INSTRUCTOR USAGE OF LEARNING MANAGEMENT SYSTEMS UTILIZING A TECHNOLOGY ACCEPTANCE MODEL

by

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ABSTRACT

Limited research exists on the factors that influence an instructor's choice to use a learning management system. The purpose of the current study is to explore how task technology fit constructs relate to the other constructs that comprise Davis' Technology Acceptance mode. The technology acceptance model is widely used as an indicator of actual use of a technology system. A sample of 284 instructors completed a survey consisting of demographic questions, open ended questions about their reasons for choosing to choose to utilize a learning management system, and Likert scale questions about six constructs of the research model including task technology fit, ease of use, usefulness, attitude, intent to use, and actual use. The relationships between TAM model constructs and Task Technology Fit were analyzed using a partial least squares structural equation model method with SMART- PLS. The relationship between task technology fit and actual use was mediated by ease of use, usefulness, attitude, and intent to use. To evaluate the constructs in the model, an exploratory factor analysis was conducted and the factor structure for online and face-to-face instructors were different. Two models were developed, one for face-to-face instructors, and one for online instructors to account for this difference. The research models were evaluated for face-to-face instructors and online instructors. The study found significant relationships between all the TAM constructs and Task Technology Fit for face-to-face instructors. The relationship between attitude and intent to use was not significant for online instructors. This research supports the need for more research into the differences between online and face-to-face instructor's perceptions of technology use. The differing instructional needs of face-to-face and online instructors have implications on the training and support an institution should provide to increase usage of learning management systems.

CHAPTER ONE

INTRODUCTION

Background

In 1993, Stanford University developed a self-paced, individualized computer-based instructional system, transforming students from passive learners to more active learners in the classroom (Molnar, 1997). This greatly expanded the use of educational computers which were initially used as mathematical problem solving tools exemplified by the 1959 University of Illinois PLATO system (Molnar, 1997). The new, self-paced, Stanford system encouraged the movement from a focus on information discovery to a focus on organizing and synthesizing information and higher-level thinking (Molnar, 1997), paving the way for current practices in online education.

Online education has seen tremendous growth in the last 10 years (Allen & Seaman, 2013, 2016; Nworie, 2012; Singleton, Bowser, Hux, & Neal, 2013). The growth can be driven by cost savings, increased flexibility, and improved accessibility (Kirkwood & Price, 2013). The goal of transforming learning and teaching also drives the growth of online education through the influx of new technologies which are rebuilding education rather than just remodeling it (Joseph, 2014). There is an expectation that educators and students are able to utilize and adapt to technology with the goal of managing the extensive amounts of digital information today (Hampel, 2014).

The advent of the personal computer in education leads us to a world where instructors are increasingly expected to integrate technology into their classroom practices to increase student digital literacy. Digital literacy is a skill that will be critical to student's success in their future workplaces (Johnson, Adams Becker, Estrada, & Freeman, 2015). The mode of delivery, online, blended, or face-to-face, all incur similar technology integration challenges. Instructors must convert the content into digital form, redesign interactions to work within an online system, and learn new tools to deliver grades and administer the course. Face-to-face classes are defined as classes where all instruction takes place face-to-face. Online classes are classes where all instruction takes place online. Blended classes are defined as classes where some of the instructional time set aside as face-to-face is delivered online instead. Every type of technology has both pros and cons for use in the classroom (Campo Yagüe, Negro Valdecantos, & Nuñez, 2012). Instructors must weigh the pros and cons of each new technology to decide how, and if, the technology will improve their educational practice or method of teaching. Campo Yagüe et al. (2012) also state that an instructor's goal is to keep themselves updated to offer students both content and to provide motivation with new technologies. Teachers must choose which technology to use in a world of overwhelming choices.

The growth in the integration of technology has also driven institutions to rely on technology to manage institutional data and to support educational delivery. Higher education institutions are choosing to centralize technology purchases and focus on technology packages that serve a wide variety of functions. Departments and colleges don't have to purchase their own technology systems and the institution provides one

instead. One of the most commonly purchased and used group of technology packages today are referred to as learning management systems. Learning management systems (LMS) are also called Personal Learning Environments, Virtual Learning Environments, Content Management Systems, Course Management Systems, and Collaborative Learning Environments (Cavus & Alhih, 2014). For this study, I will use the term *learning management systems* (LMSs). Learning management systems all have similar features and functionality. Learning management systems are computer programs hosted on a server that allow for content delivery, communications between students and instructors, and course management functions such as grades, or assessment functions. Learning management systems also have online administration, tracking, reporting and documentation available to instructors (Cavus & Alhih, 2014; Dias & Diniz, 2013). In the United States today, 99% of higher education institutions utilize a learning management system to provide a common platform tool to all instructors at their institution to achieve instructional goals (Dahlstrom, Brooks, & Bichsel, 2014). By 2018, higher education institutions are predicted to invest approximately 7.8 billion dollars a year on learning management systems with the goal of supporting instruction (Dahlstrom et al., 2014).

Nationally, 85% of university instructors utilize a learning management system (Dahlstrom et al., 2014). University instructors utilize a LMS in a variety of ways, 58% use it to push out information to students while only 41% of instructors choose to use the LMS to increase interaction among students (Dahlstrom et al., 2014). The majority of instructors either don’t utilize the LMS at all or fail to utilize the full functionality of the LMS (Lang & Pirani, 2014). This is a concern considering the high level of institutional

resources, both financial and in training, being utilized to support LMS usage in an institution. Research is just beginning on the factors that influence an instructor's choice to utilize a learning management system in their classroom instruction with a hope to increase utilization of the available tool, the LMS (Allen & Seaman, 2012b; Bacow, Bowen, Guthrie, Lack, & Long, 2012).

Problem Statement

Not only are learning management systems instrumental for online-only courses but they also offer opportunities to enhance typical face-to-face instruction. These systems provide opportunities for increased collaboration between students and increased contact between the instructor and students as well as storing tracking about the interactions (Bacow et al., 2012; Cavus & Alhih, 2014). There are other benefits of utilizing a learning management system such as ensuring that all students are afforded the same technology based learning tools across university departments and colleges. Choosing a single learning management system for an institution reduces training costs and time. Institutions do not have to provide training for multiple technologies and can focus their support on a single platform. It provides consistency for students since all students have access to the same platform and tools (García-Peñalvo & Alier Forment, 2014). Learning management systems are usually utilized more for support of instruction rather than transforming teaching or directly improving student outcomes (Kirkwood & Price, 2013).

When instructors report on their satisfaction in using a learning management

system, 92% report being satisfied with the functioning and features of their Learning Management System (Dahlstrom et al., 2014). Three out of four instructors across the United States report that the learning management system is a very useful tool for teaching and improving student learning and fifty percent of all college instructors use the Learning Management System daily (Dahlstrom et al., 2014). Even though instructors have high levels of satisfaction and report using the LMS heavily the learning management system can still be underutilized. Instructors may underutilize the LMS by not using the full availability of the tools built into the LMS. The functions that are most often used by instructors are basic course management functions but the higher level functions such as student collaboration are not used as frequently (Allen & Seaman, 2012b; Dahlstrom et al., 2014). Fifty six percent of students say they wish the instructors used the Learning Management System more but many instructors only utilize the Learning Management System for basic tasks such as supplying a syllabus and grades (Dahlstrom et al., 2014). Instructors may also underutilize the LMS by not choosing to use the system at all to enhance teaching in their classes (Baleghi-Zadeh, Ayub, Mahmud, & Daud, 2014; Dahlstrom et al., 2014).

Why instructors choose not to utilize a learning management system at all is the more difficult type of underutilization to understand. It is relatively easy for an instructor to activate a course and upload a syllabus, yet twenty percent of instructors don’t even choose to do this basic instructional step based on a national study of 4,564 faculty and 591 administrators (Allen & Seaman, 2012b). Typically, an institution creates a course shell in the learning management system. Once the shell is created each instructor must

load content and create the gradebook, assessments, or discussion prompts. The instructor must then activate their course shell to allow students access to the course. Even though eighty five percent of instructors nationally use their institutionally provided Learning Management System, the adoption rate by instructors can vary greatly among different institutions (Dahlstrom et al., 2014). For the institution, providing a Learning Management System and supporting instructor and student training as well as technical support for the system is a significant cost (García-Peñalvo & Alier Forment, 2014). Decisions on additional support in technology instruction, pedagogy, or institutional purchases can't be determined without knowing why instructors are choosing to utilize the provided learning management systems and what is preventing the instructors from using the LMS. The decision by instructors to utilize a learning management system to implement learning goals or classroom tasks is not fully understood (Gautreau, 2011). Knowing why instructors are choosing to use a learning management system will help the institution increase usage in the hope of increasing the potential of technology to transform educational practice.

The focus of this research was to investigate factors affecting instructor choice to use of a learning management system in a large sized University located in a rural western state. This research adds information to the gap in knowledge of instructor usage of learning management systems. Instructors and institutions will benefit from understanding the reasons instructors chose to utilize a prevalent educational technology, the LMS.

Purpose Statement

The purpose of this quantitative survey research study was to investigate factors that influence university instructors' choice to utilize learning management systems in instruction. The study investigated the potential links between task technology fit, ease of use, usefulness, attitude, an instructor's intention to use a learning management system and their actual use of the LMS.

Research Questions

This study has the following guiding questions:

1. How do instructors describe the factors that influence their decisions to use a Learning Management System?
2. What is the frequency of use of "basic" learning management system tools?
3. How do face-to-face and online/blended faculty perceive ease of use, usefulness, their attitudes, their intent to use the system, and the task technology fit of learning management systems?
4. Is there a relationship between task technology fit, the Technology Acceptance Model (TAM) factors, and Actual Technology use for face-to-face and online/blended instructors?

Theoretical Framework of the Technology Acceptance Model

This study is based on Davis's (1989) Technology Acceptance Model (TAM). TAM was specifically designed to predict a user's adoption of a form of technology. In 1999, Dishaw and Strong added the Task Technology Fit construct to the model. For the purposes of the present study, the construct, Task Technology Fit, assists in investigating the subtleties of why instructors choose to utilize a learning management system to support their instructional goals.

The Technology Acceptance Model (TAM) has its foundation in the Theory of Planned Behavior. Both the Theory of Planned Behavior and its precursor, the Theory of Reasoned Action, investigate why people behave in certain ways in situations when people have limited control over the actions being performed (Ajzen, 1991). When an instructor chooses to use technology, in particular a learning management system, the instructor has choice over using the system but the functions that the system provides are beyond their ability to change. This makes the choice of using a LMS a prime example of a system that the TAM model can be used to predict usage. Predicting behavior is very complex and can include social attitudes, behavioral dispositions, and personality traits (Ajzen, 1991). The Technology Acceptance Model applies the Theory of Planned Behavior to users of technology with the underlying assumption that users can choose to adopt technology to implement a task.

The Technology Acceptance Model was one of the first models designed to investigate worker technology acceptance and how that influenced the worker intent to

use technology. Davis (1993) believed that user acceptance is often the pivotal factor in determining the success or failure of implementing new technology. The Technology Acceptance Model presumed that the user's awareness of the usefulness and feelings of ease towards technology influenced the user's attitudes towards utilization of technology (Huang, Deggs, Jabor, & Machtmes, 2011). Usefulness of technology is described as the extent to which a user believes using technology would enhance his or her job performance. Ease of use of the technology is the extent to which a user believes that using technology would be free of effort. Both perceived usefulness and perceived ease-of-use are predictors of a user's attitude toward technology which in turn impacts the user's intent to use technology (see Figure 1.1 below) (Viswanath Venkatesh, Morris, Davis, & Davis, 2003). In this case, intention to do a specific behavior is a predictor of actually performing the behavior (Stone, Kisamore, & Jawahar, 2007).

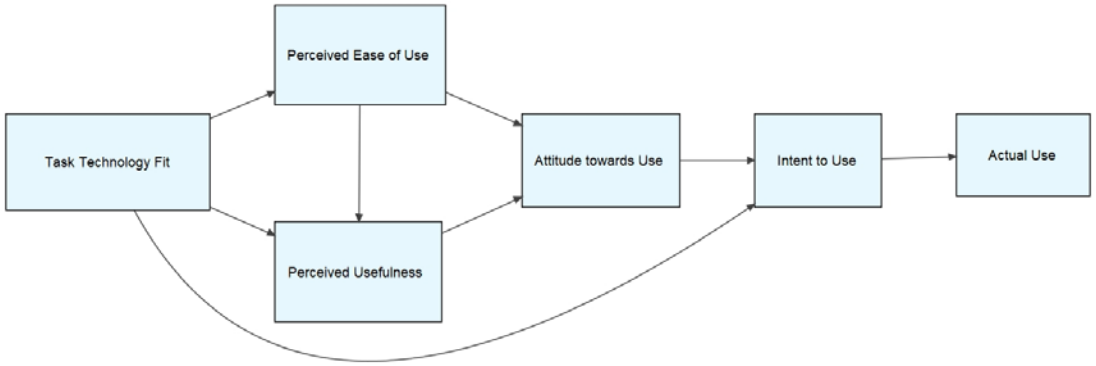

Figure 1.1 Technology Acceptance Model with Task Technology Fit Extension (Dishaw & Strong, 1999)

The sensitivity of the Technology Acceptance Model is confined to overall system

usage and is not designed to measure the actual use of specific tools down to a task level (Schoonenboom, 2014). The additional component, Task Technology Fit, is added to increase the sensitivity of the model to measure actual tool usage on a finer scale (Dishaw & Strong, 1999; Schoonenboom, 2014). Task Technology Fit comes from a background of designing technology to fit the task that users are truly performing (Dishaw & Strong, 2005). The basis of the construct is that technology will be used if its function supports the task of the user. The alignment of task and function is termed the task technology fit (Dishaw & Strong, 2005). If the task does not align with the function of the technology, then the user will choose another way to accomplish the task. Task technology fit predicts the actual use of the tools, that is, the better the fit, the higher the chance of the tool being used.

There are two major factors that influence task technology fit: task characteristics and tool functionality. Task characteristics describe the actual activity required from the task and tool functionality describes the functions that a particular tool can accomplish. Both components are integral to task-technology fit (Dishaw & Strong, 2005). Task technology fit is a strong predictor of actual tool usage but the user's tool experience also influences the user choosing to perform the task with a particular technology. The task and technology tool might exhibit a high degree of fit but if the user has no experience with the technology tool then the user might choose to perform the task in another way. The Task Technology Fit construct does not predict actual tool use but instead becomes a predictor of the perceived ease-of-use and perceived usefulness of the tool. The ease-of-use of the tool then influences both the attitude of the user towards the technology and the

perceived usefulness of the tool. The easier a tool is to use the more positive the attitude and perceived usefulness a user might have (Schoonenboom, 2014). The perceived usefulness in turn influences the user's attitude as well as their intention to use the tool. Task Technology fit also influences the intention to use the tool which in turn predicts the user's actual tool usage (Davis, 1989; Schoonenboom, 2012; Viswanath Venkatesh et al., 2003). The Technology Acceptance Model with the addition of task technology fit will be used in this study to provide a model with the greatest potential sensitivity to determine the factors in the underutilization issue of a learning management system.

Conceptual Framework

The conceptual framework grounding this study links together the theoretical Technology Acceptance Model with the quantitative survey research methodology to investigate the utilization of a learning management system by instructors (Figure 1.2). The conceptual model integrates the concepts of task technology fit along with technology acceptance and instructor actions.

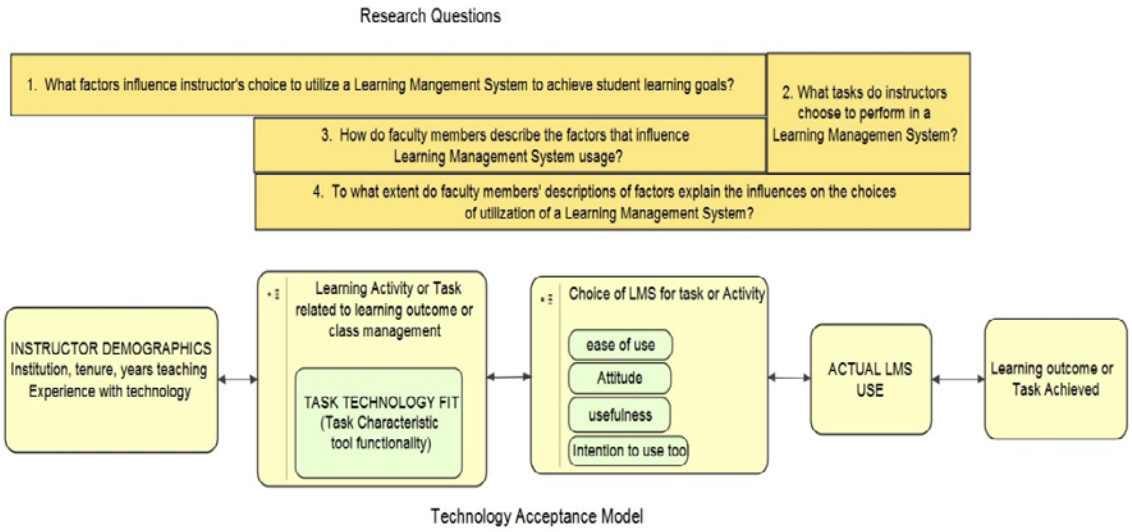

Figure 1.2. Proposed conceptual model of the Technology Acceptance Model and Instructor choice to utilize a Learning Management System.

There are several stages an instructor must go through in choosing to use a learning management system to help in their classroom instruction. The first stage begins with the instructor deciding to perform a specific task. The instructor has many influences on the decision of what kinds of tasks to perform while teaching and addressing the learning outcomes of their students. The instructors' teaching style, years of teaching, discipline, experience with technology, and the type of institutions and culture of the institution all impact their choices of tasks to perform and which technology tools are considered for the task (De Smet, Bourgonjon, De Wever, Schellens, & Valcke, 2012).

The instructor must decide if the task they want to perform fits with the function of the technology available within the learning management system. The task characteristics must align with the tool functionality of the learning management system

for instructors to view the learning management system as a viable tool to help in classroom instruction.

If the task – technology alignment or fit is high, there is a chance that the instructor will consider using the learning management system to perform the task. The choice of using the learning management system is influenced by the instructor's perception of how useful and easy-to-use the learning management system is. The instructor's attitude towards the system also impacts the instructor's intention to utilize the learning management system.

The areas of learning management system functionality might have an influence on what types of tasks the instructor chooses to use the learning management system for. Common functions in a learning management system are classified in this study as collaboration, course management, content delivery, communication, and assessment (Allen & Seaman, 2012b). Instructors might utilize one function of the learning management system but never utilize another. For example, if an instructor does not use tests or quizzes in their class then they might never choose to use the learning management system for assessment. Most instructors do hand out a syllabus to their class so a feature of concern in this study is what motivates instructors to choose the LMS content delivery functions as the tool for the task of delivery of the syllabus to students (Allen & Seaman, 2012b). Activating a course for delivery of a syllabus is the minimum act for this study's definition of utilization of the LMS system.

This study is a quantitative survey research project set in a mid-sized institution in the Pacific Northwest. Instructors who are tenure track, tenured, non-tenure track,

adjunct, or graduate research or teaching assistant who taught in the fall of 2016 were surveyed to determine their perceptions of why they choose to use a learning management system to support their teaching.

Assumptions

All instructors in the study have access to the learning management system for all courses where they are officially the instructor of record. The instructor of record is officially listed by the registrar's office and is automatically loaded into the learning management system. It is assumed that all instructors know that a course in D2L is automatically built when they are instructor of records. All instructors have access to institutionally led training on use of the learning management system tools. Courses are automatically created in the learning management system based on courses listed by the registrar's office. Students are automatically populated into the learning management system based on the courses they are registered for.

Limitations and Delimitations

This study was limited to participants at a Pacific – Northwest university where a learning management system is provided for all courses. Instructors may or may not have activated their courses. This limitation was due to the specification of the research model which required the instructor to activate the course in the LMS. Activating a course for delivery of a syllabus is the minimum act for this study's definition of utilization of the LMS system. The results may not be generalized to institutions without

a centrally provided learning management system where all courses are automatically populated into the system and must be activated by instructors. Participants who choose to respond to the survey who are either great supporters of technology or who have strong feelings against the learning management system may be overrepresented in the survey. All data collected is through self-reported surveys of the instructors' perceptions. There may be a tendency to report data that they perceive the study is looking for. Self-reporting may have produced responses that either over or under reported their use of tools and perceptions of the learning management system. Groves et al. (2011) report that as the number of items to be recalled increase, respondents go to a rate-based estimation method that is prone to overestimation. Actual course content is not investigated or evaluated for the utilization of the learning management system so there is no inherent check on instructor responses.

Definitions

Blended Course – A course that is partially offered through the internet using technology and partially face-to-face. Some of the face-to-face time required is substituted with online time.

D2L – Desire to Learn -An enterprise web-based software learning management system designed for the delivery of web enhanced or online learning.

Course Activation – Instructor selecting to open the class for students to view.

Course Provision – Automatically creating a course shell for every course in a university system.

Face-to-Face Course – A course that is offered where students must be present in person to take the course.

Instructor – Instructors are either tenured, tenure track, non-tenured, adjunct or graduate research assistants or graduate teaching assistants.

Learning Management System – An electronic, server based, collection of tools that support student learning.

Online Course – A course that is offered through the internet using technology. No classroom space is allocated at the institution for the course.

Partial Least Squares Structural Equation Modeling - a multivariate data analysis method utilized for causal modeling with no assumptions about data distributions.

Web enhanced Course – A course that is offered face-to-face with additional materials or features offered online.

Significance of the Study

If we understand the reasons instructors are not utilizing the learning management resource, we can increase support or training to increase use and also focus institutional resources to purchase resources instructors will use. Instructors can choose to use the LMS for administrative support or to enhance innovative pedagogy in the classroom (Sinclair & Aho, 2017). The institution can learn how to mitigate the reasons the instructors are not utilizing the system. This study will add to the body of knowledge about the interaction of instructors and the electronic tools available to support teaching and learning. The knowledge gained from the relationship between instructors'

technology acceptance and their perception of the task-technology fit will help inform higher education administrators and decision makers on limits of the learning management use at their institution. Technology acceptance and task – technology fit have been related to intent to use technology (Davis, 1989; Dishaw & Strong, 2005; Schoonenboom, 2012). By removing barriers in using technology, colleges and universities can leverage their investment in technology and improve their instructors' effectiveness in teaching through the use of a learning management system.

Summary

Higher education institutions invest a significant amount of money into learning management systems to support teaching and learning with the expectation of high instructor usage. Instructors are under pressure from university administrators to integrate electronic resources, such as the learning management system, into their daily instructional duties. It is unreasonable to expect that university instructors can automatically transfer their teaching style into an online format without training and structure.

Instructors need more than just training on electronic tools to begin integrating the learning management system into their teaching. The greater the body of empirical knowledge about technology acceptance and task-technology fit, the more resources an instructor will have to appropriately integrate technology. Institutions can help in the process to provide resources to instructors interested in incorporating the learning management system and providing quality technology experiences for students.

Technology, such as the learning management system, can be used to transform teaching to more active forms that include collaboration and social interactions. Some of the benefits of utilizing a learning management system include increased collaboration and interaction with students, differentiated learning, easy updating of materials, and increased monitoring of student progress (Hampel, 2014; Malikowski, 2008). Technology can also be used for administrative tasks such as providing resources, communication, and grades. Little is known about the direct connection between specific technology and student outcomes (Kirkwood & Price, 2013). This study will address the lack of information about thne factors that influence an instructor's choice of using a learning management system with the aim of providing guidance to institutions interested in increasing LMS use.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter provides an overview of studies on the factors that influence university instructors' choices to utilize learning management systems in instruction. The chapter provides the organization, development, and use of learning management systems as well as methods of measuring learning management usage in higher education. A variety of academic search engines were utilized including JSTOR, ProQuest Central, Web of Science, ERIC, Academic Search Complete, and Science Direct. Search terms included learning management system, task technology fit, technology acceptance, technology acceptance model, technology and higher education, and teaching with technology.

