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ACCEPTANCE OF LEARNING MANAGEMENT SYSTEMS: A PERSPECTIVE OF NORTHERN NIGERIAN STUDENTS

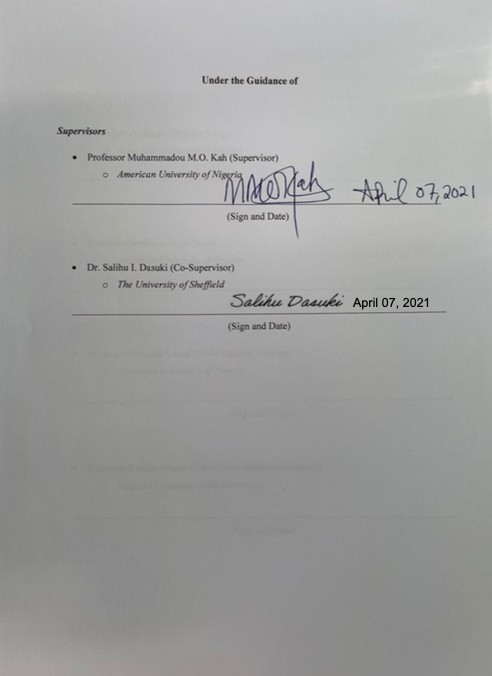
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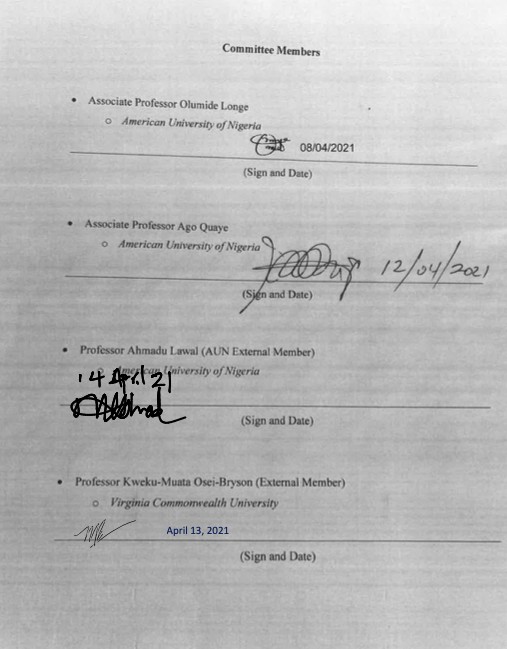
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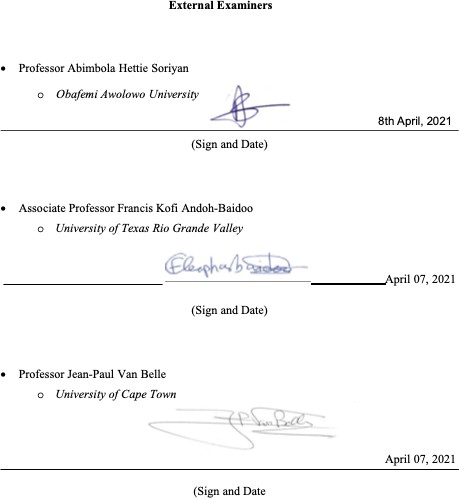
## In Information Systems

**BY**

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(Sign and Date)

Professor Chris Mbah

(Dean of the School of Graduate Studies) American University of Nigeria

# DEDICATIONS

First and foremost, I dedicate this work to the Creator of all that is seen and unseen. Without Him, there is nothing and through Him everything exists. He has been my source of strength, and hope.

This study is also dedicated to my beautiful and lovely wife, Hauwa, and my five soldiers, Mally, Tariq, Jay-Jay, Khalil and Ebi-Ebi. Your support and tolerance have made this journey worthwhile.

I also would like to dedicate this to my parents, Mrs. Olufunmilayo Yakubu and late Dr. Ahmed Uthman Ibn Yakubu. Thank you for instilling in me, the need to be educated and to pursue a career.

Finally, this is dedicated to my colleagues (at work and school) for your encouragement and support.

# ACKNOWLEDGMENTS

The completion of this thesis would not have been possible without the help of certain people whom the almighty God has placed in my life. As a result, I would like to thank my creator for giving me a life that can only be considered as blessed.

I would also like to extend my sincere gratitude to my supervisor, Prof. Muhammadou Kah for the invaluable support, guidance, and advice before and during the course of this dissertation. I feel very honored to have worked with you and I believe the work will not end just the PhD has been completed.

I would also like to express my heartfelt appreciation to my co-supervisor Dr. Salihu I Dasuki. Dr Dasuki contributed immensely to my research experience and was completely dedicated to ensuring the completion of this enormous task. The road was not easy but I would not trade the experience for anything else.

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I received so much support from my PhD colleagues in the Information Systems department, Naima, Ibro, Abdul, Nakama, Kude, Nathan, Aisha, to mention a few. Thank you all for encouraging me.

Finally, I would like to then the founder of the American University of Nigeria (AUN), H.E Atiku Abubakar, GCON, for creating a conducive learning environment. Where else in sub-Saharan Africa would I be able to embark on an American styled education?

**Go Stallions!**

# DECLARATIONS

The articles listed below have been published during the course of my PhD journey:

### Published Peer-Reviewed Articles in International Journals

1. Yakubu, M. N., & Dasuki, S. I. (2018). Factors affecting the adoption of e-learning technologies among higher education students in Nigeria: A structural equation modeling approach. *Information Development*, 35(3), 492-502.
2. Yakubu, M. N., & Dasuki, S. (2018b). Assessing eLearning systems success in Nigeria: an application of the DeLone and McLean Information Systems Success Model. *Journal of Information Technology Education: Research*, 17, 183-203.
3. Yakubu, M. N. (2019). The Effect of Quality Antecedents on the Acceptance of Learning Management Systems: A case of two Private Universities in Nigeria. *International Journal of Education and Development using Information and Communication Technology*, *15*(4), 101-115.
4. Yakubu, M. N., Dasuki, S. I., Abubakar, A. M., & Kah, M. M. (2020). Determinants of learning management systems adoption in Nigeria: A hybrid SEM and artificial neural network approach. *Education and Information Technologies*, 1-25.

### International Peer-Reviewed Conference Papers

1. Yakubu, M. N., Kah, M. O., Dasuki, S. I., & Quaye, A. (2019). Learning Management Systems: The Nigerian Students Experience. *Pan African International Conference on Science, Computing and Telecommunications*, (pp. 181 – 190). Swaziland.
2. Yakubu, M. N., Kah, M. M., & Dasuki, S. I. (2019, April). Student’s Acceptance of Learning Management Systems: A Case Study of the National Open University of Nigeria. *In International Conference on Sustainable ICT, Education, and Learning* (pp. 245-255). Springer, Cham.
3. Yakubu, M. N., & Kah, M. M. (2020). Nigerian Instructors’ Acceptance of Learning Management Systems: A structural Modeling Approach. In *2020 IST-Africa Conference (IST-Africa)*. IEEE.

# ABSTRACT

Access to the internet in developing countries is on the increase due to the declining cost of internet subscription and the availability of cheaper alternatives to internet-ready devices. This has ensured that most industries can leverage on technology advancements in order to improve their processes. In Nigeria however, there is a disparity between the way government-owned and private-owned industries use technology, while privately owned industries are funded (investment) to make profit, government-owned industries have been neglected. Higher education institutions are a good example of this disparity. Private universities have invested heavily in technological resources to provide value-for-money education; on the other hand public universities are faced with challenges resulting from inadequate funding.

In higher education institutions, a very important technology is the learning management system (LMS) and prior research has shown that an LMS, when used prudently, has the potential to improve the instruction and learning process both in and out of the classroom. Till date, only a few of Nigerian universities have been able to implement a fully functional learning management system (LMS) and as a result, the present literature is devoid of research examining the factors that facilitate the acceptance of these eLearning systems by Nigerian students. Most of the studies have omitted critical factors such as instructors’ influence and course content and design quality; thus, there is no study that has been carried out in Nigeria that has comprehensively investigated the acceptance and use of LMS’.

There is an abundance of studies on the acceptance of LMS’ in developed countries and these studies have identified factors that are responsible for influencing both instructors and students to use a LMS. However, this may not be applicable to developing countries where there is a significant difference in culture.

This dissertation aims to fill this gap by the development and testing of a conceptual framework, which is derived from the socio-psychology domain. The framework is applied to investigate Nigerian university students’ acceptance and use of learning management systems and to compare the similarities and differences between public and private Nigerian university students’ acceptance and use of learning management systems.

The universities in this study comprise of 2 (two) public and 2 (two) private universities located

in northern Nigeria and a total of 1116 usable responses were received. Structural Equation Modeling (SEM) was used test the research model and its associated hypotheses while multi-group analysis method was used to test the effect of the moderators and to compare the similarities and differences between the public and private university students use of LMS’.

The findings showed that students from both private and public universities attribute their use of the LMS to the perceived ease of using (PEOU) the system, facilitating conditions (FC) and the influence of others (SI) to use the system. There was no support for the relationship between course quality (CQ) and the usefulness of the LMS in both student samples. Similarly, the relationship between learning value (LV) on BI in both student samples was not supported. Only the private university students attributed the usefulness (PU) of the systems as a determinant of their intention to use the system. The multi-group analysis results showed that age gender and experience have some effect on some of the relationships. The T-test analysis for the equality of the means was also carried out to determine if there are differences between public and private university students use of the LMS. The results indicated that indeed there are disparities in the use of LMS’s in both types of institutions.

The results presented by this research contribute to existing literature by validating and supporting the conceptual model used in this study, which is based on prominent technology acceptance models, and provides several prominent implications to theory and practice for individuals and educational institutions.

# ABBREVIATIONS

|  |  |
| --- | --- |
| **AGFI** | Adjusted Goodness-of-Fit Index |
| **AMOS** | Analysis of Moment Structures |
| **AVE** | Average Variance Extracted |
| **ASV** | Average Shared Squared Variance |
| **BI** | Behavioral Intention |
| **CFA** | Confirmatory Factor Analysis |
| **CQ** | Course Quality |
| **CR** | Composite Reliability |
| **Df** | Degree of Freedom |
| **DTPB** | Decomposed Theory of Planned Behavior |
| **EFA** | Exploratory Factor Analysis |
| **FC** | Facilitating Conditions |
| **GFI** | Goodness-of-Fit Index |
| **ICT** | Information and Communication Technology |
| **IDT** | Innovations Diffusion Theory |
| **IQ** | Instructor Quality |
| **IS** | Information Systems |
| **IT** | Information Technology |
| **JAMB** | Joint Admissions and Matriculation Board |

|  |  |
| --- | --- |
| **KMO** | Kaiser-Mayer-Olkin |
| **LMS** | Learning Management Systems |
| **LV** | Learning Value |
| **MSV** | Maximum Shared Squared Variance |
| **NFI** | Normed Fit Index |
| **PEOU** | Perceived Ease of Use |
| **PU** | Perceived Usefulness |
| **R** | Coefficient of Determination |
| **RMSEA** | Root Mean Square Error of Approximation |
| **SD** | Standard Deviation |
| **SEM** | Structural Equation Modeling |
| **SCT** | Social Cognitive Theory |
| **SI** | Social Influence |
| **SPSS** | Statistical Package for Social Science |
| **SQ** | System Quality |
| **TAM** | Technology Acceptance Model |
| **TPB** | Theory of Planned Behavior |
| **TRA** | Theory of Reasoned Action |
| **UTAUT** | Unified Theory of Acceptance and Use of Technology |
| **UTME** | Unified Tertiary Matriculation Examination |

|  |  |
| --- | --- |
| **VIF** | Variance Inflation Factor |
| **WES** | World Education Services |
| **X** | Chi-square |
| **X/df** | Normed Chi-square |

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# CHAPTER 1: INTRODUCTION

## Background

Due to the decline in prices of computing equipment, the rapid development of technology and an increase in the application of ICT in various industries, there has been a corresponding increase in ICT investment (Jorgenson, 2001). Organizations have invested heavily in technology as they strive to remain competitive in order to survive in their respective markets. These investments continue to rise for both developed and developing countries. In the case of developing countries, one sector that is of interest is that of higher education institutions due to its potential of contributing to the work force and driving innovation.

In developed countries, ICT has been used to facilitate the delivery of education, causing a paradigm shift from the traditional methods used for instruction. Developing countries are playing catch up and are faced with numerous challenges. In Nigeria, Rotimi and Oluwafemi (2016) identified epileptic power supply, insufficient devices, lack of network/internet and lack of ICT skills and knowledge as some of the considerations that hinder the use of ICT in universities in Nigeria. The application of ICTs in higher education usually aids eLearning by leveraging on the Internet to provide resources for research and learning for both instructors and students.

“eLearning is the use of information and communication technologies to facilitate access to curriculum that is required for instruction and learning” (Boateng et al. 2016). Some examples of eLearning technology include Web 2.0 platforms, Moodle, Blackboard, and WebCT (Akeroyd, 2005). eLearning tools have been shown to be beneficial to both instructors and students. It allows learners to access resources anytime and anywhere, and it assists instructors in managing and administering their classes effectively. There is, therefore, a need to implement eLearning in higher education so that instructors, students, and administrators benefit from the rewards of using technology in the classroom, (Arkorful & Abaidoo, 2015).

With the heavy outlay involved in installing technology and the call for the implementation of eLearning technologies in Nigerian universities, there is a need to study the acceptance and success of these technologies in order to justify these investments. It is therefore important to appreciate

the factors that ensure the successful implementation of eLearning systems in Nigerian universities.

According to the National University Commission (NUC) in Nigeria, the regulatory agency for university education in Nigeria, universities are categorized into five groups namely federal universities, state universities, private universities, distance learning centers, and approved affiliations. Based on organization and management, these five groups can be placed into two main categories, i.e., public and private universities. Public universities are owned by the federal or state government, while private universities are owned by private individuals. The former are nonprofit oriented while the latter are investments set up to be self-reliant or for profit. Based on the differences in the way public and private universities are structured and financed, there is bound to be a disparity in the implementation and maintenance of information technology (IT) infrastructure. This is likely to ensure that both set of students will have differeing perceptions on the factors that influence users to use the technologies.

The differing views by students of public and private universities can also be attributed to the backgrounds of the students. Majority of the private school students come from affluent families, i.e., families that can pay for the expensive tuition of private universities. In comparison to the public school students, it is expected that their (private university students) views on the use of technology for learning will be different as they would have been more exposed to technology.

In the last 3 decades, numerous models and theories have been postulated in a bid to explain why individuals use technology. According to Wixom and Todd (2005), there are 2 prevailing approaches in the study of users perception of technology. These approaches are the “user satisfaction” and the “technology acceptance” models. User satisfaction theories like the DeLone and McLean IS success model (DeLone & McLean, 1992; 2003) are based on system and information attributes while technology acceptance models are based on user attitudes and beliefs which were adopted from the social psychology domains as they mainly focus on behavioral intentions of users.

A clear distinction between acceptance and adoption of technology needs to be made for the purpose of clarity in this study. Adoption “is the phase of exploration, research, deliberation, and decision-making (by a firm, division, or department) to introduce a new system into the

organization” (Bouwman et al., 2005), while acceptance is “the changes in individual employee (user) attitudes, perceptions, and actions that lead them to try new practices, activities, or innovations that are different from their normal routines or behaviors” (Khosrow-Pour, 2005). This study is based on the student’s perceptions and attitudes that influence them to use eLearning systems in their respective institutions. Therefore, based on the definitions above, the emphasis of this study is on the acceptance of eLearning systems by Nigerian students.

Another clarification required for the purpose of his study is the use of the term “eLearning systems.” In the next chapter, eLearning will be discussed in-depth, with specific reference to learning management systems (LMS). An LMS is a software application used to facilitate learning by leveraging on the Internet to provide access to educational curriculum. It is also used to track student’s learning outcomes, provide discussion forums, and enable the administration of quizzes and assignments. The context of this study is based on the acceptance of learning management systems.

This study aims to identify and combine constructs from prominent theories in information systems that fall within the 2 approaches stated above (user satisfaction and technology acceptance) that have been applied in the context of eLearning. The identified constructs will be used to examine the variables that impact Nigerian student’s acceptance of learning management systems (LMS) in Nigerian universities. The study will also identify the similarities and differences between students acceptance of technology in the two university settings, i.e., public and private universities.

## Problem Statement

There is an urgent need to address the educational needs for a country such as Nigeria who is ranked 7th in the world in terms of the total population, with approximately 186 million people (World Bank, 2017). In the past seven years, Nigeria has also recorded the highest growth rate in the top 10 most populated countries at 54.8% (Internet World Stats, 2017). Currently, there are only 155 higher education institutions in Nigeria. This is insufficient for the educational needs of a country as large as Nigeria. Education can be viewed as an investment in human capital, which usually contributes to the development of an economy (Psacharopoulos & Woodhall, 1993). Prior

research has supported the notion that education has a positive effect on development; see (Khan et al., 2016; Krus et al., 2015; Jaoul, 2002; Psacharopoulos & Woodhall, 1993).

In order to cater for the current and future educational requirements of a country like Nigeria, there needs to be an increase in the number of universities available for students. But more importantly, there must be a transformation in the delivery of education to improve the effectiveness of teaching, and this can be done by the introduction of technologies into the classroom and beyond.

Prior research has shown that the application of technology for instruction will aid the teaching and learning process (Tamim et al., 2011). The use of technology in the classroom has been shown to increase students learning outcome (Siyam, 2019). If properly implemented, eLearning technologies can help to alleviate some of the challenges faced by Nigerian higher education institutions. Some of these challenges are access to course material, plagiarism detection, and class management. ELearning tools will aid in tracking student’s learning outcomes by providing a platform that easily tracks students’ performance and provides access to learning resources.

With the abundance of resources in Nigeria, it is very surprising that Nigeria is still referred to as Africa’s sleeping giant due to its stunted growth in almost every industrial sector and the education industry is no exception. Saint et al. (2003) claim that “the country’s low research output probably reflects the low priority accorded to research and development by government decision-makers.” This implies that decisions are made without proper support. The few universities that have implemented eLearning technologies have not taken the time to research the different options available; they have not considered the student or instructors views and readiness to use such technology. This results in the misuse of funds. The limited funds made available to universities should be used shrewdly to improve teaching and learning. Thus there is a pressing need to research the acceptance of technology in the Nigerian classroom.

Currently, the assessment of adopting ICTs in higher education institutions is a challenge in Nigeria. This is partly because most of the institutions do not have the infrastructure required to support the use of such technologies and as such, do not have the technologies in place. Thus, there has been a dearth of reliable research in the application of eLearning technologies in Nigerian universities. This study will aid in addressing this issue by identifying the factors that contribute

to the acceptance of LMS’ by Nigerian students. It is important that universities looking to invest in eLearning are attentive to the factors that influence the acceptance of eLearning tools.

While developed countries have embraced the use of technology for teaching and learning, the difference in culture between developed and developing countries such as Nigeria have ensured that there will be differences in the way technology is applied in the classrooms. Thus, this study will comprehensively study the acceptance of learning management systems by students of Nigerian universities.

This research sets out to examine the constructs of established IS frameworks within the two approaches mentioned earlier by Wixom and Todd (2005) regarding users’ perception of technology (in the context of eLearning), and how they influence the acceptance of technology by Nigerian students. The contribution of the research will include the development of a conceptual model that will aid in investigating the acceptance of learning management systems by students. The model will be empirically validated and used to compare the behavioral intention to use an LMS by public and private university students in Nigeria.

The following section identifies the aims and objectives of this research.

## Research Aims and Objectives

This research aims at developing and testing a conceptual model that explains the contributing factors that influence Nigerian students’ behavioral intention to use an LMS’ in Nigerian universities. The proposed research model is built upon empirically tested theories that explain the behavioral intentions of users and IS Success models. The conceptual model aims at contributing to the existing literature on eLearning and the acceptance of technology. It is expected that the findings from this research will aid as a guideline in assisting policymakers and educators gain an improved understanding of the factors that contribute to the student’s acceptance and use of LMS’ in Nigeria and possibly developing countries as a whole. This is important as the potential impact of eLearning technologies on higher education in Nigeria can help students to improve their learning experiences, achieve learning outcomes, and aid instructors to manage and administer their classes.

The application of technology acceptance models, to explain students’ behavioral intention to use eLearning technologies in Nigerian universities, have been limited and need further investigation. Findings from this study will help to determine what factors are responsible for influencing students to accept eLearning in Nigerian universities. It will also assist in comparing the influencing factors between private and public university students.

The primary focus of this research is to answer the following questions:

* + 1. What are the factors that influence Nigerian students’ behavioral intentions to use learning management systems?
    2. What are the similarities and differences between how Nigerian public and private university students use learning management systems?

To answer the research questions posed above, the following objectives will be need to be achieved:

1. To develop a conceptual model that captures the determinants of learning management systems acceptance by students based on user satisfaction and technology acceptance models.
2. To emperically validate the research model within the context of students in Nigerian higher education institutions.
3. To determine if differences exist between how public and private university students use learning management systems.

More specifically, the following steps/tasks will aid in achieving the objectives:

1. Gain an understanding of the current state and background
   1. A review of eLearning, its application, advantages and how it will be beneficial to education in Nigeria
   2. A review of the current situation in terms of using learning management systems in Nigerian universities
   3. A review of technology acceptance and information systems success theories.
2. Develop a conceptual framework by hypothesizing the factors that will significantly influence Nigerian students’ acceptance of learning management systems.
   1. Identify the factors for the conceptual model
   2. Identify the moderating variables (e.g., age, gender, and experience)
   3. Develop the conceptual framework
3. Empirically validate the conceptual model within the scope of Nigerian private and public universities and compare the similarities and differences between the two types of universities. This will also aid in validating factors previously found to significantly influence eLearning systems adoption (in developed countries) by Nigerian students.

The findings from the study will assist in providing recommendations that can be used as guidelines, frameworks, and policies to improve Nigerian students’ acceptance of learning management systems.

## Research Scope

It is important to take into consideration the scope of a study in the context of the aims and objectives of the research. The resources required also need to be considered, as they are significant factors in determining the scope of the study.

The study aims at investigating factors responsible for Nigerian student’s acceptance of learning management systems by drawing factors from prior validated theories in the acceptance of technology and user satisfaction of information systems. The study will also investigate the similarities and differences between private and public university students use of LMS’.

The scope of this research is threefold and relates to the institutions of study, the group of people studied and the system used by the selected group of people as listed below:

* + 1. The eLearning system under investigation is a learning management system/portal. This is the application that is used to engage students in learning activities such as providing access to resources, assignments, and grading, tracking of learning activities and outcomes and other routine eLearning activities
    2. The study is confined to northern Nigeria where responses are gathered from private and public universities that have an LMS. Nigeria is a vast country in terms of landmass (923,763 km²), it will not be feasible, in terms of costs and time, to include all universities

in the 6 geo-political zones of Nigeria in this research. As a result, this study will focus on universities in Northern Nigeria that use a learning management system for teaching and learning purposes.

* + 1. The study is limited only to registered students of the studied universities (see item 2) that use a learning management system. Instructors are not included in the research unless they are also enrolled in the institutions as students, e.g., Ph.D. candidates.

## Significance of the Study

The use of eLearning technologies for instruction has evolved over a period of time in developed countries. In developing countries, specifically Nigeria, this is not the case. The introduction of eLearning technologies into schools where the use of technology is still at an infancy stage will pose a problem. It is, therefore, necessary to explore the factors that are responsible for determining the acceptance of implementing technology in the classroom.

The results from this research will aid in understanding the factors responsible for the acceptance of LMS’ from the Nigerian student’s perspective. An understanding of these factors will aid administrators, educators, and software developers identify student’s expectancy of eLearning systems. For administrators, the results will assist in the formulation of guiding principles and best practices to ensure that the student’s eLearning needs are met. As this research also considers the properties and quality of the eLearning system, software developers can use the results to enhance the design and functionality of existing eLearning systems.

Governing bodies such as the Nigerian University Commission (NUC) and the tertiary fund (TETFUND) will also benefit from the research observations. The findings from this study will help them in making administrative decisions that could influence the methods of teaching (pedagogy) and the application of ICT in the classroom.

A motivating factor for this research has to do with the fact that no other study has examined the combined effects of the constructs: course quality, instructor quality, and learning value, in the Nigerian university systems setting, as prior research has shown that these constructs are important determinants of students’ acceptance of eLearning systems. Also, to the best of this study’s knowledge, there has not been any study that has compared the differences between how students

of private and public universities use learning management systems. Therefore, the results of this study can comprehensively inform researchers on the key determinants of eLearning systems acceptance by Nigerian students and inform higher education institutions on how to engage students in using the LMS to achieve the required learning outcomes.

## Contribution of the Study

This study will mainly contribute to the body of literature on the acceptance of technology in the context of eLearning systems, specifically learning management systems. The research sets out to make contributions to knowledge:

* This study critically analyzes literature pertinent to technology acceptance, diffusion of innovations and information systems success theories, with emphasis on how they have been used in the context of eLearning systems from a student’s perspective.
* The study illuminates the current state of learning management systems use in Nigerian universities. It is expected that the findings of this study will identify the technological needs of Nigerian universities in order to successfully implement learning management systems in the universities that plan to adopt these technologies.
* This is also the first study of its kind, to the best of our knowledge, carried out in Nigeria that takes into consideration constructs pertaining to the acceptance and use of eLearning systems. For instance, Instructor Quality, Course Quality and Learning Value.
* The study also employs the use of moderators (age, gender, experience and training level) to investigate their impact on some of the relationships in our model.
* The research also contributes to the trends of studies and literature in both social sciences and information systems that use Structural Equation Modeling (SEM) techniques to analyze data. SEM provides a method to better understand technology acceptance especially when using multi group analysis to compare different groups of data.
* The study examines and understands the students’ perception of the internal and external supports on influencing their usage and acceptance of learning management systems.
* The research categorizes the similarities and differences between private and public university students on their acceptance and usage of learning management systems.

## Dissertation Outline

The outline below is a breakdown of the chapters that make up this dissertation.

### Chapter 1 Introduction

This chapter introduces the research by giving an overview of the problem in which the study is going to investigate. Further subsections in this chapter give a detailed explanation of the statement of the problem, the aims and objectives of the study, and the research questions posed in this study. Finally, the section ends with the significance and limitations of the study.

### Chapter 2 Literature Review

The literature review section begins by defining eLearning and LMS’. This is followed by discussions that explore the current state of its implementation in Nigerian universities. Next, the university system in Nigeria will be discussed, stating the different types of universities as well as how they are set up. This will help to explain why it is expected that students from different types of university group (i.e., public or private) would accept LMS’ in different ways hence the need to identify the salient factors in both settings. The existing theories used in information systems (IS) research pertaining to the acceptance of technology and information systems success will also be critically reviewed. Finally, the chapter ends with a discussion on the researchers’ previous studies that have guided this dissertation.

### Chapter 3 Theoretical Framework

The theoretical framework section discusses how the conceptual model was developed based on hypothesizing on the factors that are deemed to influence behavioral intention and usage of eLearning systems by students of Nigerian Universities. The constructs in the conceptual model are derived from some of the theories reviewed in Chapter 2.

### Chapter 4 Research Design and Methodology

The chapter starts by stating the philosophical assumptions used in this study and why it was chosen. Also, in this chapter, the approach used to capture, validate, and examine the data and models are discussed in-depth with detailed explanations as to why these methods are used.

### Chapter 5 Result Analysis

In this section, the data obtained from the survey is analyzed using Statistical Package for the Social Science (SPSS) version 21.0. The following procedures are performed in order to analyze the data:

* Data screening
* Frequencies and percentages
* Reliability analysis
* Exploratory factor analysis (EFA)
* T-tests

The result from the tests carried out ensures that the data is ready to test the structural relationships of the conceptual model.

### Chapter 6 Testing the Conceptual Model

This chapter presents the findings of the two-step approach used in chapter 5. It involves the assessment of the measures used to ensure the reliability and validity of the 10 constructs used in this study. The chapter also shows the results of testing the relationships between the constructs in both private and public university samples. The researcher also analyzes the effect of the moderators on the proposed model. The use of tables and figures obtained by statistical calculations is used to identify constructs within the proposed model that are statistically significant in their relationships.

### Chapter 7 Discussion

The discussion section reflects on the major findings of the study based on the results obtained in the Result Analysis chapter. The discussions chapter elaborates on the factors that are responsible for influencing both private and public university student’s behavioral intention and usage of eLearning systems and compares these findings with prior research on a construct-by-construct basis. It will also explain the meaning of the findings and the observed similarities and differences between students in both settings, i.e., public and private universities.

### Chapter 8 Conclusion, Contributions, Limitations and Further Research

This chapter is divided into the following four subsections:

* + 1. An overview of the purpose, methods, and results of the research
    2. Original contributions of the research
    3. Recommendations to practice based on the findings of the research
    4. Identification of areas for further research

# CHAPTER 2: LITERATURE REVIEW

## Introduction

This chapter is divided into 3 sections. The first section discusses eLearning, its definition and characteristics, followed by the types of eLearning, and the benefits of using eLearning systems with particular reference to learning management systems. The second section reviews the structure of Universities in Nigeria and some of the challenges they experience. It also highlights how some of these challenges can be overcome by the use of LMS’ in the classroom. The final section presents the theories used in the acceptance of technology and concludes by reviewing current research that has applied some of these theories to investigate student’s acceptance of eLearning systems.

## eLearning Definition

The development of eLearning, in what is now called Nigeria, can been traced back to 1886, during the advancement of telecommunication where cable connections were installed by colonial masters to facilitate communication between Lagos and London (Ajadi et al., 2008). Since then, the rate of use and development in the tools required for eLearning has remained relatively stagnant, especially when compared to how developed countries have seamlessly integrated technology with the instructional process.

“E-learning is a new and important learning model, and is now a fundamental tool for universities and other educational centers to gain a competitive edge.” (Sánchez & Hueros, 2010). Over the years, there have been several definitions of eLearning. In its simplest form, eLearning is the use of technology to facilitate the learning process. According to Trombley and Lee (2002), eLearning is a learning method that uses electronic instructional content usually delivered through the internet.

eLearning has evolved over time, replacing the traditional classrooms where the instructor is the center of focus. With more emphasis now placed on students and their learning needs, technology can be used in creative ways to provide access to curriculum. Prior to the pervasive use of the internet, radios and television sets were used to deliver educational content to students in different geographical locations. These methods were expensive, and access was limited to when the

programs were aired. The internet has overcome these challenges as the cost of internet access is low, and access to content is open 24/7.

eLearning uses both hardware and software ICT tools to enable interaction between students and their instructors. eLearning also overcomes the challenges posed by the traditional methods of teaching by allowing students and instructors to interact irrespective of time and distance. In developed countries, this has enabled Universities and other learning organizations to provide courses and programs to students overseas; this saves costs for students and increases revenue for the educational institutions. Students that take advantage of eLearning can benefit from accessing programs and courses that they would not normally have access to. For mature or salary earners it allows them to carry on earning a living and study at their own pace and in their spare time.

## Types of eLearning

eLearning comes in different forms and can be categorized in terms of transmission synchronization; thus, there are two types of eLearning methods, namely synchronous and asynchronous eLearning. Due to the numerous needs of students, a wide range of eLearning tools has been designed to address this need. These tools can be used in the 2 types of eLearning. It should be noted that some of these tools can be used in both categories.

Synchronous eLearning involves the use of real-time eLearning tools such as video conferencing systems. This allows for real-time or face-to-face interaction. They include virtual classrooms where interaction is accomplished via the use of instant messages, chats, and video conferencing. The classroom sessions can be recorded and played back for learning tracking purposes.

Asynchronous eLearning, on the other hand, involves the delivery of and access to curriculum and lectures at the convenience of the student. An example of asynchronous eLearning is web-based training that allows students to study at their own convenience. It is a very flexible method as it allows access to resources irrespective of time and location.

Due to the peculiar nature of the Nigerian university systems coupled with the challenges they face (see section 2.3.2), synchronous eLearning is difficult to implement. Majority of the eLearning implementations in Nigeria are based on the asynchronous model. As a result, this study focuses on asynchronous eLearning, and henceforth all reference to eLearning assumes the asynchronous model unless otherwise stated.

## eLearning Tools

eLearning tools can be grouped into 2 main categories. The first category is referred to as authoring tools. Authoring tools are software applications used to design and package content for eLearning. Usually, the content created is in electronic formats (multimedia), such as video, text, images, and audio. The content is usually shared online through the internet. Examples of authoring tools are Camtasia, Elucidate, Microsoft Office Suite, and Adobe Captivate. These tools are used to create content that can be accessed by students to enhance their learning activities.

The second group of tools is referred to as content management or storage tools. These basically provide a repository for the content already created. They allow students to access these resources in an order as specified by the instructors. Sophisticated content management systems, also known as learning management systems (LMS), also allow for advanced interactions between students and instructors, for example, the use of discussion forums, grading, assignments, and quizzes. LMS’ facilitate teaching and learning by providing functionalities such as 1) course content management, 2) communication between students and instructors, 3) student assessment and administration, and 4) student progress tracking. These provided functionalities can take place irrespective of the boundaries of location and time, which ensures that the learning process is flexible. Examples of LMS’ are Canvas, Moodle, Blackboard, and MIT’s Stellar.

Learning management systems (LMS) are now the preferred platform used to provide access to educational curriculum. While tools like smartboards, PowerPoint presentations, social media, etc. can be used to create and deliver educational content, it is the LMS that ensures continuous access to educational resources. A good LMS will store and make available all the learning materials required for a course, track students’ progress, and provide reports. The functionality of LMS’ can also be extended to incorporate the use of other applications and social media (e.g., Turnitin, Facebook) for increased functionality.

It should be noted that like other software applications, eLearning tools can be grouped either as proprietary or off-the-shelf. The off-the-shelf tools can be open source or subscribed to by institutions. It is also worth mentioning that the tools can either be hosted locally or on the cloud. Hosting on the cloud reduces the administrative tasks involved in running the application. The former method requires the application to be hosted locally (e.g., on-campus) so that access is via the intranet. Internet access will be required for access to users who are off-campus.

## Benefits of Learning Management Systems

The Internet has made available to users worldwide, resources for learning, and research. Learning with the use of technology embraces the Internet, along with other forms of technology to provide learning resources and management. Some of the benefits of LMS’ include:

* + - * The flexibility of time and place allows students and instructors to access curriculum at any time and from anywhere.
      * Easy access to resources. All that is required is a device connected to the Internet.
      * Increases opportunities for access and relationships between learners (discussions forums) and between learners and their instructors
      * It can be cost-effective when costs like travel or buildings space are taken into consideration. This is especially true for overseas or distance learning students. The cost of travel is eliminated completely and replaced with the minimal cost of accessing the internet.
      * eLearning takes into consideration the differences observed in individual learners. A well- designed course will enable students to study at their own pace and ensure that modules within the course are completed in the order set by the instructor.
      * Offers a more personalized instruction for students, especially in Nigerian universities where the instructor to student ratio can be up to 1: 250.

The use of eLearning tools has been shown to contribute towards the learning experience, by easing the access to resources (Concannon et al., 2005), facilitating communication and motivation of students (Arkorful & Abaidoo, 2015) and providing an advantage in terms of students’ achievement over traditional methods of teaching (Al-Qahtani & Higgins, 2013). Thus, if LMS’ are deployed and used successfully in Nigeria, there will be an expected positive contribution towards the development of education, for example increasing access to resources, encouraging students to self-study, and assist in the management of large classroom sizes.

## Factors Affecting eLearning Acceptance

The acceptance of eLearning is crucial for the success of its implementation. Despite the wide use of eLearning in higher education institutions as well as the advantages that come with it, if the users (students and instructors) resist the use of the technology, then implementation will fail. For

this reason, it is important for administrators and practitioners to understand the factors responsible for the acceptance of eLearning technologies. An understanding of these factors will increase acceptance rates and has been proven to enhance students learning experience (Liaw & Huang, 2011).

Prior research has shown that eLearning acceptance is not based entirely on the technological aspects but includes other factors that must be considered such as social factors (Tarhini et al., 2013; Hernandez et al., 2011), cultural factors (Masoumi, 2010) and organizational factors (Ong et al., 2004). These factors have been proven to affect the acceptance of eLearning systems. As a result, several information systems (IS) theories and models have been used to investigate the acceptance of eLearning; the theories are discussed in detail in section 2.4.

