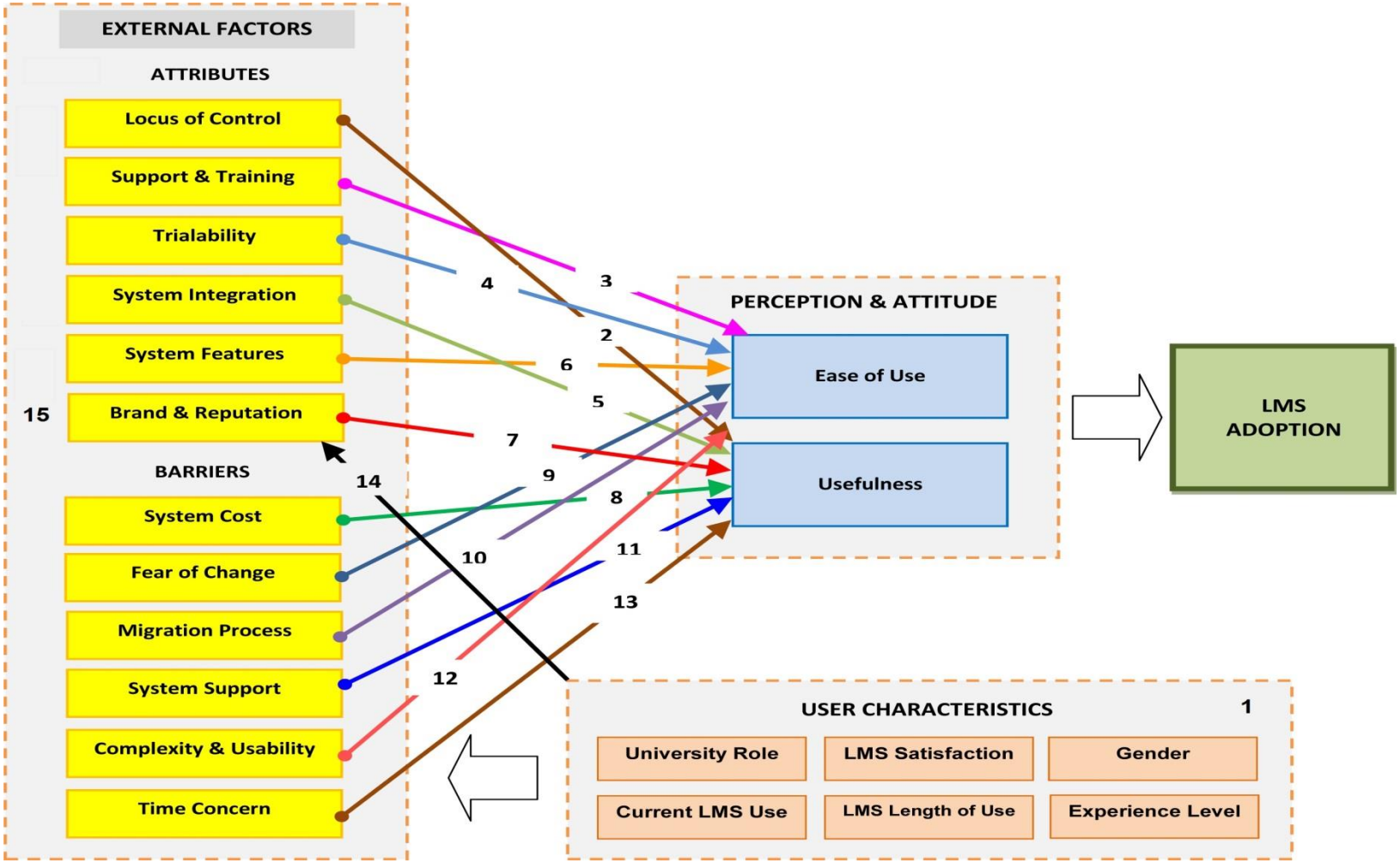

Figure A-1. Conceptual Diagram (Enlarged). The block diagram displays the two sets of external factors and the relationships (numbered per objective) on user perception and attitude.

APPENDIX B

RESPONDENT EMAIL

You have been selected to participate in a research study to help understand how the e-learning system is being used at TAMU.

Your participation is greatly appreciated, as this study has the potential to impact the selection of a new e-learning system and future training of faculty, students, and staff at TAMU.

Please note:

- Your participation is voluntary.
- Your identification and responses will be kept confidential.
- You can elect to withdraw at any time.
- You will not be compensated for participation.
- Data collected will be kept secured for up to three years, afterwards it will be destroyed.
- Minimal risk is involved.

The survey will take approximately **10-15 minutes** to complete and will be available for two weeks. Please respond to all statements. The survey can be found here:

Begin Survey

This research study has been reviewed by the Human Subjects' Protection Program and/or the Institutional Review Board at Texas A&M University. For research-related problems or questions regarding your rights as a research participant, you can contact these offices at (979) 458-4067 or irb@tamu.edu.