Universities have a long history of trying to offer education to students who are not able to physically attend campus classes (Allen & Seaman, 2013; Eskey & Roehrich, 2013). For example, in the early 1950's the University of Wisconsin was awarded a contract for the education of the Armed Forces servicemen on active duty (Eskey & Roehrich, 2013). More recently, the development of the internet and e-mail greatly expanded distance education. E-mail gave the student and the instructor the opportunity to correspond much quicker and to have a deeper discussion of content. The development of the Internet and associated technologies has increased the ability for the instructor and

student to communicate online in real time to exchange ideas and discuss the content of the course. In fact, approximately thirty-one percent of all college students had taken at least one online course as of 2010 (Allen & Seaman, 2011). In 2012, 6.7 million students had taken at least one online course (Allen & Seaman, 2013). Online education continues to grow at a rate of 9.3 percent, which is slower than the previous 10 percent growth rate in previous years (Allen & Seaman, 2011, 2013; Eskey & Roehrich, 2013). Many of the students taking courses are non-traditional students who can't fit traditional face-to-face courses into their schedules or are place bound and can't come to campus. The greater maturity of the non-traditional students help them achieve success in online courses (Mann & Henneberry, 2012).

Online education can provide reliable instruction at a reduced cost (Crawford-Ferre & Wiest, 2012). The reduced price of online education as well as the increased availability of technology has made the task of integrating technology more prevalent. Technology integration is seen in three forms in higher education classwork: online, blended, and web-enhanced. The term online education is a narrower definition and refers to online courses that utilize the internet to allow interaction between instructors, students and materials (Anderson, 2009). Courses can be fully online or they can be blended, which combines both face-to-face components as well as online components. In blended classes, online instruction replaces some of the face-to-face time. Courses can also be web-enhanced where all the primary instruction is face-to-face but online technologies are used to enrich the classroom instruction by providing support functions or information.

The most common technology system in use to support online, blended and web-enhanced courses is the learning management system (García-Peñalvo & Alier Forment, 2014). Over ninety percent of all institutions have a learning management system (Lonn & Teasley, 2009). However, there is limited research about why instructors adopt new technologies such as learning management systems or how they use these technologies after adoption (Torrisi-Steele & Drew, 2013). Torrisi-Steele and Drew (2013) reviewed 827 articles located through the Web of Knowledge in 2011 and found that in blended learning, twenty five percent of research is on student use of technology, 69% of research is on how to use tools, 5% of research is on academics but only 0.6% of research is focused why instructors do or don't use technology. There is a need to understand why instructors choose to use a learning management system as well as how they use the learning management system with an ultimate goal to transform teaching practice. The way that an instructor approaches teaching their class influences their use of technology and technology can be utilized to support active teaching styles (Kirkwood & Price, 2013). One of the goals of active learning is to mimic the learning environment in industry so that students are able to compete in a digital world (Johnson et al., 2015).

Learning Management Systems

A learning management system is a set of software tools designed to deliver, track, and administer educational experiences (Cavus & Alhih, 2014; Dias & Diniz, 2013). Learning management systems are comprised of a variety of tools located within a surrounding user management system (Gautreau, 2011; Hampel, 2014). The tools are

designed to be used by instructors with little training with the intent to make instructors more productive and effective in their teaching (S. Lin, Shih, & Chuang, 2013). The three most commonly adopted learning management systems in 2013 include Blackboard, Moodle, and Desire2Learn (Dahlstrom et al., 2014; Lang & Pirani, 2014). A wide variety of open source learning management systems such as Sakai and Canvas are gradually occupying a greater percentage of the learning management systems in use (Dahlstrom et al., 2014; Lang & Pirani, 2014). The functions common to learning management systems remain stable but as technology improves and companies work to gain a greater market share of business, individual learning management companies are creating customized tools. Tools common to all learning management systems include e-mail, a content area, gradebook, discussion area, and assignment area.

All learning management systems include tools that allow instructors and students to share materials, communicate, turn in assignments, assign grades, and make announcements (Dahlstrom et al., 2014; Lonn & Teasley, 2009). Learning management systems can capture data on how users interact with various components of an online/blended course and the data gathered can be useful in improving tools (Cator & Adams, 2013; Means, Toyama, Murphy, Bakia, & Jones, 2009). Instructors report that having evidence that student learning is increased through using technology would increase their use of a learning management system (Dahlstrom et al., 2014).

Studies have been conducted comparing the learning outcomes from online and face-to-face equivalent courses (Allen & Seaman, 2011, 2013). These studies show that learning outcomes for each delivery mode are similar regardless of the type of media or

technology utilized (Cator & Adams, 2013). For example, Mann and Henneberry (2012) report that there is a positive relationship between inclusions of some web 2.0 tools such as Facebook and Skype and the willingness of students to take an online course. Research has also shown that the inclusion of interactive multimedia in online courses improves student learning (Dikshit, Garg, & Panda, 2013). All of these factors impact an instructor's actual use of a learning management system.

How instructors utilize a learning management system is unique to each instructor (Musarrat & Williams, 2013). Many instructors do not choose to utilize a learning management system even though research shows many benefits. Some of the benefits of utilizing a learning management system include increased collaboration and interaction with students, differentiated learning, easy updating of materials, and increased monitoring of student progress (Hampel, 2014; Malikowski, 2008). Instructors give a variety of reasons for increasing the utilization of a learning management system including seeing more value with the tools, increased comfort with the interface, and mentoring from other instructors (Malikowski, 2008). The interface is the look and function of the system that a user interacts with to do a task. Understanding why instructors choose to utilize a learning management system and how they utilize the system will help institutions support the learning management system to improve educational outcomes (Lonn & Teasley, 2009; T. J. McGill & Hobbs, 2008).

The Technology Acceptance model describes six factors that are commonly identified in relationship to an instructor's choice to utilize a learning management system (Dishaw & Strong, 1999). These factors are ease of use, usefulness, attitude, task-technology fit, intention to use, and actual tool use. The ease of use relates to how easy the instructor feels the LMS is to use. Usefulness and task-technology fit both relate to the alignment the instructor sees between the tasks they do to teach a class and the functionality of the learning management system. The more useful a task is to teaching and the more aligned the technology is to the task, the greater the chance is that an instructor will chose to utilize the LMS. The more positive attitude of the instructor towards utilizing technology, in particular the LMS, the more chance that the instructor will have a greater intention to utilize the LMS and will follow through and actually use the Learning Management System in their teaching. The technology acceptance model is designed to predict the actual use of the LMS as determined by the instructor's intention to use the system, figure 2.1.

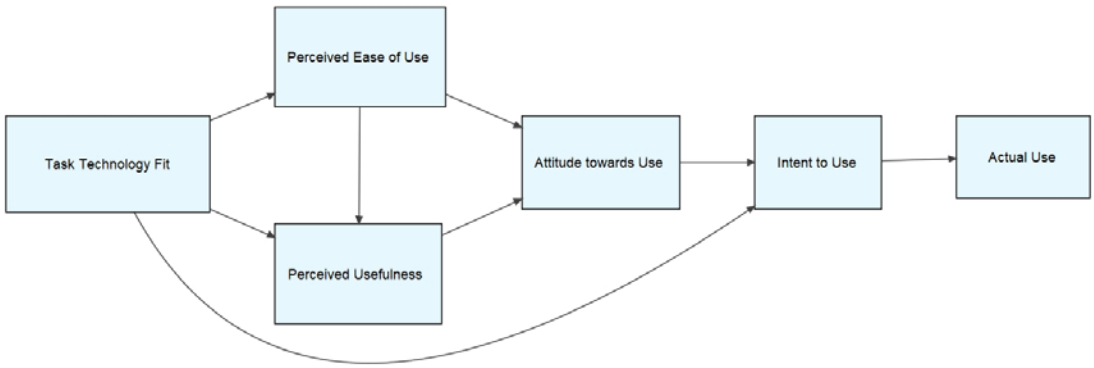

Figure 2.1 Technology Acceptance Model with Task Technology Fit Extension (Dishaw & Strong, 1999)

Learning Management System Use by Instructors

Determining the actual learning management use can be a complex issue. Learning management system use can be measured in two primary ways. The first way is to measure the depth of the actual use of the system. This method entails having access to every course an instructor teaches and examining how frequently each tool in the learning management system is used as well as how elaborate the use of the tool is. This method is designed to describe how users of the learning management system use the online technology (Schoonenboom, 2014). The second method does not measure actual learning management system use but instead looks at instructor's intention to use the system, which in turn predicts use of a system (Davis, 1989). Intention to use a learning management system is usually obtained through instructors self-reporting LMS usage in a survey rather than a researcher going into the LMS to measure depth of usage (Wang & Wang, 2009).

There is an array of online technologies to help support online, blended, and web enhanced courses. Evaluating and learning all of the new tools available in online learning is a daunting task (Cator & Adams, 2013). New products are being created each year from a variety of vendors. Instructors are in charge of not only learning how to change their pedagogy for online instruction but also having to learn a whole new set of tools available to deliver the content. The primary reason identified for instructor's lack of adoption of online tools was instructors' lack of knowledge about the tools that were available and how they could enhance instruction toward accomplishing course objectives (McClary, 2013).

The most common use of a learning management system is for course content delivery (Allen & Seaman, 2012b; Jurado & Pettersson, 2011; Malikowski, 2008). The most basic type of content delivery is for the instructor to provide a syllabus to communicate course expectations (Newlin & Wang, 2002). Few instructors provide in depth content delivery (Allen & Seaman, 2012b). Other common learning management system functions are assessment and communication (Allen & Seaman, 2012b). More and more instructors are utilizing the course management functions of the learning management system to track student progress through the content to see if students are reading all assignments and even how long students take on each part of the content (Bacow et al., 2012; Calisir, Altin Gumussoy, Bayraktaroglu, & Karaali, 2014).

Teaching online is similar to teaching in a face-to-face classroom in the sense that the instructor must convey information, manage communication, and perform support tasks such as grading and classroom management (Sinclair & Aho, 2017). However, when using learning management systems for online instruction there are additional teaching strategies available that particularly support important instructional interactions. Chickering and Gamson (1987) listed seven principles of good practice in undergraduate education that have since been applied to online and blended courses including; encouraging instructor/student contact, developing reciprocity and cooperation, engaging in active learning, providing quick feedback, emphasizing the amount of time dedicated to a task, communicating high expectations, and respecting diversity (Babb, Stewart, & Johnson, 2013). Five of the seven principles are based on interaction. The high level of interaction necessary for utilizing a learning management system in courses proves

difficult for many instructors. Effective course that take advantage of a learning management system are based on four types of interaction; student - instructor interaction, student- student interaction, student - content interaction, and student – interface interaction (Corry, 2008; Kuo, Walker, Belland, & Schroder, 2013; Thurmond & Wambach, 2004).

There are also many challenges to teaching with technology. An instructor must pre-plan a course in more detail than often found in a face-to-face course which places increased upfront time investment on the instructors part (Bacow et al., 2012). The increase in the amount of communication with students, and meeting students 24/7 expectations of communication, take more instructor time (Allen & Seaman, 2012b). Instructors report that not only the lack of time to implement a course but also a lack of resources and expert help keep them from using technology in their teaching (Watty, McKay, & Ngo, 2016). Faculty also report that the work they do online is not rewarded at the same level in the tenure process as work done face-to-face (Allen & Seaman, 2012b).

Learning Management System Interactions

The functionality of the Learning Management System is highly impacted by the four types of interaction found in the classroom. Instructors need to understand the types of functionality a learning management system can provide in order to choose to use the technology.

Instructor-student interaction is the most commonly investigated interaction. Every time the instructor communicates with a student it adds to the instructor -student interaction. Instructors have several areas where communication occurs including the discussion forum where instructors set up the main interaction area of the course. The discussion area is where most evaluations measure the learning community in the classroom (Eskey & Schulte, 2012). Instructor-student interaction also happens in news items, e-mails, video messages, chats, webinars, and responses to student work (Santilli & Beck, 2005). Students value the interaction with their instructors and view this interaction as a demonstration of teacher presence in the online environment. There is also a positive correlation with the amount of instructor interaction and students perceived learning (Thurmond & Wambach, 2004). The student-instructor interaction helps define and explain the content as well as expanding on navigating the course.

Student-student interaction is also an important factor in quality online courses. Students may be working directly with another student or with a team. Collaborative learning has proven to increase learning outcomes and to lessen learner isolation in online courses (Abrahamson, 1998; Crawford-Ferre & Wiest, 2012). Studies have looked at the depth of conversation between students in the discussion area of online courses and found that the depth is greater than interactions that occur in face-to-face courses. Many student who are reluctant to talk in a face-to-face class talk more in an online course (Thurmond & Wambach, 2004). Part of this might be to the anonymity of online courses (Mann & Henneberry, 2012). Students may feel more comfortable posting messages and have more time to compose a message than they do in a traditional classroom. Instructors can utilize

a variety of tools inside of a learning management system to foster student-student interaction including discussions, wikis, chats, video and audio conferencing.

The third type of interaction is between the student and the LMS system itself. The student-interface interaction is constantly changing as new technologies are folded into the learning management system. The way that the student interacts with the technology impacts their learning in online courses (Thurmond & Wambach, 2004). The students' experience in technology and their access to technology impact the student-interface interaction. Inexperience with technology can increase anxiety, but studies have shown that after more experience in online courses is gained the anxiety decreases and the perceived learning increases (Crawford-Ferre & Wiest, 2012). Lack of access to technology or interactions with technology that do not work increase anxiety in online courses and may negatively impact students' perception of learning in the class (Thurmond & Wambach, 2004). Every aspect of how an instructor uses the learning management system impacts the student-interface interaction. When an instructor adds a news item, sends an e-mail, posts a discussion, gives a grade, or comments on assignment the instructor is providing an opportunity for the student to interact with the system while navigating the course (Lonn & Teasley, 2009).

The fourth interaction type, student-content interaction, is one of the least studied (Terantino & Agbehonou, 2012). This interaction consists of the student interacting and reflecting on the subject matter of the course (Kuo et al., 2013). Studies have shown that the design of the online content in the learning management system may be the most important contributor to student satisfaction (Kuo et al., 2013). The design of the content

is more complex than just what information is presented. The way the information is presented is critical (Nworie, 2012). Instructors organize the content, decide on document layout, and include tools to increase student interaction and interest in the content (Kuo et al., 2013). Instructors must keep in mind behavior of the students, learning styles, media familiarity, time it takes to do each task, level of participation required, and the quality of the assignments (Dikshit et al., 2013; Hachey, Conway, & Wladis, 2013). Instructors must include multiple methods of content delivery including both asynchronous and synchronous activities as appropriate (Calli, Balcikanli, Calli, Cebeci, & Seymen, 2013; Crawford-Ferre & Wiest, 2012). The multiple methods of content delivery can include items such as videos, PowerPoint, e-mail, chat, webinars, documents, external web links, images, animations, web pages, journal articles, textbook chapters, audio files, blogs, social media, quizzes and surveys, and case studies or problem based learning (Calli et al., 2013; Singleton et al., 2013). The combination of all of the learning tools must make sense to the learner, which forces the instructor into the role of being the expert of how and when to use all of the tools (Corry, 2008). Failure to create a coherent, unified course from all of the technology available increases the failure rate in online courses, which have been reported in national surveys to average up to thirty to forty percent (Hachey et al., 2013; Pituch & Lee, 2006). Instructors in a national report greater stress levels when using digital technology in their classes (Allen & Seaman, 2012b). Sixty six percent of instructors, in a national study of online education, report that their perception is that learning outcomes in an online course are not as good as in a face-to-face course (Allen & Seaman, 2012a).

Task Technology Fit

Task technology fit is a key factor in an instructor's use of a learning management system for instruction. Instructors' intentions and attitudes towards use of a learning management system are rarely formed in isolation. There are numerous factors in an instructors' work environment than can impact their intentions to use a learning management system. Recent studies have focused on the influence of the relationship between the task to be performed and the ability of the learning management system to be able to perform the task (Dishaw & Strong, 1999; Tanya J McGill & Hobbs, 2006; Schoonenboom, 2014; Strong, Dishaw, & Bandy, 2006). The Task Technology Fit Theory describes the connection between the task and the ability of the technology to perform the task. If the connection is strong then the instructor will perceive that the learning management system is useful, easy to use and will actually choose to use the learning management system to do the task (Dishaw & Strong, 1999, 2005). A study by Schoonenboom (2014) investigated how instructors use the tools in a learning management system. Results from his research determined that the characteristics of the task, as well as the functionality of the learning management tool, impacted the overall relationship between the task and the learning management system, the task technology fit also impacted how easy the instructor felt the learning management system was to use.

The characteristics of tasks in an online or blended class impacts the instructor's choice to use a learning management system. Online technologies have changed the way students receive and communicate with the instructor and other students in higher education classes. It has also changed the way that instructors teach their online classes

because of the numerous new tools available for use (Nworie, 2012; Singleton et al., 2013). Interaction with content is an internal process where the learner is reflecting on the content and the interaction is usually triggered by an event in the learning management system: the reflection is supported by the structure of the learning management system (Dias & Diniz, 2013). E-learning with online technologies provides an opportunity for an engaging environment where learners can interact with dynamic content, have collaborative opportunities, and experience non-linear content to create an unique learning path (Cavus & Alhih, 2014). Non-linear content is describing learning opportunities where learners can take a unique path through the information based on their mastery of required concepts. A learner who shows content mastery can navigate the class quickly and a learner who needs remediation can be provided with extra opportunities to learn. These new types of interactions change the characteristics of the tasks needing to be performed in the classroom and can impact the task technology fit (Dishaw & Strong, 1999).

Perceived Ease of Use of Learning Management Systems

The perceived ease of use of a learning management system is also related to attitude. The perceived ease of use of a system does not directly impact the intention to use a learning management system but the ease of use does impact both the perceived usefulness as well as an instructor's attitude towards use of the learning management system (McFarland & Hamilton, 2006). The easier an instructor perceives a learning management system is to use the more an instructor might actually use the system and

thus find the learning management system useful. In addition, if the learning management system is easy to use the instructor could have a more positive attitude towards the use of the learning management system (Islam, 2013; McFarland & Hamilton, 2006).

Perceived Usefulness of Learning Management Systems

Perceived usefulness is related to an instructor's attitude towards utilizing a learning management system. If an instructor perceives that a learning management system is useful and the instructor has a positive attitude towards the use of the learning management system then the instructor can be predicted have a higher intention to use the system (Klopping & McKinney, 2004). If the instructor does not believe the learning management system is useful or if the instructor has a negative reaction to the learning management system then the instructor can be predicted to not want to use the system (Klopping & McKinney, 2004). Perceived Usefulness has been shown in other quantitative survey studies to influence user's attitude towards technology as well as a user's direct intent to use a system (Wu & Chen, 2017). Usefulness is one of the most powerful predictors of technology use (Davis, 1989; Ducey & Coovert, 2016).

Instructor Attitudes Toward Learning Management System Use

An instructor's attitude toward a learning management system is a factor in an instructor's use of learning management systems. Numerous studies have focused on how to measure the technology acceptance level of instructors in an effort to identify how to increase their use of technology in online courses (Buchanan, Sainter, & Saunders, 2013; Calli et al., 2013; Davis, 1989; Huang et al., 2011; Park, Lee, & Cheong, 2007; Payette &

Verreault, 2011; Pituch & Lee, 2006; Viswanath Venkatesh et al., 2003). Buchanan et al. (2013) surveyed 114 faculty to investigate the factors associated with the use of technology in learning. They found that self-efficacy, which was an alternate measure of ease-of-use, structural factors and perceived usefulness were positively associated with use of technology. Calli et al. (2013) chose to study e-learning by surveying 930 students about their perceptions of playfulness, ease-of-use, and multimedia effectiveness. Even though the study was focused on students it provides evidence of the ease-of-use of technology. All three factors had a positive effect on usefulness which had a positive effect on satisfaction and e-learning tool usage. It has been shown that instructors' attitudes and acceptance of technology determines how successful they are in utilizing technology in their online teaching (Hsiao, 2012). In the Technology Acceptance Model attitudes towards behaviors impact actual use of technology (Davis, 1989; Viswanath Venkatesh et al., 2003). Attitude is often not a strong predictor of intent to use technology (Viswanath Venkatesh et al., 2003; Yang & Yoo, 2004). Yang and Yoo (2004) found that there are two components in attitude, affective and cognitive. Affective attitude refers to how much the user likes the technology while cognitive attitude refers to the user's beliefs about an object. Cognitive focused questions are better at mediating ease of use and usefulness on intent to use technology (Yang & Yoo, 2004).

Instructor Intention to Use Learning Management Systems

An instructor's intentions to use a learning management system is used as a predictor of an instructor's actual use of a learning management system (Davis, 1989).

The intentions to use a learning management system do not measure actual learning management system use. Rather, intent to use is a self-reported measure where instructors predict intention to use the system. This construct does not indicate the frequency or depth of use for each tool in the learning management system. However, this construct does address both instructors who use the learning management system as well as users who don't use the system. Intent to Use has been chosen for this study as a key indicator of an instructor's choice to either use or not use the learning management system. This adds to the body of knowledge of why users choose to utilize a new online technology and in particular adds information as to why learning management systems are underutilized (Gautreau, 2011).

Learning Management System Experience

An instructor's learning management system experience is linked to the training instructors receive in the system. The better trained the instructors are the more likely they are to use the system (Cigdem & Topcu, 2015). The increase in online technologies has created a critical need to train instructors to use technology more effectively in their teaching. Adoption of online and blended learning in higher education institutions and changes in the technology available have outpaced support systems for training instructors (Singleton et al., 2013). Often instructors are left out of the discussions when institutions are adopting online education systems and the instructor expertise may be ignored (Ioannou & Hannafin, 2008; Singleton et al., 2013). Instructors are typically presented with a learning management system and provided with training on how to use

the tools in the system. Nworie (2012) suggests that there needs to be stronger Distance Education leaders who can guide instructors in moving from face-to-face instruction into the online world while still utilizing the tools and incorporating the appropriate pedagogy.

One of the barriers preventing instructors teaching online is the difficulty instructors have in determining how to deliver the content of their course online (McClary, 2013). Instructors are given training on how to operate the online technology tools but instructors still struggle to determine how to deliver their content online (Faux & Black-Hughes, 2000). Novice online instructors are faced with the challenge of either capturing their lectures by a video capture device or webcam or by transcribing their traditional lectures and putting the transcription online or by designing a combination of content, readings and assignments to deliver the content (Hopewell, 2012). Instructors must know the tools and how to use them as well as the pedagogic advantages and disadvantages of each tool function. Instructors also must know how to integrate the tools into a course (Torrisi-Steele & Drew, 2013). Adoption of technology requires course realignment and a shift to more student driven instruction where the students must take more responsibility for learning (Torrisi-Steele & Drew, 2013). The inclusion of a learning management system allows new opportunities and challenges with student interactions, both with other students and the instructor, as well as with course management issues such as assignments, evaluation, and content delivery and grading (Boling, Hough, Krinsky, Saleem, & Stevens, 2012). Teaching online requires a different

pedagogy and set including becoming a mentor and coordinating the learning rather than lecturing (Boling et al., 2012).

Summary

Instructors are increasingly pressured to utilize the university provided learning management systems which requires aligning their classes to the new technology. Instructor resistance to technology use is one of the key deterrents to the continued increase in online education (Huang et al., 2011). A variety of factors ranging from ease of use to task technology fit influence an instructor's choice to use a learning management system in their classroom teaching. The information gathered by investigating the relationship between these different factors can be used to predict how instructors will use the learning management system. Predicting LMS usage is important because technology has changed the way in which instructors teach (T. McGill, Klobas, & Renzi, 2011). Wang and Wang (2009) state that the number of users of a LMS is growing slower than expected considering the growth of online and blended education. Understanding the relationships between factors influencing instructor use of learning management systems can also be used to help institutions determine where additional professional development can be used to ease barriers to increased utilization of the learning management systems.