## Nigerian Universities

There is a total of 171 universities in Nigeria accredited by the National Universities Commission (NUC). The NUC was established in 1962 initially as an advisory agent to the cabinet office. In 1974 it became a statutory body and now operates as an arm of the Federal Ministry of Education (FME). The main responsibility of the NUC is the management and development of education in Nigerian universities.

According to the NUC, their main functions include:

1. Granting approval for all academic programs run in Nigerian universities;
2. Granting approval for the establishment of all higher educational institutions offering degree programs in Nigerian universities;
3. Ensure quality assurance of all academic programs offered in Nigerian universities; and
4. Channel for all external support to the Nigerian universities.

## Structure of Nigerian Universities

According to the NUC, there are a total of 171 accredited universities in Nigeria, and they are grouped into 3 categories: 1) Federal Universities, 2) State Universities and 3) Private Universities. The categories are based on ownership as the names imply. Federal universities are owned by the Federal government of Nigeria, state universities are owned by the state in which they are located,

and private universities are owned by an individual or a group of individuals. For the purpose of this study, the researcher has grouped the universities into public (government-owned) and private (individual owned) universities. The universities are set up differently, while the government- owned universities (federal and state) are set up to provide a service, the private universities are set up either for profit or to be self-reliant.

### Table 2. 1: Number of Universities per group

|  |  |
| --- | --- |
| **University Type** | **Number of Universities** |
| Federal Universities | 44 |
| State Universities | 48 |
| Private Universities | 79 |

Figure 2.1 below depicts the grouping of Nigerian universities, and table 2.1 shows the count for each of the groups.

Nigerian Universities

Public University

State Universities

Federal Universities

Private University

***Figure 2. 1: Grouping of Nigerian Universities***

## Challenges in Nigerian Universities

Nigeria has always been faced with problems with regards to education since the early fifties, as highlighted by Patterson (1955). The root of most of the challenges to the Nigerian public universities is funding. Babalola (2001), identified university funding as an issue; with the universities complaining of underfunding while the government, on the other hand, accuses the universities of poorly utilizing the allocated funds. The funding problem means that there is little or no investment in the higher education sector. This results in neglected buildings, lack of laboratory equipment, poor research output, sub-standard libraries, and inadequate supplies. Okebukola (2006) confirms the issue of funding by stating that “under-funding has been a major problem of education in many developing countries, including Nigeria” (Okebukola, 2006). Similarly, Salako (2014), listed inadequate financing, deteriorated infrastructure, brain drain, and erosion of university autonomy as some of the challenges that are faced by Nigerian Universities. Of the four challenges listed by Salako (2014), the first; state are related to funding allocation and utilization. The lack of funds has also affected the evolution of the education system in Nigeria as most of the universities still employ the 19th-century academic traditions, i.e., the traditional classroom that lacks the use of technology for instruction. Inadequate infrastructure is another

offshoot of funding; Dinim (2018) identified amenities such as “electricity, water, good hostels, and medical care are inadequate,” stating that the availability of these amenities would enhance students’ performance. An extension of Dinim’s claim is the lack of classrooms, laboratories, libraries, and lecture halls, as stated by a survey conducted by the National University Commission (NUC). The NUC survey indicated that only 30% of students have access to these resources; this indicates that more universities must be built to cater for the growing population of Nigerian students.

The Joint Admissions and Matriculations Board (JAMB) is the Nigerian governing body for admitting students into tertiary-level institutions. According to the JAMB website, in 2016, approximately 1.600,00 students sat the Unified Tertiary Matriculation Examination (UTME) for entry into tertiary-level institutions. This number of applying students exceeded the number of available seats for entry into higher education institutions by a ratio of 2:1. Based on these Figures, there is a need to provide more tertiary institutions in Nigeria. World Educational Services (WES), states that “Nigeria’s system of education presently leaves over a million qualified college-age Nigerians without access to postsecondary education on an annual basis” (WES Staff, 2017). The World Educational Services also identified underfunding, academic corruption, and fraud as the main barriers to Nigerian universities (WES Staff, 2017).

Okebukola (2006), highlighted the issue of a decline in the quality of the programs in Nigerian universities, stating that the decline is attributed to “underfunding, inadequate academic staff numbers and quality, inadequate physical facilities and equipment, over-crowding resulting from increasing demand and other contributory factors” (Okebukola, 2006). The quality assurance of the programs, in turn, has an implication on the quality of graduates produced from these programs.

Exam malpractice and plagiarism are also a huge problem faced by all Universities in Nigeria (Dinim, 2018). Dinim attributes exam malpractice to the high rate of acceptance of unprepared students admitted into Nigerian universities which instigates unethical practices in order to get good grades. Plagiarism (Academic dishonesty) is the stealing of someone else’s work or ideas and representing it as original work. The rate of plagiarism is very high in Nigerian universities, Babalola (2012), cited “most students lack adequate understanding of the behaviors that constitute plagiarism and are thus more likely to commit unintentional plagiarism” (Babalola, 2012). According to Dinim (2018), a lack of zeal and resources that foster creativity is the cause of the

common problem of plagiarism in Nigerian universities. Orim et al. (2013), suggests that plagiarism by Nigerian students is as a result of a lack of awareness of the concept of plagiarism.

Another challenge that faces the Nigerian university system is the acts carried out by cult groups. These actions disrupt academic progress due to the incidents and crises that result from the groups.

Finally, the strike actions carried out by bodies such as the Academic Staff Union of Universities (ASUU) and the National Union of Nigerian Students (NUNS) affects the stability of the universities due to the temporary shut-down of academic sessions, this, in turn, leads to a decline in student and staff performance.

Below is a summary of the challenges faced by Nigerian universities as:

* Underfunding
  + Quality assurance
  + Lack of resources
  + Brain drain
  + Inadequate infrastructure
  + Obsolete education system
  + Strike actions
* Exam Malpractice
* Plagiarism
* Cult activities

## How LMS’ can help overcome some of the challenges in Nigerian Universities

LMS’ on its own cannot resolve all the challenges identified in the previous section. But the proper implementation of eLearning tools such as LMS’ could help in alleviating some of the problems identified, and to improve the teaching quality by providing feedback and access to resources (Concannon et al., 2005).

Funding needs to be addressed, as there are costs involved in setting up the technology and resources required for implementing eLearning systems. The costs vary, and there are quite a few options that can be considered. For instance, should the system be hosted on the “cloud” or locally on campus? Cloud hosting involves subscription fees, which also include support of the system

and possibly staff training. On the other hand, hosting on-campus attributes costs to equipment such as servers and support staff. Another factor to consider is whether to go with open-source LMS’ or proprietary systems; the latter option comes with a cost of subscription and implementation. But once the system is in place, issues such as auditing of courses for quality assurance will be easier to manage; this is due to the ease of access to the resources used in courses.

Another challenge that can be overcome by the implementation of LMS’ is the obsolete education system that has been in use since the early sixties (Dinim, 2018). This teaching practice involves the teacher being the center of attraction in the classroom where the student can only gain access to knowledge via the instructor. Newer pedagogies have been shown to improve the students learning experience by allowing the students to access knowledge from other sources as well as the teacher. Technologies such as LMS’ facilitate access to electronic and online resources from anywhere and at any time. An example of such pedagogy is the flipped classroom. Lage et al. (2000), explains the flipped classroom by stating that “inverting the classroom means that events that have traditionally taken place inside the classroom now take place outside the classroom and vice versa” (Lage et al., 2000). Flipped classroom shifts the traditional classroom by allowing students to access information while the teacher plays the role of a coach or facilitator. It is expected that the student brings to class topics that need clarity on and for the instructor to clarify the topics.

Exam Malpractice and plagiarism can also be checkmated by the use of LMS’. For example, Canvas LMS provides integration to a popular anti-plagiarism application called Turnitin. Homework and assignments submitted via Canvas are automatically sent to Turnitin where a plagiarism check is performed to show the level of originality of the submitted paper. This will particularly be useful in large classrooms. Other LMS’s like Moodle also has this built-in functionality of integration with anti-plagiarism applications.

A common problem with Nigerian universities is the size of classrooms. This problem falls under lack of resources as there are few teachers when compared to the number of students. It is not uncommon to have a teacher to student ratio of 1:200 in some classes, and most of the time, these classrooms cannot accommodate every student. Classes with too many students will be very difficult to manage. The use of an LMS can ease the workload of instructors by leveraging on functionalities of the LMS such as announcements, discussions, and grading.

Another issue that stems from the lack of resources that can easily be resolved by the use of an LMS is access to learning resources such as lecture notes/slides, syllabus, and online resources. The current practice in most institutions is that students do not get to see the syllabus; lecture notes are photocopied and sold to students by instructors. As these notes are paper-based, the students can lose them, or they can get damaged. Electronic copies would resolve these issues as they can be downloaded multiple times and on different types of devices. Also, access to online resources such as eBooks, open access journals, and databases can be provided on the course page of the LMS for access by all students.

Finally, the use of LMS technology has some added benefits to both students and instructors. In the evolving world, we live in today where almost every process involves the use of technology; both students and instructors will gain exposure to the use of technology for learning and teaching. For students, they will adapt better to online professional development courses as opposed to students that have not been exposed to the use of technology for learning. Instructors, on the other hand, will have an added advantage in the job-seeking market. Overall, once both students and instructors get over the initial learning curve, they will find that the use of LMS will enhance their learning and teaching roles, respectively.

## Private versus public Nigerian universities

There are 4 universities that are used in this study, and all the universities are located in northern Nigeria. Two of the universities are public (government-owned) universities, while the other two are private.

As mentioned in chapter 1, one of the objectives of this study is to understand what similarities and differences exist between public and private university student’s acceptance of eLearning systems. This objective was raised because the authors believe that there will be differences between the 2 types of institutions due to the difference in the way the institutions are set up. Funding is probably the most significant factor that affects teaching and learning (Ajayi & Adeniji 2009), listed and explained below are a list of sub-factors that are influenced by funding:

* + - * Technology resources: With low funding, a paucity of resources such as internet/intranet access, servers, computers, and software applications will be expected. This is the theme across most public universities where access to the internet and computers is limited to

areas such as labs and libraries. This puts a strain on the resources because there are so many students in public universities. Private universities, on the other hand, are well funded. Tuition fees can be up to 50 times more expensive in private universities; thus, there is an expectation from paying students that access to these resources is adequate. An example is the American University of Nigeria (AUN) where internet access is available 24/7 and from anywhere on Campus, also access to resources such as the library and the LMS is from anywhere in the world. Another contributing factor to the better technological resources of private universities lies in the competition between the private universities. Because they (private universities) are run based on business rules, it is expected that they will strive to attract a larger percentage of students by ensuring that the resources to ensure a conducive learning environment is in place. Public universities are not set up for profit- making; instead, they are viewed as a service provided to the Nigerian population, and the pressure to provide favorable learning environments is therefore absent. This coupled with the fact that allocated funds to public universities are low (Aluede et al., 2012), it means that private universities are able to provide and maintain technological resources better than public universities.

* + - * Instructor’s morale: Another sub-factor that is influenced by funding is the morale of instructors in Nigerian universities. As mentioned above, private universities are in a competitive niche and will do their best to attract the best instructors with higher salaries and benefits. For instance, in AUN, instructors are hired with attractive packages of free housing (with free water, electricity and internet access) and the opportunity to travel for one conference a year to present published papers. On the other hand, public university instructors do not enjoy such benefits. An indicator of the instructor morale in public universities is seen in the rate at which the Academic Staff Union of Universities (ASUU) call for strikes due to demands to improve salaries, benefits, and funding. It is expected, based on the facts just stated, that the morale of private university instructors will be higher than their colleagues in public universities.
      * Quality Assurance: Another factor raised earlier in section 2.3.2 is the effect funding has on quality assurance. Course quality assurance ensures a high level of course quality, student understanding, and participation. Private universities will continue to monitor course quality in order to provide the best value for money to students. Unfortunately,

underfunding in public universities has resulted in a stagnated education system where year after year, the same resources are being used to teach.

The 3 sub-factors identified are identified as significant factors that contribute towards the Nigerian students’ eLearning experience (Yakubu et al., 2019) and they will form the basis of 3 hypotheses to be tested in order to compare the difference between public and private university students’ perception on the quality of eLearning. This will be used to answer one of the research questions posed in this study.

## Theories in Technology Acceptance and Information Systems Success

Over the past three decades, several theories have been proposed in order to predict and explain the acceptance of tools, products, services, and technologies. This section introduces the different models and theories that have been proposed and validated in the context of usage and acceptance of information systems and technologies.

Information systems are designed to work with and for individuals in order to achieve objectives. When new software or an application is introduced to users (especially by an organization) if the culminating factors that are attributed to the use of the software dissuade the targeted users, the intention to use such software is decreased, and the proposed increase in productivity by the organization is not achieved. This has resulted in numerous studies which aim at understanding and predicting the factors that play a role in the acceptance of systems and technologies.

The acceptance of technology has been studied at great depths and breadths. With the aim of promoting usage, researchers have tried to find the reasons why technology is accepted by users and the underlying factors that contribute to the intention to use them.

Studies on the acceptance and use of technologies are important to organizations and developers. The information obtained from these studies, such as the factors why a particular software or application is accepted (and used) helps to direct developers in producing quality software and applications that will be used in order to increase productivity. Organizations can use these studies to predict the acceptance of an application that could potentially contribute to the success of the organization.

Some of these theories were initially developed before the widespread use of technology and information systems as we now know them now. The theories were based on products or tools and the intention to use them. For example, the innovation diffusion theory, which is one of the theories adopted in the information systems field, has been used since the 1960s to study the acceptance of agricultural equipment, see (Robertson, 1967; Bhola, 1965; Katz, Martin, & Hamilton, 1963).

Psychological and sociological theories initially developed to study human and individual behavior, have been adopted and are the basis of the majority of the technology acceptance models. A good example is the Theory of Planned Behavior, a theory in psychology, that links behavior to beliefs (Ajzen, 1985). It has been adopted in various fields such as healthcare, advertising, and public relations. It has also been used by researchers to predict user behavioral intentions in the information systems field (Pavlou & Fygenson, 2006; Ifinedo, 2012; Cheon et al., 2012; Mathieson, 1991).

The research in technology acceptance using these theories have evolved and tailored to meet the requirements of different scenarios. For instance, certain models work well for technologies where usage is voluntary versus being mandatory. Other models were tested at different stages of the implementation of the technology studied. Also, the way technology is used has changed over the past two decades due to advances in technology and user demands. As a result, a constant review of existing theories and how they have been applied is important in order to ensure that the right set of constructs are applied to any particular study.

Some of the constructs used in the theories below share some similarities. These will be summarized and grouped at the end of the detailed descriptions of the reviewed theories. The theories discussed below have been selected as they have been used extensively in the study of user acceptance and usage of technologies and information systems.

## Social Cognitive Theory (SCT)

SCT (Bandura, 1991) is a theory deeply rooted in psychology (human behavior), it started off as the Social Learning Theory in the 1960s by Albert Bandura and evolved into SCT in 1986. SCT suggests that human behavior and reasoning is influenced by an individual’s experiences and social interactions. SCT proposes that the ways an individual acquires knowledge is related to observation, experiences and external influences, the importance of social influence and its

emphasis on external and internal social reinforcement are a unique feature of SCT. The theory insists that experience is gained by knowledge passed on and putting to practice this knowledge by replication via observation.

Albert Bandura is a renowned psychologist; he suggests that there is a direct relationship between an individual’s perceived self-efficacy and a change in the individual’s behavior as a result of social learning (Bandura, 1986). SCT recognizes human behavior as being a product of the external environment, individual behavior, and events.

As shown below in the model used by Bandura 1986, there are 3 different interactions. The SCT model indicates that an individual’s behavior is determined by three dynamic and mutual factors. These factors are the external environment, personal factors, and behavior.

Behavior

Environmental Influences

Personal Factors

### Figure 2. 2: Diagram representation of Social Cognitive Theory (Bandura, 1986)

SCT has been applied to the information systems and technology fields. One of the first information systems and technology studies to apply SCT was done by (Compeau & Higgins, 1995b) to examine the computer training process and compare 2 different types of training. The first was the traditional training program, and the second was based on SCT. The SCT based training was carried out by modeling the training to conform to Bandura’s idea that watching people’s behavior will influence the observer’s opinion of their own ability to perform the same task. Compeau & Higgins, (1995b) indicated that self-efficacy was largely responsible for performance in both training models and that the behavioral approach was measured to be more effective than the traditional method used in training.

SCT provides a framework for understanding, predicting, and changing human behavior, and it is a widely recognized and empirically supported model of individual behavior. Compeau et al. (1999) extended SCT to the acceptance and usage of information technology. In Compeau’s study, usage was the dependent variable influenced by the following variables:

* Outcome Expectations (Performance): These are job-related consequences of performing a certain task. Outcome expectations, such as increased productivity are examples.
* Outcome Expectations (Personal): These individual expectations are a collective result of exhibiting a certain behavior such as a sense of accomplishment and personal esteem.
* Self-Efficacy: Self-efficacy is an individual’s perception of their ability to perform a task.
* Affect: This describes an individual’s affinity towards a particular behavior. For instance, an individual who enjoys working with computers will be more inclined to use computer technology as opposed to an individual who has a very low tolerance for technology.
* Anxiety: Anxious emotions that are exhibited by individuals when performing a particular task can prevent them from repeating such tasks such as computer use.

Over the years, there have been several other studies that have used SCT. In an attempt to explain internet use and gratifications, LaRose and Matthew (2004) used SCT variables to improve the predictive power of media gratifications. Lin and Huang (2008) extended the task-technology fit theory with SCT to investigate the factors that influence the use of knowledge management systems (KMS). The findings indicated that self-efficacy was an important construct for determining the use of KMS (Lin & Huang, 2008). More recently, Rana and Dwivedi (2015)

employed an extended model of SCT to observe the constructs responsible for influencing the intentions of users to adopt an electronic government system in India. Six of the seven constructs hypothesized showed significant relationships.

While SCT has been used in various studies that try to explain the usage of technology, there are limitations of the theory. SCT does not take into account an individual’s emotions or the factors that will motivate an individual to use the technology. For any given technology, the individuals that use the technology could have different perspectives about the technology. Where some see benefits or rewards, others might view as complex or time-wasting. Since Bandura’s theory suggests that behavior is as a result of one's experiences and environment, emotional responses are minimized. Another limitation of SCT is that it does not state which of the extent to which the factors affect an individual’s actual behavior. It only states that there is a relationship between behavior, environment and personal factors and by focusing solely on the process of learning, it does not take into account how these factors are affected by an individual’s experience and expectations.

SCT is good at explaining a large number of behaviors and also offers a way of integrating social and cognitive theories. It handles behavioral inconsistencies well, and its application in technology is relevant to understanding what factors are responsible for its use.

## Theory of Reasoned Action (TRA)

The theory of reasoned action (TRA) (Ajzen & Fishbein, 1975), is another popular theory drawn from social psychology and based on human behavior. TRA suggests that an individual’s behavior is determined by his intentions, which in turn are dependent on the individual’s attitude towards the behavior and subjective norm. This implies that attitude towards behavior is an individual’s responses about executing a certain behavior. Individual’s attitudes are measured based on the outcomes of behavior and the desirable effects. The variance observed by the application of TRA to individual acceptance of technology is consistent with other studies that used TRA in the context of other behaviors (Davis et al., 1989). This implies that TRA can be applied to the acceptance of technology.

TRA has 2 core constructs: (1) attitude towards behavior and (2) subjective norm. These constructs are determinants of an individual’s behavior. Attitude towards behavior is the thought approach

that an individual uses to make decisions based on possible outcomes of their actions. It includes their beliefs and past experiences, if any, of the behavior they opt to or opt not to perform. This means that if an individual believes that by performing a particular, action positive outcomes would be the end result, then the individual has a positive attitude towards that action. For a negative outcome, the individual will similarly have a negative attitude toward the action.

Subjective norm is the social influence on an individual or the individual’s decision to perform a specific action. It is an individual’s “perception that most people who are important to him think he should or should not perform the behavior in question” (Ajzen & Fishbein, 1975). Below is the theoretical model showing the relationship between the constructs (attitude towards behavior and subjective norm), behavioral intentions, and behavior.

Subjective Norm

Behavior

Behavioral Intention

Attitude toward act or behavior

### Figure 2. 3: Schema of the Theory of Reasoned Action (Ajzen & Fishbein, 1975)

Sheppard et al. (1988) investigated the effectiveness of TRA and showed that there was strong evidence for the predictive utility of the model. The meta-analysis of their study showed the prominence of attitude towards behavior and subjective norm towards predicting behavior was significant (r=0.67). The findings also confirmed that behavioral intentions determined future behaviors.

TRA has proven to be an influential predictor of behavior in a wide variety of fields, such as applied in information technology (Mishra et al., 2014), advertising (Lee et al., 2013), human behavior (Doane et al., 2014) and health (Hornik, 2007).

In the domain of information systems, there have been several studies that adopt TRA in order to explain the behavioral use of systems. TRA was used by (Celuch et al., 2004) to understand the intentions of insurance salespersons to use internet information management systems, data from over 700 participants explored the TRA model using structural equation modeling with the results indicating a good fit of the data to the model. A more recent study that applied TRA was by (Oni et al., 2017) in order to understand the factors that affect the acceptance of online political participation (e-democracy) by integrating TRA with the Civic Voluntarism Model. Another interesting study by Memarzadeh (2017) was to understand how online reviews affect choices made by travelers in choosing the right accommodation. The travelers’ attitude and subjective norm on intentions to pay for accommodation were compared based on the attitude constructs such as service quality, value for money, hotel facilities, and security and food quality. The participants were business travelers (n=275) who had stayed in a hotel after reading e-comments before paying for the accommodation service. TRA has also been applied in the context of social media (Sheldon, 2016); Sheldon (2016) investigated the factors that influence faculty and students intentions to add each other as friends on Facebook, the faculty attitude was the most significant predictor of intention to add students as friends while subjective norm was the more significant determinant of intentions to add faculty as friends.

The studies mentioned above show that TRA is a fairly good model and has widely been adopted by researchers in order to explain behavioral intentions not just in the field of technology but in other fields. It is a simple model that can easily be used in explaining an individual’s behavioral intentions in a voluntary setting.

As good as TRA is at predicting an individual’s behavior, there are limitations to the theory. The model has a few constraints, including a noteworthy danger of confusing attitudes and norms since attitudes and norms can be used interchangeably. Also, in reality, time constraints, environmental factors, organizational regulations, and habits can influence an individuals’ behavioral intention. For instance, if an individual has the intention to perform a certain action, the regulations within the organization, he/she, works for could force the individual not to carry out the intended action.

The theory of planned behavior (TPB) (Ajzen, 1985), attempts to address this limitation. In a study by Hansen et al. (2004) to compare the 2 models (TRA and TPB), data collected from 2 different countries (n-1222 and n=1039), the authors showed that TPB provided the best fit to the data in trying to predict the intention to purchase grocery online. This result corroborates the findings by Celuch (2004) who also compared the two models.

In order to address some of the limitations of TRA, the theory of planned behavior (TPB) was conceived.

## Theory of Planned Behavior (TPB)

The Theory of Planned Behavior (TPB) (Ajzen, 1985) is considered an extension of TRA. In order to address the limitations by TRA. TPB like TRA, associates beliefs and behavior and introduces a third independent construct (Perceived Behavioral Control) as a determinant of behavioral intention. Ajzen (1985) proposes that human behavior is driven by 1) beliefs and evaluations about the possible outcomes of the behavior (behavior beliefs), 2) beliefs about the normative expectations of other people and compliance (normative beliefs) and 3) the belief that there are factors that may ease or inhibit the execution of the behavior as well as the perceived influence of these factors (control beliefs).

The model was proposed in order to explain behaviors over which individuals have the ability to apply self-control. The key construct of this model is the behavioral intention (BI), and BI is influenced by the attitude towards the behavior, subjective norm, and perceived behavioral control, as shown in Figure 2. 4.

The TPB model differentiates between three types of beliefs (behavioral, normative, and control). This results in a model that comprises four constructs that mutually characterize an individuals’ control over any given behavior. The constructs are:

***Attitudes toward behavior:*** This is the degree to which an individual has a positive or negative evaluation of the specified behavior. It involves considering the outcomes of performing the behavior.

***Behavioral intention:*** Behavioral intentions are the motivational factors that influence a specified behavior. The implication of behavioral intentions is that the stronger the intention to perform an action, the more likely it is that the action will be performed.

***Subjective norms:*** This refers to the belief about whether other individuals encourage or discourage a specified behavior. It relates to an individual’s beliefs about whether social groups that the individual belongs to think that he or she should participate in the behavior.

Perceived behavioral control: This is an individual’s perception of the ease in performing a specified behavior. Perceived behavioral control differs based on scenarios, situations, and actions, and these, in turn, affect an individual’s perceptions of behavioral control. The perceived behavioral control construct was added to the TRA model in order to address its limitations.

TPB was developed initially to study behavior (psychology) but has been adopted in a wide variety of subjects. TPB has been used successfully to predict and explain a wide range of health behaviors, (Conner & Norman, 2005; McEachan et al., 2011; Cooke et al., 2016), entrepreneurial behaviors such as (Kautonen, et al., 2015; Kautonen et al., 2013) and in the acceptance of technology (Riemenschneide et al., 2003; Aboelmaged & Gebba., 2013; Al-Debei et al., 2013; Mathieson, 1991).

Attitude

Subjective

Norm

Intention

Behavior

Perceived Behavioral Control

### Figure 2. 4: Model of the Theory of Planned Behavior (Ajzen, 1985)

TPB is more widely accepted than TRA, and it accounts mostly for voluntary behavior. This is because it takes into account that an individual might not have complete volitional control over the behavior. There are, however, several limitations of the theory. One of the limitations is the assumption that in order to perform the desired behavior, the individual must have acquired the opportunities and resources necessary to succeed in the behavior regardless of the individual’s intention. TPB does not consider other variables that can affect behavioral intention and motivation. Some of the variables that could influence behavior are past experience, fear, mood, and threats. TPB also does not cater for factors such as economic or environmental changes that could influence an individual’s intention to perform a specific behavior though it does consider normative influences.

While the addition of the perceived behavioral control construct was a significant improvement to TRA, the perceived behavioral control construct does not specify the actual controls over behavior. The theory is also limited in the assumption that an action is the result of a direct decision-making

process, but in reality, this is not always true. There is a time frame from when the decision process starts until the action is completed, which is also not accounted for by the theory.

The TPB has shown its usefulness in trying to explain individual behaviors, especially with regards to health research, but it is still limited in its inability to consider economic and environmental influences. In the past, researchers have modified TPB by adding other components from behavioral theory in order to make it a more integrated model. This has been in response to some of the identified limitations of the TPB.

## Decomposed Theory of Planned Behavior (DTPB)

DTPB (Taylor & Todd, 1995b) is an extension of TPB and still maintains that the most significant determinant of behavior is the intention to use technology. As with TPB, DTPB consists of three constructs (attitude towards behavior, subjective norm, and perceived behavior control) these are the same constructs used in TPB, but their belief structure is decomposed in order to increase the explanation of behavioral intention. The results from a study titled “Understanding Information Technology Usage: A Test of Competing Models” by Taylor and Todd (1995) indicated that the decomposed TPB provides a better understanding of behavioral intention as it focuses on the factors that affect system usage by applying both design and implementation strategies. Another study by the same authors titled “Decomposition and crossover effects in the theory of planned behavior: A study of consumer adoption intentions.” further confirmed that the DTPB is an improvement over the TPB in terms of predicting behavior.

As seen in the diagram below, the attitude construct has been decomposed into three factors that are related to technology usage. The attitude belief factors are perceived ease of use, perceived usefulness, and compatibility. Similarly, the subjective norm belief was decomposed into two influences on an individual. The first influence is the peer influence on an individual, and the second is the superior’s influence. Both types of influence can affect an individual’s intention to behavior, and the influences could have a similar view or differ from each other. Finally, the perceived behavior control belief was decomposed into three factors, namely self-efficacy, technology facilitating condition, and resource facilitating condition. The resource facilitating conditions include constraints such as time and money, while the technology facilitating conditions include constraints that could affect the usage.

In the information systems field, numerous studies have been carried out to explain usage behavior using the DTPB model. Shi and Fang (2004) used DTPB to study the usage of internet banking in Taiwan, their results based on a comparison of TRA and TPB showed that DTPB was better at explaining behavioral intention, attitude and subjective norm than the TRA and pure TPB models. Another study by Hsu and Chiu (2004) adapted DTPB in trying to predict electronic service continuance (continued usage of technology), the results of the study suggest that the intention to continue using the information system (web-based tax filing service) is determined by self-efficacy and satisfaction. Furthermore, the satisfaction construct was decomposed into perceived usefulness, perceived playfulness, and interpersonal influence.

Perceived Usefulness

Perceived Ease of Use

Attitude

Compatibility

Peer Influence

Subjective Behavioral Usage Norm Intention Behavior

Superior Influence

Self Efficacy

Resource Perceived

Facilitating Behavioral Conditions Control

Technology Facilitating Conditions

***Figure 2. 5: Model of the Decomposed Theory of Planned Behavior (Taylor & Todd, 1995b)***

## Technology Acceptance Model (TAM)

The technology acceptance model (Davis, 1989) is one of the most influential theories used in information systems. The TAM model was developed from TRA by Davis (1989). Like TRA,

TAM posits that an individual’s intention to use a system is a mediator of the actual usage of the system. The difference between TAM and TRA are the determinants of the intention to use the system. While TRA uses the constructs attitude towards behavior and subjective norm, TAM uses two newly introduced variables.

Davis (1989) tried to ascertain valid measurement scales for the use of predicting usage of technology as the approaches used at the time were not validated. As a result, two variables were developed that were reasoned to be vital determinants of user acceptance. The two variables are perceived usefulness and perceived ease of use. Both variables were found to be significantly related to the use of technology-based in the study involving 152 users and four application programs (Davis, 1989).

Perceived ease of use (PEOU) is defined as “the degree to which a person believes that using a particular system would be free of effort.” (Davis, 1989, p.320). PEOU indicates the amount of effort required by users to use the technology. TAM assumes that the usage of technology is completely voluntary for individuals and PEOU will determine if a user will use a particular technology based on whether the technology is easy to use or not. Technology complexity i.e., technology that is difficult to use or learn, will not be accepted by users; hence, the usage will be low. The opposite is true if the technology is easy to use, as this will increase the likelihood of usage.

Perceived Usefulness (PU) is defined as “the degree to which a person believes that using a particular system will enhance his or her job performance.” (Davis, 1989, p. 320). PU states how useful technology is to the individual. In the context of organizations, this variable is not as significant where the technology use is mandatory. For the voluntary use of technology, however, PU as a determinant of behavioral intention is very strong thus, if an individual perceives that technology will aid him or her to accomplish a task or to be more productive the individual is more likely to plan to use the software more often or whenever necessary.

Figure 2. 6 illustrates the schema showing the relationship between PEOU, PU, behavioral intention to use, and actual usage as proposed by Davis (1989).

Perceived Ease of Use

Usage Behavior

Intention to Use

Perceived Usefulness

### Figure 2. 6: Model of the Technology Acceptance Model (Davis, 1989)

TAM posits that PU and PEOU are direct determinants of behavioral intention, which in turn influences usage. These behavioral elements are at the core of TAM and TRA, and both theories assume that when an individual intends to perform a certain action, they will perform the action irrespective of any other external constraints. But in reality, this is not always the case as constraints such as time, habits, environmental and political limitations can change an individual’s intention.

TAM has been extensively used by researchers in the domain of information systems and technology. The usage of TAM usually falls into 3 categories. The first category includes research that tests the validity of the model using data from different settings. A good example is a study carried out by Adams et al. (1992) to test the validity of the instruments and measurement scales used by Davis (1989). More recently TAM has been validated by studying adoption of technologies such as RSS feeds to support learning (Tarhini et al., 2015), Facebook (Rauniar et al., 2014), Learning Management Systems (LMS) (Alharbi & Drew, 2014), e-learning (Lee et al., 2013) and mobile banking (Aboelmaged & Gebba., 2013) just to mention a few.

The second category extends TAM by the inclusion of additional constructs in order to explain user acceptance. Usually, these extensions are derived from other theories; an example is the

combination of TAM and TPB models to form the C-TAM-TPB model. Taylor and Todd (1995) added the 2 constraints, subjective norm, and perceived behavioral control to the TAM model because of their predictive usefulness in the usage of technology (Taylor & Todd, 1995a). Similarly, TAM has been extended in conjunction with signaling theory (Kashi & Zheng, 2013) in the study of e-recruitment in Iran. Another extension dubbed as TAM2 by Venkatesh and Davis (2000) extended TAM by introducing new independent variables which determine perceived usefulness, one of the independent variables in TAM. The newly introduced variables are subjective norm, image, job relevance, output quality, result demonstrability, experience, and voluntariness (Venkatesh & Davis, 2000). Amoako-Gyampah and Salam (2004) researched the acceptance of technology with respect to enterprise resource planning. They extended TAM to include 3 new variables. The study evaluates the effect of belief as a construct (i.e., shared beliefs in the benefits of technology) which depended on 2 widely recognized technology implementation success factors (training and communication) on the perceived usefulness and perceived ease of use during technology implementation (Amoako-Gyampah & Salam, 2004).

Finally, the last category involves studies that compare the results of TAM with other competing models. One of such studies compares TPB, TAM, and innovation diffusion theory (IDT). The study was carried out by Hu et al. (2014). The study analyzed computer technology acceptance of Arabian workers in order to compare the 3 theories. IDT was found to provide a better explanation of workers acceptance of technology out of the 3 models. It was also observed that in comparison to developed countries, the explanatory power of the 3 theories was lower.

Despite its frequent use, TAM does have its limitations. First of all, TAM did not take into account other moderating factors such as voluntariness and experience in using the technology, especially as studies have shown that the ease of use variable becomes nonsignificant with increased experience. This has led to the redefinition of TAM to include moderators and variables to help address these limitations. Another limitation of TAM is the low explanatory power of the model, and the unreliable relationship observed among the constructs (Sun & Zhang, 2006). Finally, TAM does not provide an insight into how to improve the usage of technology through design and implementation as it only states the usefulness and ease of using the technology.

## Technology Acceptance Model 2 (TAM2)

TAM2 builds on the original TAM model by the addition of more constraints and moderators in order to address identified limitations of TAM. As mentioned earlier, TAM was based on TRA, and it (TAM) did not take into account the subjective norms construct. The new and extended model (TAM2) explains perceived usefulness and usage intention in the context of social influence (subjective norm, voluntariness, and image) and cognitive instrumental process (job relevance, output quality, result demonstrability, and perceived ease of use), (Venkatesh & Davis, 2000). It was observed that both social influence and cognitive instrumental process were significant in influencing user acceptance (Venkatesh & Davis, 2000).

The authors of TAM2 conducted the study within 4 different systems in 4 separate organizations. The use of technology in 2 of the organizations was mandatory while in the other 2 technology use was voluntary. The model constructs were measured at 3 different points in time for each organization (pre-implementation, 1-month post-implementation, and 3 months post- implementation). For all 4 organizations and in all 3 points in time, the model was strongly supported.

Figure 7 illustrates the model developed by Venkatesh and Davis (2000) showing the added constructs as well as their relationships.

As mentioned earlier, TAM2 builds on TAM by the addition of other variables that help to explain the main constructs of TAM. These variables fall into 2 categories.

1. Social Influence Processes
   1. Subjective norm: Consistent with TRA and TPB, subjective norm is defined as a person's perception that most people who are important to him think he should or should not perform the behavior in question (Ajzen & Fishbein, 1975).
   2. Voluntariness: Subjective norm was observed to have a significant effect on behavioral intentions in a mandatory setting, and as such, the voluntariness variable was added as a moderator within the TAM2 model.
   3. Image: Image is defined as “the degree to which the use of an innovation is perceived to enhance ones image or status in one's social system” (Moore & Benbasat, 1991, P.195).
2. Cognitive Instrumental Processes
   1. Job Relevance: Job relevance is defined as the perception by an individual of how relevant a system is to the individual’s job. If using the system has no relevance in accomplishing the task at hand, then the system will be deemed as useless.
   2. Output quality: Output quality defines an individual’s perceptions of how well the system performs the tasks required.
   3. Result demonstrability: This is defined as the "tangibility of the results of using the innovation" (Moore & Benbasat, 1991, 203). Result demonstrability has a direct influence on perceived usefulness.
   4. Perceived ease of use: This construct was retained from TAM and is still a deciding factor for explaining behavioral intentions. Perceived ease of use is defined as an individual’s perception of how easy it is to use the system. An easy to use system should have a very low learning curve.