Thank you for giving your valuable time and response to this study.

If you require additional information about the survey or have questions, please email me at dswalke2@tamu.edu or call (979) 458-3384.

APPENDIX C

STUDY INSTRUMENT

First, you will be asked a few qualifying questions to determine your participation in the survey (2 minutes).

Web based education (e-Learning) is an important delivery strategy used by faculty to educate students?

- ❍ Agree
- ❍ Disagree

Please indicate your role with the University:

- ❍ Faculty
- ❍ Staff (Instructional Involvement or Support)
- ❍ Staff (No Instructional Involvement or Support)
- ❍ Student

Are you currently using or have you previously used the e-Learning platform at the University?

- ❍ Yes
- ❍ No

You indicated that you do not use the e-Learning platform. Please select the choice that best describes why you do not use the e-Learning platform:

- ❍ None of my courses are taught in the e-Learning platform.
- ❍ The e-Learning platform is too complex to use.
- ❍ I prefer traditional teaching methods over on-line teaching.
- ❍ Other reason (please enter below): _____

How long have you been using the e-Learning platform?

- ❍ Less than 1 Year
- ❍ 1 - 2 Years
- ❍ 3 - 4 Years
- ❍ 5 - 6 Years
- ❍ More than 6 Years

Select the choice that best describes your level of experience in using the e-Learning platform:

- ❍ Low Level - posting of syllabus, grade book, student communication, email
- ❍ Moderate Level - course content, links, discussion boards, chat rooms
- ❍ High Level - assessments, quizzes, learning modules, portfolio
- ❍ Fully On-line Level - complete course on-line

Who is primarily responsible for setting up your course(s) in the e-Learning platform?

- ❍ Myself
- ❍ A staff member (Departmental or College)
- ❍ A graduate student or Teaching Assistant
- ❍ Other (Please enter below): _____

Select the choice that best describes your attitude towards using an e-Learning platform:

- ❍ Asset for the University.
- ❍ Helps in educating students.
- ❍ Saves time in teaching.
- ❍ Simple to use.
- ❍ Reliable.

Next you will be asked a few questions pertaining to attributes that impact the usage of the e-Learning platform (3 minutes).

Locus of Control

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
I need the ability to access course material in the e-Learning platform at any time and on any type of device.	○	○	○	○	○
It is important to be able to navigate easily through the course interface in the e-Learning platform.	○	○	○	○	○
It is important that I am able to modify my profile information in the e-Learning platform.	○	○	○	○	○
The e-Learning platform helps me to better understand the course material by taking advantage of my learning or teaching style.	○	○	○	○	○
Having my own personal space in the e-Learning platform gives me a sense of ownership.	○	○	○	○	○

Support and Training

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Training on how to use the e-Learning platform will improve my learning or teaching.	○	○	○	○	○
Having user support for the e-Learning platform will help me gain knowledge.	○	○	○	○	○
On-line help in the e-Learning platform helps me resolve issues on my own.	○	○	○	○	○
Specialized training will save me time on learning to use the e-Learning platform.	○	○	○	○	○
Documentation should be provided for the e-Learning platform for users wanting to learn on their own.	○	○	○	○	○

Trialability

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Using the latest technology in the e-Learning platform enhances the learning and teaching experience.	○	○	○	○	○
It is important that content can be shared with other courses in the e-Learning platform.	○	○	○	○	○
The e-Learning platform should be accessible from anywhere to increase learning and teaching potential.	○	○	○	○	○
Having a personal space in the e-Learning platform gives me a sense of ownership.	○	○	○	○	○
Learning improves with course interaction in the e-Learning platform.	○	○	○	○	○

System Integration

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
It is important that social media be part of the e-Learning platform to increase learning and teaching interaction.	○	○	○	○	○
Third party applications such as Turnitin, publisher epacks, Respondus, response clickers, wikis, blogs, etc... should be part of the e-Learning platform to improve teaching and learning.	○	○	○	○	○
Student grades and course roster data should be exchangeable between the student information system and the e-Learning platform.	○	○	○	○	○
Incorporating new features and tools into the e-Learning platform is beneficial to teaching and learning.	○	○	○	○	○
Other University websites should be accessible from within the e-Learning platform.	○	○	○	○	○

System Features

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
The e-Learning platform should have a grade book and automated grading of assignments.	○	○	○	○	○
The e-Learning platform should support a blog or wiki application to share learning experiences with others.	○	○	○	○	○
The e-Learning platform should have social media tools that allow for interaction with others in the course.	○	○	○	○	○
The e-Learning platform should contain an eportfolio to allow a working history of progress for each student.	○	○	○	○	○
A tracking tool should be part of the e-Learning platform to monitor a student's progress in a course.	○	○	○	○	○

Next you will be asked a few questions pertaining to barriers that impact the usage of the e-Learning platform (3 minutes).