CHAPTER THREE

METHODS

Introduction

The goal of this study was to investigate the potential links between task technology fit, ease of use, usefulness, attitude, an instructor's intention to use a learning management system and their actual use of the LMS. This study collected information focusing on describing the research participants and investigating factors that influence and instructor's use of a learning management system. The participants were asked to identify the actual tasks they perform in a learning management system as well as their perceptions about the learning management system.

Research Questions

This study addressed the following research questions:

1. How do instructors describe the factors that influence their decisions to use a learning management system?
2. What is the frequency of use of "basic" learning management system tools?
3. How do face-to-face and online/blended faculty perceive ease of use, usefulness, their attitudes, their intent to use the system, and the task technology fit of learning management systems?

4. Is there a relationship between task technology fit, the TAM model factors, and Actual Technology use for face-to-face and online/blended instructors?

Research Design

This study utilized a quantitative, non-experimental, survey method research design. The quantitative focus of this study allowed for testing of hypotheses about the relationship between constructs (Creswell, 2009). Partial Least Square structural equation modeling was utilized to allow a deeper understanding of the relationship between the constructs of the research model (Grimm & Yarnold, 1995).

Quantitative data on the Technology Acceptance model was collected through an online questionnaire. The survey also included open-ended questions focused on instructor perceptions of their use of a learning management system.

Context of the Study

This study was conducted in a mid-sized Northwest Pacific Carnegie research 2 classified institution. This semester was chosen to provide information on LMS usage in a single point in time. Fall semesters at the study institution traditionally have the highest number of classes. In fall of 2016 the institution had 16,440 students and 981 instructors. The number of instructors included tenure and adjunct instructors but did not reflect the use of graduate teaching assistants to teach classes which was not reported by the institution. The institution utilized the learning management system, Desire-to-Learn (D2L). Each semester every course offered was automatically provisioned into the

learning management system. Instructors did not have to request a course to be placed into D2L. Students and instructors were automatically enrolled into the learning management system. Students were placed into the courses they were enrolled in and instructors were placed into the assigned courses. All instructors had access to the learning management system and the courses they taught. Instructors must be listed as the instructor of record in the registrar's office to have instructor access in D2L. Instructors must manually activate the course in order for the course to be visible to students. The number of courses provisioned, potential courses and activated courses in D2L from fall 2014 to fall 2016 are shown in figure 3.1 below. All courses created by the registrar's office are imported into D2L and considered provisioned. Potential courses for instructors to activate were calculated by removing all courses from the registrar's office that either had zero registrations or staff listed as the instructor of record. There is no expectation of an instructor with zero registrations to activate a course in D2L. There is no way for the generic staff designation to activate a course since staff does not map to an actual person. A specific instructor must be identified by the registrar's office and uploaded into D2L to activate a course. The courses marked active are the courses where an instructor manually activated the course for students to see. This study focuses on why instructors choose to utilize the learning management system by activating their courses. Courses where the instructor manually activated the course were considered to be actively used by the instructor.

Figure 3.1. The number of courses provisioned, potential for activation, and activated in D2L from fall 2014 to fall 2016.

The percentage of potential courses activated differed depending on the semester. The research institution shows lower activation rates than the national average of 85% (Dahlstrom et al., 2014). Figure 3.2 shows the percentage of potential course that were activated each semester.

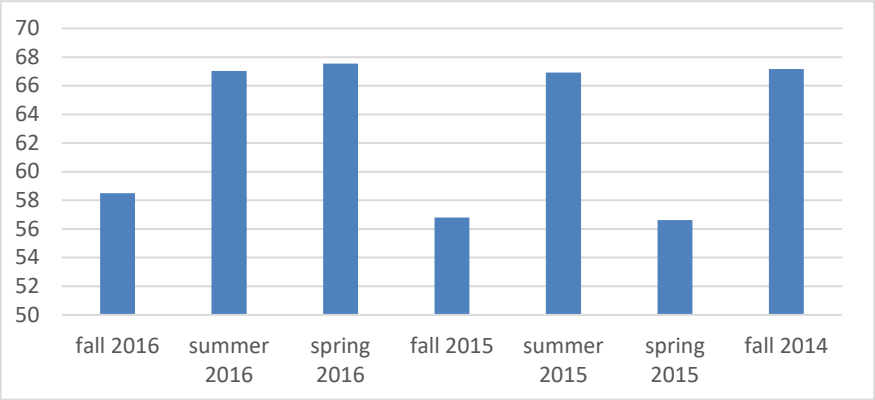

Figure 3.2. The percentage of courses potential courses activated in D2L from fall 2014 to fall 2016.

Participants

Research participants consisted of instructors teaching during the fall 2016 semester. Nine hundred and eighty-one instructors were identified as tenure or adjunct instructors from a variety of departments across campus in the fall of 2016. Instructors who taught in fall 2016 may or may not have utilized a learning management system during the semester. Classes taught were either face-to-face, blended, or online. Participants in the study were classified as Tenured, Tenure Track, Adjunct, GTA/GRA or Non-tenured instructors. The Office of Planning and Analysis randomly selected 700 instructors from all instructors who taught in the fall of 2016 who were invited to participate in the study. An ideal sample response size for a structural equation model analysis based on six variables was determined to be 98 to 250 responses (Hox & Bechger, 1998). In terms of the questionnaire, the goal sample size of 248 yielded a 95% confidence level and a confidence interval of 5 for the population of 700 potential instructors (http://www.surveysystem.com/sscalc.htm).

Participant Demographics

Participants were described based on information from the Demographic Survey. The gender and academic rank were broken into face-to-face and online/blended instructors. Information was also collected on the instructor's home department and experience in the LMS and in other LMS systems. Information was also collected on

how many years instructors taught in higher education and was disaggregated into face-to-face and online/blended instructors.

Gender and Academic Rank

The survey for this study was sent to 700 instructors who taught in the fall semester of 2016. Two hundred eighty-five instructors chose to complete the survey (121 males, 162 females, 1 other). One instructor chose not to identify their gender. Table 3.1 shows the frequency and percentages of instructors by gender and academic rank. Fifty-seven percent of instructors who completed the survey were female (n = 162). Most instructors (27.6%, n = 79), had an academic rank of Adjunct instructor. Tenured instructors (24.5%, n = 70) were slightly more frequent than Non-tenured instructors (22.7%, n = 65). The respondents of the survey reported the fewest graduate assistants (15.4%, n = 44) and instructors in the tenure track process (9.8%, n = 28). Non-tenured and Adjunct instructors are essentially the same. The study acknowledged the different ways that instructors self-identified and included both categories of instructors.

Table 3.1. Demographics of a Sample of 271 Instructors

Characteristics	Face-to-face		Online/blended	
	n	%	*n*	%
Gender				
Male	92	34	24	9
Female	115	43	37	14
Other	1	0.4		
Academic Rank				
Tenured	52	19.2	10	3.7
Tenure Track	23	8.5	5	1.8
Adjunct / non-tenured	96	35.2	42	15.4
GTA/ GRA	40	14.8	3	1.1

Home Department

Instructors were asked to report their home department. Instructors came from 37 departments across campus. Instructors who reported their home department was a not an academic department but instead offered some aspect of institutional support were aggregated into a single support offices category. Eleven instructors (3.9%) reported their home department as a support office. Two departments were represented at a higher level by instructors who responded to the survey. Those departments were Mathematics (10.8%, *n* = 30) and Education (10.4%, *n* = 29). Table 3.2 shows the distribution of respondents and their home departments. All ten colleges, Architecture, Arts and Architecture, Business, Education, Health and Human Development, Engineering, Letters & Science, Nursing, Graduate School, Gallatin College, and Honors had had respondents from at least one of the departments within their college. In addition, University Studies and Library and Information Computing had instructors who identified those departments as their home department.

Table 3.2 Home Department of Instructors

Home Department	*n*	%
Agricultural Economics and Economics	6	2.2
Animal & Range Sciences	8	2.9
Architecture	6	2.2
Art	10	3.6
Cell Biology and Neuroscience	2	0.7
Chemical and Biological Engineering	11	3.9
Civil Engineering	10	3.6
College of Business	14	5.0
Computer Science	2	0.7

Table 3.2 Continued

Earth Sciences	7	2.5
Ecology	3	1.1
Education	29	10.4
Electrical and Computer Engineering	3	1.1
English	15	5.4
Gallatin College	10	3.6
Health and Human Development	11	3.9
History & Philosophy	3	1.1
Honors College	4	1.4
Intercollege Programs for Science Education	2	0.7
Land Resources and Environmental Sciences	9	3.2
Liberal Studies	3	1.1
Library Informatics and Computing	3	1.1
Mathematical Sciences	30	10.8
Mechanical and Industrial Engineering	6	2.2
Microbiology & Immunology	5	1.8
Modern Languages & Literatures	3	1.1
Music	6	2.2
Native American Studies	4	1.4
Nursing	12	4.3
Physics	5	1.8
Plant Sciences and Plant Pathology	3	1.1
Political Science	2	0.7
Psychology	8	2.9
School of Film & Photography	2	0.7
Sociology & Anthropology	2	0.7
Support Offices	11	3.9
University Studies	9	3.2

Years of Teaching

Instructors were asked to report how many years they had been teaching in higher education. The categories that were available were 0-5 years, 6-11 years, and 12 or more years. Table 3.3 shows that 120 instructors (42.3%) had been teaching between 0-5 years (n=269). The next highest category of experience was among instructors who have taught

in higher education for 12 or more years (34.2%, *n* = 97). Only 67 instructors (23.6%) had taught between 6 to 11 years. An equal number of online/blended instructors taught in each of the categories where the face-to-face instructors had more instructors who taught 0-5 years and 12 or more years.

Table 3.3 Years of Teaching in Higher Education

Years	Face-to-Face		Online/blended	
	n	%	*n*	%
0-5 years	96	35.7	20	7.4
6-11 years	43	15.9	20	7.4
12 or more years	70	26.0	20	7.4

Previous Learning Management Experience

Instructors were asked how many semesters they had used D2L. Instructors could choose none, 1-2, 3-4, 5-6, 7-8, or more than 8 semesters. The majority (46%, *n* = 132) had used D2L for more than 8 semesters. Only 3.8% (*n* = 11) of instructors indicated that they had never used D2L. Most online/blended instructors taught more than 8 semesters. Table 3.4 summarizes the number of semesters instructors utilized D2L (n=272).

Table 3.4 Semesters Using Brightspace (D2L)

Semesters	Face-to-Face		Online/blended	
	n	%	n	%
None	9	3.3	0	0
1-2 semesters	38	13.9	2	0.7
3-4 semesters	33	12.1	7	2.6
5-6 semesters	33	12.1	7	2.6

Table 3.4 Continued

7-8 semesters	11	4.0	6	2.2
More than 8 semesters	87	31.9	39	13.9

Instructors were asked to indicate other learning management systems they had experience with. Instructors could choose as many systems as applicable resulting in a total of 546 reports of learning management systems instructors have used. The most commonly reported learning management system was Brightspace D2L with 47.9% (*n* = 262) of instructors reporting having used D2L. Three other learning management systems showed moderate use. Moderately used learning management systems included Blackboard (15.9%, *n* = 87), Moodle (11.5%, *n* = 63) and WebCt (12.3%, *n* = 67). Table 3.5 summaries the learning management systems used by the instructors. Twenty-seven instructors indicated they have used other systems including Adobe presenter, WizIQ, Google, Wisetail, Teachable, MyMath Lab, ZOOM, Immers2Learn, and ECollege.

Table 3.5 Experience with Learning Management Systems

Semesters	*n*	%
Angel	6	1.1
Blackboard	87	15.9
Brightspace (D2L)	262	48.0
Canvas	15	2.8
Coursera	14	2.6
Moodle	63	11.5
Sakai	5	0.9
WebCT	67	12.3
Other	27	5.0

Access to Participants and confidentiality

The researcher asked for participation by instructors through e-mail and phone calls. Participants were informed of the project and were provided information on an informed consent form and only participants who agreed to be in the study were allowed to continue to the questionnaire. Participants were notified that they may choose to withdraw or stop the study at any time. Participants were informed that all data would be confidential and the participant identity would remain anonymous. All questionnaire information and notes were kept in secured locations. The study conformed to all Institutional Review Board requirements of the Institution.

Data Collection Instruments

Quantitative data were collected using three instruments which were combined into one survey. The first instrument was a Demographics Survey (Appendix A). The second instrument was a Descriptive Survey (Appendix B). The final instrument was a Learning Management System Usage Questionnaire (Appendix C). Survey creation was aligned with the following table of specification (Table 3.6).

Table 3.6 Table of Specifications

Measure	Research Question			
	1	2	3	4
Demographics Survey	X			
Descriptive Survey	X	X	X	X
Learning Management System Usage Questionnaire	X	X	X	X

Demographics Survey

The Demographics Survey consisted of six questions focused on the demographics of the instructors including gender, teaching department, rank, years of teaching experience and experience with D2L and other systems. The survey was designed to describe the participants and their place in their career. Results were reported in the Participants section of chapter 3 in order to describe the participants in the research project.

Descriptive Survey

The Descriptive Survey consisted of five open ended questions focused on how instructors use the learning management system D2L, why instructors choose to use or not use the learning management system and any training instructors have received on the learning management system.

Learning Management System Usage Questionnaire

The Learning Management System Usage Questionnaire consisted of six constructs related to the conceptual framework of the Technology Acceptance Model that includes the Task Technology Fit construct. The constructs are described below. There was a total of 54 questions. The association of constructs and survey questions is shown in the research model (Figure 3.3).

The research model proposes the following hypotheses:

H1: Task Technology fit has a positive effect on Usefulness.

H2: Task Technology fit has a positive effect on Ease of Use.

H3: Task Technology fit has a positive effect on Intent to Use.

H4: Ease of Use has a positive effect on Usefulness.

H5: Ease of Use has a positive effect on Attitude.

H6: Usefulness has a positive effect on Attitude.

H7: Attitude has a positive effect on Intent to Use.

H8: Intent to use has a positive effect on Actual Use.

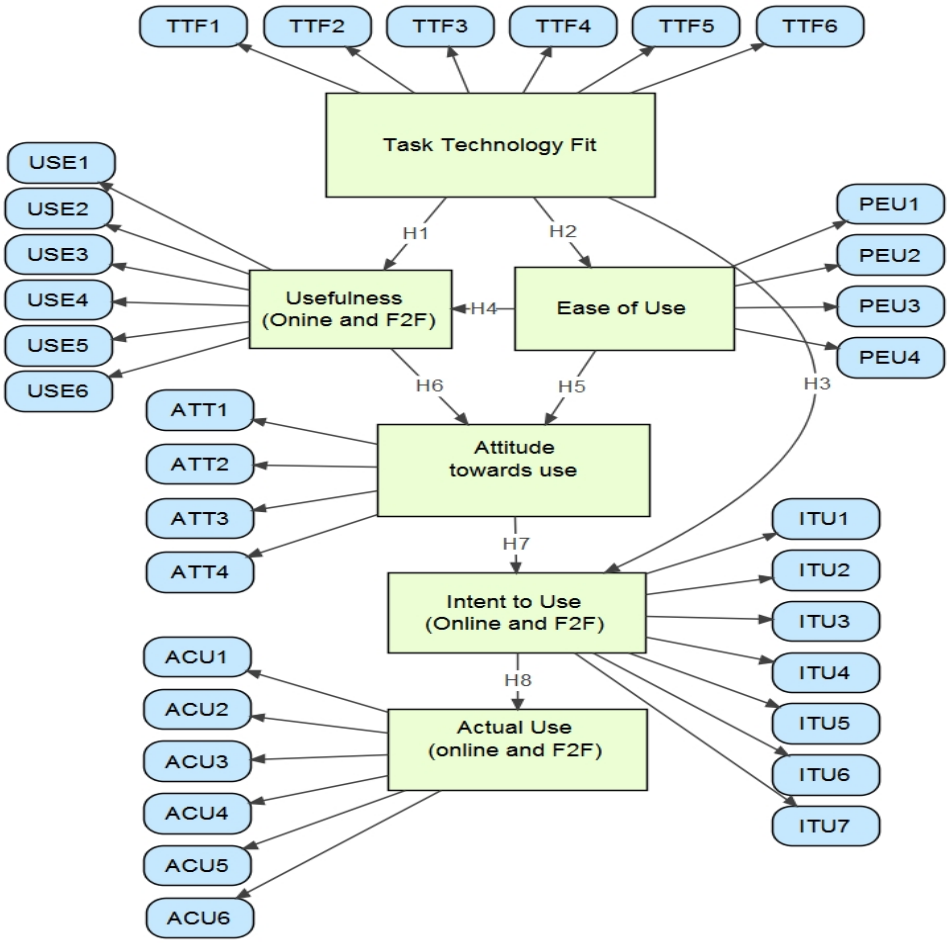

Figure 3.3 Research model and associated Learning Management System survey questions.

The research model and associated Learning Management System Usage Questionnaire was designed to focus on research questions 2, 3, and 4 investigating how instructors were using the LMS and what their perceptions were about the constructs related to use of the system. All questions in the Learning Management System Usage Questionnaire were modified from existing surveys by changing the name of the technology in the original question to D2L. Questions were adopted that had a scale reliability of above 0.7 utilizing either Cronbach's alpha or Composite Reliability scores in the original study (Cortina, 1993; Hair, Black, Babin, Anderson, & Tatham, 2006). The reliability scores indicated that the questions in their original study adequately tested the associated construct and had a high inter-item reliability. The Learning Management System Usage Questionnaire was piloted summer 2016 with 17 instructors who taught a course spring 2016 semester. Items were modified for the current study based on the results of the pilot study. Some questions were eliminated and the questions about D2L usage were simplified and aligned to reflect the most commonly used tools in the learning management system. The questionnaire was also shortened based on feedback from pilot participants.

Task Technology Fit was measured using six questions. All six items were measured on a seven point Likert scale labeled from Strongly Disagree ("1") to Strongly Agree ("7"). The questions were designed to investigate the instructor's perceptions of the alignment of learning management tools with the common areas of learning management system functions as well as how easy it is to utilize D2L for tasks (table 3.7). The questions in this section of the survey were modified based on the results from

the pilot summer 2016. Only questions on communication, discussion and content delivery were included and questions on assessment and management were eliminated to align the questions with other commonly used tools. The questions related to the general use of the learning management system were consistent in both the pilot and this survey. TTF1, TTF2, and TTF3 has an inter-item reliability score of 0.851 Cronbach's alpha based on six questions from Yu and Yu (2010). TTF4, TTF5, and TTF6 which were based on thirteen items from McGill and Klobas (2009) had a Cronbach's alpha inter-item reliability score of 0.95.

Table 3.7 Task Technology Fit.

Question	Measures	Source
TTF1	- It is easy to understand which tool to use for Communication with a student.	Yu and Yu (2010)
TTF2	- It is easy to understand which tool to use for discussions.	Yu and Yu (2010)
TTF3	- It is easy to understand what tool to use to deliver content.	Yu and Yu (2010)
TTF4	- It is easy to get D2L to do what I want it to do.	T. McGill and Klobas (2009)
TTF5	- D2L is easy to learn.	T. McGill and Klobas (2009)
TTF6	- It is easy for me to become more skillful at using D2L.	T. McGill and Klobas (2009)

Perceived Ease of Use was measured using four items. All four items were measured on a seven point Likert scale labeled from Strongly Disagree ("1") to Strongly

Agree (“7”). The questions were designed to investigate the instructor’s perception of how easy to use a learning management system is (table 3.8). The questions chosen address four aspects of ease of use including how easy the system is, how clear it is, how flexible the LMS is and how easy it is to incorporate the LMS in teaching. PEU1, based from three questions in Huang et al. (2011), which had an inter-item composite reliability score of 0.914. PEU1, PEU2, and PEU3 were based from Dishaw and Strong’s (1999) four questions which had an inter-item reliability of 0.97 using Cronbach alpha. PEU4, based on two questions from Ajjan and Hartshorne (2008) which had an inter-item Cronbach alpha reliability of 0.9 in the original study.

Table 3.8 Perceived Ease of Use.

Question	Measures	Source
PEU1	- I will find D2L easy to use.	Huang et al. (2011) Dishaw and Strong (1999)
PEU2	- My interaction with D2L will be clear and understandable.	Dishaw and Strong (1999)
PEU3	- I will find D2L to be flexible to interact with.	Dishaw and Strong (1999)
PEU4	- I feel using D2L will be easy to incorporate with my classes.	Ajjan and Hartshorne (2008)

Perceived Usefulness was measured using six items. All six items were measured on a seven point Likert scale labeled from Strongly Disagree (“1”) to Strongly Agree (“7”). The questions were designed to investigate how useful an instructor felt the learning management system might be in teaching a class (table 3.9). Instructors

answered all six questions for usefulness of D2L in their face-to-face classes and then all six questions for their usefulness in online or blended classes. The six questions were chosen to explore different aspects of usefulness including being useful in terms of teaching as well as performing tasks quicker. USE2, USE3, USE4, USE5, and USE6 were based off six questions from Dishaw and Strong (1999) that had a Cronbach alpha inter-item reliability of 0.98. USE2 was also had a composite inter-item reliability score of 0.940 from Huang et al.'s (2011) three original questions. USE3 and USE4 had a composite inter-item reliability score of 0.9 in a study with four questions from Boe, Gulbrandsen, and Sorebo (2015).

Table 3.9 Perceived Usefulness.

Question	Measures	Source
USE1	- Using D2l will enable me to accomplish my tasks more quickly.	Dishaw and Strong (1999)
USE2	- Using D2L will enable me to improve my performance teaching my class.	Huang et al. (2011); Dishaw and Strong (1999)
USE3	- Using D2L will enable me to increase my productivity.	Bøe, Gulbrandsen, and Sørebø (2015); Dishaw and Strong (1999)
USE4	- Using D2L will enhance my effectiveness.	Bøe et al. (2015); Dishaw and Strong (1999)
USE5	- Using D2L will make it easier to teach my class.	Dishaw and Strong (1999)
USE6	- I will find D2L useful while teaching my class.	Dishaw and Strong (1999)

Attitudes Toward a Learning Management System was measured using four items. All four items were measured on a seven point Likert scale labeled from Strongly Disagree (“1”) to Strongly Agree (“7”). The questions were designed to investigate an instructor’s attitude about using a learning management system in their teaching (Table 3.10). The questions selected to be included were chosen to address four aspects of attitude. ATT1 addresses the user’s attitude towards using technology in teaching while ATT3 addresses the user’s attitude towards using technology in learning. ATT2 asks if the user finds using technology in teaching pleasant while ATT4 addresses the advantages and disadvantages of using the technology. ATT1 and ATT4 were based on Ajjan and Hartshorne’s (2008) three survey questions which had a reported inner-item reliability of 0.932 using Cronbach’s alpha while ATT2 and ATT3, based on Yu and Yu (2010), were selected from four questions that had a reported inner-item reliability score of 0.888 using Cronbach’s alpha.

Table 3.10 Attitude.

Question	Measures	Source
ATT1	-I think D2L is useful in my teaching.	Ajjan and Hartshorne (2008)
ATT2	-Using D2L for teaching would be pleasant.	Yu and Yu (2010)
ATT3	-I like the idea of using D2L for learning.	Yu and Yu (2010)
ATT4	-The advantages of using D2L outweigh the disadvantages.	Ajjan and Hartshorne (2008)

Intentions to Use a Learning Management System was measured using seven items. All seven items were measured on a seven point Likert scale labeled from Strongly Disagree (“1”) to Strongly Agree (“7”). The questions were designed to investigate the potential intention of an instructor to use a learning management system in one of the five categories of learning management functionality (table 3.11). Instructors were asked all seven questions about their attitude toward using D2L in their face-to-face class and again about their attitude about using D2L in their online or blended classes. The seven questions chosen to be included in this study were modified after the pilot study of summer 2016. The pilot questions asked instructors about their intent to use D2L for communication, administration, content or grading. Pilot instructors reported that the questions in the pilot were too generalized and needed to be more specific. Instructors also reported that their intention to use the learning management system differed depending if the instructor taught an online/blended course or not. Responding to the pilot study feedback, the questions for intention to use were made more specific by asking participants to rate their intention to use specific tools within D2L. The tools chosen were classified as the most common tools instructors utilize within a learning management system (Mahdizadeh, Biemans, & Mulder, 2008). The more general question, ITU1, remained the same in the pilot study and in the current study. Huang et. al (2011) stated that ITU1 has a composite inter-item reliability of 0.947 for the two questions in their study. The remainder of the questions, consisted of Lin and Wang’s (2012) seven questions and had Cronbach’s Alpha of 0.92.