Perceived Usefulness

Result Demonstrabilit y

Output Quality

Job Relevance

Image

Subjective Norm

Voluntariness

Experience

Perceived Ease of Use

Technology Acceptance Model

Usage Behavior

Intention to Use

### Figure 2. 7: Model of the Extended Technology Acceptance Model (TAM2) (Venkatesh & Davis, 2000)

TAM2 is has been tested and adopted by various studies. In the healthcare sector, TAM2 was used to investigate the physicians’ intention to adopt Internet-based health applications (Chismar & Wiley-Patton, 2003). The findings from the study partially supported TAM2 as significant aspects of the theory were not maintained. Perceived ease of use, subjective norm, and image constructs was found to have an insignificant effect. The TAM2 model used in the study explained more than half the variance of the behavioral intention (r2 = 0.59). Another study in the healthcare sector that has employed TAM2 was carried out by Basak et al. (2015) to identify the factors that affect Turkish physician’s behavioral intention to use personal digital assistant (PDA) technology. It was observed just over 70% of the physicians’ intention to use PDA technology was explained by perceived usefulness (PU) and perceived ease of use (PEOU) with PEOU having a stronger effect on intentions to use.

TAM2 has also been used in studies covering a broad range of fields such as E-Commerce where Lallmahamood (2015) explored the impact of perceived security and privacy on the intention to use Internet banking. Tarhini et al. (2017) applied TAM2 to eLearning in order to observe the effects of individual-level culture on students’ adoption and acceptance of e-learning tools. In both studies mentioned above, not all the constructs were found to have a significant effect on behavioral intention.

## Combined TAM and TPB (C-TAM-TPB)

C-TAM-TPB (Taylor & Todd, 1995c) as the name implies is a combination of TAM and TPB see Figure 8. The authors of C-TAM-TPB added two more variables to the original TAM model. This was in order to address the limitations of the original TAM that did not capture the significance of social and control variables on behavioral intention. The variables added are the social and control factors.

Several studies identified the social and control factors as determinants to the behavioral intention to use IT (Taylor & Todd, 1995c; Mathieson, 1991; Moore & Benbasat, 1991). These variables are also key determinants in the theory of planned behavior (Azjen, 1991); hence, their inclusion into the TAM model.

TAM, on its own, was developed based on studies where the participants were familiar with the technology; thus, it did not take into consideration novice users. Taylor and Todd (1995) suggest that the C-TAM-TPB model is a better representation for both experienced users and novices.

Attitude Toward Behavior

Subjective Norm

Behavioral Intention

Actual Intention

Perceived Ease of Use

Perceived Usefulness

Perceived Behavioral Control

### Figure 2. 8: Model of the Combined TAM (C-TAM-TPB) (Taylor & Todd, 1995a)

Taylor and Todd’s (1995) study showed that the C-TAM-TPB model provides an adequate model of intentions and usage of IT for both experienced and inexperienced users. All determinants except for attitudes were significant. The model can be used to predict subsequent usage behavior prior to users having any hands-on experience with a system (Taylor & Todd, 1995a). This means that the model may be used as a diagnostic tool prior to the implementation of the system. The model also showed that there are significant differences in the influence the determinants have on usage, which in turn depends on experience.

## Task-Technology Fit (TTF)

The task-technology fit model (see figure 2.9) tries to explain the link between information systems and the performance of an individual. The theory posits that a system or technology will positively

influence an individual’s performance and usage if the system’s functionality matches the job that the individual must perform (Goodhue & Thompson, 1995).

The theory was developed by Goodhue and Thompson (1995), and it used 8 factors: quality, ease of use/training, production timeliness, systems reliability, locatability, authorization, compatibility, and relationships with users to develop a measure of task-technology fit. The study involved over 600 individuals from 2 different companies, and it indicates that TTF significantly predicts job performance and effectiveness based on the use of a specific technology.

Actual Tool Use

Tool Functionality

Individual Performance

Task Requirement

Task Technology Fit

### Figure 2. 9: Task-Technology Fit Model (Goodhue & Thompson, 1995)

The TTF model was used initially to study individuals, but further research has shown that TTF can be applied to groups of users (Zigurs et al., 1999). TTF has been applied in various fields of study; it has been used to understand the behavioral intentions to use social media (Lu & Yang, 2014), instructors use of learning management systems (Schoonenboom, 2014), mobile banking adoption (Oliveira et al., 2014) and in the healthcare sector (Chen et al., 2015).

## Diffusion of Innovation Theory (DOI)

The diffusion of innovation theory (Rogers, 2003) explains the diffusion of new innovations through societies and organizations. Rogers sees new inventions as being transferred between individuals through different phases, over a period of time and within a social structure. This is

quite different from the acceptance of technology where the adoption of innovation solely rests with the individual.

The DOI theory comprises of the following:

1. Innovation decision process: This is made up of the different phases an individual or a deciding group must go through to either accept or reject an innovation. The stages are knowledge, persuasion, decision, implementation, and confirmation
2. Adopter characteristics: Based on the differences observed, in individuals’ willingness to adopt an innovation, 5 different groups were identified. The groups are: innovators, early adopters, early majority, late majority, laggards
3. Innovation Characteristics
4. Opinion Leadership

Moore and Benbasat (1991) used some of the characteristics of DOI to develop a set of instruments in order to measure the different perceptions involved in adopting an information technology (IT) innovation. The core constructs identified were

1. Relative Advantage: “the degree to which an innovation is perceived as being better than its precursor” (Moore & Benbasat, 1991, p. 195).
2. Ease of Use: This is “the degree to which use of an innovation is perceived as being difficult to use” (Moore & Benbasat, 1991, p. 195).
3. Image: This is “the degree to which use of an innovation is perceived to enhance one’s image or status in one’s social system” (Moore & Benbasat, 1991, p. 195).
4. Visibility: This refers to how the individual sees others using the system in question by other members of the organization.
5. Compatibility: This is “the degree to which an innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters” (Moore & Benbasat, 1991, p. 195).
6. Results Demonstrability: This is “the tangibility of the results of using the innovation, including their observability and communicability” (Moore & Benbasat, 1991, p. 203).
7. Voluntariness of Use: This is “the degree to which use of the innovation is perceived as being voluntary or of free will” (Moore & Benbasat, 1991, p. 195).

In the context of information systems adoption and success, prior research has shown that technical compatibility, technical complexity (ease of use), and relative advantage (perceived need) significantly influence the adoption of innovation (Bradford & Florin, 2003; Crum et al., 1996; Agarwal & Prasad, 1998; Cooper & Zmud, 1990)

## Unified Theory of Acceptance and Use of Technology (UTAUT and UTAUT2)

A good number of theories and models have been employed to understand individuals’ intention to adopt and use technology. Some of which have been mentioned earlier, such as TRA, TAM, and TPB. Another theory on the adoption of technology is the unified theory of acceptance and use of technology (UTAUT) which was developed by Venkatesh et al. (2003) by the merging of the constructs of 8 different theories used in prior research to explain the usage and behavioral intentions to use technology.

The eight theories used in the development of UTAUT are listed below:

* + - * Technology Acceptance Model (Davis, 1989)
      * Theory of Reasoned Action (Ajzen & Fishbein, 1980)
      * Theory of Planned Behavior (Ajzen, 1985; Azjen, 1991)
      * Compeau and Higgins (1995b) adaptation of the Social Cognitive Theory
      * Combined TAM and TPB (Taylor & Todd, 1995a)
      * Moore and Benbasat (1991) adaptation of the Diffusion of Innovation Theory
      * Model of PC Utilization (Thompson et al., 1991)
      * Davis et al. (1992) adaptation of the Motivational Model

The first six models have been discussed in the previous sections. The Model of PC Utilization (MPCU) was developed by Thompson et al. (1991). MPCU was derived from Triandis’ (1977) theory of human behavior. The model developed by Thompson was used to predict the usage behavior of an individual as opposed to an individuals’ behavioral intention. The model comprised of 6 core constructs: job-fit, complexity, long-term consequences, affect towards use, social factors, and facilitating conditions.

The final theory in the list was developed in order to explain the adoption of new technology by Davis et al. (1992). The model applied the motivational theory and consisted of two constructs, 1)

Extrinsic motivation is the perception that an individual will perform an activity “because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself, such as improved job performance, pay, or promotions” (Davis et al., 1992, p. 1112). 2) Intrinsic motivation is an individuals’ perception that will make the individual perform an activity “for no apparent reinforcement other than the process of performing the activity per se” (Davis et al., 1992, p. 1112).

Voluntariness

Experience

Age

Gender

Facilitating Conditions

Social Influence

Use Behavior

Behavioral Intentions

Effort Expectancy

Performance Expectancy

### Figure 2. 10: Unified Theory of Acceptance and Use of Technology (Venkatesh, Morris, Davis, & Davis, 2003)

The UTAUT model integrates constructs from empirically validated theories in the acceptance of technology. UTAUT emphasized on 7 constructs deemed to be direct determinants of the acceptance and use of technology. Venkatesh et al. (2003) dropped 3 of the constructs due to the minimal impact they had on the acceptance and use of technology. The 3 constructs dropped were self-efficacy, anxiety, and attitude. The constructs that make up the UTAUT framework are listed below:

* + - * Performance Expectancy: This is the degree to which a person believes that the use of technology will improve job performance
      * Effort Expectancy: This is the degree of ease associated with using the technology
      * Social Influence: This is the degree to which a person perceives that important others believe that they should use the technology
      * Facilitating Conditions: This is the degree to which a person believes that an organizational and technical infrastructure exists to support the use of the technology

Figure 2. 10 shows the relationship between the listed constructs and behavioral intention to use technology. The illustration also shows that the relationships are moderated by variables such as age, gender, experience, and voluntariness of use.

UTAUT has been validated as a robust model in the context of explaining usage behavior. It has been shown to be a superior model to other acceptance models as it considers moderating variables such as gender, age, voluntariness, and experience. This makes the model suitable for recent technologies which are product or service-oriented. Also, the UTAUT model was found to account for up to 70% of the variance in behavioral intention (Venkatesh, Morris, Davis, & Davis, 2003).

UTAUT has been used extensively in the study of learning management systems (Raman et al., 2014; Hsu, 2013) eCommerce (Escobar-Rodríguez & Carvajal-Trujillo, 2014; Musleh et al., 2015) and in the context of healthcare (Kim et al., 2015; Maillet et al., 2015).

UTAUT2 (Venkatesh et al., 2012) extended the original UTAUT model by adding 3 new constructs, as illustrated in Figure 11. The 3 added constructs are:

* + - * Hedonic motivation: This “is defined as the fun or pleasure derived from using technology” (Venkatesh et al., 2012, p. 161 ).
      * Habit: Habit is the extent to which an individual performs a certain behavior automatically due to the frequent use of an application.
      * Price Value: This is the consumers’ perception of the benefits of the applications when compared to the cost of using the application.

The inclusion of the 3 new constructs was to provide a framework for consumer acceptance of technology as opposed to the original UTAUT that was developed for employee acceptance and use setting.

UTAUT2 showed a significant improvement in the explained variance in behavioral intention and the use of technology when compared to the original UTAUT model (Venkatesh et al., 2012). Due to the inclusion of constructs that cater for consumer-oriented applications, UTAUT has been applied in a wide range of topics such as mobile learning acceptance (Kang et al., 2015), eLearning acceptance (Ain et al., 2016; El-Masri & Tarhini, 2017; Tarhini et al., 2017), mobile technology adoption (Baabdullah et al., 2014), eCommerce (Li et al., 2016; Singh et al., 2017), and the healthcare sector (Cimpermanet al., 2016; Slade et al., 2013).

Behavioral Use Behavior Intention

Experience

Age

Gender

Habit

**Notes**

\* Moderated by age and gender

\*\*Moderated by age, gender and experience

\*\*\*Moderated by age, gender and experience

\*\*\*\*Effect on use behavior is moderated by age and experience

Facilitating Conditions\*\*\*\*

Hedonic Motivation

Price Value

Social Influence\*\*\*

Effort Expectancy\*\*

Performance Expectancy\*

### Figure 2. 11: Unified Theory of Acceptance and Use of Technology (Venkatesh, Thong, & Xu, 2012)

The use of the UTAUT 2 model to explain use behavior of eLearning applications has produced interesting findings. El-Masri and Tarhini (2017) used the UTAUT 2 model to identify the factors that affect the adoption of eLearning systems by university students in Quarter and USA. The authors added trust as an external variable, which, along with performance expectancy, hedonic motivation, and habit were all found to be significant predictors of students’ behavioral intention for both countries. The price value construct was insignificant in its relation to students’ behavioral intention. This was corroborated by Ain et al. (2016) who believed that cost does not influence student’s behavior to use eLearning systems; as a result, Ain et al. (2016) replaced the price value construct learning value instead, and learning value was found to significantly influence behavioral intention of students to use of eLearning systems using the UTAUT2 framework.

## End-User Computing Satisfaction

Doll and Torkzadeh (1988) in a bid to measure the satisfaction of users who directly interact with computer applications came up with "a 12-item instrument that measures five components of end- user satisfaction” (Doll & Torkzadeh, 1988). The components are content, accuracy, format, ease of use, and timeliness. The study included responses from different industries, such as manufacturing, finance, education, health services, and retail. The responses also included respondents occupying different positions within the industries such as top management, operating personnel supervisors, etc. The instruments used in the study were found to be valid and reliable.

Several studies have been carried out using the EUCS model in order to explain user satisfaction of using computer applications See ERP systems (Somers et al., 2003), Websites (Abdinnour- Helm et al., 2005) and healthcare systems (Aggelidis & Chatzoglou, 2012). In the context of eLearning systems, Nor and Yamin (2015) used the model to investigate the end-user’s satisfaction on an LMS in a Malaysian university. The findings from the study showed that the content, format, and accuracy were components that contributed towards the end-user’s satisfaction.

The components identified by Doll and Torkzadeh can be likened to the constructs or instruments used in other theories. For example, ease of use is also seen in TAM, content, accuracy, timeliness, and format are instruments measured in the construct “information quality” derived from the DeLone and McLean information systems success model which is discussed in the next sections.

|  |  |  |
| --- | --- | --- |
| Content  Accuracy  End-User  Format Computing  Satisfaction (EUCS)  Ease of Use | | |
|  | Timeliness |  |

***Figure 2. 12: End-User Computing Satisfaction (Doll & Torkzadeh, 1988: Doll, Xia, & Torkzadeh, 1994)***

## DeLone and McLean IS success model (D&M ISSM)

The DeLone and McLean IS success model (DeLone & McLean, 1992) aims at identifying the factors responsible for the success of information systems. The initial D&M ISSM combined the communication theory (Shannon & Weaver, 1949) and the information influence model of (Mason, 1978). The combination resulted in a model that was both process and causal in nature.

The authors of the D&M ISSM reviewed the approaches taken by IS researchers to measure IS success and crafted the following observations:

1. There is a wide range of variables to choose from in an attempt to determine IS success.
2. For the easy comparison of results by researchers, there should be a reduction in the number of dependent factors.
3. There is an absence of research efforts to measure the impact of IS efforts on organizational performance.
4. Based on the identified success categories, IS success is a multidimensional construct and should be measured as such

The D&M ISSM posits that there are many IS success measures, all of which fall into 6 main categories (shown in Figure 12) as listed below:

1. System Quality: This measures the information processing system by capturing items such as response time, reliability, and completeness.
2. Information Quality: this is a measure of the information system output. These include the relevance, currency, timeliness, and accuracy of the information output.
3. Use: This is an individuals’ use of the output of the information system
4. Use Satisfaction: This defined as the recipient response to the use of the output of an information system (DeLone & McLean, 1992).
5. Individual Impact: This is the effect of the information from the system on the behavior of the user. The individual impact construct caters for improved productivity; decision attributes such as involvement, correctness, timeliness, and confidence, and an individual’s awareness and understanding of the information output.
6. Organizational Impact: This is the effect of the output of the system on organizations performance. This construct captures overall productivity, cost/benefit ratio, work volume, product/service quality, and efficiency and returns on investments.

Use Satisfaction

Information Quality

Organizational Impact

Individual Impact

Use

System Quality

### Figure 2. 13: DeLone and McLean IS success model (DeLone & McLean, 1992)

The D&M ISSM was updated 10 years later in response to calls for development and validation of the original D&M ISSM. The updated model is made up of six interdepended variables identified as measures of IS success. Three of the variables: user satisfaction, information, and system quality were retained. The impact factors were combined to form net benefits. A new variable, service quality was added to cater for the increasing importance of service as a contributor to the success of IS. Finally, the use construct was subdivided into 2, intention to use, and actual use. These constructs capture an individual’s attitude and resultant behavior, respectively.

The two new dimensions added are defined as follows:

1. Service quality: Service quality encompasses the support given by the support team. The characteristics of service quality include knowledge, empathy, responsiveness, and effectiveness
2. Net Benefits: Net benefits encompass the various impacts derived from the initial D&M ISSM such as societal impact, customer impact, industry impact, and inter-organizational impact.

Information Quality

Intentio

n to Use Use

System Quality

Net Benefits

Service Quality

User Satisfaction

### Figure 2. 14: DeLone and McLean IS success model (DeLone & McLean, 2003)

Figure 13 shows the proposed relationships between the success dimensions in the updated D&M ISSM. The model shows that a system can be assessed by the quality dimensions (information, system, and service quality); these, in turn, affect the use or intention to use and user satisfaction dimensions. The Net benefits are a result of using the system, which will also influence user satisfaction and the continued use of the system.

The D&M ISSM is one of the most significant theories in modern IS research as it has been cited in over 10,000 articles to date. In the context of eLearning, various researchers have used the model or a modified version of the model to aid in understanding the variables that determine the success of eLearning systems. Holsapple and Lee-Post (2006) employed a modified version of the model for evaluating eLearning. It has also been used in assessing the success of an online learning system (Lin, 2007). Yakubu (2018b) used a modified version of the updated D&M ISSM to explain the usage of Canvas LMS.

It should be noted that most of these studies using the D&M ISSM were carried out from a student’s perspective as they are the main benefactors of the learning process. A critical variable that is missing from D&M ISSM is the role of the instructor. The instructor plays an important role, as noted by Cheng (2012), where the instructor quality construct was added to the D&M ISSM and found to be significant as an antecedent of e-learning acceptance. Instructor quality is the instructors’ attitude towards the learners and the use of the eLearning system.

## Information Systems Theories and eLearning Acceptance

A recurring relationship in the technology acceptance theories reviewed shows that “behavioral intention to use technology” has a causal effect on “actual usage of the technology.” The other relationships involve the factors that directly or indirectly influence behavioral intentions. This section reviews the current literature that has investigated students’ acceptance of eLearning systems using the theories and models discussed in the previous sections. The section concludes by listing important constructs identified to be significant in influencing students’ behavioral intentions to use eLearning systems; these constructs will then be used to create the conceptual model presented in Chapter 3.

From the reviewed literature on the acceptance of eLearning systems, 3 main theories were found to have been used extensively: 1) Technology acceptance model, 2) Unified theory of acceptance and use of technology and 3) DeLone and McLean IS success model.

The technology acceptance model (TAM) is the most widely used theory used to investigate the acceptance of eLearning by students in comparison to UTAUT and DeLone, and McLean IS success model. Prior research has used TAM to investigate the acceptance of eLearning applications in various 2 main ways which are 1) validating TAM (Ngai et al., 2007; Lee, 2006) and 2) extending TAM by the addition of variables (Park, 2009; Lee et al, 2011) or integration with other models (Mohammadi, 2015).

In the context of eLearning, the constructs that makeup TAM have proven to influence students’ acceptance of eLearning systems. Perceived ease of use (PEOU) has been shown to be a direct determinant of perceived usefulness (PU) (Ngai et al., 2007; Masrom, 2007; Lee, 2006), similarly behavioral intention (BI) is influenced by PU (Masrom, 2007; Lee, 2006) and PEOU (Lee, 2006).

Recent studies that have used TAM to study students’ acceptance of eLearning have confirmed a positive relationship between PU and BI (Gamble, 2018; Mohammadi, 2015). This indicates that students in these studies believe that the eLearning system is useful to their studies. However, there are a few studies where the relationship between PU and BI was not significant. For example, Ibrahim et al. (2017) in their study found the relationship to be insignificant; the insignificant relationship could be attributed to other variables that have a causal effect on PU such as the quality of the system or the design and content of the course. Similarly, the relationship between PEOU and BI can be both statistically significant (Ibrahim et al., 2017; Gamble, 2018) and insignificant (Mohammadi, 2015) depending on the effect of eternal variables on PEOU. This indicates that for a student to believe that the eLearning system is useful or easy to use, certain conditions must be met to satisfy the students’ needs.

The updated D&M ISS model has been used in the context of Health systems (Bossen et al., 2013), Knowledge management systems (Wu & Wang, 2006), web portals (Al-Debei et al., 2013) and e- Government (Wang & Liao, 2008). The model has also been applied to eLearning technologies. Wang et al. (2007) applied the updated D&M ISS model to develop and validate scales used to measure eLearning systems success within the context of an organization. Yengin et al., (2011)

developed a model (based on the updated D&M ISS model) to measure eLearning success for instructors by modifying the measurement metrics to suit the role of the instructors. Holsapple and Lee-Post (2006) showed how to define, evaluate, and promote eLearning success from an information systems perspective by adapting the updated D&M ISS model. Lin (2007) used the updated D&M ISS model to examine the constructs that determine the successful use of online learning systems. A framework was proposed by Lin and Wang (2012) to examine the association between perceived fit and system factors that can be used to motivate students to continue using an eLearning system, this framework used the systems success factors (information quality and system quality) from the updated D&M ISS model and task-technology fit (Goodhue & Thompson, 1995). Collectively these studies have used the updated D&M ISS models to propose eLearning technology models (see Lin & Wang, 2012), validate the D&M ISS model (see Lin, 2007) and to develop and validate eLearning scales (see Wang et al., 2007).

More recently, Yakubu and Dasuki (2018), used the model as a theoretical lens to investigate the success factors responsible for the acceptance of Canvas LMS, a positive and significant relationship was established between system and information quality and behavioral intention to use Canvas by students of the studied Nigerian university. Similarly, Mohammadi (2015) used an integrated model (TAM and D&M ISS model) and found that system quality and information quality were the primary factors driving users’ intentions of using eLearning. These relationships were corroborated in similar studies using the D&M ISS model, see: (Cidral et al., 2018; Aldholay et al., 2018; Dağhan & Akkoyunlu, 2016).

From these findings, it shows that system quality and information quality are important determinants of behavioral intentions. While using the D&M ISS model in the context of eLearning, several authors have used the constructs: course content quality (Cheng, 2012; Lee, 2006; Lee et al., 2009; Choi et al., 2007), and course design quality (Cheng, 2012; Liu et al., 2010) to replace information quality as a construct. Cheng (2012) used the measurement instruments for both course design quality and course content quality to measure information quality while employing the D&M ISS model to study the effects of quality antecedents on learners’ acceptance of eLearning.

The unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003; Venkatesh et al., 2012) has also been extensively applied to the domain of eLearning acceptance.

Yakubu and Dasuki (2018)m used the model to investigate Nigerian students acceptance of Canvas LMS. The results from their study showed that performance expectancy (PE), effort expectancy (EE) and facilitating conditions (FC) all influences the students’ behavioral intention (BI) to use the LMS. PE had the most significant influence on BI, followed by EE and then FC. There was no support for the relationship between the construct “social influence” (SI) on BI. The researchers attributed the non-significant relationship to the fact that Canvas usage by faculty is mandatory; thus, usage by students does not depend on referral by their colleagues or instructors (Yakubu & Dasuki, 2018a). These findings were similar to a study carried out on students participating in vocational education in Halu Oleo University (Nur et al., 2017), where PE and EE were found to influence BI. Contrary to Yakubu and Dasuki’s findings, social influence was found to influence BI though the relationship was weak. Another study that employed the UTAU framework was carried out by Salloum and Shaalan (2018), where PE and SI were found to positively influence BI but no evidence was found on the relationship between EE and BI. As mentioned earlier, the extended UTAUT model was modified in response to the evolution of technology to become more consumer-focused. As a result, habit, price value, and hedonic motivation constructs were added. UTAUT 2 has also been used to study the acceptance of eLearning systems by several authors. Tarhini et al. (2017) used the model to compare students’ acceptance of eLearning in a developed and a developing country. Their result showed that PE, EE, SI, hedonic motivation to positively influence BI in developing countries. There was no support for SI and EE on BI in the developed country. Also, the relationship between price value and BI was insignificant. Ain et al. (2016) also used the UTAUT model in the investigation of Malaysian students’ acceptance of eLearning and found that PE and SI influenced BI. There was no support for hedonic motivation, habit, EE and FC on BI. Ain et al. (2016) replace the “price value” construct with “learning value” stating that “in the institutional context, students are not liable to pay any cost to gain benefits from LMS technology, however, students devote time and effort to gain benefit from LMS” (Ain, Kaur , & Waheed, 2016, p. 1311).

The theories reviewed in this study were not designed specifically for eLearning systems. As a result, researchers have modified these theories to suit the context of eLearning technologies. A good example is seen in the study carried out by Ain et al. (2016), where the researchers used the “learning value” construct with the extended UTAUT model as mentioned above. Other authors have used constructs such as instructor quality (Cheng, 2012; Lwoga, 2014) course design quality

(Cheng, 2012; Liu, et al., 2010) and course content quality (Cheng, 2012; Lee, 2006; Choi et al., 2007; Lee et al., 2009) in a bid to explain students’ acceptance of eLearning. Cheng (2012) stated that in the context of eLearning, course quality is the most frequently used measure of the quality of information (Cheng, 2012). Also, the design of the courses can significantly influence learners to use the system. Indeed, Cheng found both course design quality and course content quality to influence the usefulness of the eLearning system as well as the ease of using the system. Instructors also play an important role in the use of the eLearning systems by the learners, as they influence learners’ attitudes and behavior in the eLearning course (Cheng, 2012). Prior studies have shown that instructor quality significantly influences the usefulness and ease of using eLearning systems (Cheng, 2012; Choi et al., 2007; Lee et al., 2009).

Based on the 3 theories discussed (TAM, UTAUT, and D&M ISS model), table 2.2 summarizes the significant relationships identified.

***Table 2. 2: Significant relationships identified by eLearning acceptance literature***

## Endogenous Variables Exogenous Variables Sources

Course quality (content and design)

Perceived usefulness (PU)

Perceived ease of use (PEOU)

(Cheng, 2012; Lee, 2006;

Choi et al., 2007; Lee et al., 2009; Liu, et al., 2010)

(Cheng, 2012; Lee, 2006;

Choi et al., 2007; Lee et al., 2009; Liu et al., 2010)

Instructor Quality Perceived usefulness (PU)

(Cheng, 2012; Choi et al., 2007; Lee et al., 2009;

Lwoga, 2014)

Perceived ease of use (PEOU)

(Cheng, 2012; Choi et al., 2007; Lee et al., 2009;

Lwoga, 2014)

System Quality

Perceived usefulness (PU)

Perceived ease of use (PEOU)

(Lwoga, 2014; Cheng,

2012; Mohammadi, 2015)

(Lwoga, 2014; Cheng,

2012; Mohammadi, 2015)

Perceived ease of use Perceived usefulness (PU)

(Cheng, 2012;

Mohammadi, 2015)

Learning Value (Ain, 2016)

Perceived usefulness (PU) or Performance Expectancy (PE)

(Lwoga 2014; Cheng 2012;

Mohammadi, 2015; Tarhini et al., 2017; Ogunbase 2014; Abu-Al-Aish and Love, 2013; Tarhini et al., 2013; Al-Gahtani, 2016; Yakubu & Dasuki, 2018a)

Perceived ease of use (PEOU) or Effort expectancy (EE)

Social influence (SI) or subjective norm (SN)

Behavioral intention to use

(Cheng, 2012; Adewole-

Odeshi, 2014; Ogunbase

2014; Tarhini et al., 2017; Abu-Al-Aish and Love, 2013; Tarhini et al,. 2013;

Al-Gahtani, 2016; Yakubu & Dasuki, 2018a)

(Cheng, 2012; Abu-Al-Aish

& Love, 2013; Olatunbosun, et al., 2015;

Olatubosun, et al., 2014; Adewole-Odeshi, 2014; Ain, 2016; Tarhini et al,. 2013; Al-Gahtani, 2016; Tarhini et al., 2017)

Facilitating conditions (FC) or Service Quality (ServQ)

(Yakubu & Dasuki, 2018a; Tarhini et al., 2013; Tarhini et al., 2017; Cheng, 2012; Olatunbosun, et al., 2015; Olatubosun, et al., 2014)

Facilitating conditions Behavioral intentions to use

Actual usage

(Ain, 2016)

(Ain, 2016; Yakubu & Dasuki, 2018a)

TAM seems to be the most predominantly used theory in the explanation of students’ acceptance of technology; this is followed by UTAUT. Bervell and Umar (2017), also agree that TAM is the most popular model used to investigate the acceptance of LMS in sub-Saharan Africa. Their study systematically reviewed 31 articles and found that the main determinants of LMS acceptance were:

1. Attitude
2. Perceived Usefulness
3. Performance Expectancy
4. Perceived Ease of Use
5. Social Influence

In the context of eLearning acceptance by students in higher education institutions in Nigeria, only 8 studies were identified by this research and all of which were carried out using TAM (4), UTAUT

(3) or the D&M ISS model (1). Table 2.3 summarizes reviewed literature on eLearning acceptance by higher education students.

***Table 2. 3: Summary of research on student’s acceptance of LMS’ in Nigeria***

## Author(s) Theory Used Significant predictors of behavioral intention

Adewole-Odeshi (2014)

TAM Perceived usefulness, perceived ease of use and attitude towards technology

Yakubu and Dasuki (2018a)

UTAUT Performance expectancy, effort expectancy and

Facilitating conditions

Yakubu and Dasuki (2018b)

D&M ISS model System quality, information quality, and user

satisfaction.

Eke (2011) TAM Perceived usefulness, perceived ease of use,

pressure to use e-learning, and attitude towards technology

Olatubosun et al. (2014)

UTAUT Performance expectancy, effort expectancy social influence, and facilitating conditions.

Nicholas- Omoregbe et al. (2017)

UTAUT Attitude, Social Influence and Technology Culturation

Ogunbase (2014) TAM Perceived usefulness, perceived ease of use, social

influence, and attitude towards technology

Ayodele et al. (2016)

TAM Power supply, technical resources, perceived usefulness and perceived ease of use

The constructs (and associated relationships) identified in this section are the most influential in terms of the acceptance of eLearning systems by students. The next chapter (Chapter 3) builds on the identified constructs in this section to develop a conceptual model that would be used to answer the research questions posed in Section 1. However, the following section (2.6) helps to justify the conceptual model and the research questions that guide this dissertation.

## Research Articles that Guided this Thesis

In this section, The author discusses prior literature that was either published or that is in the process of publication that has directly or indirectly contributed to the aims and objectives of this thesis. In total, there are 6 articles, each of which will be summarized. This will be followed by a discussion of how the article contributes to the research questions asked in this study.

1. Yakubu, M. N., & Dasuki, S. I. (2018). Factors affecting the adoption of e-learning technologies among higher education students in Nigeria: A structural equation modelling approach. *Information Development*, 35(3), 492-502.

The main aim of the study was to understand the factors responsible for the adoption and use of an eLearning system (Canvas LMS). With a survey, the author empirically investigates the adoption of Canvas – a web-based learning management system in a Nigerian University using the Unified Theory of User Acceptance of Technology (UTAUT) as a theoretical lens, see figure 2.15. Structural equation modeling was used to analyze student’s responses and to test the hypotheses proposed by the study.

The results from the study showed that performance expectancy, effort expectancy and facilitating conditions positively and significantly influenced the student’s behavioral intention to use the Canvas LMS. However, there was no support for the relationship between social influence and behavioral intention to use the LMS.

Future research directions, recommended by the study include:

* A wider scope of students, i.e. students from other universities especially public universities.
* The use of other models as a theoretical lens in the investigation of the students’ acceptance of eLearning systems, e.g. the updated DeLone and McLean IS Success model, (DeLone & McLean, 2003).
* Further research should investigate other types of learning management systems such as Blackboard and WebCT.
* Future works should also investigate the effect of other contextual factors such as culture, gender and other socio-economic factors.

H1

H2

H5

H3

H4

Facilitating Conditions

Social Influence

Actual Usage

Behavioral Intentions

Effort Expectancy

Performance Expectancy

### Figure 2. 15: Research Model for Paper 1

1. Yakubu, M. N., & Dasuki, S. (2018b). Assessing eLearning systems success in Nigeria: an application of the DeLone and McLean Information Systems Success Model. *Journal of Information Technology Education: Research*, 17, 183-203.

Similar to the first paper, the aim of this study was to identify the factors responsible for the acceptance of an eLearning system by Nigerian students using the DeLone and McLean information systems success model (DeLone & McLean, 2003) as a theoretical lens. SEM was used to test the relationships between the constructs that made up the research model, see figure 2.16.

The findings from the study showed that information quality and system quality significantly influenced the students’ behavioral intention to use the eLearning system. Service quality was a direct determinant of user satisfaction but had no significant effect on behavioral intention. Information quality and system quality did not influence the users’ satisfaction and the latter did not have a significant effect on the students’ behavioral intention.

Future research directions, recommended by the study include:

* A wider scope of students, i.e. students from other universities especially public universities.
* Future works should also investigate the effect of other contextual factors such as culture, gender and other socio-economic factors.
* To investigate the effect of other factors, especially in the context of eLearning, that could influence the student’s acceptance and use of eLearning systems
* Future research could investigate the factors that influence instructors’ behavioral intentions to use eLearning systems as well as the effect of the instructors on students’ use of an eLearning system.

User Satisfaction

Behavioral Intention to use Canvas LMS

Service Quality

Actual Usage

Information Quality

System Quality

### Figure 2. 16: Research Model for Paper 2

1. Yakubu, M. N., Kah, M. O., Dasuki, S. I., & Quaye, A. (2019). Learning Management Systems: The Nigerian Students Experience. *Pan African International Conference on Science, Computing and Telecommunications*, (pp. 181 – 190). Swaziland.

As a follow up to the previous 2 papers, this study focuses on trying to understand the Nigerian student’s experience of using a Learning management system. The paper reviewed prior literature in the context of eLearning acceptance by students and grouped the factors identified as influencers of the acceptance and use of eLearning systems into 3 groups, technology aspects, instructors’ influence and course design and content.

The results indicated that all 3 factors positively influenced the student’s experience in using the learning management system. The students rated the instructor's influence as the most significant contributor towards their use of the application followed by the technological aspects (system quality) and then the course design and content.

Future research directions, recommended by the study include:

* Identifying how the students use the LMS in order to get a better understanding of how these factors influence the acceptance of the LMS.
* Empirically validating the findings by using a theoretical model to test the effects of the 3 factors on students’ behavioral intention to use a learning management system.

1. Yakubu, M. (2019). The Effect of Quality Antecedents on the Acceptance of Learning Management Systems: A case of two Private Universities in Nigeria. *International Journal of Education and Development using ICT*, *15*(4).

The fourth paper builds on paper 3 (Yakubu, M. N., Kah, M. O., Dasuki, S. I., & Quaye, A., 2019). It uses SEM to test the relationship between the factors (course quality, system quality and instructor quality), identified by Yakubu et al. (2019) and students’ behavioral intention to use a learning management system, see figure 2.17.

The results from the study showed that all 3 factors significantly influenced the student’s behavioral intention to use the LMS.

Future research directions, recommended by the study include:

* The first limitation is that the study surveyed only students of private universities and did not consider public universities students where the use of LMS might be different. Future studies should include students from both types of universities.
* The study did not capture other factors that have been shown to influence student’s acceptance of eLearning systems, factors such as perceived ease of use, and perceived usefulness can be incorporated into the model.
* The study was entirely quantitative, other methods such as qualitative and mixed methods should be considered in the future to provide a deeper understanding of the factors that influence students’ use of an LMS.