Time Concerns

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Having a course in the e-Learning platform requires more of my time than a traditional course.	○	○	○	○	○
Training on how to use the e-Learning platform requires extra time out of my schedule.	○	○	○	○	○
It is important that the e-Learning platform have mobile access so I can get my course content anytime and anywhere.	○	○	○	○	○
Using the e-Learning platform allows me to do other things that a traditional course would not.	○	○	○	○	○
Taking courses in the e-Learning platform helps me manage my time better.	○	○	○	○	○

System Cost Concerns

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Funding for the e-Learning platform by the University shows a dedication to teaching and learning.	○	○	○	○	○
New components, features or plug-ins should be purchased for the e-Learning platform to enhance teaching and learning.	○	○	○	○	○
A well-known e-Learning platform should be purchased by the University since students are paying for it with associated fees.	○	○	○	○	○
The University should purchase an e-Learning platform regardless of price because of vendor reputation and product support.	○	○	○	○	○
The quality education provided by a reliable e-Learning platform should be of more concern than the purchase price.	○	○	○	○	○

Fear of Change and New Technology

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Changes in the e-Learning platform negatively affect teaching and learning.	○	○	○	○	○
I prefer face-to-face courses to on-line courses if the e-Learning platform is too complex to use.	○	○	○	○	○
Privacy of assignments and course work is threatened when using an e-Learning platform.	○	○	○	○	○
Using an e-Learning platform for teaching and learning creates isolation between the student and instructor.	○	○	○	○	○
I feel that using new technology such as an e-Learning platform provides a better environment to learn.	○	○	○	○	○

System Support Concerns

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Technical upgrades to the e-Learning platform provide access to new features.	○	○	○	○	○
The University should dedicate consultants to handle my questions concerning the e-Learning platform.	○	○	○	○	○
Making the e-Learning platform reliable and accessible 24/7 provides a quality education to students.	○	○	○	○	○
Having the University maintain the e-Learning platform shows dedication to learning.	○	○	○	○	○
Getting help quickly for an issue I have when using the e-Learning platform makes me more productive.	○	○	○	○	○

System Complexity and Usability

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Simple navigation in the e-Learning platform allows material to be found more quickly.	○	○	○	○	○
The e-Learning platform should have the same features and tools I currently use for my teaching.	○	○	○	○	○
Training on how to use the e-Learning platform should be provided by the University.	○	○	○	○	○
Mobile access to content in the e-Learning platform will increase student engagement.	○	○	○	○	○
Having the latest technology available in the e-Learning platform improves teaching and learning.	○	○	○	○	○

Migration Process

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
An automated course migration tool should be part of the e-Learning platform.	○	○	○	○	○
Course content should remain the same after migration to a different e-Learning platform.	○	○	○	○	○
Migrating course content to a different e-Learning platform will be time consuming.	○	○	○	○	○
The migration to a different e-Learning platform is a good time to clean up old content.	○	○	○	○	○
The University should dedicate a team to help in the migration process for the e-Learning platform.	○	○	○	○	○

Lastly, you will be asked a few questions pertaining to individual characteristics and classification (2 minutes).

Have you used any of the following e-Learning platforms? (Select all that apply)

- ○ Angel
- ○ Blackboard Classic
- ○ Blackboard Vista
- ○ Canvas
- ○ Desire 2 Learn
- ○ Epsilen
- ○ Moodle
- ○ Sakai
- ○ WebAssign
- ○ WebCT
- ○ Other (Please enter below): _____

What part of the university are you associated with?

- ○ Administration
- ○ Agriculture and Life Sciences
- ○ Architecture
- ○ Associate Provost for Undergrad Programs
- ○ Center for Academic Enhancement
- ○ Council of Deans
- ○ Distance Education
- ○ Education and Human Development
- ○ English Institute
- ○ Engineering
- ○ General Studies
- ○ George Bush School of Government & Public Service
- ○ Geo Sciences
- ○ Graduate Studies
- ○ Health Science Center
- ○ Interdisciplinary TAMU
- ○ Interdisciplinary Galveston
- ○ Liberal Arts
- ○ Mays Business School
- ○ Medicine
- ○ Military Science
- ○ Qatar Campus
- ○ Science
- ○ TAMU at Galveston
- ○ Veterinary Medicine & Biomedical Science

Select the choice that best describes your typical feeling when using the e-Learning platform:

- ○ Angry
- ○ Comfortable
- ○ Confused
- ○ Excited
- ○ Frustrated
- ○ Happy
- ○ Other (Please enter below): _____

What is your gender?

- ○ Female
- ○ Male

The University is currently evaluating three e-Learning platforms. Of the choices below, which e-Learning platform would you prefer the University to use?

- ○ Blackboard Learn
- ○ Moodle
- ○ Sakai
- ○ No Preference