Table 3.11 Intention to Use.

Question	Measures	Source
ITU1	-I will use D2L for my teaching in the future.	Huang et al. (2011)
ITU2	-It is likely that I will use D2L for email.	W. Lin and Wang (2012)
ITU3	-It is likely that I will use D2L to post PDF's.	W. Lin and Wang (2012)
ITU4	-It is likely that I will use D2L to post documents.	W. Lin and Wang (2012)
ITU5	-It is likely that I will use D2L to provide external web links.	W. Lin and Wang (2012)
ITU6	-It is likely that I will use D2L to post text documents.	W. Lin and Wang (2012)
ITU7	-It is likely I will use D2L for instructor facilitated discussions.	W. Lin and Wang (2012)

Actual Learning Management System Use was measured using six questions about tool usage. The six tools chosen were determined to be the most commonly used tools in a learning management system (Jurado & Pettersson, 2011; Schoonenboom, 2014). The frequency of use of all six tools were measured on a seven point Likert scale labeled from a tool Never ("1") being used to being used Daily ('7"). The questions were designed to determine which of the common learning management system tools instructors are using and to what degree the instructor uses each tool (table 3.12). Instructors answered all six questions for their usage in face-to-face classes and then all six questions for their use in online or blended classes. The six questions were modified

after the summer 2016 pilot study. Participants responded that the questions in the pilot, similar to the results for intention to use, were too generalized. The questions modified in this survey were matched up with the most common functions utilized for the questions in the intention to use construct. Participants in the pilot study also responded that the actual use of parts of the learning management system also depended on the instructor teaching an online/blended or face-to-face class. All six questions were based from Dishaw and Strong (1999) and had an inter-item reliability of 0.72 using Cronbach's Alpha for their three original questions.

Table 3.12 Actual Use.

Question	Measures	Source
ACU1	- How often do you use Email inside D2L when teaching?	(Dishaw & Strong, 1999)
ACU2	- How often do you post PDF's inside D2L?	(Dishaw & Strong, 1999)
ACU3	- How often do you post text Documents inside D2L.	(Dishaw & Strong, 1999)
ACU4	- How often do you use External Web Links inside D2L.	(Dishaw & Strong, 1999)
ACU5	- How often do you use Instructor Facilitated Discussions inside D2L.	(Dishaw & Strong, 1999)
ACU6	- How often do you use Instructor Created Web pages inside D2L.	(Dishaw & Strong, 1999)

Data collection Procedures

Data were collected using the Demographics Survey, Descriptive Survey, and the Learning Management System Usage Questionnaire. All three instruments were administrated over a three-week period during spring semester 2017. Participants were invited to participate in the research project through email. Participants could choose to leave the study at any time. Participants were asked about courses they taught in the fall of 2016. The courses were identified by the registrar's office as face-to-face, online, or blended. The institution defines face-to-face course as a course where all faculty and students meet for every class session. Blended classes are defined as courses where some class sessions are done online. Online classes are defined where at least 80% of class sessions are done online. Participants answered questions in three surveys about their LMS usage and perceptions of the LMS for fall 2016 courses they taught. The Demographics survey included both quantitative and open-ended questions. The Descriptive survey included open ended questions and the Learning Management System Usage Questionnaire was composed of quantitative, closed-ended, questions.

Data Analysis Procedures

Data were analyzed in multiple steps to analyze the descriptive data about instructors, and to use the quantitative data to answer the four research questions. The above items were analyzed with an exploratory factor analysis to see how face-to-face

and online/blended instructors differed in their grouping on the constructs. The reliability of the resulting models was analyzed.

Demographic Data Analysis

Data from the demographics survey were analyzed using descriptive statistics to describe the participants. Descriptive statistics, including percentages, means and standard deviations, were used to summarize the demographics of the participants including gender, department, rank, years of teaching, and experience with learning management systems.

Instructors were asked about their home department in an open-ended question. Answers were condensed to match the institutional departments and the frequency of response was recorded. If instructors indicated more than one department then the first department listed was recorded. The departments indicated were mapped to the colleges in the institution to ascertain if participants represented all colleges on campus.

Research Question 1

How do instructors describe the factors that influence their decisions to use a learning management system?

Instructors were asked to reflect on their choice to use D2L as well as training they have received on LMS usage in open ended questions. Analysis of data from the open-ended question in the Descriptive Questionnaire was conducted through an open coding system (Maxwell, 2012). The data were read initially and analytic memos were created to capture thoughts on emerging themes. The potential themes were then

condensed and identified. If instructors identified more than one reason the primary reason was identified and coded. Primary reasons were either the first item mentioned by the instructor or the item the instructor spent the most time talking about. The data were then coded and labeled by the researcher and an external auditor solicited to cross check codes and themes with the researcher. The external auditor was experienced with utilizing learning management systems. The codes were utilized to identify themes in the results from the open-ended question on the factors that influence their learning management system use and on the training in using learning management systems the instructor has received (Maxwell, 2012).

Research Question 2

What is the frequency of use of “basic” learning management system tools?

Instructors were asked to report on how frequently they utilize a set of common D2L tools. The responses were analyzed using descriptive statistics including percentages, means and standard deviations to determine the frequency that instructors utilized the tools. Instructors were asked about the frequency of tool use in online/ blended classes and in face-to-face classes. Normality and skewness tests were performed in the Statistical Package for Social Sciences (SPSS) to verify the normality of the responses. Independent samples t-tests were conducted in SPSS to determine if there were significant differences in the means between the online/blended responses and the face-to-face responses.

Instructors were asked about the types of tasks performed in D2L in an open-ended question. The data were read initially, and analytic memos were created to capture thoughts on emerging themes. The potential themes were then condensed and identified. Themes were initially identified based on the types of tasks and tools found in a learning management system. If instructors identified more than one type of task or tool, each item was coded separately. It is reasonable to expect that instructors perform multiple tasks in the LMS while teaching. The data were then coded and labeled by the researcher and an external auditor solicited to cross check codes and themes with the researcher. The external auditor was experienced with utilizing learning management systems. Responses were then separated into primary and secondary tasks based on the frequency of use by instructors. The categories and responses were utilized to identify the common tools used in the learning management system as well as the secondary tools and the frequency of use (Maxwell, 2012).

Research Question 3

How do face-to-face and online/blended faculty perceive ease of use, usefulness, their attitudes, their intent to use the system, and the task technology fit of learning management systems?

Instructors were asked to report on their perceptions of ease of use, usefulness, attitude, intent to use, task technology fit in relationship to D2L. The responses were analyzed using descriptive statistics including percentages, means and standard deviations. Instructors were asked about their perceptions of usefulness and

intent to use in both their face-to-face teaching and their online/blended teaching. Normality and skewness tests were performed in SPSS to verify the normality of the responses.

Responses for the instructors who indicated they taught online/blended were grouped together. An instructor was considered an online/blended instructor even if they also taught a face-to-face class. This was done to increase the number of responses for online/blended instructors. Independent samples *t*-tests were performed in SPSS on ease of use, attitude, and task technology fit utilizing the separated online/blended and face-to-face answers. Independent samples t-tests were conducted in SPSS on usefulness and intent to use to determine if there were significant differences in the means between the online/blended responses and the face-to-face responses.

An exploratory factor analysis was conducted with SPSS to determine the reliability and construct validity of the measurement models for the six constructs from the proposed research model utilizing the quantitative data from the Learning Management System Usage Questionnaire. A separate analysis was done for instructors who taught an online/ blended course and instructors who taught face-to-face. Data was analyzed using SPSS. A principle component analysis with Oblimin rotation was utilized to reconstruct the five factors: task technology fit, ease of use, usefulness, attitude, and intent to use. Questions were considered to load to a factor if the factor loading was 0.4 or greater (Ngai, Poon, & Chan, 2007). The rotated pattern matrix was investigated for items that either did not load with other items for that factor or for items that loaded for more than 1 factor. Eigenvalues were used to identify the number of factors to extract.

Eigenvalues greater than 1 were used to identify a factor (Leech, Barrett, & Morgan, 2014). Items that did not load with the identified construct or that loaded with more than 1 construct were eliminated from the study. Remaining items were determined to describe the construct they were associated with.

Cronbach alpha was utilized to measure internal consistency of the Likert scales used for the survey. A threshold of 0.7 was utilized for each factor identified in the principal component analysis. If a construct obtained a value greater than 0.7 then the individual items comprising the construct were considered to reliably measure the construct (Heale & Twycross, 2015).

An Exploratory Factor Analysis. An exploratory factor analysis was performed on the TAM research model incorporating five factors including task technology fit, usefulness, ease of use, attitude, and intent to use. A separate analysis was done for instructors who reported they taught a face-to-face class in the Fall 2016 and those who reported they taught an online or blended class. The decision to do a separate analysis was determined from results of a pilot study for the project where instructors indicated that they utilized technology differently when teaching face-to-face versus when they taught online. Actual use was not included in the factor analysis since it reported frequency of use. An exploratory factor analysis was used to verify that the questions were loading onto each factor as anticipated before analyzing the data in the SEM model.

The research model used in this study had five factors, task technology fit, ease of use, usefulness, attitude, and intent to use. The factor analysis forced loading into five

factors to fit into the research model. Both factor analysis used principal axis factoring with Oblimin rotation and Kaiser normalization.

Face-to-Face. The five factors for instructors teaching face-to-face accounted for 76.07% of the total item variance. Factor 1 explained 50.18% of the variance, factor 2 explained 11.23%, factor 3 explained 6.34%, factor 4 explained 4.87% and factor 5 explained 3.55% of the total item variance. The factor loading for face-to-face instruction is shown in table 3.13. The third question in task technology fit, TTF3, loaded equally into more than one factor and was removed from consideration in the SEM model. Intent to use question 2, INT2-F had low loading on all factors and was removed from the study.

Table 3.13 Factor and Factor Loading for Face-to-Face Instruction

	Factor Loading				
Factor	1	2	3	4	5
ATT3	.747				
ATT1	.676				
ATT4	.601				
ATT2	.600				
INT4-F		.984			
INT3-F		.911			
INT6-F		.639			
INT5-F		.587			
INT1-F		.560			
TTF5			.925		
TTF4			.838		
PEU1			.838		
PEU2			.820		
TTF6			.805		
PEU3			.621		

Table 3.13 Continued

PEU4	.529		
TTF3	.334	.330	
TTF2		.874	
INT7-F		.468	
TTF1		.437	
USE2-F			.811
USE3-F			.809
USE4-F			.804
USE5-F			.790
USE1-F			.698
USE6-F			.624
INT2-F			.279

Online/blended. The five factors for instructors teaching face-to-face accounted for 77.97% of the total item variance. Factor 1 explained 43.67% of the variance, factor 2 explained 13.85%, factor 3 explained 11.16%, factor 4 explained 4.98% and factor 5 explained 4.30% of the total item variance. The factor loading for face-to-face instruction is shown in table 3.14. Intent to use question 7, INT7-O loaded fairly equally on two factors and was removed from consideration in the SEM model. Negatively loaded factors are considered to have a negative impact to the model but are considered to have adequate loading to the factor (Hair 2011).

Table 3.14 Factor and Factor Loading for Online/blended Instruction

	Factor Loading				
Factor	1	2	3	4	5
PEU3	.875				
PEU1	.839				
PEU2	.825				
TTF5	.802				
TTF4	.787				
PEU4	.562				
TTF6	.440				
ITU3-O		.896			
ITU4-O		.795			
ITU5-O		.739			
ITU6-O		.699			
ITU7-O		.501			.404
USE5-O			-.891		
USE3-O			-.873		
USE2-O			-.858		
USE4-O			-.781		
USE1-O			-.738		
USE6-O			-.717		
ITU1-O			-.594		
ITU2-O			-.430		
ATT4				.890	
ATT3				.804	
ATT1				.704	
ATT2				.647	
TTF3				.609	
TTF2					.609
TTF1					.560

Research Question 4

Is there a relationship between task technology fit, the TAM model factors, and Actual Technology use for face-to-face and online/blended instructors?

Structural equation modeling (SEM) using SMART-PLS was used to analyze the hypothesized relationships represented by the revised Technology Acceptance Model that includes the Task Fit component (see figure 3.2). Actual use was added to the SEM model. Separate models for face-to-face and online/blended classes were utilized based on the factor loading demonstrated in the exploratory factor analysis.

Outer weight loadings were calculated using SMART-PLS for both the face-to-face and the online/blended models. The construct internal consistency and reliability was calculated using both composite reliability measures and Cronbach's alpha. Convergent validity of both the face-to-face and online/blended models were measured with the average variance extracted. Convergent validity measures the degree to which constructs that should be related are related. Discriminate validity was also calculated to determine the extent that constructs are distinct and that the factors load primarily only a single construct (J. F. Hair Jr, Hult, Ringle, & Sarstedt, 2016).

A final structural model analysis was performed on both the face-to-face and online models. Collinearity of the constructs as well as the variance explained by each construct was calculated. Path weights and significance of each path for both models was determined using SMART-PLS. Effect size was calculated as well as model fit to determine if the research model was a good fit to the population model. RMEA was utilized to determine the model fit with the observed data. RMEA values less than 0.1 were utilized to indicate a good fit of observed data to the proposed research model (Ngai et al., 2007). SEM was utilized to test the hypothesis of relationships between the six constructs. The seven hypotheses were determined to either be true or false based on the

strength of the path variables. SEM can be utilized to test a specific model but does not indicate alternate potential models (Hair et al., 2006).

SEM Model Development. It was determined to create two SEM models, one for face-to-face instructors and one for online/blended instructors based on pilot study feedback. The exploratory factor analysis in SPSS also showed that the questions did not load onto the constructs as proposed in the research model. Table 3.15 shows how the factors loaded differently onto the constructs for the face-to-face instruction and the online/blended instruction. Any instructor who taught online/blended was included in the online model and the remaining instructors were included in the face-to-face model.

Table 3.15 Factor Loading onto Face-to-face and Online/blended Constructs

Construct	Face-to-Face Factors	Online Factors
Task Technology Fit		
	TTF1	TTF1
	TTF2	TTF2
	INT7	
Ease of Use		
	PEU1	PEU1
	PEU2	PEU2
	PEU3	PEU3
	PEU4	PEU4
	TTF4	TTF4
	TTF5	TTF5
	TTF6	TTF6
Usefulness		
	USE1	USE1
	USE2	USE2
	USE3	USE3
	USE4	USE4
	USE5	USE5
	USE6	USE6
		INT1
		INT2

Table 3.15 Continued

Attitude		
	ATT1	ATT1
	ATT2	ATT2
	ATT3	ATT3
	ATT4	ATT4
		TTF3
Intent to Use		
	INT1	INT3
	INT3	INT4
	INT4	INT5
	INT5	INT6
	INT6	

Structural equation models were created using SMART-PLS. Based on the results from the exploratory factor analysis, separate models were made for face-to-face and online/blended instruction utilizing the factor assignments from Table 4.23. Actual use was added into each model to determine the relationship of intent to use to actual use of the learning management system. SMART-PLS was chosen as the most appropriate model considering the small sample size (a minimum of 30 participants is suggested) and the lack of normality in the variables (Haenlein & Kaplan, 2004). The face-to-face model had 253 participants while the online/blended model had 61 participants. Covariance based SEM, such as with LISREL, focuses on reproducing a theoretical covariance matrix but is not designed with a focus on variance while partial least squares SEM, such as with SMART-PLS, is designed to focus on maximizing the explained variance of the dependent variables(Amaro, Abrantes, & Seabra, 2015). J. F. Hair Jr et al. (2016)

suggest that PLS-structural equation models (PLS-SEM) is best used when the focus of the study is on predicting key constructs that influence the model.

Measurement Model Analysis. The first step in determining if the structure of the model fits the data is to investigate how the factors loaded onto the constructs. The second step was to determine the construct's internal consistency and reliability. The final steps in evaluating the model structure was to calculate convergent and discriminant validity.

Outer Weight Loading. The outer measurement model includes the factors for each construct and their loadings (Garson, 2012). The outer loadings are similar to the factor loadings found in the exploratory factor analysis. The numbers reported are different than the SPSS loadings due to the difference in calculation process with SPSS and Smart PLS. SPSS does calculations based on the construct while Smart PLS does the factor loadings calculations based on the model (Garson, 2012; Sarstedt et al., 2017). The outer loadings represent the contribution of each factor to the associated construct and should be above 0.7 in a well-fitting model (Garson, 2012). Factor loadings above 0.7 indicate that the construct explains more than 50% of the factor's variance (Sarstedt et al., 2017).

The outer loadings for the face-to-face model is shown in Table 3.16.All loadings are above 0.7 indicating good loading for a well-fitting model except for Discussions and Email in Actual Tool Use and Intent to use discussions in task technology fit.

Table 3.16 Outer Loading onto Face-to-face Constructs done with Smart PLS

Construct	Indicator	Outer Loadings
Task Technology Fit		
	TTF1	0.847
	TTF2	0.847
	INT7	0.664
Ease of Use		
	PEU1	0.924
	PEU2	0.927
	PEU3	0.859
	PEU4	0.862
	TTF4	0.881
	TTF5	0.849
	TTF6	0.832
Usefulness		
	USE1	0.855
	USE2	0.921
	USE3	0.919
	USE4	0.933
	USE5	0.935
	USE6	0.898
Attitude		
	ATT1	0.853
	ATT2	0.889
	ATT3	0.909
	ATT4	0.865
Intent to Use		
	INT1	0.849
	INT3	0.899
	INT4	0.873
	INT5	0.834
	INT6	0.800
Actual Use		
	DISC	0.532
	EMAIL	0.597
	ExtWeb	0.832
	IntWeb	0.825
	PDF	0.780
	TEXT	0.783

The outer loadings for the online/blended model is shown in Table 3.17. All loadings are above 0.7 indicating good loading on the associated construct except for USE1 and USE2 in Usefulness, TTF3 in Attitude, INT4 in Intent to Use, and DISC, EMAIL, and TEXT in actual tool use. EMAIL has the lowest loading of any factor, online/blended or face-to-face, at 0.137 indicating that instructor use of email online does not contribute much to the construct Actual Use.

Table 3.17 Outer Loading onto Online Constructs done with Smart PLS

Construct	Indicator	Outer Loadings
Task Technology Fit		
	TTF1	0.928
	TTF2	0.870
Ease of Use		
	PEU1	0.924
	PEU2	0.922
	PEU3	0.878
	PEU4	0.892
	TTF4	0.926
	TTF5	0.912
	TTF6	0.774
Usefulness		
	USE1	0.691
	USE2	0.557
	USE3	0.904
	USE4	0.795
	USE5	0.920
	USE6	0.802
	INT1	0.834
	INT2	0.906
Attitude		
	ATT1	0.850
	ATT2	0.811
	ATT3	0.799
	ATT4	0.889
	TTF3	0.591

Table 3.17 Continued

Intent to Use		
	INT3	0.878
	INT4	0.655
	INT5	0.866
	INT6	0.740
Actual Use		
	DISC	0.684
	EMAIL	0.137
	ExtWeb	0.756
	IntWeb	0.822
	PDF	0.744
	TEXT	0.640

Construct Internal Consistency and Reliability. The reliability and validity of the six constructs, task technology fit, ease of use, usefulness, attitude, intent to use, and actual use were determined by computing the Composite reliability and Cronbach's alpha. Composite reliability is considered to be the more accurate measure of reliability when there are differing numbers of factors loading onto each construct (Garson, 2012). Composite reliability should be greater or equal to 0.7 for an adequate model fit and greater reliability (Sarstedt et al., 2017). Cronbach's alpha also measures internal consistency at lower levels but levels of 0.7 reflect adequate model fit (Garson, 2012). Cronbach's alpha can be considered a lower bound for reliability while Composite reliability is considered an upper bound (Sarstedt et al., 2017). Table 3.18 shows the Composite Reliability and Cronbach's alpha for both face-to-face constructs and online/blended constructs. Task technology fit for face-to-face instructors is the only constructs that falls slightly below the 0.7 level for adequate model fit.

Table 3.18 Reliability of Face-to-Face and Online/blended Constructs

Mode & Construct	Composite Reliability	Cronbach's Alpha
Face-to-Face		
Task Technology Fit	0.832	0.698
Ease of Use	0.959	0.950
Usefulness	0.967	0.959
Attitude	0.931	0.902
Intent to Use	0.930	0.905
Actual Use	0.872	0.826
Online/blended		
Task Technology Fit	0.895	0.769
Ease of Use	0.964	0.956
Usefulness	0.937	0.922
Attitude	0.984	0.848
Intent to Use	0.869	0.797
Actual Use	0.812	0.718

Convergent Validity. Convergent validity is also considered a measure of communality which indicates the degree to which constructs that should be related are. Convergent validity is measured with the average variance extracted (AVE) scores and measures above 0.5 are acceptable (Sarstedt et al., 2017). Table 3.19 shows the convergent validity measures for both the face-to-face constructs as well as the online/blended constructs. Actual use in online instruction is the only value that falls below the 0.5 cutoff for acceptable measures.

Table 3.19 Convergent Validity of Face-to-Face and Online/blended Constructs

Mode & Construct	AVE
Face-to-Face	
Task Technology Fit	0.626
Ease of Use	0.769
Usefulness	0.829

Table 3.19 Continued

Attitude	0.773
Intent to Use	0.726
Actual Use	0.539
Online/blended	
Task Technology Fit	0.810
Ease of Use	0.794
Usefulness	0.655
Attitude	0.631
Intent to Use	0.869
Actual Use	0.449

Discriminant Validity. Discriminant validity measures the extent to which the constructs are different from each other in both the correlation and if the factors load mainly on a single construct. Discriminant validity is measured with the Heterotrait – Monotrait ratio (HTMT) which is the correlation of indicators across the constructs relative to the correlation of indicators within a construct (Henseler et al., 2015). The upper threshold for this study was 0.9 as suggested for models where the constructs are similar in concept (Henseler et al., 2015). Table 3.20 summarizes the HTMT results. All the values for both face-to-face and online/blended instruction are below the threshold level indicating adequate discriminate validity.

Table 3.20 Discriminant Validity of Face-to-Face & Online/blended Constructs using HTMT

Mode & Construct	Actual Use	Attitude	Ease of Use	Intent to Use	Task Tech Fit	Usefulness
Face-to-Face						
Actual Use						

Table 3.20 Continued

Attitude	0.398				
Ease of Use	0.241	0.686			
Intent to Use	0.741	0.489	0.323		
Task Technology Fit	0.563	0.617	0.648	0.502	
Usefulness	0.572	0.754	0.575	0.716	0.613
Online/blended					
Actual Use					
Attitude	0.607				
Ease of Use	0.477	0.755			
Intent to Use	0.852	0.349	0.315		
Task Technology Fit	0.512	0.715	0.677	0.321	
Usefulness	0.565	0.519	0.571	0.511	0.349

Instrument Validation Methods

Validity and Reliability

Reliability, in quantitative instruments, refers to the fact that the scores are consistent (Creswell & Clark, 2007) and can be replicated in future studies. Internal consistency was determined through the computation a composite reliability and a Cronbach's alpha. Cronbach's alpha scores indicate that the items in a quantitative survey adequately represent the construct they are associated with and reliable measures above 0.7 (Heale & Twycross, 2015). Composite reliability is used when there are differing numbers of factors loading into a construct and reliable measures are greater or equal to 0.7 (Garson, 2012). Questions that were associated with each construct in the Learning Management Usage Questionnaire were chosen from existing studies that have been previously validated and had Cronbach alpha scores above 0.7.