H1

H2

Behavioral Intentions

H4

Actual Usage

H3

Instructor Quality

System Quality

Course Quality

### Figure 2. 17: Research Model for Paper 4

1. Yakubu, M. N., Kah, M. M., & Dasuki, S. I. (2019, April). Student’s Acceptance of Learning Management Systems: A Case Study of the National Open University of Nigeria. *In International Conference on Sustainable ICT, Education, and Learning* (pp. 245-255). Springer, Cham.

This paper examines the key factors that have been shown to influence the acceptance of learning management systems (LMS’). It incorporates several constructs from prior empirically validated models as well as their relationships to form a theoretical model, see figure 2.18. This model was tested on 384 students from the National Open University of Nigeria, using SEM to analyze the data obtained from the students.

The findings from this study supported most of the causal relationships hypothesized but rejected the relationships between course quality on learning value; course quality on perceived usefulness; and social influence on student’s behavioral intention.

Future research directions, recommended by the study include:

* + Future research should test the effect of moderators such as age and gender some of the relationships
  + Further research should investigate other types of learning management systems.
  + As instructors are vital to the learning process as well as the use of the LMS for learning, future studies should take into account the views of the instructors.

H1

H2 H3

H4

Perceived Usefulness

H7

H6

H5

H8

H9

H13

H10

H11

H12

Facilitating Conditions

Actual Usage

Behavioral Intention

Perceived Ease of Use

System Quality

Instructor Quality

Learning Value

Course Quality

Social Influence

### Figure 2. 18: Research Model for Paper 5

1. Yakubu, M. N., Dasuki, S. I., Abubakar, A. M., & Kah, M. M. (2020). Determinants of Learning Management Systems Adoption in Nigeria: A Hybrid SEM and Artificial Neural Network Approach. *Education and Information Technologies, 1-25.*

This paper tests the relationship of 7 factors, identified from prior literature, that have been shown to influence student’s behavioral intention to use learning management systems, see figure 2.19. Responses from students of 4 Nigerian universities were analyzed using artificial neural network (ANN) and structural equation modeling (SEM) techniques. The endogenous variables in the model include: instructor quality, course quality, learning value, social influence, facilitating conditions, system quality, perceived usefulness and perceived ease of use. The results from both ANN and SEM methods indicated that social influence, facilitating conditions, perceived usefulness and perceived ease of use were all predictors of student’s behavioral intention to use learning management systems, while there was no support in the relationship between instructor quality, course quality, and learning value on behavioral intention. With regards to system quality, the SEM results showed a negative but significant influence on behavioral intentions while the

ANN results indicated a positive and significant influence on students’ behavioral intention to use the LMS.

Future research directions, recommended by the study include:

* Future studies may utilize qualitative or mixed-method approaches for a deeper understanding.
* Comparing the students’ acceptance of LMS between private and public institutions due to the different funding structures.

H1 H2

H3

H4

H9

H3 H6 H7

H8

Perceived Ease of Use

Perceived Usefulness

System Quality

Facilitating Conditions

Actual Usage

Behavioral Intentions

Social Influence

Learning Value

Course Quality

Instructor Quality

### Figure 2. 19: Research Model for Paper 5

***Table 2. 4: Summary of research papers that guided this thesis***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Study** | **Model Used: Constructs** | **Context** | **Sample Size** | **Research Method and Technique** | **Findings** |
| Yakubu, M. N., & Dasuki, S. I. (2018a) | UTAUT: Performance expectancy, effort expectancy, social influence and facilitating conditions | Nigerian Private University | 286 | A quantitative approach was used via survey methods and SEM to analyze the data to make inferences. | Performance expectancy, effort expectancy and facilitating conditions influenced students’ behavioral intention to use the LMS. |
| Yakubu, M. N., & Dasuki, S. I. (2018b) | DeLone and McLean’s Information Systems Success: system quality, service quality, information quality and user satisfaction | Nigerian Private University | 366 | A quantitative approach was used via survey methods and SEM to analyze the data to make inferences. | System quality and information quality were key determinants of behavioral intention, while service quality and user satisfaction had no significant influence on the student’s behavioral intention to use the LMS. |
| Yakubu, M. N., Kah,  M. O., Dasuki, S. I., & Quaye, A. (2019). | N/A: Technology Aspects, Instructors  Influence and Course | Nigerian Private  University | 39 | A mixed method approach was used  comprising of a survey | Technology Aspects, Instructors Influence and Course Quality  (Content and Design) were |

Quality (Content and Design)

and a focus group to solicit responses.

significant factors in the students’ use of the LMS.

Yakubu, M. N. (2019).

N/A: Course quality, system quality and instructor quality

Nigerian Private University

378 A quantitative approach was used via survey methods and SEM to analyze the data to make inferences.

Course quality, system quality and instructor quality were identified as significant predictors of students’ behavioral intention to use an LMS

Yakubu, M. N., Kah,

M. M., & Dasuki, S. I. (2019)

Theoretical Model: Course quality, system quality, instructor quality, learning value, perceived usefulness, perceived ease of use, social influence, and facilitating conditions

Nigerian Public University

384 A quantitative approach was used via survey methods and SEM to analyze the data to make inferences.

The results showed that all relationships were supported except for the following relationships: course quality to learning value and perceived usefulness; and social influence on behavioral intentions

Yakubu, M. N.,

Dasuki, S. I., Abubakar, A. M., & Kah, .M. O. (2020)

Theoretical Model:

Course quality, system quality, instructor quality,

2 public

and 2 private Universities

1,116 A quantitative approach was used via survey methods, SEM and ANN

Social influence, facilitating conditions, perceived usefulness and perceived ease of use all influenced students’ behavioral intention while there was no support for influence of

learning value, social influence, facilitating conditions, perceived usefulness and perceived ease of use

were used to analyze the data to make inferences.

course quality, instructor quality or learning value. System quality was observed to have a significant but negative effect on behavioral intention.

A summary of the limitations identified from the six (6) papers and also how this dissertation addresses these limitations is described below.

In the context of university ownership (i.e., private or public owned universities), all but one of the 6 studies were carried out in a single type of institution only. Further research should include both types of universities and compare the acceptance and use of LMS by both sets of students. One reason for this is that eLearning facilitates learner autonomy (Bouhnik & Marcus, 2006) and prior studies have shown that private university students tend to be more autonomous with regards to learning (Ming, 2009). Another reason is due to the observed differences between both types of Nigerian universities. In contrast to Nigeria private universities, the public universities are faced with numerous problems, which stem from inadequate funding. Iruonagbe et al. (2015) states that some of the problems facing higher education in Nigeria include “inadequate funding, inconsistent policy changes, lack of infrastructure and the disruption of the school system” (Iruonagbe et al., 2015). This results in poor working conditions for instructors as they will lack the tools and infrastructure required for teaching and learning which in turn will affect the students’ perception of the learning tools and infrastructure. Iruonagbe et al. (2015) corroborates this by stating that the neglect of Nigerian public higher education institutions manifests in the “weakening of university administration; poor teaching and learning outcomes; diminishing research and consultancy traditions; and questionable service to the community” (Iruonagbe et al., 2015). The above- mentioned factors can contribute to how Nigerian students accept the use of technology for learning, thus there is an expected difference between the way public and private university students accept and use LMS’.

The second identified limitation from the previous 6 studies summarized above is that they only take into account one type of LMS. The features of LMS’, like most software applications, vary widely and the conclusions derived from one LMS does not apply to other LMS’. Generalization would be more accurate and acceptable if more than 1 (one) LMS is taken into consideration. This would help researchers and educators further understand the Nigerian students’ perceptions of using learning management systems in general. Previous studies have shown that the quality of an LMS has an influence on students’ behavioral intentions to use the eLearning system (Mohammadi, 2015; Ramayaha et al., 2010; Yakubu et al., 2019; Yakubu & Dasuki, 2018b); the quality of an LMS includes the functionality, usefulness, reliability and accessibility of the system.

Also, LMS’, like other software applications, can be grouped in terms of who the application is designed for. The 2 main groups are specific proprietary and generalized software, with the former being a software developed for an institution to meet its requirements and the later built for a general industry where not all functionality of the software can be used. Examples of such generalized application in the context of eLearning systems are Canvas, Blackboard and WebCT and an example of a proprietary LMS’ is MIT’s Stellar LMS. It is possible that students’ perception of the system could be influenced differently depending on the type of LMS (i.e., specific proprietary and generalized applications) used.

Another limitation identified is that none of the studies considered the effect of moderators on some of the causal relationships. In the UTAUT model (Venkatesh et al., 2003) identified age, gender, experience and voluntariness of use as moderators of the relationship between some of the constructs and behavioral intention. Future reseaerh should consider the effects of these moderators on the relationships. Examining the moderating effects will help to provide a deeper understanding of how certain factors influence Nigerian students acceptance of LMS’.

Papers 1,2 and 4 did not take into account several factors that have been identified as significant factors that contribute towards the acceptance of LMS’. The call for further research involving other constructs such as instructor quality and course quality resulted in paper 5 and 6 which were more comprehensive with a total of 10 constructs used in both conceptual models. The capture of students perceptions is vital to understanding why students accept and use LMS especially for factors that are specific to the context of eLearning systems.

Based on the points raised above, this dissertation will aim to address the limitations by:

1. Comparing the similarities and differences between the public and private Nigerian university students’ acceptance and use of LMS’.
   1. Comparing the similarities and differences between the use of specific proprietary and generalized LMS by Nigerian students.
2. Investigating the effect of age, experience and gender on some of the causal relationships. In this study, as discussed later on, multi-group analysis is used to compare the groups created for each moderating variable which is followed by a pairwise comparison of the path coefficients of the two groups.
3. Incorporating several factors and relationships into the research model that will help in explaining the acceptance and use of LMS’ by Nigerian students.

The next section describes the development of the conceptual framework that guides this research.

# CHAPTER 3: THEORETICAL BASIS AND CONCEPTUAL FRAMEWORK

## Introduction

The previous chapter reviewed the major IS theories that have tried to explain the acceptance of technology and the success of information systems. A recurring theme in most of these theories is that behavioral intention leads to the actual usage of technology. This study adopts this relationship and also selects constructs from the models identified in Chapter 2 deemed to be relevant in the context of eLearning and hypothesized to have a significant relationship with behavioral intention to use an LMS.

Constructs from three of the theories in the acceptance of technology and the success of information systems were selected in a bid to develop the conceptual framework. These three models were earlier identified as the most popular theories used in the investigation of eLearning systems acceptance. The theories are 1) UTAUT2 (Venkatesh et al., 2012), 2) the updated D&M ISS model (DeLone & McLean, 2003) and 3) Technology Acceptance Model (Davis, 1989).

This section describes the development of the conceptual framework that guides this research. The constructs from the reviewed models were grouped based on the different aspects identified as being responsible (directly or indirectly) for influencing a student’s use of an eLearning system.

While all the theories reviewed so far can be and have been applied in the context of eLearning, it must be noted that none of these models were directly proposed to be utilized for eLearning systems. Researchers have adopted these models by modifying the constructs or the instruments used to collect the data about the constructs. As a result, some of these modified constructs are used in developing the conceptual model.

In formulating the conceptual model, 2 different aspects were identified. These aspects are hypothesized to explain students’ behavioral intention to use eLearning systems, which in turn influences usage behavior. The causal model showing the relationship is depicted in Figure 3.1, and the aspects are:

* + 1. eLearning quality aspect
    2. Individual perception aspect

The dimensions illustrated in Figure 3.1 are made up of constructs from the previously reviewed theories on technology acceptance and information systems success. The causal model (Figure 3.1) indicates that the eLearning aspect influences some of the individuals’ perception of the eLearning system. The individual perceptions directly influence student’s behavioral intention to use the eLearning system, and finally, the actual use is influenced by behavioral intention of the students. The relationship between behavioral intention and usage behavior is consistent with most of the previously mentioned theories.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Elearning Aspect |  |  | Individual Perceptions |  |  | Behavioral Intention |  |  | Usage Behavior |
|  |  |  |

### Figure 3. 1: Overview of the causal model

The aspects and their corresponding constructs, which are expected to be key determinants of behavioral intentions and actual usage, are explained in the subsections 3.2 and 3.3.

Figure 3.2 shows the conceptual model. It shows that the eLearning aspects (course quality, instructor quality, and system quality) directly influence the student’s perceived usefulness of the system as well as their perceived ease of using the LMS. Instructor quality and course quality are hypothesized to directly influence learning value. The individual perception aspects (social influence, facilitating conditions, learning value, perceived usefulness, and perceived ease of use) directly influence the student’s behavioral intention to use an LMS. As stated earlier, it is expected that the student’s behavioral intention will translate to actual usage.

**Moderators**

\*Moderated by gender

\*\*Effect on behavioral intention is moderated by experience

\*\*\*Moderated by gender and experience

Perceived

Ease of Use\*\*\*

System Quality

Actual Usage

Behavioral Intention

Perceived Usefulness\*

Instructor Quality

Learning Value

Course Quality

Facilitating Conditions\*\*

Social Influence\*\*\*

***Figure 3. 2: Proposed Research Model***

## eLearning Aspect

The eLearning aspect consists of 3 constructs which are related to the use of an eLearning system. These are the quality of the system, the influence of the instructor in using the system, and the information that the students can obtain from the system. Each of these 3 constructs is defined below with detailed explanations of how they have been used in prior research as well as their hypothesized relationships in the causal model.

### System Quality

According to DeLone and McLean, systems quality measures Adaptability, Availability, Reliability, Response Time and Usability (DeLone & McLean, 2003). For others, the quality of software (system) includes the following characteristics: functionality, reliability, usability, efficiency, maintainability, and portability (ISO9126-1, 2001; Jalote, 2008). The latter definition

is adopted for this study because learning management systems fall into the classification of software applications; thus, this study defines system quality as a measure of the functionality, reliability, usability, and efficiency of the system by the users. It is assumed that the higher the quality of the system, the more likely it is to be used (Jalote, 2008). This implies a direct relationship between the quality of software (a system) and its use. In view of this, it is hypothesized that system quality will have a direct relationship with the individual perceptions on using the system, i.e., perceived ease of use and perceived usefulness. This relationship has been used in prior research. For example, Calisir et al. (2014) found that perceived ease of use is explained by system quality in the investigation of the intention to use a web-based learning system. Similar studies have also shown this relationship to be significant, see (Chen, 2010; Cheng, 2012; Lwoga, 2014; Alsabawy et al., 2016).

A relationship between system quality and perceived ease of use has also been established by prior research. For example, Shah and Attiq (2016) investigated the impact of technology quality, perceived ease of use and perceived usefulness on 1,338 students of virtual education system universities and found that the quality of the technology (system) had a positive and significant relationship with both perceived ease of use and perceived usefulness. This finding is similar to the results obtained by (Yang et al., 2017; Cheng, 2012; Choi et al., 2007; Pituch & Lee, 2006).

The influence of system quality on both perceived ease of use and perceived usefulness is expected; this is because a high-quality system is expected to produce an environment that is easy to use and useful to the users of the system. A high-quality system means that most, if not all, of the characteristics, mentioned earlier must be present in the system, i.e., the system must be functional, reliable, useful, maintainable, efficient and portable.

For the purpose of this study, system quality determines the student’s perceptions of the desired features such as functionality, usability, efficiency, and reliability. As mentioned earlier, prior research has shown that system quality is a significant predictor of both perceived usefulness and perceived ease of use, this means that the more students believe that the eLearning system is of high quality, the more inclined they are to use the system. As a result, the following hypothesis is made:

* + - * **H1a:** *System quality will have a positive and significant influence on public university students’ perceived usefulness.*
      * **H1b:** *System quality will have a positive and significant influence on private university students’ perceived usefulness.*
      * **H1c:** *System quality will have a positive and significant influence on public university students’ perceived ease of use of the LMS.*
      * **H1d:** *System quality will have a positive and significant influence on private university students’ perceived ease of use of the LMS.*

### Instructor Quality

The instructor quality construct was developed by prior research to improve on the models/theories discussed in Chapter 2 in the context of eLearning. According to Cheng (2012), instructors are important in the influencing learners’ behavior in the learning process as well as in using the eLearning system. Cheng, (2012) also states that “learners’ perceived satisfaction towards e- learning is positively affected by the instructor’s attitude that relates to the instructor’s response timeliness, teaching style, and explanation/help towards learners via the internet.” Therefore, response time and attitude of the instructor can be used as a measurement of the quality of the instructor. Because of the influence that the instructor has on the eLearning process, the instructor influence must be taken into consideration in the context of eLearning acceptance. On this basis, the more responsive the instructor is and the ability to use the eLearning system to cater for the learners’ needs the more the system will be seen as useful by the learners (Sun et al., 2008; Lee et al., 2009).

Prior studies that have investigated instructor quality have used metrics that capture instructor’s response time, their attitude towards learners via the eLearning system, communication via the eLearning system and style of teaching (Cheng, 2012; Lwoga, 2014). In this study, we measure the quality of the instructor using the following metrics:

* + - * Communication via the e-Learning system
      * The instructor's attitude towards students learning via the eLearning system
      * The instructor response time via the eLearning system.
      * The availability of up-to-date resources for the learners via the e-learning system
      * Knowledgeability of the instructor on the use of the eLearning system

In the study of eLearning adoption, instructor’s attitude towards students has been shown to significantly influence the perceived usefulness of the eLearning system by students (Lee et al., 2009; Cheng, 2012; Lwoga, 2014). This study adopts this relationship, thus:

* **H2a:** *Instructor quality will have a positive and significant influence on public university students’ perceived usefulness of the LMS.*
* **H2b:** *Instructor quality will have a positive and significant influence on private university students’ perceived usefulness of the LMS.*

### Course Quality

In the application of the DeLone and McLean IS success model within the domain of eLearning, prior research have used the constructs, course content quality (Lee, 2006; Choi et al., 2007; Lee et al., 2009; Cheng, 2012) and course design quality (Liu et al., 2010; Cheng, 2012) to replace information quality.

Information quality is “the quality of the information that the system produces” (DeLone & McLean, 1992). This output usually takes the form of reports or usable information to enhance productivity. Course content quality is the “judgment by (the students) of the degree to which course content management systems are provided with valuable content, concerning the defined needs of the students” (Adeyinka & Mutula, 2010, p.1798). Course design quality is a measure of the design of the course in order to meet the students learning requirements, thereby enabling them to easily access learning resources.

Cheng (2012) extended the D&M ISS model and TAM by combining the 2 constructs (course content quality and course design quality) to form information quality in his study on the effects of quality antecedents on eLearning acceptance. The findings from Cheng’s study showed that “course content quality has significant effects on perceived usefulness and perceived ease of use while course design quality has a significant effect on perceived ease of use but and an insignificant effect on perceived usefulness. Lwoga (2014) also re-specified the D&M ISS model by replacing the metrics for information quality with course content quality in a bid to examine the adoption of a web-based learning management system called Moodle. Similar to the findings by Cheng (2012), the result from Lwoga’s study gave support for the relationship between course content quality

and perceived usefulness. This result is supported by similar findings by Yang et al. (2017). In trying to understand the quality factors that influence the continuance intention of students toward participation in massive open online courses (MOOCs), Yang et al. (2017) found that perceived usefulness was influenced by course content quality. MOOCs are similar to LMS’ as they are online and allow for easy access to resources as well as interaction with other students and the instructor.

This study adopts the re-specified information quality construct by Cheng (2012) of combining the course content quality and the course design quality to form course quality as opposed to information quality. Thus, course quality, in this study, assesses the availability of learning resources, content in terms of relevance, learning flexibility, how up-to-date the resources are, and difficulty level. It is expected that the course quality will have an effect on the students' perceived usefulness of the LMS, thus:

* + - * **H3a:** *Course quality will have a positive and significant influence on the public university students’ perceived usefulness of the LMS.*
      * **H3b:** *Course quality will have a positive and significant influence on the private university students’ perceived usefulness of the LMS.*

Table 3.1 below summarizes the relationships between the constructs that make up the eLearning aspect and the students’ perceptions on the ease of use and the usefulness of the LMS. These relationships are supported by prior research in the context of eLearning acceptance by students.

***Table 3. 1: Summary of the quality antecedents and their relationships***

## Relationship References

SQ  PEOU (Shah & Attiq, 2016; Alsabawy et l., 2016; Calisir et al., 2014; Lwoga, 2014;

Cheng, 2012; Chen, 2010).

SQ  PU (Yang et al., 2017; Shah & Attiq, 2016; Cheng, 2012; Choi et al., 2007; Pituch & Lee, 2006).

IQ  PU (Lwoga, 2014; Cheng, 2012; Lee et al., 2009) CQ  PU (Yang et al., 2017; Lwoga, 2014; Cheng, 2012)

Table 3.2 shows the constructs, their definitions, and the measurement scales employed in this model.

***Table 3. 2: Summary of the quality antecedent’s, definitions and measurement scales***

## Construct Definition Measurement Items

Instructor Quality Instructor quality is the

students’ perception of the instructor’s response time, teaching style, explanation, and helps students through their use of LMS.

1. The instructor communicates well via the LMS
2. The instructor's attitude is beneficial to my learning via the LMS
3. The instructor promptly responds to me via the LMS.
4. The instructor frequently updates resources for learners on the LMS
5. The instructor is knowledgeable in using the LMS

***(Cheng, 2012)***

System Quality System quality is the

measure of the functionality, reliability, usability, and efficiency of

1. The functionality of the LMS allows me to complete my learning tasks
2. Overall the LMS is highly reliable with minimal downtime
3. It is easy to learn how to use the LMS

the system by the students who use the LMS.

1. The LMS is efficient in allowing me to complete my tasks

***(DeLone & McLean, 2003; Cheng, 2012)***

Course Quality Course quality

encompasses the students’ perceptions of the value of the course resources and the design of the course in order to meet the students learning requirements.

1. The level of difficulty of the learning content is appropriate.
2. The delivery schedule of learning content is flexible
3. The LMS can provide me with individualized learning management.
4. The LMS system often provides updated information.
5. LMS can provide me with sufficient learning content.

***(Cheng, 2012)***

## Individual Perceptions – Direct Determinants of Behavioral Intentions

The individual perception aspect includes factors that pertain to the students’ perception of using the LMS. These factors are perceived ease of use, perceived usefulness, social influence, learning value, and facilitating conditions.

## Perceived usefulness (PU)

Perceived usefulness is defined as “the degree to which a person believes that using a particular system would enhance his/her job performance” (Davis, 1989, p.320). PU is derived from the technology acceptance model and based on the model it is directly influenced by perceived ease of use (PEOU); this means that if the technology users find the system easy to use, then they will find the system useful. The second relationship involving PU is that it directly influences behavioral intention to use the technology. Therefore, if the user finds the system useful, then they are more inclined to use the system. In the UTAUT framework (Venkatesh et al., 2003), Venkatesh

combined metrics from the following models: PU from TAM, extrinsic motivation from motivational model, job-fit from model of PC utilization, relative advantage from diffusion of innovation theory and output expectations from social cognitive theory to a single construct called performance expectancy (PE). PE is defined as “the degree to which an individual believes that using the system will help him or her to attain gains in job performance” (Venkatesh et al., 2003, p.447). All these constructs (extrinsic motivation, job-fit relative advantage, and output expectations) are similar in nature and can be collectively defined as the extent to which usefulness of a given technology is seen to be beneficial.

In using UTAUT to study students acceptance of eLearning systems, PE is one of the strongest determinants of behavioral intentions to use of eLearning technologies such as interactive whiteboards (Šumak & Šorgo, 2016), eLearning systems (El-Masri & Tarhini, 2017; Chu & Chen, 2016), mobile learning (Arpaci, 2015) and learning management systems (Yamin et al., 2014; Yakubu & Dasuki, 2018a).

In this study, PU is selected over PE because the instruments used to capture the student’s perception of the performance expectancy of using an LMS will measure how the system will increase effectiveness and performance by using the eLearning application. On the other hand, PU metrics measure the usefulness of the LMS to the students learning process. Another reason for electing PU over PE is that TAM has been used a lot more than UTAUT in the context of eLearning systems acceptance. Also, TAM suggests that PU will be directly influenced by external factors; this model adopts several relationships in the influence of PU. It is expected that the factors that directly affect PU are system quality (Yang et al., 2017; Shah & Attiq, 2016), course quality (Yang et al., 2017; Lwoga, 2014) and instructor quality (Lwoga, 2014; Cheng, 2012)

From a students’ eLearning acceptance perspective, PU has been the most influential construct that influences the behavioral intention of students to use LMS’ (Chang & Tung, 2008; Liu et al., 2010). More recent studies have also shown that PU is a very strong determinant of behavioral intentions of students to use MOOCs (Yang et al., 2017), and eLearning (Tarhini et al., 2014; Mohammadi, 2015; Al-Rahmi et al., 2018).

Based on the literature reviewed, PU is also expected to have a positive effect on behavioral intention of Nigerian students to use an LMS because if the students find the eLearning system

useful, then they are more likely to change their attitude towards using the system; thus it is expected that:

* **H4a:** *Perceived usefulness will have a positive and significant influence on public university students’ behavioral intention to use an LMS*
* **H4b:** *Perceived usefulness will have a positive and significant influence on private university students’ behavioral intention to use an LMS*

## Perceived Ease of Use (PEOU)

Perceived ease of use (PEOU) is defined as “the degree to which a person believes that using a particular system would be free of physical and mental effort” (Davis, 1989: p.320). PEOU is derived from TAM, where it was hypothesized to influence behavioral intentions to use technology. In terms of eLearning, scholars have found PEOU to have a positive influence on behavioral intentions (Cheng, 2012) and PU (Alharbi & Drew, 2014). With regards to the relationship with behavioral intention, it is presumed that if the students find the eLearning system easy to use, then they will be motivated to change their behavior towards the use of the system.

Like PU, PEOU is also influenced by external variables according to Davis, (1989). In this study, system quality is hypothesized to have an effect on PEOU. This relationship has been established in prior research in the context of students’ acceptance of eLearning (Shah & Attiq, 2016; Alsabawy et al., 2016; Calisir et al., 2014; Lwoga, 2014; Cheng, 2012; Chen, 2010).

In UTAUT (Venkatesh et al., 2003), Venkatesh merged the metrics from the following models: perceived ease of use (TAM/TAM2), complexity (Model of PC Utilization) and ease of use (Diffusion of Innovation Theory) to form effort expectancy (EE). EE “is defined as the degree of ease associated with the use of a system” (Venkatesh, Davis, and Davis, 2003, p.450). EE is a salient factor in the UTAUT and UTAUT2 model and is a direct determinant of behavioral intention to use technology. EE captures how easy it is to use technology, and it is a factor that is taken into consideration during software development. Like PEOU, the relationship between EE and behavioral intention is based on the fact that the easier it is to use a given technology, the more desirable it is. The effect of EE on behavioral intention decreases with increased usage as the users become more familiar (experience) with the technology (Venkatesh et al., 2003).

Several studies on the adoption of eLearning have found EE to have a positive and significant effect on students’ behavioral intention. Yakubu and Dasuki (2018) found EE to positively influence students’ behavioral intention to use Canvas LMS. Similarly, El-Masri and Tarhini (2017) while investigating the factors affecting the students’ adoption of e-learning systems in the USA and Qatar found that for both the sets of students EE had a positive influence on behavioral intention. Findings from other studies on eLearning systems adoption have corroborated these findings (Wang, 2016; Sarabadani et al., 2017; Tarhini et al., 2014). In contrast, Raman et al. (2014), in their study of postgraduate students’ use of Moodle, a learning management system, did not find support for the relationship between EE and behavioral intention. Similar results have been seen in the relationship between PEOU and behavioral intention to use eLearning systems (Ibrahim et al., 2017; Shah & Attiq, 2016; Alsabawy et al., 2016; Calisir et al., 2014)

With regards to the relationship between PEOU and PU, mixed results have been observed by various authors. Mohammadi (2016) and Shah and Attiq (2016) both found support for the relationship; however, the hypothesis was rejected by Ibrahim et al., 2017. This relationship is built on the premise that if an individual finds a technology easy to use, then, the individual will find the technology useful. The mixed results are, therefore expected because not every technology that is easy to use will be useful to an individual.

If the LMS is easy to use and understand by Nigerian students, it is expected that the students will be more inclined to use the LMS and also find the LMS more useful. Therefore, it is hypothesized that:

* **H5a:** *Perceived ease of use will have a positive and significant influence on public university students’ perceived usefulness of the LMS.*
* **H5b:** *Perceived ease of use will have a positive and significant influence on private university students’ perceived usefulness of the LMS.*
* **H5c:** *Perceived ease of use will have a positive and significant influence on public university students’ behavioral intention to use the LMS.*
* **H5d:** *Perceived ease of use will have a positive and significant influence on private university students’ behavioral intention to use the LMS.*

## Learning Value (LV)

Learning value (LV) encompasses the benefits and rewards obtained by using the LMS by Nigerian students. The instrument items used to capture LV in this study were derived from the “net benefits” construct in the updated DeLone and McLean IS success model (DeLone & McLean, 2003) and “Learning Value” a construct used by Ain et al. (2016) in investigating the influence of learning value on the use of LMS by Malaysian university students.

In the extended UTAUT model, 3 extra variables were added, hedonic motivation, habit, and price value. Price value takes into consideration monetary costs, which Venkatesh et al. (2012) attributed to the use of technology by consumers. Venkatesh argued that pricing of a particular technology could impact the usage by consumer citing preference in the use of SMS in China over more expensive messaging applications. Therefore, there is a value in the price if the rewards of using the system are beneficial.

Ain et al. used the extended UTAUT framework for the study and replace the price value construct with learning value; Ain et al. argued that “prior studies lack in exploring the influence of students’ perceived value of LMS use in terms of learning gained from LMS, habitual LMS use and associated fun or pleasure”. Ain et al. (2016) believed that students invest time and effort in order to gain benefit from eLearning systems and as a result, their perceptions about using the eLearning system will influence their intentions to invest more time and effort to get the required knowledge. This relationship was termed learning value and was found to significantly influence student’s behavioral intention to use the eLearning system.

In the extended UTAUT model, price value represents the consumers’ perception of “value for money” of the technology. However, in the context of LMS acceptance by students, the students are not responsible for the costs involved in using the LMS (Ain et al., 2016), it can be argued that this cost is built into “technology fees” which is part of the student's total fees paid annually or per semester. Out of the 4 universities investigated in this study, the average cost attributed to technology fees is 40,000 Naira per annum, this equates to approximately $130. The technology fees cover the costs of using the internet/intranet, public computers, the student information system (SIS), printing services, email services, and the LMS. There is no breakdown on the percentages of each service charge, but in Nigeria, the internet access costs are very high, and it is expected that the internet cost would take a major share of the total technology fees. Another reason for

dropping the price value construct is that students will not have any idea how much to ascribe to LMS cost from the technology fee. So instead of the monetary costs, students are more concerned about the effort and time put into learning by using the system (Ain et al., 2015). The cost of using the LMS will be very minimal, especially in the public universities where almost all the fees are subsidized by the government when compared to the profit-making private universities. This study assumes that the cost of using LMS by Nigerian students is negligible and as such the price value variable will not be a significant predictor of behavioral intention to use the LMS, this corroborates the findings of El-Masri and Tarhini (2017), there they used the extended UTAUT2 model to investigate the adoption of e-learning systems by university students in Qatar and USA. In both countries, even though the model they used explained a variance of 68% of the Qatari sample and 63% of the USA sample, there was no support for the relationship between price value and behavioral intentions in both Qatari and USA students.

Net benefits; on the other hand, was created to answer the call for additional IS impact measures other than individual and organizational impacts in the original D&M IS success model. This call was in order to cater to the evolution of IS impacts, which are consumer impacts, societal impacts, industry impacts, and inter-organizational impacts.

DeLone and McLean (2003) noted that the choice of the measured impacts should depend on the evaluated system as well as the purpose of the system. In this study, the system in question is an eLearning technology (LMS) whose purpose is to facilitate the learning process So in creating the measurement instrument for learning value, time and effort factors were taken into consideration (from the learning value concept) as well as the benefits factors from the net benefits construct.

As determinants of behavioral intention, both learning value (Ain et al., 2016) and net benefits (Chang et al., 2011; Hassanzadeh et al., 2012) have shown that a positive and significant relationship exists in the context of eLearning systems. Thus, it is expected that learning value (the effort and time put into learning by using the system) will significantly influence behavioral intentions, thus:

* **H6a:** *Learning value will have a positive and significant influence on public university students’ behavioral intention to use the LMS.*
* **H6b:** *Learning value will have a positive and significant influence on private university students’ behavioral intention to use the LMS.*

### Social Influence

“Social influence is defined as the degree to which an individual perceives that important others believe he or she should use the new system” (Venkatesh et al., 2003, p.451). SI is derived from UTAUT and is also known as “subjective norm” in TRA, “social factors” in the model of PC utilization (MPCU) and “image” in the innovation diffusion theory (IDT). Social influence (SI) is an individuals’ perception of social pressure by important others that surround the individual. Thus, in the context of an educational setting, these important others would be the instructor, fellow classmates, and the university administration.

Prior research has yielded mixed results with regards to the relationship between SI and behavioral intention of students to use an eLearning system. For example, El-Masri and Tarhini (2017), found the relationship to be statistically significant, whereas Yakubu and Dasuki (2018a) did not find support for this. Yakubu and Dasuki attributed this finding to the fact that the LMS use was mandatory for all students in the studied environment, therefore, their use of the LMS was not as a result of social influence, this contradicts Venkatesh and Davis (2000) who argued that the “effect of SN occurs only in mandatory environments and has less influence in a voluntary environment” (Venkatesh & Davis, 2000). Other studies have established a significant relationship between SI and students’ behavioral intentions to use an LMS in a mandatory setting (Ain et al., 2016; Fidani & Idrizi, 2012; Raman et al., 2014; Decman, 2015; Hsu, 2013).

This study adopts the hypothesis posed by Venkatesh and Davis (2000) as well as the findings by several authors in the context of eLearning acceptance (Ain et al., 2016; Fidani & Idrizi, 2012; Raman et al., 2014; Decman, 2015; Hsu, 2013).

This study assumes that the influence of instructors, classmates, and, the school administration will have a positive and significant effect on the Nigerian student’s behavioral intention to use an LMS. Therefore, this study proposes that:

* + - * **H7a:** *Social influence will have a positive and significant influence on public university students’ behavioral intention to use the LMS.*
      * **H7b:** *Social influence will have a positive and significant influence on private university students’ behavioral intention to use the LMS.*

### Facilitating Conditions

Facilitating Conditions (FC) is the ability to provide technical and organizational resources to support the users of the technology. “Facilitating condition (FC) is defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system” (Venkatesh et al., 2003, p.453). The facilitating conditions measurement instruments were derived from perceived behavioral control in the theory of planned behavior (TPB), facilitating conditions from the model of personal computer utilization (MCPU), and compatibility from innovation diffusion theory (IDT). A relationship between perceived behavioral control, facilitating conditions and compatibility constructs exists with behavioral intention in the TPB, MPCU and IDT models respectively, but Venkatesh et al. argued that this relationship would not be significant due to the effect of effort expectancy or perceived ease of use on behavioral intentions. However, FC has a direct effect on the actual usage of the technology.

UTAUT2, however, shows support for a positive and significant influence on both behavioral intention and use. Prior research, in the domain of eLearning acceptance by students, has supported the relationship between FC and behavioral intention as well as the relationship between FC and actual usage. For instance, El-Masri and Tarhini (2017) while investigating the adoption of eLearning in the USA and Qatar found support in the relationship between FC and behavioral intentions for the USA sample but not in the QATAR sample. The reason for this as stated by El- Masri and Tarhini was that “the Arab world is still in its infancy compared to other western/developed countries in the adoption of eLearning” (El-Masri & Tarhini, 2017). Ain et al. (2016) used the extended UTAUT as a theoretical lens in the study of LMS acceptance by Malaysian university students, and they found that the relationship between FC and behavioral intentions was not supported while there was support for the relationship between FC and actual usage of the LMS. Interestingly, the relationship between effort expectancy and behavioral intention (like FC) was also not supported in their study, Ain et al. gave the reason for the lack of support stating that this “maybe because of the effort expectancy effect on facilitating conditions, where the facilitating conditions effect was captured by effort expectancy”. (Ain et al., 2016)

In Nigeria, there was support for the relationship between FC and behavioral intention of university students to use Canvas LMS by Yakubu and Dasuki (2018a) and a similar result was observed in the United Arab Emirate (Salloum & Shaalan, 2018).