Validity is defined as the degree to which the survey measures what it is designed to (Oluwatayo, 2012). External validity of a quantitative instrument refers to the fact that the researcher can apply the results to a larger population (Creswell & Clark, 2007). The results of this study can be applied to any institution where instructors have the choice to use a learning management system. Two types of internal validity were utilized to ensure that the study design measures what it intends to measure. Convergent validity measures the degree that the constructs that should be related are actually related. Convergent validity is measured with the average variance extracted and measures above 0.5 are acceptable (Sarstedt, Ringle, & F. Hair, 2017). Discriminant validity measures the extent to which the constructs are different and if the factors load mainly onto a single construct. Discriminant validity is measured with Hererotrait-Monotrait ratio (HTMT). HTMT should be below 0.9 (Henseler, Ringle, & Sarstedt, 2015).

Role of the Researcher

While conducting this study, I was a full-time employee of the institution as well as a half-time doctoral candidate. I approached this study from the perspective of an instructor. I had 11 years of teaching high school and elementary school. One of my roles in the elementary school was as a systems administrator, training teachers to integrate technology in their classroom. My foundation in education and my technology background influenced my perceptions of instruction in the classroom and integration of technology in education.

My educational philosophy is founded in a constructivist perspective. I believe everyone continues to build upon their knowledge and that interaction with others helps to build a group knowledge in a more social constructivist manner. I have found that training in technology follows a more social constructivist perspective. When an instructor discovers a technology that aids their instruction they tend to share that knowledge with others. Many instructors work as a mentor to new instructors and share knowledge in that format. It is difficult to separate out individual influences on an instructor's choice of technology usage due to this social constructivist interaction.

I have 15 years of experience working in higher education focusing on online education. My primary role in higher education was training instructors to teach online and creating online degree programs. Most of the instructors I have worked with have chosen to be online instructors. After working with these cutting-edge instructors, I firmly believe in the advantages that technology can add to higher education. I temper my enthusiasm for technology with the acknowledgement that the technology must have a use and should not be added to a class just for technology's sake. My experience in online education can bring some assumptions into my interpretation of the results of this study. My assumption that everyone should include appropriate technology into the classroom can affect my understanding of the results. My experience also gives me a unique understanding of the challenges and issues with integrating technology and education. To help prevent bias from my pro-technology stance I located faculty members who were not pro-technology and had discussions with them about technology

usage. This kept alternative technology stances fresh in my mind as I conducted the study.

Summary

Data was collected from a large Pacific Northwestern Carnegie research 2 university from instructors who have access to a learning management system, Brightspace. A Learning Management System Usage Questionnaire was administered to instructor's spring semester 2017 concerning their fall 2016 teaching. The questionnaire consisted of demographic data, open ended questions on learning management use, and quantitative Likert scale questions on constructs in the Technology Acceptance Model. Qualitative and quantitative data were analyzed and utilized to address the four research questions.

CHAPTER FOUR

RESULTS

Introduction

The purpose of this study was to examine the factors that influence an instructor's choice to utilize a learning management system in their teaching. The Technology Acceptance Model (TAM) is the most commonly used measure of a user's intent to actually use some measure of technology ((Davis, 1989). TAM describes four constructs that influence the actual choice to use technology including ease-of-use, usefulness, attitude, and intent to use. Task technology fit is a construct that adds sensitivity to the TAM model by aligning the tasks an instructor performs in teaching with a type of technology. In this study, the technology is the learning management system. This study explored the model fit of the TAM model extended by the task technology fit construct. Instructors who taught in the fall of 2016 were surveyed to gather data on the relationship between the extended TAM model and instructor's choice to use the learning management system.

Research Question 1

How do instructors describe the factors that influence their decisions to use a learning management system?

Influences on choice to use D2L

Instructors were asked to reflect on their choice to either use D2L or not. Instructors described what influenced their choice. Table 4.1 summarizes their responses. One hundred twenty-four instructors (43.7%) indicated that they chose to use D2L because it was the learning management system provided by the institution. Thirty-one instructors (10.9%) indicated that use of D2L was required. Since the use of a learning management system to support teaching is not required by the institution, the instructors must be under mandate to use D2L from their department or the program they teach with. Some of the instructors who indicated that use of D2L was required also indicated that they taught online/blended courses and D2L was the only way to deliver the class to their students. Those instructors were included in the required category.

Table 4.1 Factors Influencing Learning Management System Use

Semesters	*n*	%
University Supplied	124	43.7
Required	31	10.9
Course Management	24	8.5
Convenient – Easy Access	21	7.4
Deliver Content	21	7.4
Communication	20	7.0
Don’t Use	17	6.0
Student Expectation	10	3.5
Grades	10	3.5
Other Faculty	6	2.1

Twenty-four instructors indicated that they utilized the learning management system to improve their course management (8.5%). As one instructor indicated, “I use

D2L because I can keep everything for the course together in one place and the students can go there and get everything they need. It also provides a record of much that transpired in the course and the date/time grades were posted, information was posted in a news item, etc." Other instructors indicated that putting their materials into one place helped them keep organized and that the learning management system helped them schedule assignments and presentations. Instructors also indicated that using the learning management system also gave greater transparency for their course.

Twenty-one instructors also indicated that D2L was convenient or they had easy access to the system (7.4%). One instructor stated, "D2L provides a platform to inform all students in the course at the same time as well as provide online learning and collaboration opportunities." Instructors also indicated that they chose D2L because of issues of accountability by the students. One instructor stated, "Students have a centralized location to find all information, cannot say they 'didn't know' something." Or as another instructor put it, "It is a convenient way for students to access all course materials at anytime from anywhere, so no more excuses that students couldn't find what they needed at 1:00 am."

Twenty-one instructors also indicated that they chose to use D2L to deliver content (7.4%). As one instructor put it, "It is an easy way to post lecture notes and homework for students; there isn't another mechanism to do this that students are familiar with (or that MSU owns)." Instructors reported that the ability for students to access materials at any time was important in the instructor's decision to use D2L. On instructor

states, “Good way to distribute info to students and they can access the info when they are ready/when they need it.”

Twenty instructors also chose to utilize the learning management system for communication with their students. One instructor indicated that D2L was particularly useful in their large class. They stated, “Ease of mass communication. Management of large numbers of electronic drobox files (I had nearly 5000 this semester alone).” One instructor indicated that communication was the only reason they chose to use D2L, “The only influence is that it reaches the very large survey class; there is no other way to communicate with all the students.” The issue of being able to communicate at all hours was also stated as demonstrated by the following statement, “The biggest thing is communication around the clock.”

Six percent (n = 17) of instructors indicated that they chose not to use the learning management system. Some instructors indicated that they used a different learning management system that was provided by the textbook company. As one instructor states, “Our department uses My Math Lab instead of D2L because it is linked to the textbooks.” Other instructors did not use D2L because of the type of course content did not work well in D2L. For example, one instructor stated, “Doesn't work for teaching film. Not very robust system.” Another instructor stated it as, “I stopped using D2L for teaching because it made comparing students' first drafts to their final portfolio drafts really difficult. I switched to Google Drive so I could easily open documents side-by-side without downloading them.” Other instructors indicated that attendance was important in their class and they chose not to use D2L because students went online rather than attending

class. Other instructors felt that D2L just added another step to the work they did to teach the course. One instructor indicated they did not use D2L because it was too restrictive. As they put it, “I hate these platforms schools buy because they are restrictive and assume/expect you to work certain ways and they are so clumsy. I don't use them anymore because I can use free things like Google Sites/Google Drive to accomplish the same things.”

Ten instructors (3.5%) indicated that they chose to use the learning management system because students expected it. As one instructor put it, “During my first day of teaching I asked the students if they used D2L and if they found it useful. They all said they used it and would prefer it for class notes, etc.” An equal number of instructors (3.5%, n = 10) indicated that they primarily chose to use D2L because of grades. One instructor explained the importance of grades in D2L as, “I use the Grade function and Grading Rubrics which makes my evaluations of their progress VERY TRANSPARENT. Their current grade in the course is always kept up to date. Since I've been doing this, I have had NO grade 'complaints'. I also can SEE the progress of the whole class by using D2L.”

The fewest number of instructors (2.1%, n = 6) indicated that the reason they chose to utilize D2L was due to other faculty or staff. The instructors indicated that they usually taught the same course as other instructors and if the other instructor used D2L then they also chose to use it. One instructor expressed the importance of others in the department being knowledgeable in D2L use as, “It is relatively easy to set up and there are many people in my department that know how to use it.”

Training in Using Learning Management Systems

Training that instructors received in using learning management systems also impacted their choice to utilize D2L. Table 4.2 summarizes the training received by instructors. Almost half of all instructors (46.9%, *n* = 130) have attended some sort of University created trainings on using D2L. Sixty-nine instructors also indicated that they are primarily self-taught (24.9%). Fifty-four instructors (19.5%) indicated they had no D2L training while 8.7% (*n* = 24) indicated that they were trained by a colleague. The data was coded by the primary training method the instructor received but many instructors reported a blend of methods. As one instructor put it, "I have received both general and specific (discussions, surveys, quizzes, 3rd party software like Respondez) training on D2L. Mostly I experiment with the system to understand its capabilities and then ask questions of the support team."

Table 4.2 Training in Using Learning Management Systems

Training Type	*n*	%
University Created	130	46.9
Self-taught	69	24.9
None	54	19.5
Colleague	24	8.7

Research Question 2

What is the frequency of use of "basic" learning management system tools?

Types of Tasks Performed in D2L

Instructors described the types of tasks they perform in D2L. There were 937 occurrences of tasks identified. Table 4.3 summarizes the responses which were condensed into two types of categories; primary and secondary. Primary tasks were announcements, assignments, content, discussions, e-mail, grades and quizzes. These tasks were reported the most frequently (*n* = 847). D2L was primarily used to deliver content (21.2%, *n* = 199) and to supply grades to students (19.1%, *n* = 179). Instructors reported ninety times on tasks classified as secondary. These tasks included attendance, class list, course schedule, eBooks, groups, links, PowerPoint and Turn-It-In. These tasks corresponded more to specific tools rather than broader categories of tasks.

Table 4.3 Types of Tasks Performed in D2L

Type of Task	*n*	%
Primary		
Announcements	105	11.2
Assignments	138	14.7
Content	199	21.2
Discussions	89	9.5
E-Mail	71	7.6
Grades	179	19.1
Quizzes	66	7.0
Secondary		
Attendance	10	1.1
Class List	7	0.7
Course Schedule	33	3.5
eBook	1	0.1
Groups	8	0.9
Links	6	0.6
PowerPoint	15	1.6
Turn-It-In	10	1.1

Frequency of Tool Usage in D2L

Instructors were asked to rate their frequency of use of specific tools in D2L on a scale of 1–never to 5-daily. Responses were collected for both online/ blended classes, and for classes taught face-to-face. The results are summarized in table 4.4. In face-to-face classes PDF documents (*M* = 3.54) and Text documents (*M* = 3.04) were utilized most frequently. Instructor facilitated discussions (*M* = 1.77) was utilized the least in face-to-face classes.

In online or blended classes PDF documents were still the most frequently used tool (*M* = 3.54). Text documents were also still the second most used tool (*M* = 3.04). The least frequently used tool in an online or blended class was the D2L e-mail (*M* = 2.85).

Table 4.4 Means, Standard Deviation and Variance for Frequency of Tool use in D2L

Delivery & Tool	*M*	*SD*	Variance
Face-to-Face (*n*=245)			
Email	2.56	1.33	1.77
PDF Documents	3.54	1.20	1.43
Internal Web Documents	2.52	1.33	1.76
External Web Links	2.75	1.25	1.55
Instructor Facilitated Discussions	1.77	1.10	1.21
Text Documents	3.04	1.32	1.75
Online/blended (*n*=62)			
Email	2.85	1.40	1.96
PDF Documents	3.98	1.02	1.03
Internal Web Documents	3.31	1.31	1.72
External Web Links	3.73	1.01	1.02
Instructor Facilitated Discussions	3.45	1.44	2.09
Text Documents	3.48	1.28	1.63

Normality, skewness and kurtosis tests were performed on the frequency of tool usage questions. The results are reported in table 4.5. The distribution of scores for all variables were significantly not normal according to the Shapiro-Wilks test. All of the variables have a skew value below 2.0 and a kurtosis of less than 7.0 indicating no significant impact on the analysis from skew or kurtosis (Fabrigar, Wegener, MacCallum, & Strahan, 1999).

Table 4.5 Normality, Skewness and Kurtosis for Frequency of Tool use in D2L

			Shapiro-Wilks		
Delivery & Tool	Skewness	Kurtosis	Statistic	df	*P*-value
Face-to-Face (*n*=245)					
Email	.498	-1.026	.859	242	.000
PDF Documents	-.859	-.272	.816	242	.000
Internal Web Documents	.372	-1.200	.862	242	.000
External Web Links	.131	-1.249	.876	242	.000
Instructor Facilitated Discussions	1.451	1.135	.709	242	.000
Text Documents	-.170	-1.305	.871	242	.000
Online (*n*=62)					
Email	.230	-1.370	.861	62	.000
PDF Documents	-1.323	1.489	.761	62	.000
Internal Web Documents	-.325	-1.203	.866	62	.000
External Web Links	-.598	-.684	.815	62	.000
Instructor Facilitated Discussions	-.473	-1.254	.836	62	.000
Text Documents	-.451	-1.071	.857	62	.000

An independent samples *t*-test was conducted on the frequency of tool use questions to determine if there were significant differences between the means of face-to-face and online/blended instructors. Although data was non-normal, for each *t* test the assumption of equal variances was reviewed and when the variances were not equal the

corrected results were used for the *t* ratio. Hopkins and Weeks (1990) indicate that non-normality does not have serious impact on the results of *t*-tests but suggest normality and skewness be reported to better describe the tendency of the data. Four tools showed significant differences between the online/blended instruction and face-to-face instruction. The four tools were external web links, $t(113) = -6.760$, p =.000, instructor facilitated discussions, $t\ (78) = -8.888$, $p = .000$, PDF documents, $t(117) = -3.791$, $p = .000$ and internal web documents, $t(311) = -4.532$, $p = .000$. The remaining two tools did not show significant difference between the means. This included email, $t(311) = -2.009$, $p = 0.045$ and text documents, $t(311) = -2.651$, $p = .008$.

Research Question 3

How do face-to-face and online/blended instructors perceive ease of use, usefulness, their attitudes, their intent to use the system, and the task technology fit of learning management systems?

Task Technology Fit

Instructors were asked about their perception between the tasks they do for teaching and the technology chosen to do the task. There were six questions that utilized a seven-point Likert scale ranging from strongly disagree to strongly agree. Results are summarized in table 4.6. Instructors had the greatest score for understanding which tool to use for communication (M = 5.03). Instructors reported the lowest score on feeling that it is easy to get D2L to do what they wanted (M = 4.41).

Table 4.6 Means, Standard Deviation and Variance for Task Technology fit towards D2L (*n*=284)

	M	*SD*	Variance
It is easy to understand which tool to use for communication	5.03	1.46	2.13
It is easy to understand which tool to use for discussions	5.02	1.49	2.21
It is easy to understand which tool to deliver content	5.50	1.28	1.65
It is easy to get D2L to do what I want	4.41	1.57	2.47
D2L is easy to learn	4.54	1.59	2.52
It is easy for me to become more skillful at using D2L	4.76	1.47	2.16

Normality, skewness and kurtosis tests were performed on the task technology fit questions. The results are reported in table 4.7 (*n*=284). The distribution of scores for all variables were significantly not normal. All variables showed non-significant levels of skew and kurtosis.

Table 4.7 Normality, Skewness and Kurtosis for Task Technology Fit

			Shapiro-Wilks		
Question	Skewness	Kurtosis	Statistic	df	*P*-value
It is easy to understand which tool to use for communication	-.753	-.276	.888	278	.000
It is easy to understand which tool to use for discussions	-.556	-.462	.912	278	.000
It is easy to understand which tool to use to deliver content	-.174	1.287	.849	278	.000
It is easy to get D2L to do what I want	-.436	-.695	.922	278	.000
D2L is easy to learn	-.544	-.543	.918	278	.000
It is easy for me to become more skillful at using D2L	-.729	- .100	.905	278	.000

An independent samples *t*-test was conducted to compare faculty perception on the task technology fit questions to determine if online/blended and face-to-face instructors' perceptions differed. Although data was non-normal, for each *t* test the assumption of equal variances was reviewed and when the variances were not equal the corrected results were used for the *t* ratio. There was no significant difference found for four of the questions. The results were as follows: *It is easy to understand which tool to use for communication*, $t(268) = -2.48$, $p = .014$; *It is easy to get D2L to do what I want*, $t(89) = -.885$, $p = .377$; *D2L is easy to learn*, $t(93) = -.101$, $p = .920$; and *It is easy for me to become more skillful at using D2L*, $t(93) = -.101$, $p = .920$. There were significant differences for two questions including *It is easy to understand which tool to use for discussions*, $t(110) = -5.46$, $p = .000$ and *It is easy to understand which tool to use to deliver content*, $t(110) = -3.86$, $p = .000$.

Ease of Use

Instructors were asked to respond to four questions related to their perceptions of the ease of use of D2L on a 7-point Likert scale ranging from strongly disagree to strongly agree. The results are summarized in table 4.8. Instructors indicated that they felt D2L was easy to incorporate in their classes ($M = 5.12$). Instructors were also positive about how easy D2L was to use ($M = 4.6$) and that their interactions with D2L are clear and understandable ($M = 4.64$). Instructors were less positive about their perception of how flexible D2L was to interact with ($M = 4.36$).

Table 4.8 Means, Standard Deviation and Variance for Ease of Use towards D2L

	M	*SD*	Variance
D2L is easy to use	4.76	1.52	2.32
My interactions with D2L are clear and understandable	4.64	1.54	2.38
D2L is flexible to interact with	4.36	1.55	2.41
I feel using D2L will be easy to incorporate with my classes	5.12	1.49	2.21

Normality, skewness and kurtosis tests were performed on the ease of use questions. The results are reported in table 4.9. The distribution of scores for all variables were significantly not normal. All the variables showed non-significant levels of skew and kurtosis.

Table 4.9 Normality, Skewness and Kurtosis for Ease of Use

			Shapiro-Wilks		
Question	Skewness	Kurtosis	Statistic	df	*P*-value
D2L is easy to use	-.793	-.169	.886	278	.000
My interactions with D2L are clear and understandable	-.555	-.675	.906	278	.000
D2L is flexible to interact with	-.399	-.727	.927	278	.000
I feel using D2L will be easy to incorporate with my classes	-.959	-.369	.878	278	.000

An independent samples *t*-test was conducted to compare faculty perception on the ease of use questions to determine if online/blended and face-to-face instructors' perceptions differed. Any instructor who taught online/blended was grouped with the online/blended instructors. Instructors who taught both online/blended and face-to-face

were also grouped with the online/blended instructors. All other instructors were grouped with face-to-face. Although data was non-normal, for each *t* test the assumption of equal variances was reviewed and when the variances were not equal the corrected results were used for the *t* ratio. There were no significant differences between the groups for three of the four questions. The results were as follows: *D2L is easy to use*, $t(268) = -.415$, $p = .678$; My *interactions with D2L are clear and understandable*, $t(268) = -1.54$, $p = .126$; D*2L is flexible to interact with*, $t(268) = -.778$, $p = .437$. The final question, *I feel using D2L will be easy to incorporate with my classes*, had significant differences between the online/blended and face-to-face instructors, $t(267) = -2.47$, $p = .014$. Online/blended instructors perceived the LMS to be easier to use than face-to-face instructors.

Usefulness

Instructors were asked to respond to six questions related to their perceptions of how useful D2L was on a seven-point Likert Scale ranging from strongly disagree to strongly agree. Results are summarized in table 4.10. Instructors were asked to answer the questions for their face-to-face class and then again if they taught an online or blended course. When instructors responded about their face-to-face class they felt that D2L would be useful while teaching (M = 5.15). They also felt that D2L was useful for the other five questions with accomplishing tasks being higher ($M = 4.94$), and D2L will enable me to improve my performance ($M = 4.72$) being the lowest.

When instructors were asked to reflect on their perceptions of how useful D2L was to their online teaching their perceptions were higher than any of their responses for

teaching face-to-face. Instructors still found that D2L would be useful while teaching their class (*M* = 5.70). Instructors also reported that D2L would make it easier to teach the online/blended class (M = 5.65) and would enable them to accomplish their tasks more quickly (*M* = 5.57). Instructors reported the lowest mean when asked about D2L increasing their productivity in their online/blended class (*M*=5.36).

Table 4.10 Means, Standard Deviation and Variance for Usefulness towards D2L

Delivery	*M*	*SD*	Variance
Face-to-Face (*n*=245)			
Using D2L will enable me to accomplish my tasks more quickly	4.94	1.58	2.49
Using D2L will enable me to improve my performance teaching my class	4.72	1.58	2.49
Using D2L will enable me to increase my productivity	4.78	1.55	2.41
Using d2L will enhance my effectiveness	4.91	1.48	2.18
Using D2L will make it easier to teach my class	4.79	1.56	2.43
I will find D2L useful while teaching my class	5.15	1.44	2.06
Online/blended (*n*=62)			
Using D2L will enable me to accomplish my tasks more quickly	5.57	1.51	2.28
Using D2L will enable me to improve my performance teaching my class	5.52	1.36	1.85
Using D2L will enable me to increase my productivity	5.36	1.40	1.97
Table 4.10 - Continued			
Using d2L will enhance my effectiveness	5.40	1.53	2.34
Using D2L will make it easier to teach my class	5.65	1.42	2.03
I will find D2L useful while teaching my class	5.70	1.32	1.74

Normality, skewness and kurtosis tests were performed on the usefulness questions. The results are reported in table 4.11. The distribution of scores for all variables were significantly not normal. All the variables showed non-significant levels of skew and kurtosis.

Table 4.11 Normality, Skewness and Kurtosis for Usefulness

			Shapiro-Wilks		
Delivery & Question	Skewness	Kurtosis	Statistic	df	*P*-value
Face-to-face (*n*=245)					
Using D2L will enable me to accomplish my tasks more quickly	-.704	-.189	.908	241	.000
Using D2L will enable me to improve my performance teaching my class	-.482	-.367	.930	241	.000
Using D2L will enable me to increase my productivity	-.617	-.070	.918	241	.000
Using d2L will enhance my effectiveness	-.631	.059	.919	241	.000
Using D2L will make it easier to teach my class	-.578	-.315	.922	241	.000
I will find D2L useful while teaching my class	-1.037	.948	.877	241	.000
Online (*n*=62)					
Using D2L will enable me to accomplish my tasks more quickly	-1.256	1.034	.825	60	.000
Using D2L will enable me to improve my performance teaching my class	-1.021	1.110	.874	60	.000
Using D2L will enable me to increase my productivity	-.934	.840	.890	60	.000
Table 4.11 - Continued					
Using d2L will enhance my effectiveness	-1.108	.886	.863	60	.000
Using D2L will make it easier to teach my class	-1.426	1.702	.802	60	.000
I will find D2L useful while teaching my class	-1.576	2.901	.806	60	.000

An independent samples *t*-test was conducted to compare faculty perception on the usefulness questions to determine if online/blended and face-to-face instructors' perceptions differed. Although data was non-normal, for each *t* test the assumption of equal variances was reviewed and when the variances were not equal the corrected results were used for the *t* ratio. Two questions had significant differences between the means, *Using D2L will enable me to improve my performance teaching my class*, $t(311) = -3.007$, $p = .003$ and *Using D2L will make it easier to teach my class*, $t(311) = -3.2113$, $p = .001$. Face-to-face instructors had a more positive view. The other questions including *Using D2L will enable me to accomplish my tasks more quickly*, $t(311) = -2.636$, $p = .009$, *Using D2L will enable me to increase my productivity*, $t(311) = -2.496$, $p = .013$, *Using D2L will enhance my effectiveness*, $t(311) = -2.660$, $p = .008$, and *I will find D2L useful while teaching my class*, $t(311) = -2.583$, $p = .010$ did not show significance differences between the means of the two groups at the .005 significant level.