In the context of this study, facilitating conditions will measure the students’ perception of their ability to access the required technical and infrastructural support in order to use the LMS. And the study presumes that with the essential resources and support in place, student’s behavioral intention will be influenced and they will be more willing to use the eLearning system, thus:

* + - * **H8a:** *Facilitating conditions will have a positive and significant influence on public university students’ behavioral intention to use the LMS.*
      * **H8b:** *Facilitating conditions will have a positive and significant influence on private university students’ behavioral intention to use the LMS.*
      * **H8c:** *Facilitating conditions will have a positive and significant influence on the public university students’ actual use of the LMS.*
      * **H8d:** *Facilitating conditions will have a positive and significant influence on the private university students’ actual use of the LMS.*

### Behavioral intention (BI)

The final relationship in the conceptual model is between behavioral intention to use the LMS and the actual use of the LMS. This relationship stems from the theory of reasoned action (TRA) developed by Martin Fishbein and Icek Ajzen in 1967 and derived from earlier research in the social-psychological domain. TRA explains human actions as a result of attitudes; thus, an individual undertakes certain actions based on how the individual feels towards the action as well as the influence of social pressure. The individuals’ attitude and social pressure influence the individuals’ intention to perform the action, which eventually leads to performing the action.

Almost all the theories reviewed in chapter 2 adopt the relationship between behavioral intentions and actual usage (use). The difference in the theories lies in the different factors/constructs that influence behavioral intention.

Behavioral intention is an individuals’ intention to use a particular technology for different undertakings. As with prior studies, especially in the context of eLearning (Yakubu & Dasuki,

2018; Ain et al., 2015; Tarhini et al., 2013), it is expected that there will be a statistically significant relationship between behavioral intention and the actual usage of LMS by Nigerian students, thus:

* + - * **H9a:** *Behavioral intention will have a positive and significant influence on actual usage of the LMS by public university students*
      * **H9b:** *Behavioral intention will have a positive and significant influence on actual usage of the LMS by private university students*

### Actual Usage (AU)

Actual usage is the final dependent variable in the model; AU measures the actions of Nigerian students in using the LMS. In almost all of the theories reviewed, the behavioral intention of an individual always leads to the actual behavior, and this relationship is retained in this study. Prior research in the context of eLearning has established this relationship (Mohammadi, 2015; Yakubu & Dasuki, 2018a; Tarhini et al., 2013).

Table 3.3 shows a summary of the relationships of the individual perception constructs used in the conceptual model as well as references of studies that have established the relationships.

## Table 3. 3: Summary of the individual perception constructs and their relationships adopted in the conceptual model

**Relationship References**

PU  BI (Al-Rahmi, et al., 2018; Yang et al., 2017; Mohammadi, 2015; Tarhini et al.,

2014; Liu et al., 2010; Chang & Tung, 2008)

PEOU  BI (Ibrahim et al., 2017; Shah & Attiq, 2016; Alsabawy et l., 2016; Calisir et al., 2014; Tarhini et al., 2014)

PEOU  PU (Mohammadi, 2015) LV  BI (Ain et al., 2016)

SI  BI (Ain et al., 2016; Tarhini et al., 2014; Fidani & Idrizi, 2012; Raman et al., 2014; Decman, 2015; Hsu, 2013)

FC  BI (Yakubu & Dasuki, 2018; Salloum & Shaalan, 2018). FC  AU (Ain et al., 2016)

BI  AU (Yakubu & Dasuki, 2018; Ain et al., 2015; Tarhini et al., 2013)

Table 3.4 shows the individual perception constructs, their definitions, and the measurement scales employed in this model.

***Table 3. 4: Constructs, definitions and measurement scales***

## Construct Definition Measurement Scale

Perceived

Usefulness

Perceived Ease of Use

Learning Value

This is the student's

perception that using the LMS will enhance learning effectiveness and performance

This is the students’ perception that learning to use the LMS is easy.

Learning value is defined as the total benefits obtained by the effort and time spent by students using the eLearning systems.

1. Using the LMS will allow me to accomplish

learning tasks more quickly

1. Using the LMS will improve my learning performance
2. Using the LMS will increase my learning productivity
3. Using the LMS will enhance my effectiveness in learning
4. Using the LMS will be useful in my studies

### (Davis, 1989; Ngai et al., 2007; Cheng, 2012)

1. My interaction with the LMS is clear and understandable.
2. It would be easy for me to become skillful at using the LMS.
3. I find the LMS easy to use
4. Learning to operate the LMS is easy for me

### (Davis, 1989; Ngai et al., 2007; Cheng, 2012)

1. Learning through the LMS is worth more than the time and effort given to it
2. Using the LMS offers access to updated curriculum.
3. The LMS is very flexible as I can access it at any time or place.

Facilitating Conditions

Social Influence

Behavioral Intention

Actual Usage

“Facilitating conditions are defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system” (Venkatesh, Davis, & Davis, 2003)

“Social influence is defined as the degree to which an individual perceives that important others believe he or she should use the new system.” (Venkatesh, Davis, & Davis, 2003) Behavioral intention is defined as “a person's perceived likelihood that an individual will engage in a given behavior” (US Institute of Medicine, 2002).

Actual usage measures the actions of an individual using the eLearning system (Yakubu and Dasuki, 2018b)

1. The LMS provides opportunities for relations between learners and the instructors (i.e., group discussions)
2. The LMS somewhat allows me to study at my own pace

### (Ain et al., 2016; DeLone & McLean, 2003)

1. I have the resources necessary to use the LMS (e.g., technology and time)
2. I have the knowledge necessary to use the LMS
3. The LMS Canvas is not compatible with other systems I use
4. A specific person or group is available to assist me with issues I have with the LMS

### (Venkatesh et al., 2003)

1. My instructors encourage me to use the LMS
2. My classmates encourage me to use the LMS
3. My school encourages me to use the LMS
4. The IT department at in my school has been helpful in supporting the use of the LMS

### (Venkatesh et al., 2003; Yakubu & Dasuki, 2018a)

1. I intend to use the LMS this semester
2. I intend to use the LMS next semester
3. I intend to use the LMS frequently for my coursework
4. When given a chance I will always try to use the LMS

### (Venkatesh et al., 2003; Yakubu & Dasuki, 2018a)

1. I use the LMS frequently
2. I depend on the LMS for my studies
3. I use many functions of the LMS

***(Venkatesh et al., 2003; Yakubu & Dasuki, 2018a)***

## Construct Definition Measurement Scale

Perceived Usefulness

This is the student's perception that using the LMS will enhance learning effectiveness and performance

* 1. Using the LMS will allow me to accomplish learning tasks more quickly
  2. Using the LMS will improve my learning performance
  3. Using the LMS will increase my learning

productivity

Perceived Ease of Use

Learning Value

Facilitating Conditions

Social Influence

Behavioral Intention

This is the students’ perception that learning to use the LMS is easy.

Learning value is defined as the total benefits obtained by the effort and time spent by students using the eLearning systems.

“Facilitating conditions are defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system” (Venkatesh, Davis, & Davis, 2003)

“Social influence is defined as the degree to which an individual perceives that important others believe he or she should use the new system.” (Venkatesh, Davis, & Davis, 2003) Behavioral intention is defined as “a person's perceived likelihood that an individual will

* 1. Using the LMS will enhance my effectiveness in learning
  2. Using the LMS will be useful in my studies

### (Davis, 1989; Ngai et al., 2007; Cheng, 2012)

1. My interaction with the LMS is clear and understandable.
2. It would be easy for me to become skillful at using the LMS.
3. I find the LMS easy to use
4. Learning to operate the LMS is easy for me

### (Davis, 1989; Ngai et al., 2007; Cheng, 2012)

1. Learning through the LMS is worth more than the time and effort given to it
2. Using the LMS offers access to updated curriculum.
3. The LMS is very flexible as I can access it at any time or place.
4. The LMS provides opportunities for relations between learners and the instructors (i.e., group discussions)
5. The LMS somewhat allows me to study at my own pace

### (Ain et al., 2016; DeLone & McLean, 2003)

1. I have the resources necessary to use the LMS (e.g., technology and time)
2. I have the knowledge necessary to use the LMS
3. The LMS Canvas is not compatible with other systems I use
4. A specific person or group is available to assist me with issues I have with the LMS

### (Venkatesh et al., 2003)

1. My instructors encourage me to use the LMS
2. My classmates encourage me to use the LMS
3. My school encourages me to use the LMS
4. The IT department at in my school has been helpful in supporting the use of the LMS

### (Venkatesh et al., 2003; Yakubu & Dasuki, 2018a)

1. I intend to use the LMS this semester
2. I intend to use the LMS next semester
3. I intend to use the LMS frequently for my coursework

Actual Usage

engage in a given behavior” (US Institute of Medicine, 2002).

Actual usage measures the actions of an individual using the eLearning system (Yakubu and Dasuki,

1. When given a chance I will always try to use the LMS

### (Venkatesh et al., 2003; Yakubu & Dasuki, 2018a)

1. I use the LMS frequently
2. I depend on the LMS for my studies
3. I use many functions of the LMS

### (Venkatesh et al., 2003; Yakubu & Dasuki, 2018a)

2018b)

## Moderating variables

There are 3 moderating variables used in the model, namely age, gender, and experience. In the 3 models used to develop the conceptual framework, only UTAUT took into consideration the effect of moderating variables. UTAUT employed 4 moderators, namely age, gender, experience, and voluntariness.

The moderators can influence the attitudes of the individuals with regards to their perceptions on using technology and as a result, should be considered in research such as this in order to rely less on the general assumptions that will be made by the findings.

In this section, the researcher discusses the 4 moderators mentioned above and justifies the inclusion or exclusion from the conceptual model.

### Gender

The use of gender in individual behavioral models were first presented by the gender schema theory by Bem, (1981) although it has also been adopted by technology acceptance models such as UTAUT, TAM2, and TPB. Previous studies have also shown that there is a difference between men and woman in terms of their decision-making (Venkatesh & Morris, 2000).

Previous research has shown that gender is a significant factor in IS models that aim at predicting individuals behavior. With regards to the acceptance of eLearning systems by students, we did not find any literature that established a moderating effect on the relationship between perceived usefulness and behavioral intention. In fact, the literature reviewed in the context of eLearning acceptance, there was support for the effect of gender on the relationship between PU and

behavioral intention (Wang et al., 2009; Tarhini et al., 2014). Tarhini reasoned that “within an educational context, males and females do not differ in terms of the emphasis they place on task completion, at least not to the extent found in other, more general computing domains” (Tarhini et al., 2014).

Therefore, based on prior research in other domains, this study will assume that in the context of eLearning, the relationship between perceived usefulness on the behavioral intention of Nigerian students to use the LMS will be moderated by gender in such a way that the influence will be stronger in the male students. This is consistent with social psychology literature, “which emphasizes that men are more pragmatic compared to women and highly task-oriented” (Minton et al., 1980). This means that men place more emphasis on how useful a system in relation to the task that needs to be completed.

Gender also has a role to play in the relationship between perceived ease of use and behavioral intention. Venkatesh et al. (2003) explained that the effect of perceived ease of use (effort expectancy) is stronger for women in the behavioral intention to use technology. In the context of eLearning acceptance by students, several authors have established this to be true (Tarhini et al., 2014; Ong & Lai, 2006). Similarly, the effect of gender on the relationship between social influence (subjective norm) and behavioral intention, according to Venkatesh et al. (2003), is stronger for females. Again prior research has found this in their results on the study of student acceptance of eLearning (Tarhini et al., 2014; He & Freeman, 2010; Hu et al., 2010; Wang et al., 2009).

Based on the previous discussion, it is anticipated that the relationship between PU and behavioral intention will be stronger for male students, while the relationship between (PEOU and SI) and behavioral intentions will be stronger for female students, thus:

* **H10a:** *The influence of perceived usefulness on the behavioral intention of public university students to use the LMS will be moderated by gender such that the influence will be stronger in male students.*
* **H10b:** *The influence of perceived usefulness on the behavioral intention of private university students to use the LMS will be moderated by gender such that the influence will be stronger in male students.*
* **H10c:** *The influence of perceived ease of use on the behavioral intention of public university students to use the LMS will be moderated by gender such that the influence will be stronger in female students.*
* **H10d:** *The influence of perceived ease of use on the behavioral intention of private university students to use the LMS will be moderated by gender such that the influence will be stronger in female students.*
* **H10e:** The influence of s*ocial influence on the behavioral intention of public university students to use the LMS will be moderated by gender such that the influence will be stronger in female students.*
* **H10f:** The influence of s*ocial influence on the behavioral intention of private university students to use the LMS will be moderated by gender such that the influence will be stronger in female students.*

### Experience

When using technology, experience has been shown to have an influence on the perceptions the users of the technology have in regards to using the technology. With more experience, certain barriers would have been overcome, which results in a system that is easier to use as the user is expected to be more familiar with the technology.

In this study, experience on using the LMS is grouped into 3; those with low experience (under 1 year of usage), medium experience (1-2 years of experience) and high experience (over 2 years experience). Venkatesh et al. (2003) theorized that experience in using technology would have an effect on the relationship between effort expectancy (PEOU) and behavioral intention such that the influence of effort expectancy (PEOU) on behavioral intention will be stronger in individuals who have not really interacted with the system (limited use). This is because the individual would not have used the technology before and if the technology is easy to use then the effect of effort expectancy (PEOU) on behavioral intention will be stronger when compared to those who have experience in using the system.

Venkatesh et al. (2003) also theorized that experience in using technology would have an effect on the relationship between social influence and behavioral intention such that the influence of social influence on behavioral intention will be stronger in individuals who have not really interacted with the system (limited use). This is because new users will be easier to influence to

use the technology by supervisors, peers, and administration in comparison to more experienced users.

Experience is also likely to influence the relationship between facilitating conditions and actual usage such that the influence of facilitating conditions on actual usage will be stronger in individuals who have not really interacted with the system (limited use). This is because new users will lack the knowledge required to use technology; thus, they will require more support and resources to use the technology.

Unfortunately, in the context of eLearning acceptance, this research did not find any study that investigated the effect experience has on behavioral intention or the actual usage of an eLearning system. Therefore, this study adopts the moderating effects as hypothesized and tested by Venkatesh et al. (2003) as listed below:

* **H11a:** *The influence of perceived ease of use on the behavioral intention of public university students to use the LMS will be moderated by experience such that the influence will be stronger in students with limited experience.*
* **H11b:** *The influence of perceived ease of use on the behavioral intention of private university students to use the LMS will be moderated by experience such that the influence will be stronger in students with limited experience.*
* **H11c:** The influence of s*ocial influence on the behavioral intention of public university students to use the LMS will be moderated by experience such that the influence will be stronger in student with limited experience.*
* **H11d:** The influence of s*ocial influence on the behavioral intention of private university students to use the LMS will be moderated by experience such that the influence will be stronger in student with limited experience.*
* **H11e:** *The influence of facilitating conditions on the actual usage of the LMS by public university students will be moderated by experience, such that the influence will be stronger in students with limited experience.*
* **H11f:** *The influence of facilitating conditions on the actual usage of the LMS by private university students will be moderated by experience, such that the influence will be stronger in students with limited experience.*

### Age

Age and gender are two of the most popular moderators used in the acceptance of technology literature. In UTAUT, Venkatesh et al. (2003) discovered that performance expectancy (similar to perceived usefulness) and facilitating conditions (FC) had a stronger relationship to behavioral intention for younger employees within an organizational context. Venkatesh also found support for a stronger relationship between effort expectancy (similar to PEOU) and social influence on older employees behavioral intention to use technology.

In the domain of eLearning acceptance, like Venkatesh et al. (2003), Tarhini et al. (2014) supported the moderating effect of age on the relationship between PEOU and social norm (similar to SI) on behavioral intention of English students intention to use an eLearning system, however the same study did not support the moderating effect of age on the relationship between PU and behavioral intention. Wang et al. (2009) found support, similar to Venkatesh et al. (2003), for the moderating effect of age on the relationship between effort expectancy and social influence on Behavioral intentions stating that the effect was stronger in older participants of mobile learning.

Despite conflicting results on the moderating effect age has on PU, PEOU, FC, and SI on behavioral intentions, this study will propose 4 hypotheses in each sample (i.e., 8 hypotheses) for testing similar to prior research (Venkatesh et al., 2003).Also, for the purpose of this study, the participants are grouped into 2 groups only, this is because, in higher education, majority of the ages will fall between the ages of 16 and 25 for undergraduates and over 25 years old as mature or postgraduate students which make up more than 50% (Yakubu & Dasuki, 2018a; Yakubu & Dasuki, 2018b). Group 1 are students under the age of 25 (young) while group 2 covers students over 25 (old).

Based on the above discussion, the following hypothesis is posed:

* + - * **H12a:** *The influence of perceived usefulness on the behavioral intention of public university students to use the LMS will be moderated by age such that the influence will be stronger in younger students.*
      * **H12b:** *The influence of perceived usefulness on the behavioral intention of private university students to use the LMS will be moderated by age such that the influence will be stronger in younger students.*
      * **H12c:** *The influence of perceived ease of use on the behavioral intention of public university students to use the LMS will be moderated by age such that the influence will be stronger in older students.*
      * **H12d:** *The influence of perceived ease of use on the behavioral intention of private university students to use the LMS will be moderated by age such that the influence will be stronger in older students.*
      * **H12e:** The influence of s*ocial influence on the behavioral intention of public university students to use the LMS will be moderated by age such that the influence will be stronger in older students.*
      * **H12f:** The influence of s*ocial influence on the behavioral intention of private university students to use the LMS will be moderated by age such that the influence will be stronger in older students.*
      * **H12g:** *The influence of facilitating conditions on the actual usage of the LMS by public university students will be moderated by age, such that the influence will be stronger in older students.*
      * **H12h:** *The influence of facilitating conditions on the actual usage of the LMS by private university students will be moderated by age, such that the influence will be stronger in older students.*

### Voluntariness

The final moderator is the voluntariness of use. Certain perceptions are influenced if the use of the technology being investigated is either in a mandatory or voluntary setting. For instance, Venkatesh et al. (2003), observed that in mandatory settings, the effect social influence has on behavioral intentions is more significant than in a setting where the use of the technology is voluntary.

The voluntariness of use moderator was excluded from the conceptual model employed by this research. The exclusion of “voluntariness of use” as a moderator is because the use of the LMS in all the 4 universities being studied is mandatory for all students.

## Mean Comparison

One of the aims of this study is to see if there are similarities or differences between public and private university student’s acceptance of eLearning systems. In section 2.3.4 (Private versus public Nigerian universities), funding was identified as the main factor responsible for the disparities between the operations of public and private universities.

Technology resources, quality assurance, and instructor morale were identified as factors that are influenced by funding and are likely to cause the contrast in eLearning implementation and use, between public and private universities.

The 3 quality factors (system quality, course quality, and instructor quality) in the conceptual model are the most likely to be affected by funding or the lack of it. The means of each of the 3 factors will be compared, i.e., public against private universities, to establish if there are differences between the students’ perceptions of these 3 factors.

Based on the literature reviewed, this study poses the following hypotheses:

* **H13a:** *System quality means will be significantly lower in private universities, compared to public universities.*
* **H13b:** *Instructor quality means will be significantly lower in private universities, compared to public universities.*
* **H13c:** *Course quality means will be significantly lower in private universities, compared to public universities.*
* **H13d***: Perceived usefulness mean will be significantly lower in private universities, compared to public universities*
* **H13e***: Perceived ease of use mean will be significantly lower in private universities, compared to public universities*
* **H13f***: Learning value means will be significantly lower in private universities, compared to public universities*
* **H13g***: Social influence means will be significantly lower in public universities, compared to private universities*
* **H13h***: Facilitating conditions mean will be significantly lower in private universities, compared to public universities*
* **H13i***: Behavioral intentions mean will be significantly lower in private universities, compared to public universities*
* **H13j***: Actual usage means will be significantly lower in private universities, compared to public universities*

It should be noted that a lower mean means that the students are more inclined to agree to the questions asked in the questionnaire as the scales used in the survey measures 1 for strongly agree, 3 for neutral and 5 for strongly disagree.

## Conclusion

In summary, this research is based on prominent technology acceptance and IS success models. Constructs deemed to be significant in the models reviewed in the literature were objectively combined to propose the conceptual model, which will be tested on students in four universities in northern Nigeria.

The constructs employed by the model were grouped into 2 groups, 1) the eLearning aspects and

2) the individual perceptions. The eLearning aspects include the quality antecedents related to eLearning; they are software quality, course quality, and instructor quality (SQ, CQ, and IQ, respectively). The individual perceptions include perceived usefulness, perceived ease of use, learning value, social influence and, facilitating conditions (PU, PEOU, LV, SI, and FC). The quality antecedents influence 2 of the individual perceptions (PU and PEOU) while the individual perceptions influence the students’ behavioral intention to use the LMS. The final relationship is between BI and AU. Also, gender and experience are moderators on the relationships between behavioral intention and actual usage.

Gender and Experience were used as moderators between some of the individual perceptions and behavioral intentions. In total there are 54 hypotheses to test, 24 are direct relationships between the constructs, 20 involve the role of moderators and the remaining 10 compare mean values of the constructs between the public and private university.

# CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY

## Introduction

Chapter 2 highlighted the importance of eLearning systems, such as LMS’, for instruction and learning purposes. The chapter also reviewed technology acceptance and IS success theories, some of which have been applied in the study of the acceptance of eLearning systems. Based on these theories, the conceptual framework was developed by extracting constructs identified as being important in determining the use of technology in the context of LMS’ in chapter 3. The constructs involved were selected to examine the acceptance of LMS’ by students in 4 Nigerian universities. These were the only universities (both private and public) in northern Nigeria that currently uses LMS’ to assist in learning and instruction.

To guide this research, a positivist approach is employed, and the use of both a paper-based and an online survey were used to collect responses from the 4 identified universities, thus this study is quantitative in nature. To analyze the data obtained in this study, structural equation modeling (SEM) technique was applied to the respondent’s data with the aid of IBM SPSS Statistic (Version 21) and AMOS version 21 (Build 1178).

This chapter is divided into subsections that explain and justify the philosophical assumptions, the methods, and techniques used to accomplish the goals set out by this study. Section 4.2 examines the philosophical approach adopted by this research, with justification for the selected approach, which forms the foundation of the design and methods used by the research. The next section, 4.3, discusses the research strategy options available ad justifies the selection of the qualitative strategy over the other available strategies. Sections 4.4 and 4.5 examine the survey and sampling methods, respectively applied in this research. The chapter continues with discussions on the data collection methods and the measurement scale used to collect and measure the data. Sections 4.8 and 4.9 provide an overview of the pilot study carried out and the tools and methods used to analyze the data. The final section before the conclusion of this study is section 4.10, which reports on the ethical considerations associated with this research.

## Philosophical Assumptions

There are several choices available to investigators with regards to the approaches that can be adopted when embarking on a research project. Each of these choices is an encapsulation of a set of beliefs that dictate how research should be carried out and the manner in which the results should be interpreted. These choices are referred to as “paradigms.” According to Henn et al. (2009), a “paradigm is a set of assumptions about how the issue of concern to the researcher should be studied.” Paradigms are also referred to as “knowledge claims” (Creswell, 2008), “philosophical assumptions, epistemologies and ontologies” (Crotty, 1998) or “research methodologies” (Neuman, 2000).

Creswell (2008) proposed a framework made up of 3 elements of inquiry that help to enforce the choice of what methods to employ in research. The 3 elements identified are philosophical assumptions (knowledge claims), strategies of inquiry, and methods. Figure 4.1 depicts how the 3 elements inform research approaches which, in turn, translate to design processes of the research.

**Elements of Inquiry**

Conceptualized by the researcher

Translated into practice

Methods

**Research Design**

Questions Theoretical lens Data Collection Data Analysis Write-up Validation

**Research Approach**

Qualitative Method Quantitative Method Mixed Method

Strategies of Inquiry

Alternative Knowledge Claims

### Figure 4. 1: Overall Research Design: Knowledge claims, strategies on inquiry and methods leading to research approaches and research design. Source: Creswell (2008)

The first element of inquiry as identified by Creswell, (2008) is the paradigm (knowledge claims). Guba and Lincoln (1994) propose that the responses to 3 fundamental questions will aid in defining paradigms. The questions are grouped into the 3 views listed below:

* + 1. Ontological: Ontology is concerned with how the world operates or the nature of being; it is defined as “a set of assumptions about what constitutes the social world and how it is experienced.” (Henn et al., 2009). In a simplified form, ontology is the belief about the nature of reality and what makes up knowledge. There are two main and differing ontological views, 1) Realism: belief that truth is present and available to be observed by measurements which can be used to make generalized assumptions. 2) Relativism: a belief that multiple versions of reality exist and that truth evolves and is created by meanings and experiences such as culture, society, and history.
    2. Epistemological: While ontology is concerned with how the world works, epistemology focuses on how one goes about understanding how the world works, it defines the relationship between the researcher and the knowledge to be acquired. Epistemology “considers questions to do with the nature of social reality, what is acceptable knowledge concerning that reality, and what are the appropriate methods for studying that reality.” (Henn et al., 2009). There are two main approaches with regards to the epistemological view, 1) Objective approaches, where the researcher has no influence on the data collected to obtain an objective measurement. 2) Subjective approaches are the opposite of objective approaches. Here the researcher is involved, for example, interacting with groups of people to find out their understanding of the truth.
    3. Methodological: Methodology describes the general principles ideologies which emphasize how the social world is investigated and to show the validity of the generated knowledge (Orlikowski & Baroudi, 1991; Mingers, 2003). Thus, how the truth/knowledge is learned and analyzed in a systemic way. There are various approaches used to systematically discover and analyze data; examples include experiments, hypothesis testing, dialogic, hermeneutic, etc.

Ontological beliefs dictate epistemological beliefs; thus, the belief a researcher has on the nature of reality influences the relationship between the researcher and what is being studied. Epistemological beliefs, in turn, dictate the methodological approaches used in research.

To inform and guide research inquiry, there are 4 major paradigms that are in competition for acceptance “positivism, postpositivism, critical theory and related ideological positions, and constructivism. Table 4.1 shows the different responses to the three fundamental questions (Ontological, epistemological, and methodical) for the 4 identified paradigms as portrayed by (Guba & Lincoln, 1994).

### Table 4. 1: Characteristics of the four major paradigms (knowledge claims)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Items** | **Positivism** | **Postpositivism** | **Critical Theory**  **and related ideological positions** | **Constructivism/ Interpretivism** |
| Ontology | Realism | Realism | Realism | Relativism |
|  | (Naïve) | (Critical) | (Historical) |  |
| Epistemology | Objectivist | Objectivist | Subjectivist | Subjectivist |
| Methodology | Hypothesis testing; experimental; Mainly quantitative methods | Modified experimental; hypothesis testing; includes qualitative  methods | Dialogic | Hermeneutical |

The Positivist paradigm believes that knowledge is only learned from observable evidence obtained by the scientific methods. The methods involved assume that the researcher distances himself from the research; therefore, he/she does not affect the outcome of the study. The role of the researcher is to collect and analyze data in an objective manner. Krauss (2005) believes that

positivism “is a position that holds that the goal of knowledge is simply to describe the phenomena that we experience” (Krauss, 2005, p.760). Creswell (2008) states that researchers studying the same phenomena will achieve the same results as long as they adhere to the same research process, “this common belief is the existence of a universal generalization that can be applied across contexts, which is now called naïve realism” (Wahyuni, 2012, p.71). The methodologies applied to the positivist approach include experiments and hypothesis verification mainly through the use of quantitative methods.

Postpositivism challenges the application of universal generalization across different contexts, i.e., naïve realism. Wahyuni (2012), states that the postpositivist approach, which also believes in generalization, is based on social conditioning (critical realist). “Critical realism assumes transcendental realist ontology, an eclectic realist/interpretivist epistemology and a generally emancipatory axiology.” (Easton, 2010, p.119). The critical realist believes that nature and knowledge exist independently and that sensations and images of the real world can be deceptive and they usually do not portray the real world (Novikov and Novikov, 2013). While studying human behavior and actions, the postpositivist researcher is not positive about the claims of knowledge (Creswell, 2008); therefore, absolute truth is elusive. Data, verification, and reasonable considerations are used to form knowledge. Positivism and postpositivism are similar; the only difference is that postpositivism recognizes that all observations are imperfect, contain error and that all theory can be revised. The methodologies applied to the postpositivist approach include modified experiments, critical multiplism, and, the falsification of hypothesis.

“Interpretivists believe that reality is constructed by social actors and people’s perceptions of it.” (Wahyuni, 2012, p.71). In the context of an information system, Walsham (1993) describes interpretivism “as the process whereby the information system influences and is influenced by the context.” Interpretivism adopts a relativist ontological view and a subjective approach (epistemology). Thus, knowledge is gathered through interaction between the respondents and the researcher. The results of the research are dependent on the respondent’s view of the phenomena being studied. The researcher uses open-ended questions to develop an understanding of the social phenomena. The interpretivist paradigm does not make general assumptions to a larger population but instead narrows the assumptions to the social context of the phenomena being studied. The

methodologies applied to the interpretivist approach involve “hermeneutical techniques compared and contrasted through a dialectical interchange” (Guba and Lincoln, 1994, p.111).

Critical theories adopt a historical realist approach. According to Guba and Lincoln (1994), the ontological belief of critical theories is that reality has been shaped over time by factors such as gender, social, political, cultural, economic, and ethnicity to now represent real structures. “Social reality is historically constituted and that it is produced and reproduced by people. Although people can consciously act to change their social and economic circumstances, critical researchers recognize that their ability to do so is constrained by various forms of social, ethnic and political domination” (Myers and Avison, 1997, p.42). The use of observations and structured interviews (dialogic/dialectical) are the methods of inquiry used in critical research.

## Justification for choosing the Positivist Paradigm

The positivist paradigm was chosen for this research based on the nature of the study. One of the aims of the study is to test a causal model; thus, a positivist approach was chosen for this study for the following reasons:

* + - * Ontological Assumption (naïve realism) – According to Guba and Lincoln (1994), the ontological view (naïve realism) of a positivist is described as “knowledge of the “*way things are*” is conventionally summarized in the form of time- and context-free generalizations, some of which take the form of cause-effect laws” (Guba & Lincoln, 1994). In this study, the knowledge to be learned is based on a causal model; observations will be made by measurement of student’s behaviors which are believed to influence the students’ acceptance of eLearning systems, the findings will then be used to make general assumptions.
      * Epistemological assumptions (dualist and objective) – The positivists' epistemological view believes that the “investigator and the investigated “*object*” are assumed to be independent entities, and the investigator to be capable of studying the object without influencing it or being influenced by it” (Guba & Lincoln, 1994, p.110). Both the research process and the outcome of this research are not influenced by the researcher and are void of any biases. Student’s behavior from the four universities taking part in this study is measured with very minimal influence by the researchers.
      * Methodological assumptions (hypothesis testing) – A positivist methodology according to Guba and Lincoln (1994), involves “questions and/or hypothesis stated in propositional form and subjected to an empirical test to verify them.” Research questions and hypothesis are clearly stated and empirically verified through validation and testing using established analysis methods (SEM). The data collected will be quantitative in nature, which is the most dominant method used by the positivist approach. The relationship between the constructs used in the research model will be analyzed by structural equation modeling (SEM), which will be used to test the hypothesis listed in the previous section (Theoretical Framework).
      * Another reason for using the positivist approach is because it is the most dominant of the 4 approaches, earlier mentioned, used in the study of technology adoption as identified by prior literature (Mingers, 2003).

Having discussed the various knowledge claims (paradigms) available and giving justification for selecting the positivist approach, Creswell (2008) suggests the next question to address with the regards to the design of the research is the strategies of inquiry which determines the procedures (Creswell, 2008). This is addressed in the next section (4.3).

## Strategies of Inquiry: Quantitative versus Qualitative Approaches

As mentioned in the previous section (Philosophical assumptions), a positivist approach was adopted for this study. The next logical step, according to Creswell (2008), in the design of the research, is the strategy used for inquiry. This is another important phase in the design of research as the strategy of inquiry determines the methods used to collect data.

There are 2 main approaches/methods:

1. Quantitative Methods: Quantitative methods emphasize the use of objective measurements. Numerical data is collected through media such as online surveys, polls, and questionnaires. The data collected is then analyzed via the use of statistical, mathematical, or numerical techniques.
2. Qualitative Methods: Qualitative research involves the use of scientific methods used to observe and collect non-numerical data. “Qualitative research methods will in general investigate and find implications as opposed to the use of numerical data (Creswell, 2008).

Researchers have also been able to integrate both methods listed above (mixed methods) in order to expand the evidence base, According to Shorten and Smith (2017), Mixed methods’ approach allows for the collection and analysis of both quantitative and qualitative data in the same investigation. Mixed method approaches allow the researcher to “explore diverse perspectives and uncover relationships that exist between the intricate layers of our multifaceted research questions” (Shorten & Smith , 2017).

The differences between both approaches, i.e., qualitative and quantitative methods, are highlighted in the table below (Table 4.2):

***Table 4. 2: Quantitative versus qualitative approaches***

## Item Quantitative Approach Qualitative Approach

Research Aim To test the hypothesis used in making

generalized assumptions on the cause- effect type of relationships

To have a deeper understanding of social interactions

Sample size Large groups Smaller groups

Sample type Mainly randomly selected Targeted groups are selected Data type collected Numbers and statistics Sentences and objects Knowledge claim Mainly positivism, postpositivism Mainly Interpretivism Methods used Closed-ended questions Open-ended questions

Researchers role Distances himself from the study.

Objective in nature.

Subjective methods where the researcher has an influence on the respondents

Data analysis methods

Statistical analysis to make generalization assumptions

The analysis involves the identification of themes and patterns

Associated strategies Experiments, surveys, and polls Ethnographies, grounded

theory, case studies, narrative research, and phenomenological research.

The quantitative approach will be adopted for this research to empirically validate the research hypothesis. This approach will be used to measure the variables and to test the hypothesis formulated in section 3. As mentioned earlier, this is the most common strategy for positivist research, where hypothesis testing via complex statistical analysis is used to uncover the nature of being.

Based on the choice of using adopting a quantitative method for this study, the next step in the design of the research is the choice of the methods used to collect data which is discussed below in section 4.4.

## Research Design and Method

Creswell (2008) identifies experiments, surveys, ethnographies, grounded theory, case studies, phenomenological research and narrative research as the major strategies of inquiry associated with quantitative and qualitative methods discussed in the previous section.

These options are best suited to the paradigm of choice and the method employed in the research. As the paradigm of choice for this study is positivism, and the research method is the quantitative approach, the options available for collecting data are experiments and surveys (Creswell, 2018).

Experiments are practical procedures undertaken to support or refute claims and to give an understanding of cause and effect relationships. Experiments include true experiments where there is a random assignment of subjects to the treatment conditions (Keppel, 1991). Surveys, on the other hand, are structured questionnaires or interviews aimed at collecting data that will be used to make generalized assumptions about a population (Creswell, 2008).

According to Gerring (2004), case studies are research designs that focus on a small unit/group in order explain features of a larger group when considering a phenomenon. VanWynsberghe (2007) suggests that a case study is not a method instead, it employs one of several methods to collect the data required to understand the phenomenon. The researcher, therefore, has a choice of several methods which can be used to gather data used to explain the phenomenon. Well-known examples of methods used to collect data in case studies include participant observation, interviews, document analysis, and questionnaires.

This study adopts a case study research strategy as 1) it is explanatory in nature, 2) the research does not control behavioural events and 3) it focuses on contemporary issues (Yin, 2003). The study involves a small sample of 4 out of 171 universities in Nigeria where the cases are made up of two public and two private universities. For collecting data from the respondents, the survey approach was used.

The survey method was chosen for this study; the list below justifies the choice of selecting the survey method to collect data from the 4 identified schools:

1. The theories employed in this study (TAM, UTAUT, and the DeLone and McLean IS Success model) have all been validated, tested and adopted by the use of survey approach; this is, therefore, the most dominant approach used in IS studies that study technology acceptance (Mingers, 2003).
2. A large amount of data will need to be collected from the 4 schools identified and to be analyzed via structural equation modeling (SEM). The most efficient and cost-effective method to use would be the survey approach where data can be collected through the use of online questionnaires where possible.
3. To test the hypothesis stated in section 3, where the conceptual model was developed, only the survey approach will be appropriate.
4. Based on the aims and objectives of this study, generalizations will be made based on the findings of the study. This will require a large amount of data which can only be obtained realistically via the survey approach.
5. A positivist approach and a quantitative method will be adopted by this study. Therefore, there are only 2 options available for data collection, experiments, and survey, with the latter being the obvious choice.
6. Finally, as the researcher will be isolated from the research which aims at measuring student’s behavior, the obvious choice for collecting data would be the survey method.

According to Zikmund et al., (2013), the survey approach allows for different methods such as email, telephone, mail interviews, and self-administered questionnaires (online and paper). The self-administered questionnaire was selected for the following reasons:

* Ease of design and administration (Sekaran & Bougie, 2016)
* To ensure the anonymity of the respondents
* Collecting a large amount of data from the respondents simultaneously, effortlessly, and economically (Zikmund et al., 2013).
* Similar studies have used this (self-administered questionnaire) method to collect data for their studies.
* Clarification required by the respondents is easier using this method
* Accuracy of collecting and coding the data (especially via an online survey) is increased via this method.
* Improved response rates can be achieved via a self-administered questionnaire (Sekaran & Bougie, 2016)

The next section discusses population and sampling methods available. The section also justifies the choice of the sampling method used in this study.

## Sampling Methods

To eliminate bias in the methods used to collect data and also to ensure that the targeted population is well represented, it is prudent to evaluate the choice of the sampling technique before the data collection phase.

Fowler (2013), states that in designing the sample required for a survey, four significant factors should be taken into consideration. These issues are listed below:

1. Choosing the sampling technique (i.e., probability or non-probability)
2. The sample frame
3. The sample size
4. The rate of response.

The subsections (***4.5.1*** *to* ***4.5.4***) below cover the four factors listed above.

## Choosing the sampling technique

Population refers to a group of people that are being studied in the research, while a sample is a part or section of the population being studied. Sampling is the technique involved in selecting the sample from the total population in order to make generalized assumptions of the total population. Sampling makes the research process more convenient and practical for the research as a whole. According to Blumberg et al. (2008), “When designing a sample, the researcher should consider several decisions and take into account the nature of the research problem and the specific questions that evolve from the question, objectives, time and budget” (Blumberg et al., 2008). A sample should, as accurately as possible, represent the population under study in order to give credibility to the research. It should capture individuals from the different sections of the population under study.

There are two main types of sampling methods available for research: probability sampling and non-probability sampling. Both are further subdivided, as shown in table 4.3.

### Table 4. 3: Classification of Sampling Methods

Probability sampling methods a) Simple Random Sampling

* 1. Systematic Sampling
  2. Stratified Sampling
  3. Cluster Sampling Non-probability Sampling Methods a) Convenience Sampling

1. Purposive Sampling
2. Quota Sampling
3. Snowball Sampling

In probability sampling, each person in the population, being studied, has a known probability at being chosen in the sample. The technique is based on the theory of probability. As mentioned earlier, there are subtypes for the probability sampling method as listed below:

* + - * Simple Random Sampling (SRS): In simple random sampling each member of the population has an equal probability of being picked, and each member of the sample is chosen at random as there are no specific criteria involved in the selection of individuals. This method is suitable for homogeneous populations, where the selection process does not affect the quality of the sample.
      * Systematic Sampling: Similar to SRS, systematic sampling picks individuals from the total population but by the use of an interval system. For instance, given a total population of 100 people, 10 subjects could be selected from the population by skipping 10 individuals then selecting a subject, i.e., 10th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, 90th, and 100th subjects.
      * Stratified Sampling: For populations that are not highly homogeneous, stratified sampling method can be used by dividing the population into groups (strata). These newly formed groups will be more homogeneous than the total population. From each of the newly formed groups, subjects are selected randomly so that each group is properly represented. Examples of groupings include age, sex, religion, race, etc.
      * Cluster Sampling: Cluster sampling is similar to stratified sampling as they both create groups where random subjects are selected as the sample used to represent the population. The difference is that in cluster sampling, the groups are created naturally; examples are a family in a town, towns in a city, and organizations within a town. Once the clusters have been identified, SRS is used to select the subjects from the clusters.

***Table 4. 4: Summary of Probability Sampling Methods Source: (Satyaprasad & Krishnaswami, 2010)***

## Method Advantages Disadvantages

Simple Random Sampling

Easy to implement and understand, the sample is a fair representation of the population as the sampling error can be easily computed, and knowledge of the composition of the total population is not compulsory.

The design might be expensive, a large sample size is required as a true representation of the population, and it does not cater for groups. It has a higher sampling error compared to other methods and impractical as it is difficult to get the full population list.

Systematic Sampling Simpler cheaper and easier to

instruct and use compared to SRS, the sample is spread evenly across the population, and it is statistically more efficient than SRS

Generalized results are less accurate as the sampling is not truly a probability sample.

Stratified Sampling It represents subgroups, easy to

implement, it has a greater

Knowledge of the population composition must be known,

statistical efficiency compared to SRS, and the population means can easily be determined by the sample mean.

expensive in terms of time and money; strata identification can lead to errors.

Cluster Sampling Convenient and easier for large

populations or geographical locations, cheaper method compared to other sampling methods. It is also flexible for multi-stage sampling.

Bias can arise from different cluster sizes and compared to other methods; the sampling error is higher.

Non-probability sampling techniques are not based on the theory of probability, and the sample does not give a true representation of the population. The subtypes for the non-probability sampling method are listed below:

* + - * Convenience Sampling: This sampling method selects individuals that are conveniently available. It involves the selection of sample units in a a 'hit and miss' fashion (Satyaprasad & Krishnaswami, 2010). For example, interviewing subjects the researcher meets by chance.
      * Purposive Sampling: This method deliberately selects a sample based on a pre-determined criterion. Satyaprasad and Krishnaswami (2010) suggest that this method is used when the typicality and specific relevance of the sampling units to the study is important as opposed to their overall representativeness to the population.
      * Quota Sampling: Quota sampling is similar to convenience sampling, but involves the grouping of the samples into units. Examples of these units could be age, sex, religion, etc. Another way of describing quota sampling is that it is similar to stratified sampling except that selection is not random.
      * Snowball Sampling: Snowball sampling involves the use of respondents from a special population to solicit further respondents. For instance, a researcher would like to

investigate the benefit of being part of a social group in a given community. Once the researcher has identified a few members to interview, the respondents can assist in referring him to other members in the society, which in turn will introduce the researcher to even more members.

***Table 4. 5: Summary of Non-Probability Sampling Methods Source: (Satyaprasad & Krishnaswami, 2010)***

## Method Advantages Disadvantages

Convenience Sampling It is cheap and convenient; it

doesn’t require a full population list or statistical expertise.

The findings cannot be generalized, and it is the least reliable sampling method and highly biased.

Purposive Sampling A cost-effective and efficient

method, and it ensures that the relevant elements are included in the sample.

It is no good for generalization, prior knowledge of the population is required and poor at inferential statistics.

Quota Sampling This method is not costly or time-consuming and is good at including and representing. different units of the population,

This method is not good at representing the population.

Snowball Sampling It is a good method for researching small social groups.

This method is not suitable for large populations and or the inclusion of all elements in the population.

The population where the sample is drawn from in this study is largely homogeneous. The population is made up of students who use a learning management system. It is expected that majority of the respondents will be within the age group of 18- 25 and will largely be made up of undergraduates. With regards to gender, it is expected that the respondents will be almost identical. Convenient sampling method was chosen for the purpose of this study, though it can be argued that purposive sampling was used as the students identified for this research are users of technology for learning. Convenient sampling was chosen due to its ease of implementation and the low cost involved, especially taking into consideration the fact that the four schools identified in Chapter 2 based in different states and in different geo-political zones.

## Sample Frame

According to Satyaprasad and Krishnaswami (2010), the sample frame is a complete list of the population elements from which the sample is taken from. Light et al. (1990) defined four categories for the sample frame (population) as inclusion, exclusion, expected effect size, and feasibility.

The main purpose of this research is to test a model that identifies the factors that contribute to the acceptance of learning management systems (LMS) by Nigerian university students. This, therefore, means that all registered university students who use the LMS will be included in the sampling frame. According to the NUC, there are a total of 164 accredited universities in Nigeria, and they are grouped into 3 categories: 1) Federal Universities, 2) State Universities and 3) Private Universities. According to the Nigerian University Commission (NUC), there are a total of about 1.961 million students actively registered in the 164 accredited universities (approximately 1% of the total population of Nigeria) (Adedigba, 2018; Daily Trust, 2018). It will be time-consuming as well as expensive to visit every school in a country as vast as Nigeria, and as a result, the study focused on the universities located in the Northern part of Nigeria thus reducing the number of Universities to 57. Furthermore, out of the 57 universities in northern Nigeria, only 4 universities confirmed to have fully implemented the use of an LMS. The universities identified were:

* + - * University of Jos (Federal)
      * National Open University of Nigeria (Federal)
      * Baze University (Private)
      * The American University of Nigeria (Private)

This resulted in the exclusion of students from the 53 universities that do not have an LMS in place from this research. All full-time students in the above-mentioned universities (that use an LMS) were included in the sample frame. With regards to the feasibility criteria, the universities located in the three geo-political zones were excluded due to distance, costs, and time constraints.

## Sample Size

The validity of any quantitative research is based on a few factors, one of which is the sample size. The sample size is defined as the number of individual samples observed in an experiment or study and drawn from a targeted population. In this study, the sample frame (population) for the four universities identified for this study is quite large, just the National Open University of Nigeria has approximately 515,000 registered students (Agency Reports, 2018). For Lenth (2001), “a study must be of adequate size, relative to the goals of the study. It must be "big enough" that an effect of such magnitude as to be of scientific significance will also be statistically significant. It is just as important, however, that the study not be "too big," where an effect of little scientific importance is nevertheless statistically detectable” (Lenth, 2001, p.187).

For most qualitative studies, sample sizes are calculated by taking into consideration the total population size, confidence level, and the confidence interval. Confidence level refers to the proportion of the likely samples expected, which will include the true population parameter. Confidence interval expresses the degree of uncertainty that is related to a sample. An example of a sample size calculation for a population of 1000 individuals, using a confidence level of 99% and a confidence interval of 3 will yield a sample size of 649 individuals.

In this study, the sample size was determined based on the technique used to analyze the data, i.e., structural equation modeling (SEM) using SPSS analysis of a moment structures (AMOS). For multivariate data analysis, such as structural equation modeling, several figures have been cited as a minimum sample size. A minimum size for the sample (n) of 200 is recommended (Kline, 2015; Weston & Gore Jr, 2006) and a maximum sample size of 500 as stated by Roscoe (1975). Kline, (2015) also suggests an alternative option for determining sample size by using size-to-parameters ratio, especially for SEM analysis that uses the maximum likelihood method. An ideal size-to-

parameters ratio would be 20:1 (Kline, 2015) or 10:1 Schreiber et al. (2006). Hair et al. (2010) recommend that the sample size should be calculated based on the number of constructs and indicators in the model and the complexity of the model.

To ensure that this study meets the above requirements a minimum sample size of 720 will be required as there are 10 parameters in the conceptual model each with about 4 indicators, hence the minimum sample size should be approximately n= 10 X 4 X 20 = 800. But for the purpose of analyzing each university, a sample size of 200 per school will be used based on the recommendation of Kline (2015), where a minimum sample size of 200 is required for SEM, therefore the total sample size to be used will be 800 where each school contributes at least 200 respondents.

In terms of executing the process of sampling, the respondents were selected based on availability. As previously mentioned, this selection process (convenient sampling) might have an effect on generalizing the findings of the sample frame. However, based on prior literature, students have similar attributes, and thus, it is expected that the results will be similar for all students (King & He, 2006). Therefore, the effect of this sampling process on generalization will be minimized.

## Response Rate

Nonresponse bias occurs when data is not received by respondents in the sample; these could be uncompleted forms or forms not submitted back to the researcher. A high response rate will produce a large sample, and this is required in order to reduce bias from the responses and increase the confidence level of the sample (Saunders et al., 2009). According to Draugalis and Plaza (2009), “a response rate of 50%-60% or greater is optimal because non-response bias is thought to be minimal with that of a high response rate” (Draugalis & Plaza, 2009, p.1). Non-response bias can influence the findings of the analysis; thus, it is important to increase the response rate.

Methods such as telephone and postal services have been shown to have high nonresponse bias as data collection methods. To improve the response rate, the survey (questionnaire) approach was used, based on the nature of the students in the sample frame. A paper-based survey was distributed to the students of the public universities while the same survey was distributed to the students of the private universities via an online application. This is further discussed in the section below.

## Data Collection Methods

The data for the study will be collected by means of a questionnaire developed and adopted from the literature reviewed on the technology acceptance models. The data collected will be used to assist in providing the answers to the research questions posed in Chapter 1.

In developing the questionnaire, several tests were carried out on the measurement instruments to ensure that the questions asked were not ambiguous and to eliminate spelling and grammar errors while keeping the research objectives in focus.

The questionnaire was made up of 4 pages, excluding the consent form and cover letter. The cover letter introduced the researcher and the research to the proposed respondent and clearly stated that participation was voluntary, and all responses will be treated confidentially (See Appendix B). Consent was given by the respondents proceeding to fill out the questionnaire.

The questionnaire was divided into 3 sections. Section A consisted of questions that capture the demographic information of the participants. The questions included:

* Name of Institution
* Age
* Gender
* Educational Level (undergraduate or postgraduate)
* Experience (length of time using the LMS)
* If prior training was given before using the LMS

These 6 questions act either as moderators in the model or to make general assumptions and were measured using a nominal scale.

The second section consists of Likert style questions that capture the students’ perceptions of the constructs used in the model as listed below:

* PU: Perceived usefulness is defined as “the degree to which a person believes that using a particular system would enhance his/her job performance” (Davis, 1989, p.320). The PU construct was measured using a five-point Likert scale and was made up of 5 questions.
* PEOU: Perceived ease of use is defined as “the degree to which a person believes that using a particular system would be free of physical and mental effort” (Davis, 1989, p.320). The PEOU construct was measured using a five-point Likert scale and was made up of 4 questions.
* LV: Learning value is defined as the total benefits obtained by the effort and time spent by students using the eLearning systems (Ain et al., 2015). The LV construct was measured using a five-point Likert scale and was made up of 5 questions.
* IQ: Instructor quality measures the response time and attitude of the instructor towards the use of the LMS. The IQ construct was measured using a five-point Likert scale and was made up of 5 questions.
* SI: “Social influence is defined as the degree to which an individual perceives that important others believe he or she should use the new system” (Venkatesh et al., 2003, p.451). The SI construct was measured using a five-point Likert scale and was made up of 4 questions.
* FC: Facilitating conditions is the ability to provide enough resources and support for the users of the technology. The FC construct was measured using a five-point Likert scale and was made up of 4 questions.
* SQ: System quality determines the student’s perceptions of the desired features such as functionality, ease of use, efficiency, and reliability. The SQ construct was measured using a five-point Likert scale and was made up of 4 questions.
* CQ: Course quality assesses the learning resources and content in terms of relevance, flexibility, and accuracy. The CQ construct was measured using a five-point Likert scale and was made up of 6 questions.
* BI: Behavioral intention is an individuals’ intention to use a particular technology for different undertakings. The BI construct was measured using a five-point Likert scale and was made up of 4 questions.
* AU: The AU construct was measured using a five-point Likert scale and was made up of 3 questions.

A 5-point Likert-scale was used to measure the responses, as shown below:

* Strongly agree = 1
* Moderately agree = 2
* Neutral = 3
* Moderately disagree = 4
* Strongly disagree = 5

The third section, like section 1, is used to make generalized assumptions of the students and lists 6 functions of the LMS that the respondents are meant to rate in terms of usage and measured by the use of nominal scales. The 6 functions of the LMS are:

* + Class announcements: The announcements feature in LMS’ are used to convey information pertaining to the class and are usually in the form of a broadcast message to all participants of the classroom.
  + Discussion Forums: Discussion forums are used to foster communication between the participants of a class. It allows students or instructors to leave messages which are open to replies o responses.
  + Assignments, Quizzes, and Tests: This functionality allows the instructors to conveniently set test, quizzes, assignments, and exams using the LMS platform. The module facilitates submission, plagiarism checks, and grading.
  + Links to online Resources: As the name implies, links to resources are shared using this section of the LMS to provide access to external resources to the class.
  + Lecture notes and presentation slides: This section consists of folders and files that are assessable to the students. They include digital material like PowerPoint slides, Word documents, PDF files, videos, and images.
  + Syllabus and course handbook: This are usually a set of files that aid to guide the students. It is designed to inform students of what is expected of them and the learning outcomes of the course.

While the online, (https://[www.surveymonkey.com/r/Q888TMY)](http://www.surveymonkey.com/r/Q888TMY)) and the paper-based questionnaires (see appendix A) were identical, in the context of the questions asked, some extra measures were taken for the online survey as listed below:

* Multiple responses: This feature allows the survey to be taken more than once from the same device. This was turned off to eliminate duplicate responses from the same person.
* Response editing: This allows the respondent to change their answers on any of the surveys pages up until they complete the survey. This option was selected to allow editing of responses while the survey was yet to be completed.
* Anonymous responses: This was turned on to ensure that responses remained anonymous. If left off, details such as IP addresses will be captured.
* Instant Results: This was turned on so that respondents can see the responses they made if they chose too.

The options selected above were to ensure that both the paper-based and the online surveys were as similar as possible.

## Methods used to Improve Response Rates

There are two main reasons why researchers find it difficult to achieve high response rates; the reasons are “failure to deliver the questionnaires to the target population” and “the reluctance of people to respond” (Baruch & Holtom, 2008). Deutskens et al. (2004), identified the length of the survey, visual enhancements, follow-ups and the use of incentives such as vouchers to improve the response rates

Based on these reasons and factors, the following approaches were used to improve the rates of response and to reduce the non-response bias:

* The questionnaires were distributed to students in popular “hang out” areas within the school premises and during the school session to ensure that distribution to as many students was made.
* The length of the questionnaire minimized to the best of the researchers' ability.
* The use of nominal and Likert-style questions aid in simplifying both for the paper-based and the online questionnaire.
* The use of simple and plain language was also used to ease the process of completing the questionnaire.
* For the online questionnaire, the use of a customized template was employed to improve the aesthetics of the survey.
* A reminder email was sent in the middle and at the end of the semester to submit as a means of following up on students who had not yet responded.

A total of 1200 copies of the questionnaire were made to be distributed to the public universities as they (the universities) did not have an email system for the students. The period for distribution and collecting data was between the months of September 2018 and December 2018. A response rate of approximately 73.8% was achieved as 738 usable responses were received.

## Questionnaire Pre-test and Pilot Study

Pre-testing the questionnaire aims at designing an effective survey by determining its strengths and weaknesses. A participating pre-test was carried out where respondents were free to ask questions and explain their observations of the form in terms of clarity, errors, and presentation. This ensures that the final survey would be understandable by most of the respondents. A second pretest was carried out where the questionnaires were distributed to a group of students to complete without the interview setting used in the participatory test. This validates the standardization of the survey as well as the choice of analysis as recommended by Converse and Presser (1986). According to Prescott and Soeken (1989), pilot testing the questionnaires is important in research as it aims at assessing the feasibility, the instrument adequacy, and the problems associated with collecting data. It is important to conduct a pre-test and a pilot study prior to collecting data from the respondents; this is in order to validate the instrument, improve clarity and to ensure an error- free questionnaire will be distributed.

## Questionnaire Pre-testing

In this study, the researcher used a sample of 20 students in order to evaluate the survey in terms of:

* + - * Readability: The ease in which the students can read and understand the text in terms of content and clarity.
      * Presentation: The order and layout of the questionnaire.
      * Grammar: The detection of spelling and grammatical errors

The students were selected at random and grouped, with each group consisting of 5 students (i.e., 4 groups). Two groups tested the paper-based survey while the other two groups used the online survey to test the questionnaires. The wordings for both the consent form as well as the questions in the survey were identical in both the online and the paper-based survey. The students were informed that the exercise was a practice run where they were expected to identify errors in the questionnaire and make suggestions to improve the quality and clarity of the survey. The aim was to produce a survey that was easy to read and fill out.

After the participating pre-test, the suggestions noted and errors identified were taken into consideration to further modify the questionnaire. Academic experts (Dr. Salihu Ibrahim Dasuki and Prof. Muhammadou Kah) was also consulted to further establish the validity and content of the questionnaire. It must also be noted that very little modifications were made as the questions had been used in prior studies by the researcher which have been published in reputable journals (Yakubu & Dasuki, 2018a; Yakubu & Dasuki, 2018b).

## Pilot Study

Step two of the pre-testing involved distributing the survey to 60 students. Once more the survey was tested on both the paper-based and the online format where 30 students were randomly selected to complete the paper-based questionnaire, and 30 random student emails were used to send the link for the online survey. In total, 47 responses were received, a response rate of 78.3%. 26 responses were received from the paper-based survey (response rate of 86.6%) and 21 responses from the online survey (response rate of 70%).

For the pilot test, 2 universities were used, 1 public (NOUN) and 1 private university (AUN), for both the paper-based and the online surveys respectively. As the study does not take into consideration the departments/courses of the students, the students were selected at random. With regards to the response rate, it was expected that the response rate of the web-based survey would be higher (Greenlaw & Brown, 2009). But in this case, the paper-based survey had a slightly higher response rate. This could be attributed to the small sample size. The sample size recommended by prior literature could be as small as 10-15 per group (Hertzog, 2008).

The duration of the pilot study lasted for 2 weeks in August 2018. Reminders were sent to those who were to participate in the survey via the online format.

SPSS statistical software version 21 was used to analyze the 47 responses from the pilot study. Table 4.6 shows the demographic details of the participants of the demographic study. It shows the groupings of the age, gender, educational level, experience in using the LMS, and if training was given prior to using the LMS which are captured in Section 1 of the questionnaire.

The findings indicate that majority of the respondents were male (n=27, 57.4%) while the rest were female (n=20, 42.6%). 24 (51.1%) of the students were under the age of 25 years, and 23 students (48.9%) were over 25 years of age, indicating an even balance between the 2 groups.

With regards to the level of education, most of the respondents are undergraduates (n=44, 93.6) and the other 3 (6.4%) respondents were postgraduates. In addition, 34 (72.3%) students had used the LMS for, under 1 year, 2 students (4.3%) used the LMS between 1and 2 years, while 11 students (23.4%) used the LMS for over 2 years. Finally, 29 students (61.7%) indicated that they had some form of training to use the LMS while the remaining 18 students (38.3%) stated that they did not have any kind of training.

### Table 4. 6: Demographic Responses for the Pilot Study (N=47)

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Category** | **Frequency** | **Percentage (%)** |
| Gender | Male  Female | 27  20 | 57.4  42.6 |
| Age | Under 25  Over 25 | 24  23 | 51.1  48.9 |
| Educational Level | Undergraduate  Postgraduate | 44  3 | 93.6  6.4 |
| Experience using the LMS | Less than 1 year  Over 1 Year | 38  9 | 80.9  19.9 |

Prior Training

Yes 29 61.7

No 18 38.3

Table 4.7 shows the Cronbach’s alpha for the items of the constructs. Reliability of the items used in the pilot study was assessed based on the internal consistency. According to George and Mallery (2003), Cronbach’s alpha values over 0.7 are acceptable and based on the measured values shown in Table 4.7; all the measured items were found to be over 0.7 thereby establishing that the responses to the items were consistent.

The final section of the questionnaire, as mentioned earlier, captured the frequency of using some of the functionalities of the LMS by the responses and the results are shown in Table 4.8.

***Table 4. 7: Instrument Reliability***

## Construct

|  |  |  |
| --- | --- | --- |
|  | **items** | **Alpha** |
| PU | 5 | 0.844 |
| PEOU | 4 | 0.821 |
| LV | 5 | 0.743 |
| IQ | 5 | 0.826 |
| SI | 4 | 0.723 |
| FC | 4 | 0.774 |
| SQ | 4 | 0.720 |
| CQ | 5 | 0.847 |
| BI | 4 | 0.748 |

**Number of**

## Cronbach’s

AU 3 0.855

### Table 4. 8: Frequency of Using Functions of the LMS (Pilot Study)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Functionality | Frequency (Percentage %) | | | | |
| Never | Rarely | To some extent | Moderately | Frequently |

Class announcements

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 6 (12.8%) | | 13 (27.7%) | 11 (23.4%) | 9 (19.1%) | 8 (17%) |
| Assessments  (Assignments,  8 (17%)  tests) | | 11 (23.4%) | 11 (23.4%) | 6 (12.8%) | 11 (23.4%) |
| Discussion  3 (6.4%) | | 12 (25.5%) | 10 (21.3%) | 14 (29.8%) | 8 (17%) |
| Links to online  2 (4.3%) | | 4 (8.5%) | 13 (27.7%) | 13 (27.7%) | 15 (31.9%) |
| Lecture Notes  and  5 (10.6%) | | 8 (17%) | 11(23.4%) | 13 (27.7%) | 10 (21.3%) |
| presentation  slides |  |  |  |  |  |
| Syllabus and course | 3 (6.4%) | 11 (23.4%) | 9 (19.1%) | 14 (29.8%) | 10 (21.3%) |
| handbook |  |  |  |  |  |

quizzes and

Forums

resources

## Data Analysis

For this study, the data was analyzed in 2 different phases using 2 separate applications. In the first phase, the data from the respondents were analyzed using IBM SPSS statistics version 21.0 to carry out preliminary data analysis and to provide a demographic report of the respondents. The preliminary data analysis included missing data, outliers, means, standard deviations, multicollinearity, and Skewness. In the second phase, Structural Equation Modeling (SEM) was employed to examine the relationships between the constructs within the conceptual model.

## Structural Equation Modeling (SEM)

Initially conceived by Wright (1918), structural equation modeling is a popular technique frequently used in research in psychology, sociology, education, and economics fields (Teo & Khine, 2009). SEM is a statistical method used to test the relationships between variables (observed and latent) in a causal model. SEM is a method that takes a hypothesis-testing (confirmatory) approach to analyze a theory related to some phenomenon (Teo & Khine, 2009). Hair et al. (2010), defines SEM as “multivariate technique, which combines features of multiple regression and factor analysis in order to estimate a multiple of networking relationships simultaneously” (Hair et al., 2010, p19). SEM not only examines and tests the relationships in a causal model, but it also has the ability to assess if the data collected fits the model (Yuan, 2005).

Advances in technologies have given rise to applications such as AMOS, LISREL, and MPLUS, which are responsible growth of studies that use of SEM approach. In the field of information systems and behavioral and social sciences, SEM has been widely accepted due to its ability to answer a wide range of research questions (MacCallum & Austin, 2000).

In this study, SEM was chosen as the tool for analysis due to the following reasons:

* + - * A unique feature of SEM is its capability of modeling multivariate relationships and its ability to approximate direct and indirect effects of the constructs used in a model (Byrne, 2001)
      * SEM is a second-generation statistical tool that can be used to examine the relationships in a causal model. The conceptual model in chapter 3 of this research is a complex causal model consisting of both endogenous and exogenous constructs. Some of the constructs in

the model are both endogenous and exogenous (PE, EE, and BI) in nature, which will be cumbersome using a first-generation tool like regression or factor analysis.

* + - * SEM is more appropriate for hypothesis testing, which will be carried out in this study to examine the relationships between the constructs. Similar IS studies that involve hypothesis testing of complex relationships have employed SEM as the method adopts a confirmatory approach (Teo & Khine, 2009).

SEM has 2 main approaches, as listed below:

1. Covariance-based SEM: Covariance-based SEM is useful in 3 different scenarios 1) generating models, 2) confirming models, and 3) for selecting models. Therefore, covariance-based SEM is useful for theory testing and confirmation or to choose between alternative theories. Software such as LISREL, AMOS, and MPLUS are all based on covariance-based SEM.
2. Partial Least Squares (PLS)-SEM: PLS-SEM is useful for predicting and development of theories. It is suited for complex models where the sample size is small, and subsequent analysis uses latent variable scores.

Covariance-based SEM was the approach adopted for this study in order to confirm the conceptual model proposed in chapter 3. A two-stepped approach, as recommended by Hair et al. (2010) to examine the model. Step 1 (measurement model) is composed of 4 stages, while step 2 (structural model) has 2 stages, as shown in Figure 4.2.

|  |  |  |
| --- | --- | --- |
|  | | |
| **Measurement Model** |  | **Structural Model** |
|  | | |
| **Stage 1**  Defining individual constructs |  | **Stage 5**  Specify structural model |
|  | | |
| **Stage 2**  Developing the overall measurement model |  | **Stage 6** Assessing the structural model  validity |
|  | | |
| **Stage 3** Designing a study to produce empirical  results |  | |
|  | | |
| **Stage 4**  Assessing measurement model validity |  | |

***Figure 4. 2: Two-stepped approach as specified by Hair et al. (2010)***

## Research Ethics

The American University of Nigeria (AUN) takes ethical issues very seriously and as a result, the university ethical board, AUN Institutional review board, requires that all research involving human subjects must first seek approval before commencement of the data collection process. The process of seeking approval involves completing the “Application for Human Subjects Research Proposal Review” form. As this study involves human subjects, it was a requirement to complete the form. There are 2 forms to choose from, 1) FAST TRACK Application for Human Subjects Research Proposal Review and 2) Application for Human Subjects Research Proposal Review.

The “fast track” form was selected as the listed criteria below were met based on the requirements stipulated by the AUN IRB:

* The research project does not involve vulnerable populations.
* Research project presents no more than minimal risk to human participants.
* Research participants will not be compensated, financially or otherwise (e.g., gifts).

Another requirement of the AUN IRB is the use of a cover/consent letter (see Appendix B). This was used to introduce the research to all the respondents by capturing the following information:

* Title of the research
* Purpose of the research
* Significance of the research
* Researchers contact details
* AUN IRB contact details

Furthermore, the respondents were informed of the minimal risks involved in completing the survey, and if they had any questions, they could reach out to the researcher or the ethical board for the American University of Nigeria (AUN IRB). The respondents were also informed that participation was voluntary and completely anonymous.

A security approval form is also required for research conducted off-campus involving human subjects. The form captures the research title, the researcher's information, dates when the research data will be collected, and the selected locations.

Also, a faculty advisor assurance form must be signed by the researcher’s supervisor (students only) to certify that they have reviewed the research protocol and believe that it is scientifically and ethically sound. Furthermore, the advisor confirms that the student has the necessary training, experience, and knowledge to conduct the research in an ethical manner.

Another requirement for researchers by the AUN IRB is that all researchers, as well as advisors, are expected to study and pass 2 courses with the Collaborative Institutional Training Initiative (CITI PROGRAM), see Appendix C. The programs are listed below:

* + 1. Nigerian National Code for Health Research Ethics Module (A must-read for all investigators and staff conducting research in Nigeria.)
    2. Stage 1 Basic course: Human Research

Both courses are compulsory for all investigators in the University and are valid for 3 and 3 years respectively.

The approved security form, the survey questions, the consent letter, the completed FAST TRACK Application for Human Subjects Research Proposal Review form and the 2 certificates from the CITI program are all submitted to the AUN IRB for review and approval before data can be collected.

The data for the study did not capture identifiable information such as names and email addresses and as such anonymity was established. The data was coded by the researcher, and access to the data was only to the researcher and encrypted on a personal laptop.

Data collection started once approval from the AUN IRB was received.

## Conclusion

This chapter presents the philosophical assumptions, the strategy of inquiry, statistical methods, data analysis techniques, and ethical considerations involved in this study. Justification for the approaches, methods, techniques, and assumptions was also provided in this chapter.

In order to answer the research questions, a quantitative method using the survey technique was used to gather data required to validate the conceptual model conceived in chapter 3. A questionnaire (online and paper-based) was used as the data collection instrument; the instrument was pre-tested validated via a pilot study. Due to the nature of this study, the convenience sampling technique was used to select the participants.

The collected data was coded appropriately for the data analysis technique (SEM) adopted in this study. A two-step approach, as recommended by Hair et al. (2010), was applied to the data to test the relationship between the constructs in the conceptual model.

Finally, ethical measures are taken in this study to ensure that the approaches used to collect and present data adhere to the AUN IRB code of conduct.

The results from the data analysis are discussed next in Chapter 5.

# CHAPTER 5: RESULT ANALYSIS

## Introduction

Chapter 3 illustrated the conceptual model employed by this study to explain the acceptance of LMS’ by students of Nigerian higher education institutions. The model consists of 10 constructs and measurement instruments associated with the constructs were used to collect responses from the participants of this research. Furthermore, demographic information of the students is also collected in order to assist in examining the students’ acceptance of LMS. The survey research approach is used to achieve the aims and objectives of this study, as highlighted in Chapter 4. Also highlighted are the philosophical assumptions and research methods used to guide this research, including the justification for the choices made.

In this chapter, the data obtained from the survey is analyzed using Statistical Package for the Social Science (SPSS) version 21.0. The following procedures were performed in order to analyze the data:

* + - Data screening
    - Frequencies and percentages
    - Reliability analysis
    - Exploratory factor analysis (EFA)
    - T-tests

Thus, the findings from the data analysis in this section will focus on the differences between private and public Nigerian university students’ perception of using the LMS. And also, to examine the different tasks carried out by students in using the LMS.

This chapter consists of the following subsections: Section 5.2 carries out a preliminary examination of the data by detecting missing data and outliers, as well as performing normality and homogeneity tests using SPSS. Validity and reliability checks are performed on the data in Section 5.3. Section 5.4 examines the demographic information captured by the survey for both sets of data, i.e., public and private Nigerian university students. In section 5.5, descriptive statistics of the constructs employed by this study are examined and compared based on their means and standard deviations. Section 5.6 shows the results of the t-test analysis, while section

5.7 illustrates the different tasks performed on the LMS’ by the students. The chapter concludes with a summary in section 5.8.

## Preliminary Examination of the Data

The main objective of the preliminary data examination is to prepare the data for future analysis using structural equation modeling (SEM) which is sensitive to issues such as missing data, outliers, normality and homogeneity issues. Thus, the next section illustrates the findings and step taken to resolve any identified issues in the 2 data samples.

### Data Screening

As there were 2 sets of questionnaires (online and paper-based), the data screening exercise was slightly different. In the case of the online survey, the data was exported from the online survey application (Survey Monkey) in a comma-delimited file (.csv). The file was saved as an Excel (Microsoft) file in order to perform the tasks required for data screening.

For the paper-based survey, the data was manually transcribed into Microsoft Excel. After which each column was tested to ensure that only accepted values were entered into the cells. For instance, the gender columns were checked to ensure that only the value “1” or “2” was accepted into the column to represent male or female gender.

This step was skipped for the online survey as the online survey system enforced the acceptable values. The data screening compared the question responses and removed values that were out of range to improve accuracy.

### Missing Data

As mentioned earlier, missing data is very important in the analysis of a data set. According to Hair et al. (2010), “missing data results from errors in data collection, or data entry, or from the omission of answers by respondents” (Hair et al., 2010, p.42). Hair et al. (2010) identifies 2 issues associated with the use of missing data in data analysis: 1) it has an influence on the sample size, and 2) it produces erroneous results.

Missing data is a problem for data analysis, and there are several methods used to overcome the issues associated with it. In this study, the researchers decided to remove cases with missing data. This decision was taken based on the fact that less than 5% of each sample had missing data, as shown in Figure 5.1. This is an acceptable value as the percentage of missing data is quite low as advised by Schumacker and Lomax (2004), while Hair et al., (2010) recommend a value of less than 10%.