Attitude

Instructors were asked to report on four questions related to their attitude towards D2L on a seven-point Likert scale ranging from strongly disagree to strongly agree. The responses are summarized in table 4.12. Instructors had the highest response to their perception that D2L is useful in their teaching ($M = 5.68$). Instructors responded with the least positive perception that using D2L for teaching would be pleasant ($M = 4.96$).

Table 4.12 Means, Standard Deviation and Variance for Attitude towards D2L (*n*=284)

	M	*SD*	Variance
I think D2L is useful in my teaching	5.68	1.24	1.54
Using D2L for teaching would be pleasant	4.96	1.54	2.36
I like the idea of using D2L for learning	5.23	1.39	1.93
The advantages outweigh the disadvantages	5.48	1.44	2.08

Normality, skewness and kurtosis tests were performed on the attitude questions. The results are reported in table 4.13. The distribution of scores for all variables were significantly not normal. All the variables showed non-significant levels of skew and kurtosis.

Table 4.13 Normality, Skewness and Kurtosis for Attitude (*n*=284)

			Shapiro-Wilks		
Question	Skewness	Kurtosis	Statistic	df	*P*-value
I think D2L is useful in my teaching	-1.520	3.106	.817	278	.000
Using D2L for teaching would be pleasant	-.869	.228	.889	278	.000
I like the idea of using D2L for learning	-.949	.865	.889	278	.000
The advantages outweigh the Disadvantages	-1.267	1.424	.840	278	.000

An independent samples *t*-test was conducted to compare faculty perception on the attitude questions to determine if online/blended and face-to-face instructors' perceptions differed. Although data was non-normal, for each *t* test the assumption of equal variances was reviewed and when the variances were not equal the corrected results

were used for the *t* ratio. Significant differences were found in all comparisons. The results were as follows: *I think D2L is useful in my teaching*, $t(134) = -4.42$, $p = .000$; *Using D2L for teaching would be pleasant*, $t(264) = -2.69$, $p = .005$; I *like the idea of using D2L for learning*, $t(112) = -4.04$, $p = .000$; and *the advantages outweigh the disadvantages*, $t(116) = -3.42$, $p = .001$. Online/blended instructors had more positive attitudes.

Intent to Use

Instructors were asked to respond to seven questions related to their intent to use D2L. Instructors were asked to respond to their intent when teaching face-to-face and again about their intent to use D2L when teaching their online or blended course. The results are summarized in table 4.14. When teaching face-to-face instructors had the highest response to posting PDF's ($M = 6.01$) and the smallest response to using D2L for instructor facilitated discussions ($M = 3.84$). Instructors had a large standard deviation ($SD = 2.16$) when asked if they would use D2L for email in their face-to-face class indicating a large range of answers.

When asked about their intent to use D2L in their online/blended class, instructors reported higher scores on all questions than when teaching face-to-face. Any instructor who indicated they taught online/blended were grouped with the online/blended instructors. All other instructors were grouped with the face-to-face instructors. Instructors had the highest score for their intent to teach with D2L in the future ($M = 6.37$). Instructors teaching online courses reported the lowest score for using D2L in their

teaching (*M* = 4.44). Teaching D2L in the future also had a large standard deviation (*SD* = 2.27) indicating a large range of responses.

Table 4.14. Means, Standard Deviation and Variance for Intent to Use towards D2L

Delivery	*M*	*SD*	Variance
Face-to-Face (*n*=245)			
I will use D2L for my teaching in the future	5.85	1.37	1.88
It is likely I will use D2L for email	4.42	2.16	4.66
It is likely I will use D2L to post PDFs	6.01	1.29	1.66
It is likely I will use D2L to post documents	6.00	1.28	1.64
It is likely that I will use D2L to provide external web links	5.55	1.52	2.30
It is likely that I will use D2L to post text documents	5.63	1.50	2.24
It is likely that I will use D2L for instructor facilitated discussions	3.84	1.90	3.61
Online/blended (*n*=62)			
I will use D2L for my teaching in the future	6.37	0.85	0.73
It is likely I will use D2L for email	4.44	2.27	5.17
It is likely I will use D2L to post PDFs	6.27	1.06	1.12
It is likely I will use D2L to post documents	6.32	0.83	0.69
It is likely that I will use D2L to provide external web links	6.34	0.70	0.49
It is likely that I will use D2L to post text documents	5.73	1.47	2.17
It is likely that I will use D2L for instructor facilitated discussions	5.55	1.71	2.91

Normality, skewness and kurtosis tests were performed on the intent to use questions. The results are reported in table 4.15. The distribution of scores for all variables were significantly not normal. Online/blended Intent to Use question 3 showed

significant skew. All remaining variables showed non-significant levels of skew and kurtosis.

Table 4.15 Normality, Skewness and Kurtosis for Intent to Use

			Shapiro-Wilks		
Delivery & Question	Skewness	Kurtosis	Statistic	df	*P*-value
Face-to-face (*n*=245)					
I will use D2L for my teaching in the future	-1.835	3.381	.742	240	.000
It is likely I will use D2L for email	-.352	-1.352	.871	240	.000
It is likely I will use D2L to post PDFs	-1.899	3.629	.721	240	.000
It is likely I will use D2L to post documents	-1.941	3.838	.716	240	.000
It is likely that I will use D2L to provide external web links	-1.179	.643	.824	240	.000
It is likely that I will use D2L to post text documents	-1.300	.963	.803	240	.000
It is likely that I will use D2L for instructor facilitated discussion	.143	-1.123	.927	240	.000
Online/blended (*n*=62)					
I will use D2L for my teaching in the future	-.771	-.411	.734	60	.000
It is likely I will use D2L for email	-.425	-1.405	.844	60	.000
It is likely I will use D2L to post PDFs	-2.699	10.064	.654	60	.000
It is likely I will use D2L to post documents	-1.570	3.507	.743	60	.000
Table 4.15 - Continued					
It is likely that I will use D2L to provide external web links	-.921	.741	.767	60	.000
It is likely that I will use D2L to post text documents	-1.345	1.183	.792	60	.000
It is likely that I will use D2L for instructor facilitated discussion	-1.230	.506	.781	60	.000

An independent samples *t*-test was conducted to compare faculty perception on the intent to use questions to determine if online/blended and face-to-face instructors' perceptions differed. Although data was non-normal, for each *t* test the assumption of equal variances was reviewed and when the variances were not equal the corrected results were used for the *t* ratio. Three questions had significant differences between the means from the online and face-to-face instructors. They were: *I will use D2L for my teaching in the future*, $t(165)=-4.169$, $p=.000$; *It is likely I will use D2L to provide external web links*, $t(234)=-6.417$, $p=.000$; and *It is likely I will use D2L for instructor facilitated discussion*, $t(104)=-7.466$, $p=.000$. There were no significant differences found for the remaining four questions. Those questions were as follows: *It is likely I will use D2L for email*, $t(311)=-.603$, $p=.547$; *It is likely I will use D2L to post PDFs*, $t(311)=-1.748$, $p=.082$; *It is likely I will use D2L to post documents*, $t(311)=-1.207$, $p=.228$; and *It is likely I will use D2L to post text documents*, $t(311)=-.912$, $p=.362$.

Research Question 4

Is there a relationship between task technology fit, the TAM model factors, and Actual Technology use for face-to-face and online/blended instructors?

Structural Model Analysis

The structural model was checked for collinearity among the constructs using a VIF assessment. VIF levels above 5 indicate collinearity which could bias the model (Sarstedt et al., 2017). Table 4.16 shows the VIF levels for both the face-to-face model

and the online/blended model. None of the constructs reach the 5-threshold level showing collinearity among the constructs.

Table 4.16 Collinearity of Face-to-Face and Online/blended Constructs

Mode & Construct	Actual Use	Attitude	Ease of Use	Intent to Use	Task Tech Fit	Usefulness
Face-to-Face						
Actual Use						
Attitude				1.348		
Ease of Use		1.439				1.440
Intent to Use	1.000					
Task Technology Fit			1.000	1.348		1.440
Usefulness		1.439				
Online/blended						
Actual Use						
Attitude				1.462		
Ease of Use		1.451				1.564
Intent to Use	1.000					
Task Technology Fit			1.000	1.462		1.564
Usefulness		1.451				

The variance explained by each endogenous construct was determined from the R^2 values on the PLS-SEM models. The outcome variable was actual use. The PLS-SEM model for face-to-face instruction is shown in Figure 4.1 and the PLS-SEM model for online/blended instruction is shown in Figure 4.2. The R^2 are shown inside each endogenous variable. Values of 0.75 are considered substantial, 0.50 is considered moderate, and 0.25 are considered weak (Sarstedt et al., 2017). In the face-to-face model, the variance explained by Attitude (R^2 = 0.585*)* is moderate while the variance for Useful

(R^2 = 0.364), Ease of Use (R^2 = 0.305), and Actual Use (R^2 = 0.444) are weak. The variance explained by Intent to Use is very weak (R^2 = 0.239). In the online model, the variance explained by Intent to Use is very weak (R^2 = 0.086). The variance explained by Usefulness (R^2 = 0.312), Ease of Use (R^2 = 0.360), Attitude (R^2 = 0.493), and Actual Use (R^2 = 0.444) were all weak.

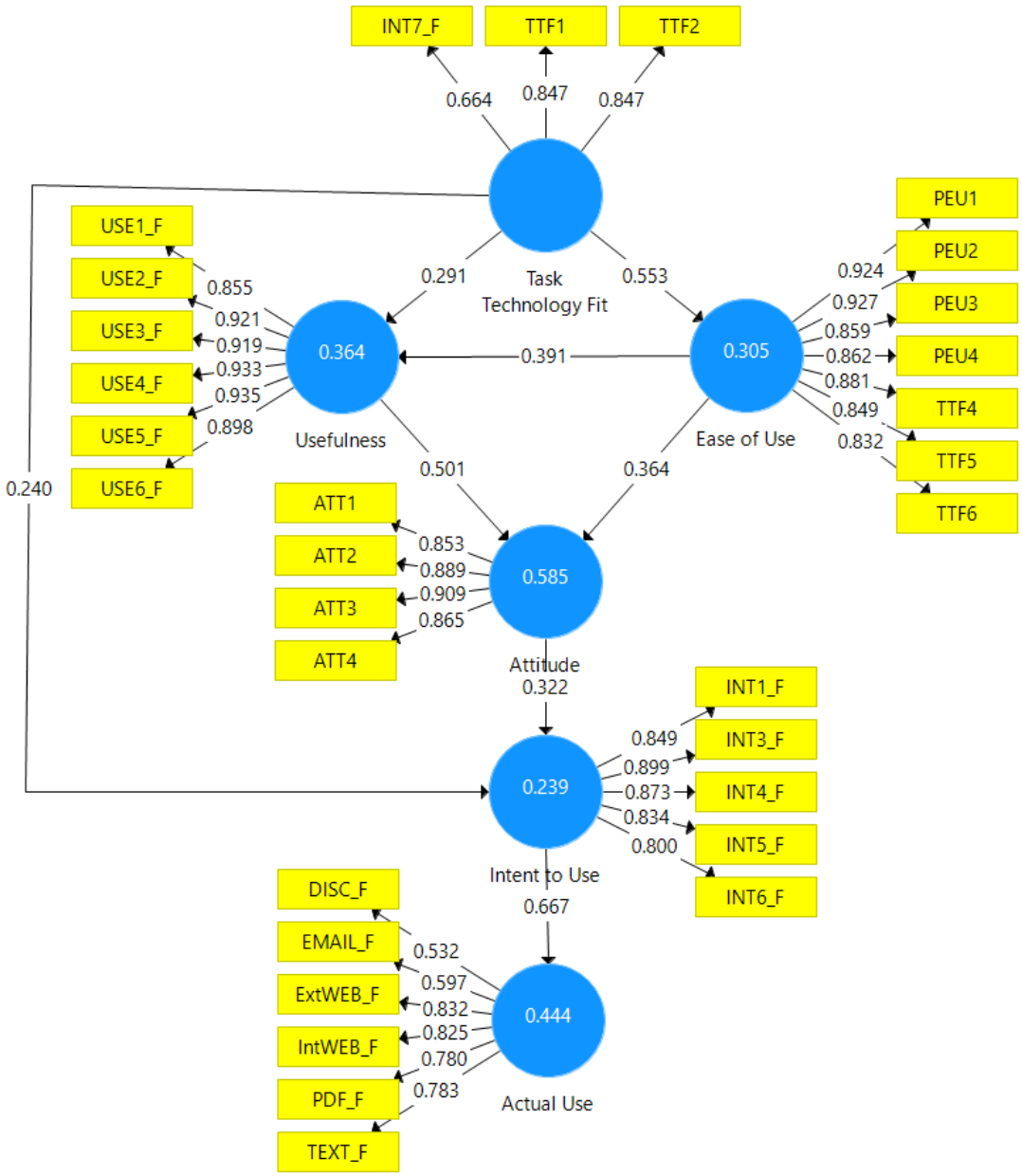

Figure 4.1 PLS-SEM model for face-to-face instruction

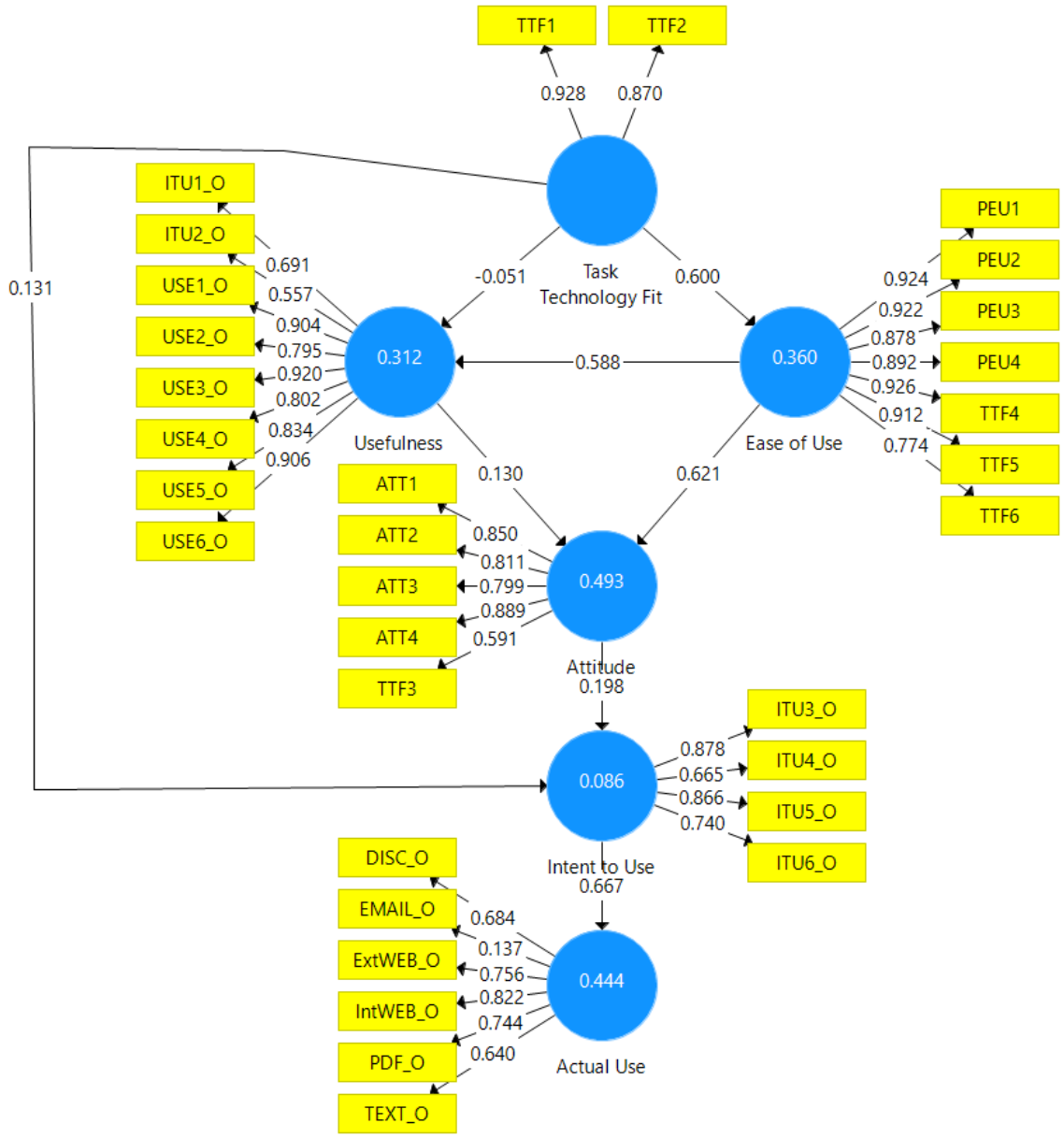

Figure 4.2 PLS-SEM model for online/blended instruction

Significance of each path weight was calculated for the face-to-face model and the online/blended model. Results can be seen in Table 4.17. All the paths in the face-to-face model are significant to the 0.05 confidence level. The online/blended model had

four paths that were not significant to the 0.05 level including Attitude to Intent to Use, Task Technology Fit to Intent to Use, Task Technology Fit to Usefulness, and Usefulness to Attitude.

Table 4.17 Path Weights and Significance of Face-to-Face and Online Models

Hypothesis	Causal Relationship	Original Sample (O)	*p*-value
	Face-to-Face		
H1	Task Technology Fit -> Usefulness	0.291	0.000
H2	Task Technology Fit -> Ease of Use	0.553	0.000
H3	Task Technology Fit -> Intent to Use	0.240	0.000
H4	Ease of Use -> Usefulness	0.391	0.000
H5	Ease of Use -> Attitude	0.364	0.000
H6	Usefulness -> Attitude	0.501	0.000
H7	Attitude -> Intent to Use	0.322	0.000
H8	Intent to Use -> Actual Use	0.667	0.000
	Online/blended		
H1	Task Technology Fit -> Usefulness	-0.051	0.774
H2	Task Technology Fit -> Ease of Use	0.600	0.000
H3	Task Technology Fit -> Intent to Use	0.131	0.524
H4	Ease of Use -> Usefulness	0.558	0.000
H5	Ease of Use -> Attitude	0.621	0.005
H6	Usefulness -> Attitude	0.130	0.623
H7	Attitude -> Intent to Use	0.198	0.513
H8	Intent to Use -> Actual Use	0.667	0.000

Effect size was calculated using f^2 values. Table 4.18 shows the effect size for the paths between variables. Values below 0.02 show a small effect size, while values below 0.15 are considered medium effect, and values above 0.35 are considered large effects (Sarstedt et al., 2017). In the face-to-face model, the paths between Attitude and Intent to Use, Task Technology Fit to Intent to Use, and Task Technology Fit to Usefulness all have medium effect sizes. All the remaining paths have large effect sizes. In the online

model, the paths from Task Technology Fit to Intent to Use, and from Task Technology Fit to Usefulness both have small effect size. The paths from Attitude to Intent to Use and Usefulness to Attitude had medium effect size. The paths from Intent to Use to Actual Use, Ease of Use to Attitude, Task Technology Fit to Ease of Use and Ease of Use to Usefulness all had large effect size.

Table 4.18 Effect Size of Face-to-Face and Online/blended Constructs using f2

Mode & Construct	Face-to-Face	Online	Difference
Task Technology Fit -> Usefulness	0.093	0.002	0.091
Task Technology Fit -> Ease of Use	0.440	0.564	-0.124
Task Technology Fit -> Intent to Use	0.056	0.013	0.043
Ease of Use -> Usefulness	0.167	0.321	-0.154
Ease of Use -> Attitude	0.222	0.524	-0.302
Usefulness -> Attitude	0.420	0.023	0.397
Attitude -> Intent to Use	0.101	0.029	0.072
Intent to Use -> Actual Use	0.800	0.800	0.000

The model fit of both the face-to-face and online/blended models were evaluated using the standardized root mean residual (SRMR). Values of less than 0.08 or less than 0.1 are considered a good fit (Henseler et al., 2015). The SRMR value for the face-to-face model is 0.072 showing a good fit. The SRMR value for the online/blended model is 0.112 which does not show as good of a good fit to the population.

Summary

The results of this study can inform faculty and administration on the factors that influence an instructor to utilize a learning management system to support their teaching.

Instructors reported on why and if they choose to use D2L as well as how often they use the tools within D2L. Tool usage was broken out into primary tools that are used frequently such as announcements, assignments, content, discussions, grades, quizzes, and e-mail and tools that are used less frequently. The difference in tool usage between online/blended and face-to-face instructors was investigated and online/blended instructors showed more frequent use of D2L tools.

Instructors also reported on their perceptions of the task technology fit, ease of use, usefulness, attitude, and their intent to use D2L. The study found significant differences between results reported by online/blended and face-to-face instructors for two factors of usefulness. Significant differences were found in all factors of attitude. No significant differences were found in the factors from online/blended and face-to-face instructors for any of the other variables.

An exploratory factor analysis showed that the factors for the research model loaded differently than in the proposed model. Factors also loaded differently between the face-to-face instructors and the online/blended instructors.

Structural equation modeling was utilized to determine the fit of the face-to-face and the online/blended model developed with the exploratory factor analysis. The face-to-face model had significant loading on the path weights and a good model fit. Four of the paths in the online/blended model were not significant and the model did not show a good fit to the general population.

CHAPTER FIVE

CONCLUSION

Introduction

This study was designed to examine how instructors perceive their reasons for using a learning management system. The technology acceptance model with a task technology fit extension was utilized to examine the relationship between potential factors that influence an instructor's use of the learning management system.

This study adds to the body of knowledge about the interaction of instructors and the electronic tools available to support teaching and learning. The knowledge gained from the relationship between instructors' technology acceptance and their perception of the task-technology fit will help inform higher education administrators and decision makers on limits of learning management system use at their institution.

This chapter presents a discussion and interpretation of the results of the investigation. This chapter also describes the implication of the results on teaching practice and professional training for instructors.

Context of the Study

Institutions make significant investment in learning management systems (LMS) to help in instruction in face-to-face, blended, and online classes. There are many barriers to the adoption of a LMS by faculty including the time it takes to set up and use a LMS

for a class, lack of training and support, fear of technology, and consequence of adoption (Sinclair & Aho, 2017). Even with these common barriers, the majority of faculty across the nation utilize a LMS in their teaching (Allen & Seaman, 2016; Sinclair & Aho, 2017). If an institution is not utilizing the LMS then it opens up an area of concern. As institutions evaluate the allocation of the budget towards technology, a lower rate of usage of the LMS may indicate a technology tool that is not needed. To avoid the LMS being removed from all instructors at an institution, more research is needed to study why instructors choose to utilize a LMS. The issue of increasing the adoption of the LMS to retain the availability of the tool in institutions is important to instructors who teach face-to-face, online, or in a blended format.

This study was designed to look at the reasons faculty choose to utilize a learning management system in an institution that has lower adoption rates than the national average. The technology acceptance model (TAM) by Davis (1989) is the model most widely used to measure acceptance of a technology tool. Mathieson suggests (1991) that ease of use and usefulness are considered to be the best predictors of a new technology use (Mathieson, 1991). Numerous research studies have shown that even though ease of use and usefulness are good predictors of technology use they are general measures and don’t give an institution information on how to improve technology adoption (Sinclair & Aho, 2017; Wu & Chen, 2017). Task technology fit was an additional construct added to TAM to provide more sensitivity to the technology acceptance model. Previous studies have shown the potential for task technology fit to be related to technology acceptance (Mathieson, 1991; T. McGill & Klobas, 2009; Schoonenboom, 2014; Wu & Chen, 2017).

This study had four guiding research questions that were utilized to investigate the factors of why faculty choose to utilize a learning management system in their teaching. The questions are:

1. How do instructors describe the factors that influence their decisions to use a learning management system?
2. What is the frequency of use of "basic" learning management system tools?
3. How do face-to-face and online/blended faculty perceive ease of use, usefulness, their attitudes, their intent to use the system, and the task technology fit of learning management systems?
4. Is there a relationship between task technology fit, the TAM model factors, and Actual Technology use for online/blended and face-to-face instructors?