### Table 5. 1: Missing Data

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| University | Responses Received | Usable Responses | Deleted Responses | Percentage of Deleted Responses |
| University of Jos | 372 | 357 | 15 | 4.03% |
| Baze University | 183 | 176 | 7 | 3.8% |
| American University of Nigeria | 214 | 205 | 9 | 4.2% |
| National Open University of Nigeria | 405 | 386 | 19 | 4.7% |
| Total | 1174 | 1124 | 50 | 4.3% |

* + 1. ***Outliers***

Outliers are “observations with a unique combination of characteristics identifiable as distinctly different from the other observation” (Hair et al., 2010, p64). Kline (2015), defines outliers as “scores that are different from the rest” (Kline, 2015). Outliers are extremely high or low values outside the expected range of a variable. The effect of outliers in a data set is that the results of any statistical analysis can produce undesirable results. For instance, if we look at the average age of students in a class of 20 where the age ranges from 18 to 21 years of age, the mean age will be somewhere between the age of 18-21 irrespective of how many students are in the class. But the introduction of a student who is over 60 years of age will mean that for a smaller sized class the mean would be over 21 years of age. Depending on the type of investigation being carried out, the calculated mean may or may not be a true representation of the class.

For more complex statistical analysis such as SEM, the presence of outliers can just be as problematic, and as such, the sample data must be screened for outliers. Hair et al. (2010) attributes cases of outliers to the following 4 sources:

* + - 1. Data entry or a coding mistake
      2. Observation due to an extraordinary event that can be explained by the researcher.
      3. Observation due to an extraordinary event that cannot be explained by the researcher. 4.Observations that fall within the expected range of values but are unique in their

combination.

Based on the data types and data collection methods used in this study, our sample is prone to items 1 and 4. Hair et al. (2010) suggests for item 4; the researcher should “retain the observations unless specific evidence is available that discounts the outlier as a valid member of the population” (Hair et al., 2010, p65). This leaves only item 1 as a source of outliers in the 2 data samples. For the private university data sample, the online survey system ensures that only the expected values are available for respondents to select from. As an example, this study uses a 5 point-Likert scale for most of the questions, thus for these types of questions, only the values between 1 and 5 are presented for selection. Also, while exporting the data, there will be no errors as the data exporting task is automated. For the public university sample, checks were performed on each column for each variable to ensure that the values fall within the expected range. No outliers were detected.

In order to identify univariate outliers, SPPS descriptive test was carried out on the constructs for the 2 data samples, the frequency distributions of the z-score were determined and the ± 3.29 rule, as suggested by Kline (2010) was applied, i.e., z-score values within ± 3.29 are accepted. The researchers also decided to delete rows with more than 2 univariate outliers, and as a result, 5 rows were removed from the public university sample, and 3 rows were deleted from the private university sample. Appendix D shows the tables derived from the descriptive analysis, i.e., the univariate outliers for both data samples.

Multivariate outliers test was carried out using Mahalanobis D squared to detect the presence of any multivariate outliers. The test involves the analysis of multiple variables at a time. Mahalanobis D squared the gap between variable case and the central point of the other cases. AMOS version 21 was used to identify all records with a P1 value of less than 0.05, any cases with an outlier of less than 0.05 indicates an outlier. In the public university sample, 14 cases were detected, while 10 cases were detected in the private university sample (See appendix D). The outliers were kept as they were few in number when compared to the entire sample, and as such, they were not deemed to influence our analysis.

### Testing for Normality

Data normality is a statistical concept based on the normal distribution of data in a data set (bell curve). Normality of data is vital for multivariate analysis techniques such as SEM. Data sets that are not normal are known to influence the results of validity and reliability tests, and as such, it is important to test for the presence of normality.

According to Kline (2015), Skew and kurtosis are approaches that indicate that a distribution is non-normal. Skewness in data indicates that the distribution of data relative to the mean is asymmetrical. Positive skewness means that the mean is above most of the data, while a negative skew indicates the opposite. Kurtosis, on the other hand, is the height of the peak of a distribution curve; a higher peak indicates positive kurtosis while a negative peak indicates a more leveled distribution peak.

This study employs the skewness and kurtosis tests to test for data normality. Tabachnick and Fidell (2007) suggest that a range of ± 2.58 is acceptable for normal data. Other researches have suggested ranges such as ± 2 (George and Mallery, 2010), ± 1 (Hair et al., 2010).

SPSS version 21.0 was used to run the skewness and kurtosis tests on the 2 samples (public and private universities). Tables 1 and 2 in Appendix E show the skewness and kurtosis values for the variables used in the multivariate analysis. All values for the skewness and kurtosis tests were within the ± 2 range as suggested by George and Mallery (2010) indicating that both samples were free of any normality problems.

### Homogeneity of Variance in the Data

The assumption of homogeneity of variance is that the variance between a set of dependent variables is similar to the variance of the independent variable(s). In multivariate analysis examining data to detect the presence of homogeneity of variance is vital, according to Hair et al. (2010) issues with homogeneity of variance could lead to undesired estimates.

There are several tests available to check that a sample meets the assumption of homogeneity of variance as listed below:

* Bartlett’s Test
* Box’s M Test
* Brown-Forsythe Test
* Hartley’s Fmax test
* Levene’s Test

The Levene’s test was employed in this research using SPSS version 21.0. A significant value in the Levene’s test indicates unequal variance between the groups. For the t-test, gender was used as a non-metric variable. The results, table 5.3, show that the variances for all of the constructs are similar with the exception of social influence (SI) in the public university sample, thereby establishing the homogeneity of variance.

***Table 5. 2: Homogeneity of Variances Test***

## Public University Private University

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Item | Levene  Statistic | df1 |  | df2 | Sig. | Levene  Statistic | df1 |  | df2 | Sig. |
| PU | 23.455 |  | 1 | 735 | 0.182 | 5.371 |  | 1 | 375 | 0.087 |
| PEOU | 2.390 |  | 1 | 735 | 0.171 | 1.627 |  | 1 | 375 | 0.464 |
| LV | 0.927 |  | 1 | 735 | 0.437 | 1.250 |  | 1 | 375 | 0.451 |
| IQ | 21.448 |  | 1 | 735 | 0.119 | 1.151 |  | 1 | 375 | 0.447 |
| SI | 29.311 |  | 1 | 735 | 0.013 | 3.354 |  | 1 | 375 | 0.189 |
| FC | 1.318 |  | 1 | 735 | 0.279 | 1.763 |  | 1 | 375 | 0.263 |
| SQ | 3.824 |  | 1 | 735 | 0.401 | 1.351 |  | 1 | 375 | 0.307 |
| CQ | 23.681 |  | 1 | 735 | 0.331 | 0.935 |  | 1 | 375 | 0.405 |
| BI | 3.968 |  | 1 | 735 | 0.199 | 2.462 |  | 1 | 375 | 0.421 |
| AU | 4.238 |  | 1 | 735 | 0.512 | 2.839 |  | 1 | 375 | 0.283 |

### Multicollinearity

Multicollinearity exists when there is a high correlation between 2 or more variables. Multivariate techniques such as SEM are sensitive to multicollinearity. To confirm the absence of multicollinearity, collinearity tests were performed on the constructs in the 2 samples. “The

Variance Inflation Factor (VIF) and tolerance are both widely used measures of the degree of multi-collinearity of the ith independent variable with the other independent variables in a regression model” (O’brien, 2007, p.673). Thus, for this study, multicollinearity is established by the tolerance and VIF (Variance Inflation Factor) values. According to Hair et al. (2010), a VIF value that exceeds 4.0 or a tolerance value of less than 0.2 indicates issues with multicollinearity. Mason et al. (1989) states that a VIF of over 10 can be problematic. The acceptable values are dependent on the number of explanatory variables involved.

In this study, the strictest values were used thus the presence of multicollinearity is established with tolerance and VIF values less than 0.10 and greater than 3.0 for tolerance and VIF respectively, i.e., when tolerance > 0.10 and VIF < 3.0 then there is no multicollinearity.

Based on the regression model tested, the values for the VIF and tolerance indicate that there are no multicollinearity issues as the independent constructs tested in both samples showed tolerance values of above 0.10 and VIF values under 3.0.

## Reliability

To test the reliability of the constructs in both samples, Cronbach’s Alpha (Cronbach, 1951) is used via SPSS version 21.0. Table 5.3 presents the results of the reliability tests. All the constructs showed satisfactory reliability. In the sample for the public university, the Cronbach alpha values were between 0.762 and 0.907 while for the private university, the Cronbach alpha values ranged from 0.7000 to 0.888. According to Hair et al. (2010), these values are acceptable, and items for each construct are positively correlated.

***Table 5. 3: Cronbach’s Alpha for both samples***

|  |  |  |  |
| --- | --- | --- | --- |
| **Constructs** | **No of Items** | **Public University Cronbach Alpha** | **Private University Cronbach Alpha** |
| PU | 5 | 0.831 | 0.805 |
| PEOU | 4 | 0.762 | 0.811 |
| LV | 5 | 0.862 | 0.733 |
| SQ | 5 | 0.839 | 0.851 |
| CQ | 5 | 0.798 | 0.888 |
| IQ | 5 | 0.860 | 0.700 |
| FC | 4 | 0.903 | 0.727 |
| SI | 4 | 0.907 | 0.804 |
| BI | 4 | 0.871 | 0.878 |
| AU | 3 | 0.830 | 0.847 |

## The Respondents Profile

For this study, the sample included students from 4 universities in Northern Nigeria who use learning management systems provided by their respective universities for learning purposes. The students were either full time or part-time active students in either undergraduate or postgraduate level. For the private universities, an online survey was distributed via the student's email in order to solicit for responses, for the public university students, 600 questionnaires were distributed to each of the schools hence a total of 1200 questionnaires were distributed. 738 valid responses were obtained from the public university sample after the data screening exercise while from the public university, 397 responses were received, and 387 were usable. Table 5.4, 5.5, and 5.6 shows the breakdown of the frequency of the respondent.

### Table 5. 4: Frequency and percentage of students’ responses

|  |  |  |
| --- | --- | --- |
|  | **Frequency** | **Percentage** |
| **Public University** | 738 | 66.1% |
| **Private University** | 378 | 33.9% |
| **Total** | 1116 | 100% |

***Table 5. 5: Frequency and percentage of students’ responses by public university***

|  |  |  |
| --- | --- | --- |
| **Public University** | **Frequency** | **Percentage** |
| University of Jos | 364 | 49.3% |
| National Open University of Nigeria | 374 | 50.7% |
| **Total** | 738 | 100% |

### Table 5. 6: Frequency and percentage of students’ responses by private university

|  |  |  |
| --- | --- | --- |
| **Private University** | **Frequency** | **Percentage** |
| Baze University | 180 | 47.6% |
| American University of Nigeria | 198 | 52.4% |
| **Total** | 378 | 100% |

Table 5.4 shows that 61.1% of the students in this study are from the public universities, out of which 49.3% are from the University of Jos, and 50.7% are from the National Open University of Nigeria (Table 5.5). Table 5.4 also shows that 33.9% of the students in this study are from the private universities, out of which 47.6% are from Baze University, and 52.4% are from the American University of Nigeria (Table 5.6).

With regards to age, table 5.7 indicates that 41.1% of the respondents were below the age of 25 years old out of which 46% (212) are from the private university sample. In the total sample, 58.9% are made up of students over the age of 25 years, 74.7% (491) are from the public university.

This means 44% of the responses are form students in the public university and over the age of 25 years.

### Table 5. 7: Frequency and percentage of students by age group

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Age Group** | **Public University** | | **Private University** | | **Total** | |
| **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** | **Percentage** |
| **Under 25** | 247 | 33.5% | 212 | 56.1% | 459 | 41.1% |
| **Over 25** | 491 | 66.5% | 166 | 43.9% | 657 | 58.9% |

The responses, when grouped by gender, are almost similar. Both samples (public and private universities) have over 60 % of the responses by male students and fewer than 40% by female students giving a total of 63% male and 36% female respondents as illustrated in table 5.8.

### Table 5. 8: Frequency and percentage of students by gender

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Gender** | **Public University** | | **Private University** | | **Total** | |
| **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** | **Percentage** |
| **Male** | 481 | 65.2% | 231 | 61.1% | 711 | 63.7% |
| **Female** | 257 | 34.8% | 147 | 38.9% | 405 | 36.3% |

In terms of the education level of the respondents, a total of 56% responses were made by undergraduate students, while 43% were made by postgraduate students (masters and doctoral students). In the private university, a higher percentage (85%) of the responses were by undergraduate students as compared to 41% for the public university sample. The ratio of undergraduate to postgraduate students in the public university is almost equal, as seen in table 5.9.

### Table 5. 9: Frequency and percentage of students by education level

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Education Level** | **Public University** | | **Private University** | | **Total** | |
| **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** | **Percentage** |
| **Undergraduate** | 309 | 41.9% | 321 | 84.9% | 630 | 56.45% |
| **Postgraduate** | 429 | 58.1% | 57 | 15.1% | 486 | 43.55% |

Experience captures the length of time that the students have used the LMS. In this study, the students' experience was grouped into 2 categories: Usage of the LMS for less than 1 year and usage of the LMS for over 1 year. Table 5.10 shows that a slightly larger number of the responses (51.2%) have used their LMS for, under 1 year, 60% of this group are from the public universities. 48.8% of the total responses have used the LMS for over 1 year, and 70% of this total is once more from the public university sample. These percentages are expected as the sample size for the public university is almost double that of the private university sample. The private university sample indicates that more of the respondents have used the LMS for less than a year, and the reverse is the case for the public university sample.

### Table 5. 10: Frequency and percentage of students by experience

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Experience** | **Public University** | | **Private University** | | **Total** | |
| **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** | **Percentage** |
| **Under 1 Year use** | 347 | 47% | 224 | 59.3% | 571 | 51.2% |
| **Over 1 Year use** | 391 | 53% | 154 | 40.7% | 545 | 48.8% |

Table 5.11 captures whether the students had been trained on the LMS prior to using the LMS. In both samples, the results are similar to most of the students (just over 60%), indicating that they had no prior training to use the LMS. This is reflected in the total sample, where 66% of the students stated that they had no prior training in using the LMS before using the system.

***Table 5. 11: Frequency and percentage of students by prior training***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Training** | **Public University** | | **Private University** | | **Total** | |
| **Frequency** | **Percentage** | **Frequency** | **Percentage** | **Frequency** | **Percentage** |
| **Prior Training** | 243 | 32.9% | 130 | 34.4% | 373 | 33.42% |
| **No Prior Training** | 495 | 67.1% | 248 | 65.6% | 743 | 66.58% |

## Descriptive statistics of construct items

In this study, for each of the variables used in the conceptual model (independent and dependent), descriptive statistics are analyzed and presented in the subsequent subsections so as to understand the students’ perception towards the different variables measured in the research.

The means and standard deviation (SD) values are used to interpret the general responses by the students. Based on the measurement instrument used in this study, a lower mean value indicates a more positive the response to the constructs by the students and the lower the SD the closer the spread of the values around the mean.

### Course Quality

Course quality (CQ) is a measure of the resources and attributes associated with a course. It is the students’ perception of how the design of the course on the LMS as well as the availability and access of the course resources will improve their learning experience. Based on prior research (Liu et al., 2010; Cheng, 2012; Lee, 2006), five (5) items were adopted and used to measure the students' perception of the course quality using a 5 point-Likert scale where 1 represents strongly agree, and 5 represents strongly disagree. Table 5.12 shows that for the public university, the students are neutral in terms of their perception of the course quality as the mean values range from 2.08 and

3.54. This is the general conception by most of the public university students as the standard deviation (SD) ranges between (±0.847) and (±1.481). On the other hand, the private university students tend to agree on this construct as seen by the mean values of 1.98(±0.972) and 2.20 (±0.974).

### Table 5. 12: Descriptive statistics of Course Quality

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Public University** | | **Private University** | |
| **Mean** | **Std Dev** | **Mean** | **Std Dev** |
| **CQ1** | 3.14 | 1.481 | 1.98 | .972 |
| **CQ2** | 3.00 | 1.360 | 1.90 | .949 |
| **CQ3** | 3.21 | 1.378 | 2.20 | .974 |
| **CQ4** | 3.54 | 1.367 | 2.03 | .953 |
| **CQ5** | 2.08 | .847 | 2.01 | .947 |

* + 1. ***Instructor Quality***

Instructor quality (IQ) measures the students’ perception of the response time and teaching style of the instructor while using the LMS. Based on prior research (Cheng, 2012; Lwoga, 2014), Five

(5) items were adopted and used to measure the students' perception of the quality of the instructor using a 5 point-Likert scale where 1 represents strongly agree, and 5 represents strongly disagree. Table 5.13 shows that for the public university, the students are neutral in terms of their perception of the instructor quality as the mean values range from 3.13 and 3.75. This is the general conception by most of the public university students as the standard deviation (SD) ranges between (±1.175) and (±1.440). On the other hand, the private university students tend to strongly agree on this construct as seen by the mean values of 1.26 (±0.534) and 1.81 (±0.773).

### Table 5. 13: Descriptive statistics of Instructor Quality

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Public University** | | **Private University** | |
| **Mean** | **Std Dev** | **Mean** | **Std Dev** |
| **IQ1** | 3.75 | 1.175 | 1.26 | .534 |
| **IQ2** | 3.24 | 1.438 | 1.58 | .798 |
| **IQ3** | 3.13 | 1.373 | 1.78 | .917 |
| **IQ4** | 3.20 | 1.430 | 1.67 | .764 |
| **IQ5** | 3.47 | 1.440 | 1.81 | .773 |

* + 1. ***System Quality***

System quality is a measure of the functionality, reliability, usability, and efficiency of the system by the students in using the LMS. Based on prior research (Lin, 2007; Cheng, 2012; Lwoga, 2014), Four (4) items were adopted and used to measure the students' perception of the LMS system quality using a 5 point-Likert scale where 1 represents strongly agree, and 5 represents strongly disagree. Table 5.14 shows that both the public university and the private university students strongly agree with the system quality construct, for the public university students the means range between the values of 1.33 and 1.74. The SD values are all under ±1.0, indicating a narrow spread of the responses towards the mean. There is a similar trend noticed in the private university students’ responses, as the mean values ranged between 1.40 and 1.83. Similarly, the range of the standard deviations also shows a narrow spread as the means are all below ±1.0, indicating that the majority of the students strongly agree with the construct.

### Table 5. 14: Descriptive statistics of System Quality

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Public University** | | **Private University** | |
| **Mean** | **Std Dev** | **Mean** | **Std Dev** |
| **SQ1** | 1.33 | .577 | 1.40 | .658 |
| **SQ2** | 1.69 | .795 | 1.74 | .898 |
| **SQ3** | 1.74 | .892 | 1.83 | .879 |
| **SQ4** | 1.65 | .779 | 1.70 | .786 |

* + 1. ***Learning Value***

Learning value (LV) encompasses the total benefits obtained by the time and effort spent by the students in using the LMS. Based on prior research (Ain, 2016), Five (5) items were adopted and used to measure the students' perception of the learning value gained by using the system using a 5 point-Likert scale where 1 represents strongly agree, and 5 represents strongly disagree. Table

5.15 shows that the public university students agree that there is value in using the LMS as the range of their mean values is between 1.82 and 2.01. The private university students, on the other hand, are neutral to the construct with a mean range of 1.63 to 3.79. Furthermore, in both samples, the SDs are low, indicating that the responses of the students in both samples are close to the mean.

### Table 5. 15: Descriptive statistics of Learning Value

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Public University** | | **Private University** | |
| **Mean** | **Std Dev** | **Mean** | **Std Dev** |
| **LV1** | 1.90 | .882 | 3.37 | 1.440 |
| **LV2** | 1.82 | .837 | 3.32 | 1.337 |
| **LV3** | 2.21 | .894 | 3.51 | 1.367 |
| **LV4** | 1.97 | .887 | 3.79 | 1.318 |
| **LV5** | 2.01 | .865 | 1.63 | .797 |

* + 1. ***Perceived Usefulness***

Perceived usefulness in this study is a measure of the students’ perception that using the LMS will improve the students’ performance and productivity. Five (5) items were adopted and used to measure the students' perception of the usefulness of the LMS using a 5 point-Likert scale where 1 represents strongly agree, and 5 represents strongly disagree. Table 5.16 indicates that in both samples the means and SDs indicate that the students agree that the LMS will improve their performance and productivity as all the means are under 2 and the SDs are all less than 1.00.

### Table 5. 16: Descriptive statistics of Perceived Usefulness

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Public University** | | **Private University** | |
| **Mean** | **Std Dev** | **Mean** | **Std Dev** |
| **PU1** | 1.59 | .672 | 1.66 | .763 |
| **PU2** | 1.38 | .638 | 1.31 | .557 |
| **PU3** | 1.29 | .475 | 1.26 | .464 |
| **PU4** | 1.35 | .490 | 1.32 | .489 |
| **PU5** | 1.32 | .544 | 1.26 | .461 |

* + 1. ***Perceived Ease of Use***

Perceived ease of use (PEOU) in this study is a measure of the students’ perception that using the LMS is easy to understand and learn how to use. Four (4) items were adopted from previous literature (Ngai et al., 2007; Cheng, 2012) and used to measure the students' perception of the ease of using the LMS using a 5 point-Likert scale where 1 represents strongly agree, and 5 represents strongly disagree. Table 5.17 indicates that in both samples the means and SDs indicate that the students agree that the LMS is easy to understand and use as all the means are under 2, and the SDs are all less than 1.00.

### Table 5. 17: Descriptive statistics of Perceived Ease of Use

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Public University** | | **Private University** | |
| **Mean** | **Std Dev** | **Mean** | **Std Dev** |
| **PEOU1** | 1.37 | .564 | 1.46 | .635 |
| **PEOU2** | 1.47 | .646 | 1.48 | .627 |
| **PEOU3** | 1.65 | .675 | 1.41 | .625 |
| **PEOU4** | 1.61 | .764 | 1.42 | .588 |

* + 1. ***Social Influence***

Social influence (SI) in this study is the students’ perception that their interaction with their peers, instructors, and the school administration influences the students to use the LMS. Four (4) items were adopted from previous literature (Venkatesh et al., 2003; Yakubu & Dasuki, 2018a) and used to measure the influence on students using the LMS due to interactions with their peers, instructors, and the school administration. A 5 point-Likert scale, where 1 represents strongly agree, and 5 represents strongly disagree, was used to capture the responses and table 5.18 indicates that in both samples the means and SDs indicate that the students agree that the students use the LMS because of influence on them by important others in the context of their education. This is validated by the Figures in table 5.18, which shows that the means are under 2 and the SDs are all less than 1.00.

### Table 5. 18: Descriptive statistics of Social Influence

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Public University** | | **Private University** | |
| **Mean** | **Std Dev** | **Mean** | **Std Dev** |
| **SI1** | 1.69 | .801 | 1.74 | .662 |
| **SI2** | 1.59 | .820 | 1.68 | .615 |
| **SI3** | 1.70 | .898 | 1.72 | .611 |
| **SI4** | 1.67 | .790 | 1.40 | .567 |

* + 1. ***Facilitating Conditions***

Facilitating conditions (FC) in this study measures the student’s belief that their school has the organizational and technical infrastructure necessary to support their use of the LMS. The items were adopted from prior research (Venkatesh et al., 2003; Yakubu & Dasuki, 2018) and measured using a 5 point-Likert scale. Table 5.19 shows the results of the descriptive statistics of the facilitating conditions for both the private and public university sample. The results show that in both samples, the mean values are less than 2. This indicates that both the private and public university students believe that their educational institutions have the necessary organizational and technical infrastructure required to support their use of the LMS.

### Table 5. 19: Descriptive statistics of Facilitating Conditions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Public University** | | **Private University** | |
| **Mean** | **Std Dev** | **Mean** | **Std Dev** |
| **FC1** | 1.63 | .783 | 1.56 | .562 |
| **FC2** | 1.67 | .784 | 1.58 | .591 |
| **FC3** | 1.68 | .786 | 1.45 | .573 |
| **FC4** | 1.78 | .815 | 1.74 | .751 |

* + 1. ***Behavioral Intention***

Behavioral Intention (BI) captures the students’ behavioral intention to use the LMS in the future. Four (4) items were adapted from prior research (Venkatesh et al., 2003; Yakubu & Dasuki, 2018) and used to measure the students' behavioral intention to use the LMS using a 5 point-Likert scale where 1 represents strongly agree, and 5 represents strongly disagree. Table 5.20 shows the descriptive statistics for the students' behavioral intention to use the LMS. In the public university, the students agree with the BI construct with mean values between 1.46 and 1.50. This is the general conception by most of the public university students as the standard deviation (SD) ranges between (±0.712) and (±0.763). Similarly, the private university students also agree on this construct as seen by the mean values of 1.49 (±0.775) and 1.52 (±0.808).

### Table 5. 20: Descriptive statistics of Behavioral Conditions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Public University** | | **Private University** | |
| **Mean** | **Std Dev** | **Mean** | **Std Dev** |
| **BI1** | 1.50 | .763 | 1.52 | .808 |
| **BI2** | 1.46 | .756 | 1.49 | .775 |
| **BI3** | 1.47 | .712 | 1.49 | .711 |
| **BI4** | 1.47 | .720 | 1.51 | .733 |

* + 1. ***Actual Usage***

The actual usage (AU) construct captures the students’ perception of their actual use of the LMS. Three (3) items were adapted from prior research (Venkatesh et al., 2003; Yakubu & Dasuki, 2018) and used to measure the students' actual usage of the LMS using a 5 point-Likert scale where 1 represents strongly agree, and 5 represents strongly disagree. Table 5.21 shows the mean ranged between 1.44 (±0.703) and 1.55 (±0.748) for the public university sample, whereas ranged between

1.27 (±0.510) and 1.56 (±0.755) for the private university sample. The results indicate that in both samples, students agree that they depend on and use the LMS frequently.

***Table 5. 21: Descriptive statistics of Actual Usage***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Public University** | | **Private University** | |
| **Mean** | **Std Dev** | **Mean** | **Std Dev** |
| **AU1** | 1.55 | .748 | 1.27 | .510 |
| **AU2** | 1.44 | .703 | 1.36 | .581 |
| **AU3** | 1.51 | .789 | 1.56 | .755 |

## Differences between the University Samples

A T-test was used to investigate the similarities and differences between the public and private university students’ perceptions of using their respective LMS. The results from the T-test will aid in answering one of the research questions posed by this study, which is to identify and understand the observed differences between the two samples.

The mean and group differences (t-test) for each construct in the conceptual model is shown in table 5.22 for both the public and the private university students.

***Table 5. 22: T-test for all Constructs***

## T-test for Equality of Means

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Public**  **Construct University Mean** | **Private University Mean** | **T-test** | **Sig. (2-**  **tailed)** | **Mean Difference** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| PU | 1.3846 | 1.3614 | .959 | 0.338 | .02318 |
| PEOU | 1.5241 | 1.4438 | 2.530 | 0.012\* | .08027 |
| LV | 1.9808 | 3.1233 | 23.520\*\*\* | 0.000\*\*\* | 1.14252 |
| IQ | 3.3566 | 1.6212 | 31.781\*\*\* | 0.000\*\*\* | 1.73548 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| SI | 1.6602 | 1.6343 | .623 | 0.534 | .02597 |
| FC | 1.6894 | 1.5840 | 2.654\*\* | 0.008\*\* | .10537 |
| SQ | 1.6030 | 1.6706 | -1.655 | 0.098 | -.06765 |
| CQ | 2.9930 | 2.0222 | 16.753\*\*\* | 0.000\*\*\* | .97073 |
| BI | 1.4746 | 1.5020 | -.683 | 0.495 | .02739 |
| AU | 1.4995 | 1.3959 | 3.376\*\* | 0.001\*\* | .10360 |

*Note: \*p<.05, \*\*p<.01, \*\*\*p<.001*

For the perceived usefulness construct (t = .959, mean difference = .02318), there was no significant difference between the private and the public university students. This implies that both sets of students believe that the LMS used in their respective institutions are useful for their learning processes. Similarly, for the system quality construct (t = -1.655, mean difference = -

.06765), there was no significant difference between the private and the public university students.

With regards to PEOU, the private university has a significantly lower mean (1.4438) compared to public university students (1.5241). Similarly, the private university students’ mean scores for the constructs IQ (1.6212) and CQ (2.0222) are significantly lower (t = 31.781 and t = 16.753, p<.001) than the observed results of the public university students (3.3566 and 2.9930 respectively). These results indicate that private university students strongly agree that their LMS is easier to learn and use in comparison to their public university counterparts. Also, the private university students’ perception of the instructor quality and the course quality is higher compared to the public university.

While both the public and the private university students strongly agree that their institutions have the organizational and technical resources required to support the use of the LMS, it is the private university students who have a significantly higher mean (1.5840, p<.01) compared to the public university students (1.6894).

Unexpectedly, for the learning value construct (t = -23.520 and mean difference = -1.14252), a significant difference was observed. A lower mean (1.9808) was observed in the public university sample as compared to the private university sample (3.1233). A possible explanation for this difference is that the public universities (in this study) appreciate the presence of the LMS as a source of learning resources when compared to the lecture notes and other manual learning processes they experience in their institution. The private university students, on the other hand, are constantly immersed in the use of technology for almost all of their learning activities, and possibly take this for granted.

The results showed no significant difference in the SI and BI construct between the two samples. Both sets of students agree that they are influenced by significant others, in the context of their institutions, to use the LMS and also intend to use the LMS in the future.

With respect to the actual usage of the LMS the private university students mean score is 1.3959 and for the public university students 1.4995 implying that both sets of students are using the LMS, but there is a significant difference (t = 3.376, p<.01). This means that the private university students use the LMS and its features more frequently in comparison to the public university students.

Based on the t-test for equality of means between the private and public university students for the constructs in the conceptual model, table 5.23 summarizes the results of hypothesis H14a through H14j. Out of the 10 hypotheses tested; support was found for only 5 of the hypotheses

***Table 5. 23: Summary of the hypotheses results for difference in Means***

## T-test for Equality of Means Observed Results

**H13a:** *System quality means will be significantly lower in private universities, compared to public universities.*

Not Supported

**H13b:** *Instructor quality means will be significantly lower in private universities, compared to public universities.*

Supported

**H13c:** *Course quality means will be significantly lower in private universities, compared to public universities.*

Supported

**H13d***: Perceived usefulness mean will be significantly lower in private universities, compared to public universities.*

Not Supported

**H13e***: Perceived ease of use mean will be significantly lower in private universities, compared to public universities.*

Supported

**H13f***: Learning value means will be significantly lower in private universities, compared to public universities.*

Not supported (Significant but lower in the public university.)

**H13g***: Social influence means will be significantly lower in public universities, compared to private universities.*

Not supported

**H13h***: Facilitating conditions mean will be significantly lower in private universities, compared to public universities.*

Supported

**H13i***: Behavioral intentions mean will be significantly lower in private universities, compared to public universities.*

Not Supported

**H13j***: Actual usage means will be significantly lower in private universities, compared to public universities.*

Supported

## Students use of the LMS Functions

The third section of the questionnaire used in this study aimed at capturing the frequency in using some of the LMS functions by both sets of students. The percentage frequency was determined using SPSS version 21.1, and a t-test was performed to compare the means for both samples. The results are used in order to further explain the similarities and differences between the Nigerian public and private university students. This helps to answer one of the research questions asked by this study, i.e., to identify and understand the observed similarities and differences between the two samples.

The following scales were used to obtain responses from the students with regards to the tasks that they use the LMS to perform: 1 = frequent use, 2 = moderate use, 3 = to some extent use, 4 = rarely used and 5 = never used.

***Table 5. 24: Descriptive statistics of LMS functionality usage***

## Group Statistics

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **LMS Functions** | **University Type** | **N** | **Mean** | **Std. Dev.** |
| Class Announcements | Public | 738 | 3.8651 | .81218 |
|  | Private | 378 | 4.4783 | 1.16551 |
| Discussions Forums | Public | 738 | 3.6270 | .70065 |
|  | Private | 378 | 4.1734 | 1.10269 |
| Assessments | Public | 738 | 4.2090 | .95567 |
|  | Private | 378 | 2.5678 | 1.09797 |
| Links to online resources | Public | 738 | 3.9206 | .85051 |
|  | Private | 378 | 3.0813 | 1.10175 |
| Lecture Notes and presentation slides | Public | 738 | 4.243 | 1.0845 |
|  | Private | 378 | 2.701 | 1.0847 |
| Syllabus and course handbook | Public | 738 | 4.1746 | .73817 |
|  | Private | 378 | 2.2425 | 1.05609 |

Table 5.24 shows the descriptive statistics of the students’ usage of the LMS functions. For both samples, the standard deviation values from the means are between the values of 0.70065 and 1.16551, indicating a narrow spread around the mean values for all the items measured. Thus, the majority of the responses from the students agree with the mean.

***Table 5. 25: Public university students’ actual usage of the LMS***

## Public University Frequency

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Items** | **Never Used (%)** | **Rarely Used (%)** | **Used to some extent (%)** | **Moderately Used (%)** | **Frequently Used (%)** |
| Class Announcements | 37.0 | 33.1 | 13.5 | 12.2 | 4.2 |
| Discussions Forums | 23.3 | 37.3 | 22.8 | 12.2 | 4.5 |
| Assessments |  |  |  |  |  |
| (Assignments, | 53.7 | 28.3 | 7.4 | 6.3 | 4.2 |
| quizzes and tests) |  |  |  |  |  |
| Links to online resources | 35.2 | 38.4 | 13.8 | 6.6 | 5.0 |
| Lecture Notes and presentation slides | 58.5 | 19.6 | 13.0 | 5.8 | 3.2 |
| Syllabus and course handbook | 52.1 | 25.1 | 2.7 | 8.2 | 1.9 |

Table 5.25 shows the frequency (%) of the public university sample, for all the items measured, majority of the students claim to rarely or never use any of the items measured. The assignments,

lecture notes, and syllabus especially have over half (50%) the students claiming never to use the items. In terms of frequent use, the links to online resources have the highest (5%) percentage.

Table 5.26 shows the frequency (%) of the private university sample, similar to the public university sample class over half of the students (50%) claim to rarely or never use the announcements and discussion forum functionality of the LMS. On the other hand, for all the other functionalities of the LMS measured, over 50% of the students claim to have used the functionalities to some extent or moderately. The syllabus and the course handbook have the highest (11.8%) percentage of frequent use by private university students.

***Table 5. 26: Private university students’ actual usage of the LMS***

## Private University Frequency

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Items** | **Never Used (%)** | **Rarely Used (%)** | **Used to some extent (%)** | **Moderately Used (%)** | **Frequently Used (%)** |
| Class Announcements | 63.4 | 25.1 | 8.3 | 2.4 | 0.8 |
| Discussions Forums | 31.7 | 56.5 | 9.6 | 1.8 | 0.4 |
| Assessments |  |  |  |  |  |
| (Assignments, | 3.1 | 17.3 | 19.4 | 53.5 | 6.6 |
| quizzes and tests) |  |  |  |  |  |
| Links to online resources | 5.4 | 19.9 | 56.4 | 13.0 | 4.3 |
| Lecture Notes and presentation slides | 12.1 | 9.3 | 17.9 | 58.0 | 2.7 |

Syllabus and course handbook

1.4 2.2 27.6

11.8

57.0

As mentioned earlier, a T-test for the equality of means was carried out; table 5.27 shows the results of the t-test. All of the differences observed in the means were significant. The results show that public university students tend to use the class announcements (T = -10.242, p < .001) and discussion forum (T = -10.069, p < .001) functionalities of the LMS more in comparison to the private university students.

The private university students use all the other functionalities of the LMS more than their counterparts in the public university. The most significant difference being the use of the syllabus and course handbook (t = 35.559, p < .001), followed by the assessment’s functionality (t = 25.792, p < .001) then the lecture notes and presentation slide (t = 22.491, p < .001).

The final item is the links to online resources (t = 13.071, p < .001), which also indicates that it is used more frequently by private university students.