Research Question 1

The first research question investigated how instructors described the factors that influence their decisions to use a learning management system. Results from this study indicate that faculty identified three major factors that influence their decision to use a learning management system. The first factor is related to the fact that the institution supplies the LMSs to all faculty for free. Most institutions provide a LMS for their faculty to use in teaching (Allen & Seaman, 2013). Integrating technology with teaching can help provide students with technology skills to meet the increasing demands of a technology rich world (Vivek Venkatesh, Croteau, & Rabah, 2014). The fact that the LMS is readily available means that students have access to information at any time and

from anywhere (Vivek Venkatesh et al., 2014). Even though the LMS has the functionality to provide access, the instructor must still choose to upload information into the system. Making the LMS available to all instructors can reduce the barrier of an instructor needing to undergo additional steps to set up their course in a LMS which adds time to course preparation (Sinclair & Aho, 2017). Watty et al. (2016) did a semi-structured interview of high users of technology in the study of accounting. They found that time was a major constraint or instructors to adopt new technology. The fact that the LMS is readily available to all instructors can help alleviate one barrier to LMS adoption.

The second factor that influenced an instructor's choice to use the learning management system was related to the functionality of the LMS. Instructors indicated that they use the LMS for course management, to deliver content, to communicate with students, and to provide grades. These functional use areas are common to learning management systems (Jurado & Pettersson, 2011; Mahdizadeh et al., 2008). Just because instructors indicated that they use the LMS for one of the tasks above does not imply that they like the system. Many instructors indicate that the interface was difficult and that the functions did not always match with the pedagogy needed in their classrooms. Katsifli (2010) indicated that instructors might need to incorporate tools other than the LMS into their teaching to meet the needs of their students. It has been shown that digital natives do use a greater variety of technology in their lives but only 14% of them are high users of technology (Thompson, 2013). Instructors also often use one set of tools intensely and hardly touch other tools (Schoonenboom, 2012). Instructors who indicated

they used the LMS to support their instruction indicated that the benefits outweighed the challenges.

The third factor that influenced an instructor's choice to use the LMS was the issue of support. Instructors indicated that having the support of a peer or mentor to guide their use of the learning management system was critical to their implementation. Lack of institutional support is considered one of the barriers to technology adoption (Allen & Seaman, 2012a; Huang et al., 2011). Instructors indicated that they utilized a variety of support mechanisms which included university sponsored training, self-study, as well as faculty mentors and peers. Faculty influence other faculty to use a LMS in two ways. Faculty influence can act as a subjective norm pressuring another instructor to use technology. Subjective norms are a common extension to the technology acceptance model (Ducey & Coovert, 2016). If the majority of instructors in a department are using the LMS then there is an expectation and pressure that everyone should use the system. The external pressure might also be from the institution wanting more instructors to use the LMS. Pressures from the institution or other faculty to use a LMS is one form of peer pressure. Another aspect of peer faculty influences on choice is that of peer support. Viswanath Venkatesh and Bala (2008) did a longitudinal study of 4 organizations to investigate new extensions to the technology acceptance mode. Peer support was discovered to influence a technology user's impression of both usefulness and ease of use of a system. Peer support refers to the activities that a fellow instructor might do to help a new user to D2L. This might be showing their courses in D2L, providing informal training, or even just encouragement that it can be done and is helpful in teaching. The

majority of instructors indicated that they attended university-sponsored training as a way to start or increase their use of the LMS. Najmul Islam (2014) reported that it is commonly believed that if a LMS is working well that users will be satisfied with the use. This has been found not to be accurate. Instructors have many reasons to be satisfied or dissatisfied with the LMS and those reasons can impact their choice to use the system. Dutta, Roy, and Seetharaman (2013) indicate that there is support and training that need to occur when a LMS is first adopted but that there is a secondary set of training that needs to occur to encourage instructors to continue the use of the LMS or to get new instructors to choose to utilize the LMS. The fact that the majority of instructors in the study indicate they attend university created training sounds good until it is realized that all of the training provided is on how to use the individual tools. Peer support might be an effective secondary training method to encourage LMS adoption.

Research Question 2

Descriptive results from the instructor survey developed for this study were used to determine the frequency of use of “basic” learning management system tools. The tools that instructors reported using can be broken down into primary tools, which were used frequently for communication, content delivery, and assessment. Other tools were classified as secondary due to their low frequency of use. The primary tools are of more interest in this study because primary tools map closely to the most common tools used in a learning management system (Mahdizadeh et al., 2008). Tools were used most

frequently for assessment and grading followed by tools for content delivery. Tools for communication were used less frequently.

Primary tools help the instructor manage the flow of the class through the activities of assessment, communicating, or delivering content. All three activities provide opportunities for the student to interact within the course with the instructor (communication), with content (delivering content), or with the interface (assessment) (Chan, Walker, & Gleaves, 2015; Corry, 2008). Increased interactions within a LMS have shown potential to increase student satisfaction in a course (Corry, 2008; Song, Singleton, Hill, & Koh, 2004).

Instructors who taught face-to-face and online/blended were asked to report on their frequency of usage of email, pdf documents, internal web documents, external web links, instructor facilitated discussions and text documents inside of the LMS. There were significant differences in the frequency of use between online/blended and face-to-face instructors using web links, discussions, pdf documents and internal web pages. In all four cases, the online/blended instructors had significantly higher usage. This is not unexpected considering the needs of online instruction. The primary way online instructors have to deliver the course necessitates using web pages, web links, and pdf documents. One of the main avenues for communication between students and with the instructor is through the discussion area in the learning management system. The greatest difference in use between face-to-face and online/blended instructors was found in the use of instructor facilitated discussions. Instructors who lead a face-to-face discussion have the option of reading body language and voice inflection to gauge student

engagement and meaning. Instructors who lead online discussions don't have those non-verbal cues and must rely on what is being typed. Some of the satisfaction with leading an online discussion could be diminished, leading to a reduction in the usage of online discussions by face-to-face instructors. Schoonenboom (2012) reports that the importance of the task has an impact on frequency of tool use. The importance of delivering content and communicating using a LMS would be higher in an online/blended course than in a face-to-face course. The difference in usage can also indicate that the instructors teaching face-to-face are not as comfortable with technology of the LMS. Lane (2009) introduces the fact that novice users utilize technology differently than experienced users. They tend to limit their use of technology as well as simplifying the organization of the course. For example, delivering content through multimedia requires a larger time investment on the instructor's part and time is one of the limiting factors in an instructor's choice to use a learning management system (Dikshit et al., 2013).

Allen and Seaman (2012b) report that online faculty use tools in a learning management system approximately 10% more than instructors who teach face-to-face. This result may be the due to faculty's perceptions of the value of online courses. Allen and Seaman (2012a) report from results of annual survey of chief academic officers and faculty that 66% of faculty believe that the learning outcomes are not as good in an online course. Tool use, such as for online discussions, might drive some of that perception.

It is interesting to note that both instructors of online/blended and face-to-face courses reported low usage of email. This corresponds to instructor perceptions in the study that the email tool in the LMS is not popular. It is not known if instructors dislike

the functionality or are just used to using alternative email tools to communicate. The ability of instructors to choose an alternative method to achieve a task is at the foundation of the current study. Task technology fit assumes an instructor has a task to perform, such as email, and if the task technology fit is high to the LMS they will choose to utilize the LMS to perform the task (Schoonenboom, 2012). The low usage of the email system within the LMS indicates that instructors do not see a high fit between the task of email and the function of the LMS. If instructors are not using the LMS then the potential for the LMS technology to transform teaching is not reaching its potential (McGill & Klobas, 2009). The frequency of use of learning management tools provides evidence that the technology acceptance model with task technology fit constructs is a good model to evaluate LMS use since instructors are performing tasks in their teaching that might be performed in D2L.

Research Question 3

Instructors' perceptions related to perceive ease of use, usefulness, their attitudes, their intent to use the system, and the task technology fit of learning management systems were also answered using results from the instructor survey developed for this research. An exploratory factor analysis of the questions used to assess faculty perceptions of ease of use, usefulness, their attitudes toward technology use, their intent to use the system, and the task technology fit was conducted. The loadings for most of the items aligned with the proposed research model for each construct. Three questions from the proposed task technology fit construct, TTF4, TTF5, and TTF6, loaded into the ease of use

construct for both online/blended and face-to-face instructors rather than loading onto the task technology fit construct. The wording of the three mismatched task technology questions: *It is easy to get D2L to do what I want*, *D2L is easy to learn*, and *It is easy to become more skillful at using D2L* are all questions that are focused on a more general usage of a task technology fit. They focus on D2L as a whole rather than focusing on a specific task – tool combination. Task technology fit is easier to understand when the task and tool are closely aligned. The remaining three task technology questions, which loaded as anticipated onto the task technology fit construct, were all focused on a specific tool – task association such as *It is easy to understand what tool to use for communication*. The generalized nature of the three questions that didn't load as expected could have contributed to them loading into ease of use for both face-to-face and online/blended instructors.

Differences in Face-to-Face and Online/blended Instructors' Factor Loadings for the TAM

Interestingly, factor loadings for the face to face and online/blended instructors differed slightly in some areas. The intent to use question INT1, *I will use D2L in my teaching in the future*, loaded into the intent to use construct for face-to-face instructors but loaded into the usefulness construct with online/blended instructors. It is not surprising that online/blended instructors perceive the fact that they *choose to use D2L in the future* as a function of the LMS being useful rather than a confirmation of their intent to use the LMS. A potential reason for the difference could be the fact that online/blended instructors must use some facet of technology to deliver their class. Both online/blended

and face-to-face instructors indicated they used the LMS because it is provided by the university, making it their choice of technology to deliver their classes. Online instructors, just by the nature of an online course, must use the LMS at a higher level to deliver their course. Instructors who are high users of technology perceive greater benefits to technology use (Georgina & Olson, 2008). The perception of greater benefit could lead to the perception that using D2L is useful to deliver the course rather than being an indication of an intention to use D2L in the future.

Two other intent to use questions loaded differently between online/blended and face-to-face instructors, INT7 – *It is likely I will use D2L for instructor facilitated discussions* and INT2 – *It is likely I will use D2L for email*. The first question, INT7, loaded with task technology fit for face-to-face instructors and was removed from the online/blended model because it cross loaded with intent to use and task technology fit. Online instructors, by the nature of teaching online, already have the intention to use instructor-facilitated discussions in their class. Online discussions increase both the student – student and the instructor – student interaction. *The statement, It is likely I will use D2L for instructor facilitated discussion,* could be seen as a more of a confirmation of intent to use rather than a confirmation of the belief that the LMS is a good match to the task of discussions. Hsiao (2012) observed that instructors attitude and acceptance of technology determines how successful they are at utilizing technology. Online/blended instructors should have a higher level of acceptance and use leading to more intent to use, which in turn could cause the cross loading with intent to use and task technology fit.

The second intent to use question, INT2 – *It is likely I will use D2L for email*, had low loadings in all areas for face-to-face instructors and was removed. The question loaded with usefulness for online/blended instructors. One of the primary forms of communication in an online class is through email (Hsiao, 2012). Face-to-face classes have more opportunities for instructors to communicate with students. Email may be one of those methods but by no means the only method. This could impact face-to-face instructor's low reaction to using email and the cause of low loading on all constructs. Online/blended instructors could view email as a required tool to teach in an online format causing INT2 to load with usefulness rather than as a reflection of intent to use.

The task technology fit question TTF3, *It is easy to understand which tool to use to deliver content*, was removed from the face-to-face model since it cross loaded both on task technology fit and ease of use. The question remained in the online/blended model but it loaded into attitude instead. It is not known why the question loaded with attitude rather than task technology fit or ease of use which would be expected from the cross loading of the face-to-face question. The difference could be due to underlying differences between online and face-to-face instructors. TAM is a generalist model and indicates general perceptions but to get at more in-depth analysis more external factors need to be added (Viswanath Venkatesh & Bala, 2008). It is possible that there are other external factors such as social norms or computer efficacy that would give more insight to online/blended instructors than task technology fit.

Comparison of Online and Face-to-Face Instructor Perceptions of TAM Constructs

Instructors answered a series of Likert style questions designed to investigate their perceived impressions of five constructs in the research model. These constructs included ease of use, usefulness, attitude, intent to use the system and task technology fit. Instructors were fairly neutral in their perceptions of how easy to use the learning management system was. Both online/blended and face-to-face instructors felt that they only *somewhat agreed* with the statements about ease of use. Positive perceptions of ease of use of a LMS are considered to be a significant predictor of attitude towards a learning management system which is a strong predictor of actual use (Ducey & Coovert, 2016). Ease of use is also one of the key constructs that predict tool usage (Dishaw & Strong, 1999). There were significant differences in how online/blended and face-to-face instructors viewed the statement about D2L *being easy to incorporate with their classes*. Online/blended instructors were more positive about incorporating the learning management system. Ajjan and Hartshorne (2008) reported that instructors have increased their integration of technology to deliver content into their classrooms. Online/blended instructors are faced with the task of delivering all of their content through the learning management system and their increased comfort with using the technology could lead to their more favorable perception of how easy it is to incorporate the LMS with their classes. Fear of using technology can be a barrier to use (Lane, 2009).

Instructors were overall more positive in their perceptions of how useful the LMS was in their teaching. Face-to-face instructors generally *somewhat agreed* that the LMS was useful while online/blended instructors *agreed* to *strongly agreed* that the learning management system was useful in their teaching. There were significant differences in

two areas between online/blended and face-to-face instructors. Online/blended instructors felt that the LMS was more *useful in helping them to improve their performance* and in *making it easier to teach their classes*. Since positive perceptions of usefulness relate to increased use of a system, it would imply that online instructors are using the LMS more than face-to-face instructors (Klopping & McKinney, 2004). It is likely, considering the lower utilization of the LMS at the study institution, that online/blended instructors are using the LMS more than face-to-face instructors and in turn the LMS is helping them to improve their performance and teach their classes. Face-to-face instructors, with their lower usage of the LMS might not view the LMS as critical to helping them improve their performance or make it easier to teach their class. An area of future study could be to look at the usage rates of the learning management system and to break it down by online/blended classes and face-to-face classes. Usefulness is considered to be one of the strongest predictor of intent to use technology as well for attitude towards technology (Wu & Chen, 2017). Not only does usefulness predict intent to use but the relationship between ease of use and attitude is mediated through usefulness (Ducey & Coovert, 2016).

Instructors were generally positive about their intention to use the learning management system. Online/blended instructors were more positive than face-to-face instructors. Both online/blended and face-to-face instructors had lower intentions to use the LMS for email and instructor facilitated discussions. The use of email was a contentious issue for both online/blended and face-to-face instructors. In both cases, instructors either *agreed* or *strongly agreed* that they would use e-mail or *disagreed* and

strongly disagreed that they would use email. There were very few instructors who were neutral about their intention to use email inside the LMS. There were significant differences in the use of instructor facilitated discussions between online/blended and face-to-face instructors. Some online/blended instructors *disagreed* that they would use discussion but most online/blended instructors *agreed* or *strongly agreed*. Face to face instructors were more neutral about the use of discussions and more instructors *disagreed* or *strongly disagreed* that they would use online discussions in their face-to-face class. There were also significant differences between online/blended and face-to-face instructors in their intention to *use D2L for the future* and to *use D2L for external web links*. In both cases, the majority of instructors *agreed* or *strongly agreed* with the questions, but the overall average was higher for online/blended instructors which indicated that online/blended instructors intend to use the LMS in the future and use more external web links. Intention to use is one of the strongest predictors of actual technology use (Ajjan & Hartshorne, 2008; Davis, 1989; Schoonenboom, 2014). Most TAM models show intention to use being predicted by ease of use, usefulness, and attitude (Viswanath Venkatesh et al., 2003). [In light of your findings, the differences between F2F and online instructors' intention to use, what would you intuit about their actual use? Even before testing the SEM model? How do your findings connect with the extant literature? I invite you to discuss the literature with respect to your findings.]

Instructors were asked about their attitude towards the learning management system. In general, all instructors were more positive about believing D2L was *useful in their teaching* and that the *benefits outweigh the disadvantages*. Instructors were not as

positive and answered *neutral* about liking the idea of *using D2L for learning* and that *using D2L would be pleasant*. Face to face and online/blended instructors differed significantly on their attitudes toward the use of a learning management system. Online/blended instructors had a more positive attitude towards the LMS. Ducey and Coovert (2016) reported that positive perceptions of ease of use of a LMS are considered to be a significant predictor of attitude towards a learning management system. It is possible that online/blended instructors use of the system makes them more comfortable in the LMS and in turn improves their attitude towards using the LMS. The role of attitude in the technology acceptance model has been questioned in some studies where the effects of usefulness overshadow the effects of attitude (Viswanath Venkatesh et al., 2003). Yang and Yoo (2004) surveyed 211 undergraduate students to determine if attitude in TAM models should be broken into cognitive attitude and affective attitude. Affective attitude refers to how much the user likes the technology while cognitive attitude refers to the user's beliefs about an object. The four attitude questions used in this study are all in the affective domain. Yang and Yoo (2004) determined that cognitive attitude plays a larger role in predicting technology use. The use of only affective focused questions weakens the attitude construct of the research model. Affective questions were the only previously validated questions available for this study.

Task technology fit was identified as a potential primary contributor to both ease of use and usefulness (Schoonenboom, 2012). Instructors in this study were generally positive about the task technology fit of D2L with most answering they *somewhat agree* or *agree* with the questions. Face to face and online instructors differed significantly on

their perceptions on *understanding which tool to use for discussions* and *understanding which tool to use for content delivery*. Dishaw and Strong (1999) define task technology fit where the instructional task to be performed matches the use of a specific tool in D2L (Dishaw & Strong, 1999). The differences in the perceptions of task technology fit in online/blended and face-to-face instructors might be due to the low usage of the LMS by face-to-face instructors. If an instructor does not use D2L they can't be expected to understand which tool to utilize. It is not the case that face-to-face instructors are not doing the learning tasks of discussions or delivering content but rather that they are unfamiliar with the technology. Lane (2009) indicates that novice technology users have a very simplistic use of a learning management system and might not use all of the LMS features.

Research Question 4

Structural equation modeling was used to investigate, Research question 4, *Is there a relationship between task technology fit, the TAM model factors, and Actual Technology use for face-to-face and online/blended instructors*. The study posed eight research hypotheses for the paths in the models. They were as follows:

H1: Task Technology fit has a positive effect on Usefulness.

H2: Task Technology fit has a positive effect on Ease of Use.

H3: Task Technology fit has a positive effect on Intent to Use.

H4: Ease of Use has a positive effect on Usefulness.

H5: Ease of Use has a positive effect on Attitude.

H6: Usefulness has a positive effect on Attitude.

H7: Attitude has a positive effect on Intent to Use.

H8: Intent to use has a positive effect on Actual Use.

All of the paths were significant in the face to face model supporting the all eight hypotheses. Not all of the paths are significant in the online/blended model as calculated by bootstrapping in SMART-PLS. Wong (2013) states that paths with a weight above 0.1 are significant, contrary to a stricter bootstrapping view, which would mean that only one path, task technology fit to usefulness in the online/blended model is not significant as shown by a dotted line in Figure 5.1. The path coefficients can be interpreted as effect sizes in terms of Cohen (1988) recommendations, where 0.20 is a small effect, 0.50 is a moderate effect and 0.80 and above is a large effect. Even if paths are significant the effect size may be small due to large sample sizes.

The path between Intent to Use and Actual Use had the largest path coefficient and a moderate effect size for both the online/blended and the face-to-face models. Intent to use has been shown to be the largest predictor of an instructor's actual use of technology (Davis, 1989; Viswanath Venkatesh et al., 2003). Turner, Kitchenham, Brereton, Charters, and Budgen (2010) report that there are few studies that measure actual use. Most studies use subjective measures with instructor's self-reporting actual use. There are questions as to the accuracy of self-reported usage. Objective measures would be a better measure of the usage (Turner et al., 2010). Objective measures would require going into the LMS system and looking in each course to measure the frequency of use of each tool.

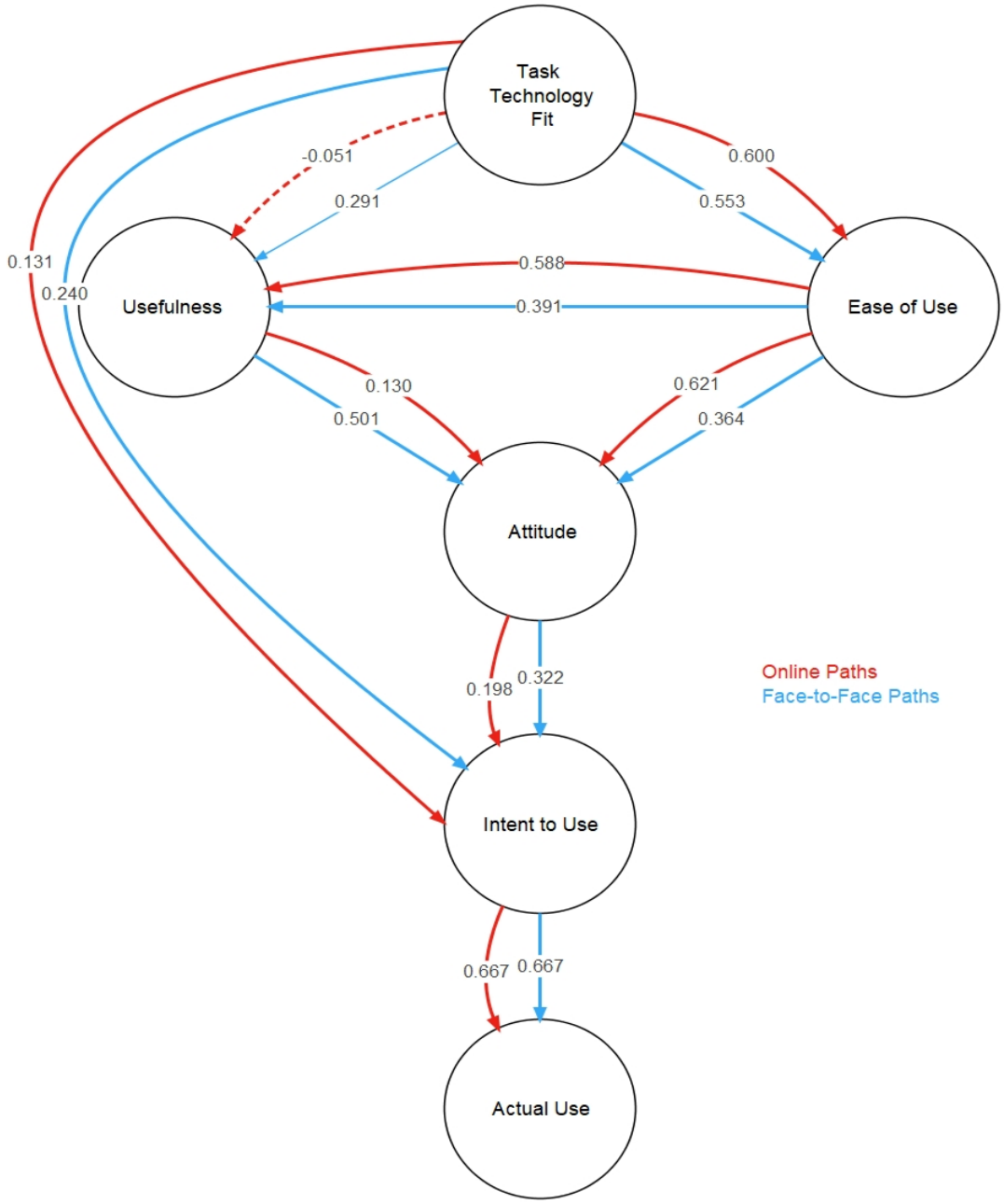

Figure 5.1 Path Model with coefficients for face-to-face and online/blended SEM models. Online paths are in red and face-to-face paths are in blue. A dashed is used to represent non-significant paths.

The paths between task technology fit and ease of use also had large path coefficients with moderate effect sizes for both face-to-face and online instructors. Baleghi-Zadeh et al. (2014), in a study of 316 students, also found a large positive relationship between task technology fit and ease of use and state that when systems are easy to use the influence of task technology fit on intention to use grows. Mathieson (1991) reports that if the fit is not high it could indicate a need to modify the components of task technology fit construct to give more definition to the measure of task technology fit. If there are multiple steps needed to do a task then the perception of ease goes down (Larsen, Sørebø, & Sørebø, 2009). For example, if an instructor chooses to post an online discussion they must go to the discussion area, create a forum, then create a topic, then post an initial post. The multiple steps in performing the task, post a discussion, could decrease task technology fit and lessen an instructor's perception of ease of use (Dishaw & Strong, 1999). (Mathieson, 1991) reports that task technology fit is complicated by the fact that some tools can be used for multiple tasks depending on the need of the instructor. This makes it difficult to capture task technology fit (Mathieson, 1991).

The paths between ease of use and attitude showed differences between online/blended and face-to-face instructors. The path for online instructors had a large path coefficient while the path for face-to-face instructors had a smaller path coefficient. Both paths were considered to have moderate effects. The easier a system is to use the better an instructor's attitude can be predicted to be. Mathieson (1991) observed that ease of use has a positive effect on attitude and in turn on the intent to use a system. If an instructor struggles with a form of technology the ease of use goes down. According to

Wingo, Ivankova, and Moss (2017) ease of use can have additional components that impact an instructor's perception of ease of use. Self-efficacy can have a large impact on ease of use (Wingo et al., 2017). Self-efficacy is increased as an instructor adapts to the online environment and gains experience. The increase in self-efficacy can lead to a higher level of ease of use but it is not measured in the current research model.

Similar patterns were seen in the paths from ease of use to usefulness where online/blended instructors had larger path coefficients than face-to-face instructors. Both paths showed moderate effects. The path coefficients for online instructors was less than the path from ease of use to attitude but the path for face-to-face instructors was greater than the path from ease of use to attitude. Computer experience also impacts the relationship between ease and usefulness According to Abdullah and Ward (2016) users with high computer experience show greater ease and usefulness. This could help interpret why online users have a stronger path coefficient than face-to-face instructors. Online/blended users tend to have more experience in using the LMS which can lead to greater ease of use and in turn a greater perception of the usefulness of the system. The ultimate result is an increased intent to use the system (De Smet et al., 2012).

The paths from usefulness to attitude showed an opposite pattern. The path coefficients for face-to-face instructors were larger and showed a moderate effect. Path coefficients for online/blended instructors were very small and showed a very small effect size. This indicates that when face-to-face instructors feel the LMS is useful they show a more positive attitude towards the LMS. Most online instructors don't see the increase in attitude towards the system even if they have a high sense of usefulness. It is

possible that online instructors are forced to use the system which could impact their attitudes. Alharbi and Drew (2014) suggests the differences between online and face-to-face instructors for this path might be due to non-system users having a higher perception of usefulness of the system. Cigdem and Topcu (2015) question that the path from usefulness to intent to use should be mediated by attitude.

Although small in magnitude, the paths from attitude to intent for face-to-face paths were larger and approached a moderate effect as compared to the path coefficient for online/blended instructors. Wu and Chen (2017) felt that attitude is a predisposition to behavior. Ajjan and Hartshorne (2008) found that attitude had the greatest effect on intent to use when combined with aspects of behavioral control such as self-efficacy or facilitating conditions. It is interesting that Ngai et al. (2007), found that online students also evidenced a small relationship between attitude and intent to use when investigating the TAM model within the context of a learning management system. They suggested that the small path coefficient could be due to the fact that online students don't have a choice to use the LMS to take their class. The same effect could be happening in this study where online/blended instructors do not have a choice of LMS for delivering instruction.

The direct path from task technology fit to intent to use had relatively small path coefficients for both online and face to face instructors. This indicates that task technology fit alone can't predict LMS usage. There are needed mediators which include ease of use, usefulness, and attitude. Larsen et al. (2009) observed that users who see that the learning management tools can help in getting work done have increased intent to do

that work using the LMS. Baleghi-Zadeh et al. (2014) suggested a direct path from task technology fit to intent where Larsen et al. (2009) felt that task technology fit had an indirect relationship to intent that was mediated by other factors. The effect of task technology is mediated through ease of use and usefulness.

The paths between task technology fit and usefulness were also found to be very small in magnitude for both online/blended instructors and face-to-face instructors. Schoonenboom (2014) found a high level of task technology fit indicated a high level of usefulness. Larsen et al. (2009) and W. Lin and Wang (2012) also found the high positive impact on usefulness when task technology fit was also high. Dishaw and Strong (1999) showed a weak link between task technology fit and usefulness. They indicated there are several components associated with task technology fit and only the component of tool experience causes an increase in task technology fit and in turn a corresponding increase in a sense of usefulness. More experience in tool use allows the instructors to better see the usefulness of the tool. The current study did not break task technology fit into smaller components which could have increased the path coefficients for online/blended instructors between task technology fit and usefulness.

Model Assessment

The online/blended and face-to-face models exhibit many differences including differences in the fit indices. The face-to-face model shows good fit while the online/blended model is slightly above the level of 0.1 suggested by Garson (2012). Chin (2010) states that the focus of a PLS analysis should not be on the traditional fit indices

but should be on the variance explained by the model. He also states that PLS is suitable for model exploration with a small samples sizes, where factors may not demonstrate high loading, or where paths may not be significant. Covariance based SEM shows a reduction in the prediction ability with any of the three items described above (Chin, 2010). The online/blended model, with a lower traditional fit, does have paths that are not significant and does have several factors that load below the suggested 0.7 levels making this study suitable for PLS analysis (Chin, 2010).

The amount of variance explained by each construct for the face-to-face and online/blended models is very similar except for intent to use. Intent to use in the online/blended model only explains 9% of the variance. Chin (2010) indicates that there is no cutoff for the acceptable level of variance explained. It all depends on the model and the path coefficients. There are four possible paths from task technology fit to actual use through the research model as listed below:

Path 1 – TTF → Ease of Use → Usefulness → Attitude → Intent to use → Use

Path 2 – TTF → Ease of Use → Attitude → Intent to use → Use

Path 3 – TTF → Usefulness → Attitude → Intent to use → Use

Path 4 – TTF → Intent to use → Use

When face-to-face instructor data is analyzed the path with the largest total path coefficient is path 1 with a total weight of 2.434. Online instructors have the largest total path coefficient with path 2 and a total weight of 2.086 (Figure 5.2)

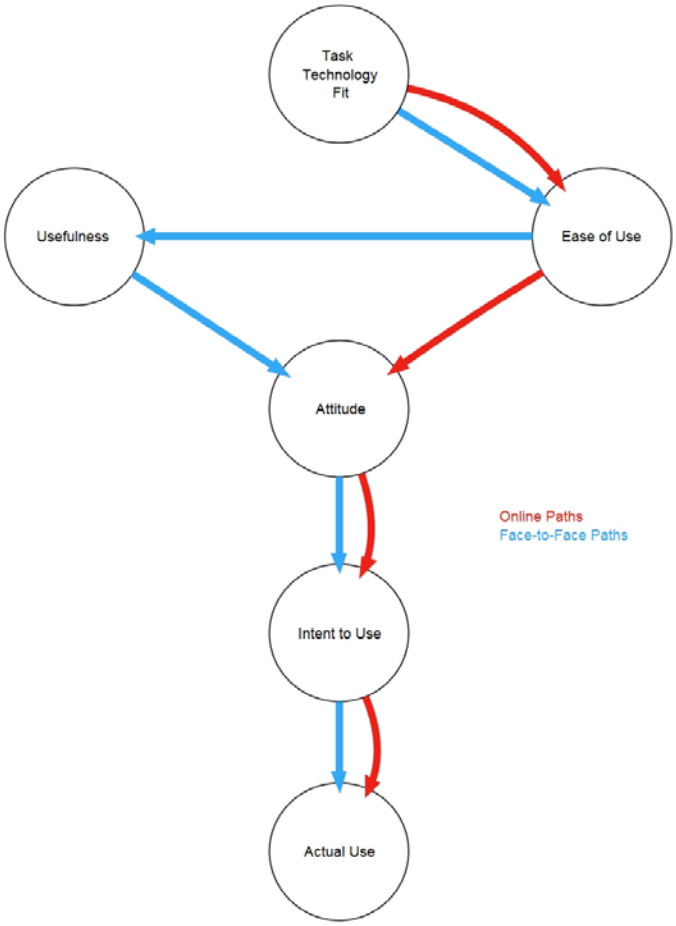

Figure 5.2 Dominant path based on total path weights for online and face-to-face instructors. Online/blended paths are in red and face-to-face paths are in blue.

Task technology fit, and the technology acceptance model can be used as predictors of actual use of the learning management system. The model explains the differences between online/blended and face-to-face instructors. For both online/blended and face-to-face instructors, ease of use shows the strongest relationship to task technology fit. A LMS must be easy to use in order for instructors to want to use the system. At this point, online/blended and face-to-face instructors take a different path to

actual use. Online/blended instructors don't view usefulness as a primary driver in use. If online/blended instructors find the LMS easy to use then they have a good attitude and will intend to use the system, which drives actual use. Face-to-face instructors also need to feel that the LMS is easy to use but then they need to know that the LMS is useful. If the LMS is useful they will have a positive attitude which will increase a face-to-face instructor's intent to use the LMS and increase their actual use of the LMS.

The differences between online/blended and face-to-face instructors as viewed through the technology acceptance model has not been well researched. Abdullah and Ward (2016) did a meta-analysis of 107 TAM papers from the last ten years. Only five papers included task technology fit as an external construct. Only seven papers were focused on instructors with the remaining focused on students or business employees. None of the articles compared online and face-to-face instructors to see if there were differences in usage of technology. This might be due to the complexity of the teaching system at an institution. One instructor might teach online, face-to-face, or blended within a single semester or within a single year. This study sheds light on how task technology fit and TAM can be used to show how instructors use the LMS and also highlights the differences between face-to-face and online instructor's perceptions about the LMS. Results from this study show that online/blended and face-to-face instructors view and use technology differently which has an impact when institutions are trying to increase use of the learning management system.

Implications for Practice

Institutions invest significant resources into learning management systems. Considering the large investment, it is normal that institutions would like to see a high usage of the LMS to justify the expense. The results from this study indicate that face-to-face and online/blended instructors differ in how they view the constructs and the relationship between the constructs of task technology fit, ease of use, usefulness, attitude, intent to use and actual use of a learning management system. This difference in view between face-to-face and online/blended instructors impacts how institutions address the low usage of a LMS.

Faculty report that one of the barriers to using a LMS is the lack of faculty training and support (Huang et al., 2011; Watty et al., 2016). Support and training are tied to an instructors perception of self-efficacy and anxiety (Al-Busaidi & Al-Shihi, 2012). Management support, incentives, and training can help increase self-efficacy and reduce anxiety in instructors who are tasked with using a new technology (Al-Busaidi & Al-Shihi, 2012). Attitude toward technology and intent to use technology are increased when facilitating conditions, such as training and support, are improved (Ajjan & Hartshorne, 2008).

Increasing training on LMS functionality could be an effective method for an institution to increase usage. The better trained the instructors are the more likely they are to use the system (Cigdem & Topcu, 2015). Currently, the study institution provides training on specific tools such as the gradebook and one mini-course designed to expose

potential online instructors to best practices in an online environment. This type of training man not be sufficient. According to Dutta et al. (2013) there are two types of training needed, a pre-adoption training and a post-adoption training. In the pre-adoption phase, training should be provided to early adopters who are comfortable integrating new technology (Huang et al., 2011). These early adopters will be able to use and test the system to provide feedback to administrators on the advisability of purchasing the new technology. Minimal training is needed with the early adopters to get them to the point where they can use the system.

Post-adoption training is needed once the technology has been purchased (Larsen et al., 2009). The training needed is different and the technology acceptance model can be used to help inform the training (Viswanath Venkatesh & Bala, 2008). Current training at the research institution, is focused on the intent to use level of TAM. Instructors have already decided to use the system at the point of training. Training is not being done to improve instructors' task technology fit, ease of use, feelings of usefulness, or attitudes towards the LMS. More specialized training is needed to address these factors that influence the use of technology for instruction prior instructors' decisions to use the LMS (Vivek Venkatesh et al., 2014). Additional training needs to help instructors see that instruction can align with the LMS as well as the LMS can be easy to use and useful. If the training addresses these issues more instructors can potentially utilize the LMS.

Training for task technology fit needs to have a pedagogy focus that looks at the tasks instructors do to teach their course and how technology can address those tasks. Schoonenboom (2014) also suggests that evaluating the importance of each task can help

increase the sense of task technology fit. More important tasks have a better fit. Once instructors believe that technology can be used to support instruction the ease of use of the LMS needs to be emphasized. This is challenging due to the intricate user interface of the LMS. How to do a task in the LMS is not intuitive, which can negatively affect the perception of ease of use. Instructors in this study indicated that they use the LMS because it is there, not because it is easy to use. Peer training could be used to increase training support in this phase (Viswanath Venkatesh & Bala, 2008). It is possible that a coworker sitting down and showing another instructor how they use the LMS would be effective in helping instructors fell the LMS is easy to use.

Based on the results of this study, training efforts for online/blended and face-to-face instructors need to be different once ease of use has been addressed. Online/blended instructors must use the LMS to deliver their class and they must do more tasks within the LMS including grading, content delivery, communication, and administration. Increasing their perception of ease of use should help them to have a positive attitude to the LMS and in turn increase their intent and actual use. Additional training in tool use would be suitable for online/blended instructors. Face-to-face instructors, on the other hand, need to have a greater sense of the usefulness of the LMS before they are willing to utilize the LMS. Training methods, such as peer training or breaking instructors into smaller supportive communities, could help new instructors understand the usefulness of the LMS. Once face-to-face instructors feel the system is more useful, their attitude may increase, leading to a greater intent to use the system and actual use. The task technology

fit and TAM model provides information that can be used to help instructors expand their use of the learning management system to support their teaching.

Recommendations for Further Research

More research needs to be done on the similarities and differences between face-to-face and online/blended instructors' use of technology. Very little is known on instructor use of the learning management system (Abdullah & Ward, 2016). Online instructors have a greater chance of utilizing tools more comprehensively to meet the requirements necessary for effective online teaching (Schoonenboom, 2014). One potential aspect of research might be on the impact of using the LMS on student achievement (Kirkwood & Price, 2013). As Wingo et al. (2017) reported, many instructors fear teaching online due to their doubt that student outcomes are as good as when they teach face-to-face. More research is also needed on how technology is being used in a learner-focused environment. Kirkwood and Price (2013) indicate that technology, if learner focused, can be a transformative factor in the learning process. Learning more about the impact of an instructor's choice to use technology on student learning might provide evidence to faculty that technology is another tool at their disposal to support teaching.

One aspect of the administrative functions of the LMS is the use of data to assess student progress in a course. D2L provides statistics on each student. The statistics include grades but also information on how many areas of the content the student has visited and how long they have spent on each page. Every login by the student is

recorded. Instructors report that they like to utilize the data available to help in their teaching. Data is a major driver for instructor use of learning management systems (Cator & Adams, 2013). More research needs to be done to see how instructors are utilizing the data to support their instruction and the impact on student use of the LMS when students understand what data is being recorded. Do students log into the LMS to show instructors they are working even if they are not? The LMS can be used as a way to engage student in learning leading to greater learning outcomes (Chen, Lambert, & Guidry, 2010). More needs to be known about this interaction.

Conclusion

The majority of institutions provide a learning management system to their faculty to support instruction. Fifty six percent of students say they wish the instructors used the learning management system more but many instructors only utilize the learning management system for basic tasks such as supplying a syllabus and grades (Dahlstrom et al., 2014). Instructors may also underutilize the LMS by not choosing to use the system at all to enhance teaching in their classes (Baleghi-Zadeh et al., 2014; Dahlstrom et al., 2014). Understanding why instructors choose to utilize a learning management system and how they utilize the system will help institutions support the learning management system to improve educational outcomes (Lonn & Teasley, 2009; T. J. McGill & Hobbs, 2008).

The technology acceptance model with task technology fit constructs can be utilized to understand some of the factors in why and how instructors are using the

learning management system. This study has shown that the factors and relationships in the TAM model explains faculty behavior differently for face-to-face and online/blended instructors. Online/blended instructors don't view usefulness as important in their decision to use the LMS as face-to-face instructors do. This has impact on the types of training institutions can do to help increase learning management system use. Most instructor training is provided to instructors once they have decided to use the LMS. Opportunities exist for institutions to provide additional training and support for instructors as they look at the tasks they perform to teach and how that relates to the LMS, as well as the ease of use and usefulness of the LMS system. The additional training could maximize LMS use and in turn maximize the institutions investment in technology to improve instruction. The use of technology in a learner focused manner can even prove to transform teaching to align with the needs of the digital native (Kirkwood & Price, 2013).

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APPENDICES

APPENDIX A

DEMOGRAPHIC SURVAY

Appendix A

Demographic Survey

DEMOGRAPHICS

What gender do you identify with?

- ○ Male
- ○ Female
- ○ Other

What is your home department?

What is your academic rank?

- ○ Tenured
- ○ Tenure Track
- ○ Adjunct
- ○ GTA/ GRA
- ○ Non-tenured Instructor

How many years have you been teaching in higher education?

- ○ 0 – 5 years
- ○ 6 – 11 years
- ○ 12 or more years

How many semesters have you used Brightspace (D2L)?

- ○ None
- ○ 1 – 2
- ○ 3 – 4
- ○ 5 – 6
- ○ 7 – 8
- ○ More than 8 semesters

What types of Learning Management Systems do you have experience with (Select all that apply)?

- ☐ Angel
- ☐ Blackboard
- ☐ Brightspace (D2L)
- ☐ Canvas
- ☐ Coursera
- ☐ Moodle
- ☐ Sakai
- ☐ WebCT
- ☐ Other

APPENDIX B

DESCRIPTIVE SURVAY

Appendix B

Descriptive Survey

DESCRIPTIVE SURVEY

What influences your choice to use D2L? If you don't use D2L what influences your choice not to use the system?

Describe the tasks you do in D2L.

Describe any training you have received on using a learning management system. Please include both formal training and self study.

Describe your experience in using a Learning Management System.

What other Learning Management Experiences have you engaged in?

APPENDIX C

LEARNING MANAGEMENT SYSTEM SURVEY

Appendix C

Learning Management System Usage Questionnaire

LEARNING MANAGEMENT SYSTEM SURVEY

Please rate the following questions on your attititude towards Brightspace D2L.

	Strongly disagree	Disagree	Somewhat disagree	Neither disagree or agree	Somewhat agree	Agree	Strongly Agree
I think D2L is useful in my teaching	○	○	○	○	○	○	○
Using D2L for teaching would be pleasant	○	○	○	○	○	○	○
I like the idea of using D2L for learning	○	○	○	○	○	○	○
The advantages of using D2L outweigh the disadvantages	○	○	○	○	○	○	○

Please rate the Ease of Use of Brightspace D2L. If you have not used D2L please give your impression of how easy it is to use.

	Strongly disagree	Disagree	Somewhat disagree	Neither disagree or agree	Somewhat agree	Agree	Strongly Agree
D2L is easy to use	○	○	○	○	○	○	○
My interactions with D2L are clear and understandable	○	○	○	○	○	○	○
D2L is flexible to interact with	○	○	○	○	○	○	○
I feel using D2L will be easy to incorporate with my classes	○	○	○	○	○	○	○

Please rate the following questions on the relationship between a task you do for teaching and the D2L technology you might use.

	Strongly disagree	Disagree	Somewhat disagree	Neither disagree or agree	Somewhat agree	Agree	Strongly Agree
It is easy to understand which tool to use for communication with a student.	○	○	○	○	○	○	○
It is easy to understand which tool to use for discussions	○	○	○	○	○	○	○
It is easy to understand what tool to use to deliver content	○	○	○	○	○	○	○
It is easy to get D2L to do what I want it to do	○	○	○	○	○	○	○
D2L is easy to learn	○	○	○	○	○	○	○
It is easy for me to become more skillful at using D2L	○	○	○	○	○	○	○

Did you teach a FACE – to – FACE class in the Fall of 2016? *

○ Yes

○ No

For the following questions, please reflect on D2L and your Face-to-Face classes where D2L might have been used as a supplement to your classroom instruction.

Please rate how useful you feel D2L is to your face-to-face teaching.

	Strongly disagree	Disagree	Somewhat disagree	Neither disagree or agree	Somewhat agree	Agree	Strongly Agree
Using D2L will enable me to accomplish my tasks more quickly	○	○	○	○	○	○	○
Using D2L will enable me to improve my performance teaching my class	○	○	○	○	○	○	○
Using D2L will enable me to increase my productivity	○	○	○	○	○	○	○
Using D2L will enhance my effectiveness	○	○	○	○	○	○	○
Using D2L will make it easier to teach my class	○	○	○	○	○	○	○
I will find D2L useful while teaching my class	○	○	○	○	○	○	○

Please rate your intention to use D2L in teaching your face-to-face classes.

	Strongly disagree	Disagree	Somewhat disagree	Neither disagree or agree	Somewhat agree	Agree	Strongly Agree
I will use D2L for my teaching in the future	○	○	○	○	○	○	○
It is likely that I will use D2L for email	○	○	○	○	○	○	○
It is likely that I will use D2L to post PDFs	○	○	○	○	○	○	○
It is likely that I will use D2L to post documents	○	○	○	○	○	○	○
It is likely that I will use D2L to provide external web links	○	○	○	○	○	○	○
It is likely that I will use D2L to post text documents	○	○	○	○	○	○	○
It is likely that I will use D2L for instructor facilitated discussions	○	○	○	○	○	○	○

How often do you use the following tools inside Brightspace D2L when teaching face-to-face?

	Never	Sometimes	Half the time	Most of the time	Daily
Email	○	○	○	○	○
PDF documents	○	○	○	○	○
Internal web documents	○	○	○	○	○
External web links	○	○	○	○	○
Instructor facilitated discussions	○	○	○	○	○
Text documents	○	○	○	○	○

Did you teach an online or blended class fall of 2016? A blended class is where a face-to-face classroom instructional time is reduced and online instruction takes its place. An online course is where there is no face-to-face instructional time and all instruction takes place online.

○ Yes

○ No

For the following questions, please reflect on D2L and your online or blended classes where D2L was used as part or all of the classroom instruction.

Please rate how useful you feel D2L is to teaching your online or blended class.

	Strongly disagree	Disagree	Somewhat disagree	Neither disagree or agree	Somewhat agree	Agree	Strongly Agree
Using D2L will enable me to accomplish my tasks more quickly	○	○	○	○	○	○	○
Using D2L will enable me to improve my performance teaching my class	○	○	○	○	○	○	○
Using D2L will enable me to increase my productivity	○	○	○	○	○	○	○
Using D2L will enhance my effictiveness	○	○	○	○	○	○	○
Using D2L will make it easier to teach my class	○	○	○	○	○	○	○
I will find D2L useful while teaching my class	○	○	○	○	○	○	○

Please rate your intention to use D2L in teaching your online or blended classes.

	Strongly disagree	Disagree	Somewhat disagree	Neither disagree or agree	Somewhat agree	Agree	Strongly Agree
I will use D2L for my teaching in the future	○	○	○	○	○	○	○
It is likely that I will use D2L for email	○	○	○	○	○	○	○
It is likely that I will use D2L to post PDFs	○	○	○	○	○	○	○
It is likely that I will use D2L to post documents	○	○	○	○	○	○	○
It is likely that I will use D2L to provide external web links	○	○	○	○	○	○	○
It is likely that I will use D2L to post text documents	○	○	○	○	○	○	○
It is likely that I will use D2L for instructor facilitated discussions	○	○	○	○	○	○	○

How often do you use the following tools inside Brightspace D2L when teaching online or in a blended format?

	Never	Sometimes	Half the time	Most of the time	Daily
Email	○	○	○	○	○
PDF documents	○	○	○	○	○
Internal web documents	○	○	○	○	○
External web links	○	○	○	○	○
Instructor facilitated discussions	○	○	○	○	○
Text documents	○	○	○	○	○