***Table 5. 27: T-test for all use of LMS functionality***

## Independent Samples Test

**t-test for Equality of Means**

## Public University Mean

**Private University Mean**

## t-test

**Sig. (2-**

## tailed)

**Mean Difference**

## Class Announcements

3.8651 4.4783 -10.242 .000\*\*\* -.61324

## Discussions Forums

3.6270 4.1734 -10.069 .000\*\*\* -.54646

## Assessments (Assignments, quizzes and tests)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 4.2090 | 2.5678 | 25.792 | .000\*\*\* | 1.64124 |
| 3.9206 | 3.0813 | 13.071 | .000\*\*\* | .83933 |
| 4.243 | 2.701 | 22.491 | .000\*\*\* | 1.54284 |
| 4.1746 | 2.2425 | 35.559 | .000\*\*\* | 1.93206 |

**Links to online resources**

## Lecture Notes and presentation slides

**Syllabus and course handbook**

*Note: \*p<.05, \*\*p<.01, \*\*\*p<.001*

## Summary and Conclusions

This chapter presents the results of the preliminary data analysis in which Microsoft Excel and SPSS version 21.0 were used to perform data screening, frequency analysis, descriptive analysis, and t-tests in order to prepare the data for further analysis as well as to report preliminary findings obtained from some of the tests.

The first section of the chapter reports on the data screening tasks performed on the dataset. Missing data were addressed in this section, as well as the presence of outliers. Kurtosis and Skewness tests were also performed to ensure the data is normal. A few cases were observed with missing data and outliers, and these were removed from the dataset. Furthermore, Levene’s test was carried out to assess the equality of variances for all the constructs used in the study and the test results showed that the variances for all of the constructs are similar with the exception of social influence (SI) in the public university sample thereby establishing the homogeneity of

variance. Finally, it was observed that all independent constructs had VIF values of less than 2.0, which suggest the absence of multicollinearity in the dataset.

The next section used frequency analysis on the data received from the respondents to profile the students that participated in the survey. The students’ demographic characteristics such as age, gender, experience, educational level, and training on the LMS were captured and analyzed for the 1116 responses received.

Next, descriptive statistics, which included the means and standard deviations (SD) for all the constructs used in the conceptual model, were presented. In order to investigate the similarities and differences between the public and private university students’ perceptions of using their respective LMS, a t-test for equality of means was performed. The t-test results showed that of the 10 hypotheses proposed (H13a through H13j); only 5 of the hypotheses were supported. The construct means were significantly lower in private universities as compared to public universities for the following constructs: IQ, CQ, PEOU, FC, and AU. For the learning value construct, the difference in means was significant but lower in the public university. The difference in means was insignificant for all other constructs.

The chapter concludes by analyzing the similarities and differences between the tasks performed by the students while using the LMS. For all the tasks captured, there were significant differences between the private and public university samples. The significant difference was higher for class announcements and discussions forums in the public university sample. For all other tasks, capture the significant difference was higher in the private university.

The next chapter uses structural equation modeling (SEM) to analyze further and test the relationships between the constructs, as illustrated in the conceptual model. The findings will be discussed in the subsequent chapters (6 and 7).

# CHAPTER 6: TESTING THE CONCEPTUAL MODEL

## Introduction

The previous chapter presented the findings of the preliminary data analysis. In this chapter, a more detailed analysis is performed to test the relationships between the construct in the conceptual model. As mentioned earlier on, a 2-step approach, as recommended by Anderson et al. (1988) and Hair et al. (2010), is used to validate and test the model. The first step involves the use of confirmatory factor analysis (CFA) to validate the constructs of the conceptual model and also to test if the data fits the model. The second step involves the use of structural equation modeling (SEM) technique to test the relationships hypothesized in this study.

This chapter is logically arranged to present the findings of the 2-step approach mentioned above; thus, the first section accesses the measures used to ensure the reliability and validity of the 10 constructs used in this study. As the data set is made up of 2 samples, i.e., private and public university students, the relationships between the constructs tested for both samples. The next section of the chapter evaluates the effect of the moderators on the proposed model, also in this section, the methods used to determine the moderator effects on some of the relationships are clearly stated.

The chapter ends with a summary of the methods used and the results obtained from the use of CFA and SEM to analyze and test the conceptual model.

## Measurement Model Analysis

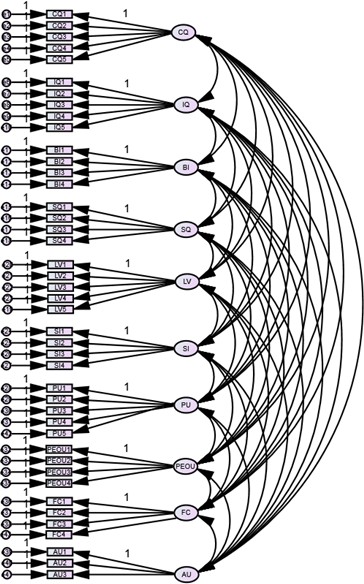
Confirmatory factor analysis (CFA) is a multivariate statistical technique used to examine how well the measured variables represent the number of constructs. CFA tests to see if the data matches the measurement model. In this research, CFA is used on the measurement model by considering the goodness of fit indices and then testing for the reliability and validity of the model.

As this study is based on 2 samples, public and private universities, each sample will be treated separately. For each of the samples, 10 constructs are used as well as a total of 43 variables, as shown in table 6.1. Figure 6.1 shows the link between the variables and the constructs in the

measurement model. The constructs in the measurement items are covaried as indicated by the double-headed arrows between the constructs.

### Table 6. 1: Constructs and their corresponding number of variables

|  |  |
| --- | --- |
| **Construct** | **Variables** |
| Course Quality | 5 |
| Instructor Quality (IQ) | 5 |
| Behavioral Intention (BI) | 4 |
| System Quality (SQ) | 4 |
| Learning Value (LV) | 5 |
| Social Influence (SI) | 4 |
| Perceived Ease of Use (PEOU) | 4 |
| Perceived Usefulness (PU) | 5 |
| Actual Usage (AU) | 3 |
| Facilitating Conditions (FC) | 4 |
| TOTAL | 43 |



***Figure 6. 1: Preliminary analysis confirmatory factor analysis model***

### Goodness of fit indices

The maximum-likelihood method was used to assess the measurement model. The maximum- likelihood method estimates the value of the parameters of a model and determines the values that will maximize the likelihood distribution of the observed parameters. Hair et al. (2010) and Kline

(2015) suggest that in order to evaluate the goodness of fit for a model, certain fit indices must be considered.

Table 6.2 summarizes the first run of the measurement model fit indices for both the private and the public university as compared to the recommended values (Hair et al., 2010; Kline, 2015). Based on the recommended values, both samples indicate slightly low values for the goodness-of- fit index (GFI), comparative fit index (CFI) and the normed fit index (NFI), while the private university also has a lower than recommended value for the Adjusted Goodness-of-fit index (AGFI) at 0.79.

***Table 6. 2: Summary of the measurement model***

## Fit Index Recommended Value

**Public University Measurement Model**

## Private University Measurement Model

Non-significant

X2

|  |  |  |  |
| --- | --- | --- | --- |
|  | at p < 0.05 |  | |
| Degrees of freedom (df) | N/A | 815 | 815 |
| X2/df | < 5 | 4.01 | 2.36 |
| Goodness-of-fit index (GFI) | > 0.90 | 0.83 | 0.82 |
| Adjusted Goodness-of-fit index (AGFI) | > 0.80 | 0.81 | 0.79 |
| Comparative fit index (CFI) | > 0.90 | 0.855 | 0.85 |
| Root mean square residuals (RMSR) | < 0.10 | 0.05 | 0.04 |

3263.808 1921.296

Root mean square error of approximation (RMSEA)

< 0.08 0.06 0.06

Normed fit index (NFI) > 0.90 0.82 0.77

Parsimony normed fit index (PNFI) > 0.60 0.74 0.70

Sources: (Hair, et al., 2010; Kline, 2015)

According to Byrne (2006) and Hair et al. (2010), to attain a better fit, the measures below were taken:

* Removal of variables with a Standardized regression weight (factor loading) of less than 0.5.
* Removal of modification indices with high regression weights and covariance values
* Removal of variables with standardized residual covariance over 2.58

For the public university sample, the following variables were removed: FC4, LV2, CQ4, CQ5, IQ1, SQ2, PU1, AU3, and PEOU4. A re-run of the measurement model was done to produce the improved fit indices in table 6.3. Similarly, after deleting some of the problematic variables in the private university sample, there was a marked improvement on the values initially obtained for the fit indices. The variables deleted were: BI4, LV5, SI4, PU1, PU4, IQ1, IQ5, FC2, and AU3.

***Table 6. 3: Summary of the revised measurement model***

## Fit Index Recommended Value Public University

**Measurement Model**

## Private University Measurement Model

Non-significant at p <

X2

0.05

1293.325 823.384

Degrees of freedom (df)

N/A 475 479

X2/df

< 5 2.723 1.719

Goodness-of-fit index (GFI)

|  |  |  |
| --- | --- | --- |
| > 0.90 | 0.906 | 0.909 |
| > 0.80 | 0.882 | 0.881 |
| 0.939 | | 0.945 |
| > 0.90 |  |  |
| < 0.10 | 0.032 | 0.032 |
| < 0.08 | 0.048 | 0.044 |
| > 0.908 | 0.91 | 0.910 |

Adjusted Goodness- of-fit index (AGFI)

Comparative fit index (CFI)

Root mean square residuals (RMSR)

Root mean square error of approximation (RMSEA)

Normed fit index (NFI)

Parsimony normed fit index (PNFI)

> 0.60 0.768 0.750

Sources: (Hair, et al., 2010; Kline, 2015)

In both samples, PU1, IQ1, and AU3 were observed to have a standardized regression weight lower than the recommended value of 0.5. Due to high covariance and regression weights, the following constructs were removed from the public university sample, CQ4, CQ5, and PEOU4. While in the private university sample, SI4 PU4, IQ5 and FC2 were also removed due to high covariance and regression weights.

Finally, in the public sample, LV2, FC4, and SQ2 were deleted as their standardized residuals din not fall within the recommended 2.58 range. BI4 and LV5 were also deleted from the private university sample for the same reason.

Table 6.3 indicates good fit indices for both private and public university samples based on the recommended values. The next step was to access the measurements models’ validity and reliability.

### Validity and reliability testing

The item measures employed by this study were subject to validity and reliability tests. “The analysis of measures with strong psychometric characteristics, such as good score reliability and validity, is essential in SEM” (Kline, 2015). Validity is the “extent to which a set of measured variables actually represent the theoretical latent construct they are designed to measure” (Hair et al., 2010) while reliability refers to the degree to which the measurement scale produces reliable results with repetitive measurements.

Construct validity is examined via convergent validity and discriminant (divergent) validity; “convergent validity and discriminant validity involve the evaluation of measures against each other instead of against an external standard” (Kline, 2015).Convergent validity is “the extent to which measures of a specific construct should converge or share a high proportion of variance in common” (Hair et al., 2010). This means that if the intercorrelations of a set of variables used to measure a construct are reasonable in magnitude, then the construct displays convergent validity.

Discriminant validity, on the other hand, tests to see if the measurements of a construct are unrelated to the measurements of other constructs.

Reliability is measured using composite reliability (CR). CR is “obtained by combining all of the true score variances and covariances in the composite of indicator variables related to constructs, and by dividing this sum by the total variance in the composite” (Şimşek and Tekeli, 2015). In addition to the composite reliability value, the following measures are used to establish convergent validity and discriminant validity:

* + - * Average Variance Extracted (AVE): AVE is the overall variance of a construct in relation to the total variance due to measurement error.
      * Maximum Shared Variance (MSV)
      * Average Shared Variance (ASV)

To establish convergent validity, the following conditions must be met:

1. AVE must be greater than 0.5 (Hair et al., 2010)
2. Composite Reliability must be greater than the corresponding AVE (Hair et al., 2010) To establish discriminant validity, the following conditions must be met:
3. The MSV value must be less than the corresponding AVE (Hair et al., 2010)
4. The ASV value must be less than the corresponding AVE value (Hair et al., 2010) Reliability is established if the CR values for a construct are over 0.5.

SPSS version 21.0 and AMOS version 21.0 do not compute the AVE or CR values for each construct; as a result, the following formulas were applied to determine AVE and CR values for each construct.

∑𝑛 "2

AVE = i%& i

𝑛

where λ = factor loadings and i = number of items

### Formula 1: Average Variance Extracted

CR = 𝑛

𝑛 i%&

"i%$∑𝑛

"i%

$∑i%& "i%$∑𝑛

$∑

i%&

i%&

i%&

"i%&$∑𝑛

ði )%

Formula 2

where λ = factor loadings, i = number of items and δ = the error variance

### Formula 2: Composite Reliability

Table 6.4 and Table 6.5 shows the CR, AVE, MSV, and ASV values for the constructs used in the conceptual model for the public and private university samples, respectively. In the public university sample, reliability was established for all constructs as the CR values are all above the corresponding AVE values. With the exception of PEOU, convergent validity was established for all constructs as the AVE values are above the 0.5 cut-off mark. This indicates some convergent validity issues, but the decision was made to leave the PEOU as the AVE is very close to the 0.5 recommended value, and the construct only has 3 measurement variables.

In terms of discriminant validity, for all constructs, the AVE values are greater than the corresponding MSV and ASV values, thus establishing discriminant validity.

In the private university sample, table 6.5 shows that reliability was established for all constructs as the CR values are all above the corresponding AVE values. Also, for all the constructs, there are no convergent validity issues as the AVE values are within the range of 0.51 and 0.70, which are all above the recommended 0.5 cut-off mark. Discriminant validity was also established as the AVE values are greater than the corresponding MSV and ASV values for all constructs.

### Table 6. 4: Construct Reliability, Convergent validity, Discriminant Validity and factor correlation matrix for the public university sample

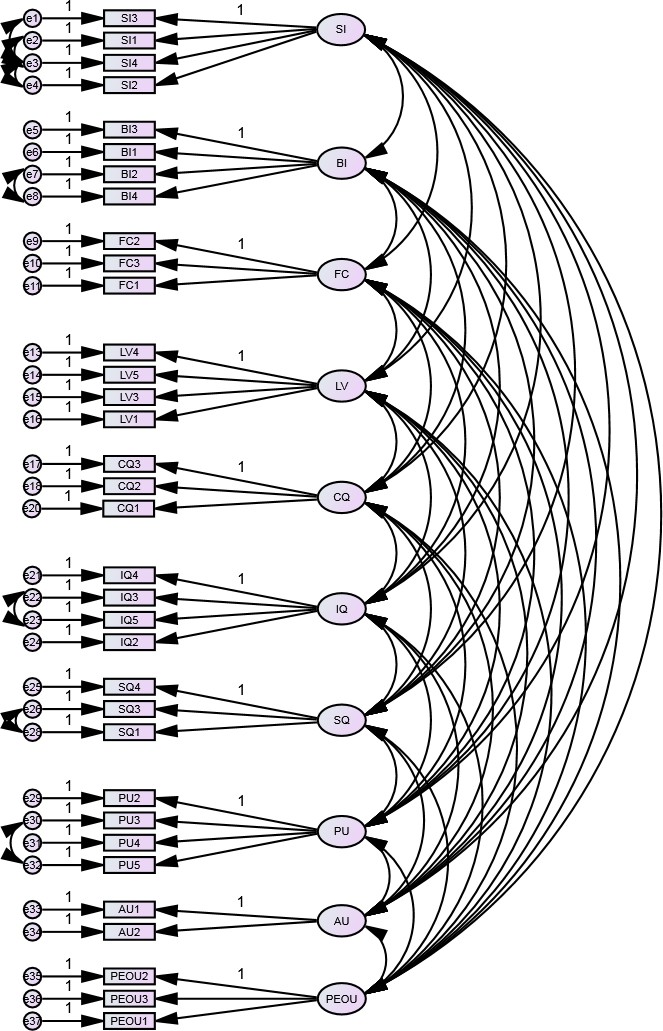
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **CR** | **AV**  **E** | **MS**  **V** | **AS**  **V** | **AU** | **SI** | **BI** | **FC** | **LV** | **CQ** | **IQ** | **SQ** | **PU** | **PEO**  **U** |
| **AU** | 0.84 | 0.73 | 0.04 | 0.04 | **0.85** |  |  |  |  |  |  |  |  |  |
| **SI** | 0.92 | 0.74 | 0.24 | 0.09 | 0.13 | **0.86** |  |  |  |  |  |  |  |  |
| **BI** | 0.88 | 0.65 | 0.34 | 0.07 | 0.19 | 0.48 | **0.81** |  |  |  |  |  |  |  |
| **FC** | 0.91 | 0.77 | 0.24 | 0.03 | 0.19 | 0.07 | 0.09 | **0.88** |  |  |  |  |  |  |
| **LV** | 0.88 | 0.64 | 0.24 | 0.03 | 0.06 | 0.08 | 0.08 | 0.49 | **0.80** |  |  |  |  |  |
| **CQ** | 0.83 | 0.62 | 0.13 | 0.02 | - | 0.01 | - | 0.04 | 0.06 | **0.79** |  |  |  |  |
|  |  |  |  |  | 0.04 |  | 0.04 |  |  |  |  |  |  |  |
| **IQ** | 0.87 | 0.62 | 0.01 | 0.00 | - | 0.05 | 0.08 | - | 0.00 | - | **0.79** |  |  |  |
|  |  |  |  |  | 0.04 |  |  | 0.01 |  | 0.04 |  |  |  |  |
| **SQ** | 0.83 | 0.63 | 0.24 | 0.04 | 0.03 | 0.49 | 0.15 | - | 0.09 | - | - | **0.79** |  |  |
|  |  |  |  |  |  |  |  | 0.01 |  | 0.05 | 0.02 |  |  |  |
| **PU** | 0.84 | 0.58 | 0.13 | 0.02 | 0.03 | - | 0.09 | 0.02 | 0.03 | - | 0.04 | 0.04 | **0.76** |  |
|  |  |  |  |  |  | 0.09 |  |  |  | 0.38 |  |  |  |  |
| **PEO** | 0.74 | 0.49 | 0.34 | 0.08 | 0.12 | 0.48 | 0.58 | 0.02 | 0.06 | - | 0.07 | 0.21 | 0.16 | **0.70** |
| **U** |  |  |  |  |  |  |  |  |  | 0.25 |  |  |  |  |

After the removal of items FC4, LV2, CQ4, CQ5, IQ1, SQ2, PU1, AU3 and PEOU4 to improve the goodness of fit indices for the public university sample, the resulting measurement model for the public university sample is shown in Figure 6.2. Furthermore, the model was also subjected to reliability and validity tests.

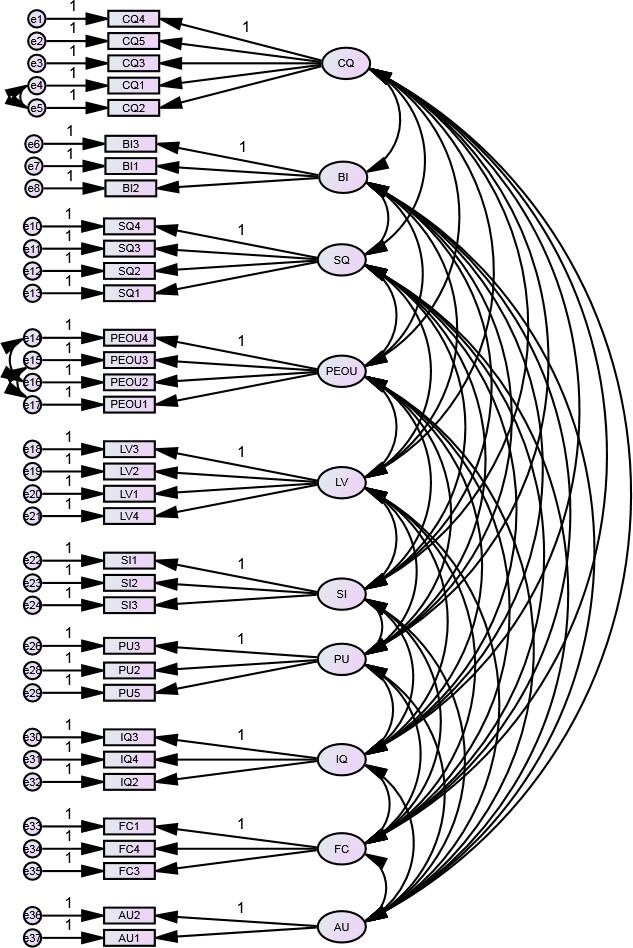
### Table 6. 5: Construct Reliability, Convergent validity, Discriminant Validity and factor correlation matrix for the private university sample

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **CR** | **AVE** | **MSV** | **ASV** | **FC** | **CQ** | **BI** | **SQ** | **PEO**  **U** | **LV** | **SI** | **PU** | **IQ** | **AU** |
| **FC** | 0.82 | 0.61 | 0.09 | 0.02 | **0.78** |  |  |  |  |  |  |  |  |  |
| **CQ** | 0.89 | 0.61 | 0.04 | 0.01 | 0.09 | **0.78** |  |  |  |  |  |  |  |  |
| **BI** | 0.87 | 0.70 | 0.21 | 0.07 | 0.24 | -0.05 | **0.84** |  |  |  |  |  |  |  |
| **SQ** | 0.86 | 0.60 | 0.02 | 0.01 | -0.02 | -0.05 | 0.05 | **0.78** |  |  |  |  |  |  |
| **PEO**  **U LV** | 0.84  0.83 | 0.57  0.55 | 0.26  0.11 | 0.07  0.03 | -0.06  0.07 | -0.05  0.19 | 0.35  -0.10 | 0.13  -0.08 | **0.76**  -0.33 | **0.74** |  |  |  |  |
| **SI** | 0.87 | 0.68 | 0.07 | 0.02 | -0.15 | 0.04 | 0.17 | 0.13 | 0.26 | -0.02 | **0.83** |  |  |  |
| **PU** | 0.76 | 0.51 | 0.21 | 0.05 | 0.13 | 0.03 | 0.46 | 0.13 | 0.23 | -0.18 | 0.12 | **0.72** |  |  |
| **IQ** | 0.87 | 0.70 | 0.26 | 0.05 | 0.05 | 0.03 | 0.21 | 0.06 | 0.51 | -0.23 | 0.12 | 0.19 | **0.83** |  |
| **AU** | 0.86 | 0.75 | 0.13 | 0.04 | 0.30 | -0.05 | 0.35 | -0.05 | 0.12 | -0.11 | 0.08 | 0.22 | 0.19 | **0.86** |

After the removal of items FC2, LV5, BI4, SI4, IQ1, IQ5, PU1, PU4 and AU3 to improve the goodness of fit indices for the private university sample, the resulting measurement model for the public university sample is shown in Figure 6.3. Furthermore, the model was also subjected to reliability and validity tests.



### Figure 6. 2: Refined public university sample measurement model



***Figure 6. 3: Refined private university sample measurement model***

## Structural Model Analysis and Testing the Hypotheses

Reliability, convergent validity, and discriminant validity were established in the 2 samples in the previous section. The next step was to build the structural model as depicted previously in Figure

3.2 (proposed research model) and then to process with the structural equation modeling method. Structural equation modeling (SEM) is a multivariate statistical technique used to analyze structural relationships by combining factor analysis and multiple regression analysis.

There are 6 exogenous variables and 4 endogenous variables in the model as opposed to the CFA model where there was no need to differentiate between exogenous and endogenous variables. Based on the rules of SEM, all the exogenous variables are covaried (indicated by a double-headed arrow) while single-headed arrows show the relationships between the constructs.

The next 2 sections show the results of the structural analysis for the public and private university samples.

### Structural Model Testing for the Public University Sample

The structural model for the public university sample, based on the conceptual model, is shown in Figure 6.4 and table 6.6 shows the goodness of fit indices for the model. All the goodness of fit indices was found to be within the recommended range for the structural model of the public university sample.

Table 6.7 shows the path coefficients for hypothesized relationships between the constructs of the conceptual model. Out of the 12 hypotheses tested, only 7 were supported, and there was no support for the remaining 5. The relationship between system quality (SQ) and course quality (CQ) with perceived usefulness (PU), (H1a and H3a), was not supported, in fact, their path coefficients were negative indicating that both SQ and CQ would have a negative impact on PU. Similarly, hypothesis H6a (learning value (LV) on behavioral intention) was rejected as the p-value, (0.778), was not significant. The other 2 relationships rejected were the relationship between instructor quality (IQ) on PU and PU on behavioral intention.

The data showed support for the relationship between SQ and perceived ease of use (PEOU) and also PEOU on PU. Social influence (SI), facilitating conditions (FC) and PEOU were all found to significantly influence the students’ behavioral intention to use the LMS for the public university sample thus supporting hypothesis H5c, H7a, and H8a. Finally, the data indicated that Actual usage

(AU) is positively influenced by FC and behavioral intention (BI), supporting hypothesis H8c and H9a. It should be noted that the relationship between CQ and PU though significant, was not positive; thus, the hypothesis was rejected as stated earlier.

***Table 6. 6: Goodness of fit summary for the public university structural model***

## Fit Index Recommended

**Value**

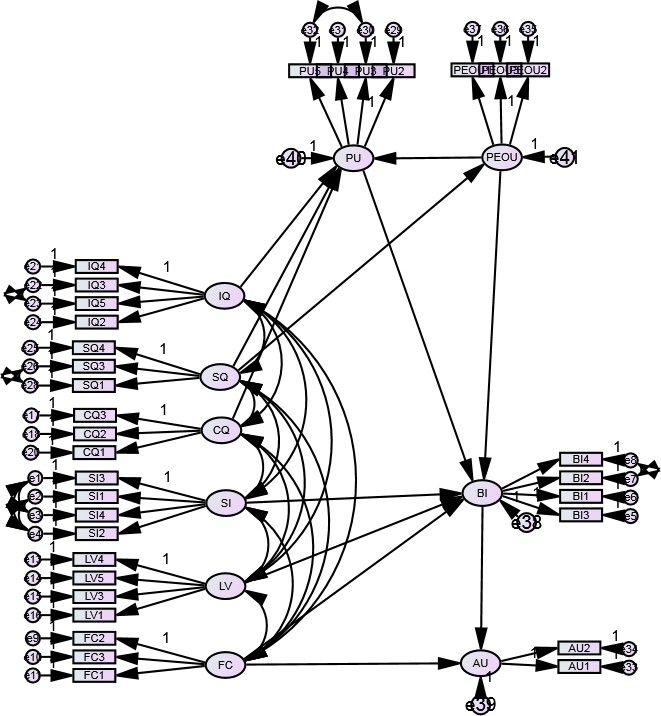
## Public University Sample

Non-significant

X2

|  |  |  |
| --- | --- | --- |
| Degrees of freedom (df) | at p < 0.05  N/A | 492 |
| X2/df | < 5 | 2.950 |
| Goodness-of-fit index (GFI) | > 0.90 | 0.911 |
| Adjusted Goodness-of-fit index (AGFI) | > 0.80 | 0.876 |
| Comparative fit index (CFI) | > 0.90 | 0.929 |
| Root mean square residuals (RMSR) | < 0.10 | 0.042 |
| Root mean square error of approximation  < 0.08 0.051 | | |
| (RMSEA) |  |  |
| Normed fit index (NFI) | > 0.90 | 0.908 |
| Parsimony normed fit index (PNFI) | > 0.60 | 0.786 |

1351.552



### Figure 6. 4: Public university sample structural model

***Table 6. 7: Summary of the hypotheses for the public university sample***

Hypothesis Relationship

Path Coefficient

P Result

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| H1a | SQ |  | PU | -0.008 | 0.847 | Not Supported |
| H1c | SQ |  | PEOU | 0.209 | \*\*\* | Supported |
| H2a | IQ |  | PU | 0.024 | 0.546 | Not Supported |
| H3a | CQ |  | PU | -0.361 | \*\*\* | Not Supported |
| H4a | PU |  | BI | 0.056 | 0.183 | Not Supported |
| H5a | PEOU |  | PU | 0.093 | \*\* | Supported |
| H5c | PEOU |  | BI | 0.456 | \*\*\* | Supported |
| H6a | LV |  | BI | -0.012 | 0.778 | Not Supported |
| H7a | SI |  | BI | 0.321 | \*\*\* | Supported |
| H8a | FC |  | BI | 0.073 | \* | Supported |
| H8c | FC |  | AU | 0.157 | \*\*\* | Supported |
| H9a | BI |  | AU | 0.157 | \*\*\* | Supported |

*Supported: \* = p < 0.1; \*\* = p < 0.05; \*\*\* = p < 0.01; Not Supported: p > 0.1*

### Structural Model Testing for the Private University Sample

The structural model for the public university sample, based on the conceptual model, is shown in Figure 6.5 and table 6.8 shows the goodness of fit indices for the model. Based on the observed indices shown in table 6.8, all the goodness of fit indices was found to be above the recommended values.

With regards to the hypotheses testing, 12 hypotheses were proposed for the private university sample out of which support was found for 10 hypotheses. There was no support for the relationship between CQ and PU (H3b); this is similar to the results obtained in the public university sample. Also, the hypothesized relationship between LV and behavioral intention (H6b) was rejected as the p-value for the relationship was above 0.1

SQ (H1d) and IQ (H2b) positively influenced the private university students’ perceived usefulness of the LMS with IQ having a larger effect on PU. The relationship between SQ and PEOU was

also significant. PU, PEOU, SI, and FC all positively influenced the students’ intention to use the LMS with PU having the greatest influence on BI followed closely by PEOU then FC.

Both FC and BI were found to have a positive and significant influence on the actual usage of the LMS by the private university students, with BI having a greater influence.

***Table 6. 8: Goodness of fit summary for the private university structural model***

## Fit Index Recommended

**Value**

## Private University Sample

Non-significant

X2

at p < 0.05

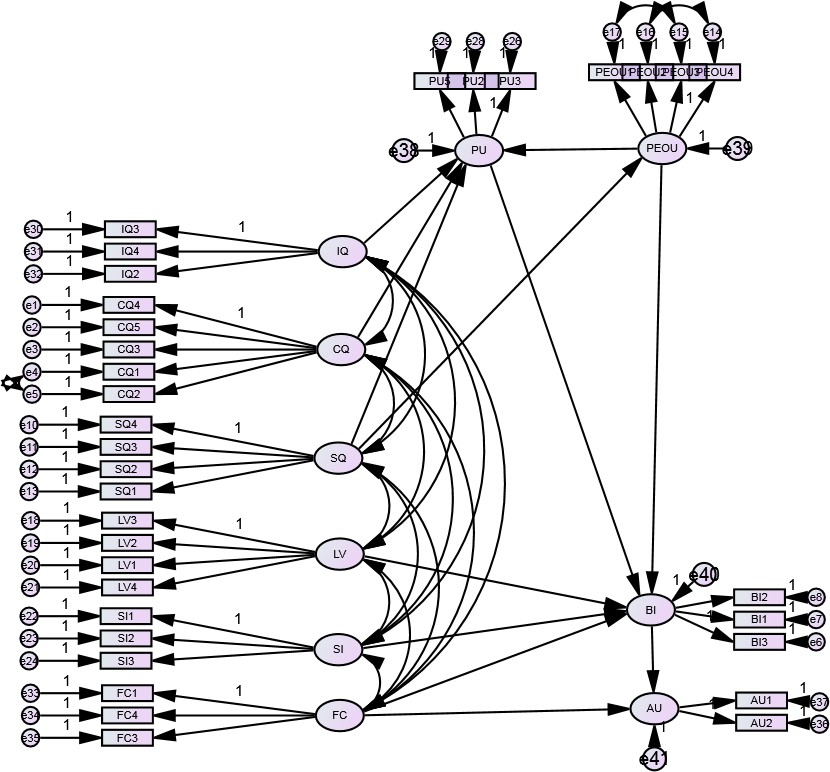
970.119

Degrees of freedom (df) N/A 497

X2/df < 5 1.952

|  |  |  |
| --- | --- | --- |
| Goodness-of-fit index (GFI) | > 0.90 | 0.906 |
| Adjusted Goodness-of-fit index (AGFI) | > 0.80 | 0.848 |
| Comparative fit index (CFI) | > 0.90 | 0.924 |
| Root mean square residuals (RMSR) | < 0.10 | 0.050 |
| Root mean square error of approximation  < 0.08 0.050 | | |
| (RMSEA) |  |  |
| Normed fit index (NFI) | > 0.908 | 0.913 |
| Parsimony normed fit index (PNFI) | > 0.60 | 0.759 |

### Figure 6. 5: Private university sample structural model



***Table 6. 9: Summary of the hypotheses for the private university sample***

Hypothesis Relationship

Path Coefficient

P Result

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| H1b | SQ | PU | 0.107 | \* | Supported |
| H1d | SQ | PEOU | 0.135 | \*\* | Supported |
| H2b | IQ | PU | 0.110 | \*\* | Supported |
| H3b | CQ | PU | 0.028 | 0.637 | Not Supported |
| H4b | PU | BI | 0.366 | \*\*\* | Supported |
| H5b | PEOU | PU | 0.169 | \*\*\* | Supported |
| H5d | PEOU | BI | 0.265 | \*\*\* | Supported |
| H6b | LV | BI | 0.012 | 0.825 | Not Supported |
| H7b | SI | BI | 0.102 | \* | Supported |
| H8b | FC | BI | 0.226 | \*\*\* | Supported |
| H8d | FC | AU | 0.225 | \*\*\* | Supported |
| H9b | BI | AU | 0.307 | \*\*\* | Supported |

*Supported: \* = p < 0.1; \*\* = p < 0.05; \*\*\* = p < 0.01; Not Supported: p > 0.1*

In this section, both the private and the public samples measured goodness-of-fit indices were within the recommended levels, and as such, there was no need to refine the models. For each sample, there were 12 hypotheses tested, and in both samples, the relationships between CQ and LV on PU and BI respectively were not supported. Furthermore, the paths SQ to PU, IQ to PU, and PU to BI were not significant in the public university sample. All other relationships were positive and significant in both samples.

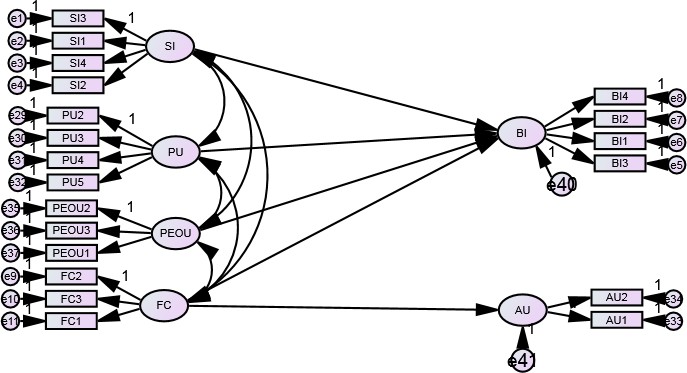
The next section tests the hypotheses involving the effect of the moderators; age, gender, and experience on the relationship between (PU, PEOU, SI, and SI) and BI in both samples.

## Testing the effect of the Moderators

This section tests the hypotheses involving the effect of the moderators; age, gender, and experience on the relationship between (PU, PEOU, SI, and SI) and BI in both samples. A summary of the hypothesis, as discussed earlier, is shown below:

* + - **H10a:** *The influence of perceived usefulness on the behavioral intention of public university students to use the LMS will be moderated by gender such that the influence will be stronger in male students.*
    - **H10b:** *The influence of perceived usefulness on the behavioral intention of private university students to use the LMS will be moderated by gender such that the influence will be stronger in male students.*
    - **H10c:** *The influence of perceived ease of use on the behavioral intention of public university students to use the LMS will be moderated by gender such that the influence will be stronger in female students.*
    - **H10d:** *The influence of perceived ease of use on the behavioral intention of private university students to use the LMS will be moderated by gender such that the influence will be stronger in female students.*
    - **H10e:** The influence of s*ocial influence on the behavioral intention of public university students to use the LMS will be moderated by gender such that the influence will be stronger in female students.*
    - **H10f:** The influence of s*ocial influence on the behavioral intention of private university students to use the LMS will be moderated by gender such that the influence will be stronger in female students.*
    - **H11a:** *The influence of perceived ease of use on the behavioral intention of public university students to use the LMS will be moderated by experience such that the influence will be stronger in students with limited experience.*
    - **H11b:** *The influence of perceived ease of use on the behavioral intention of private university students to use the LMS will be moderated by experience such that the influence will be stronger in students with limited experience.*
    - **H11c:** The influence of s*ocial influence on the behavioral intention of public university students to use the LMS will be moderated by experience such that the influence will be stronger in student with limited experience.*
    - **H11d:** The influence of s*ocial influence on the behavioral intention of private university students to use the LMS will be moderated by experience such that the influence will be stronger in student with limited experience.*
    - **H11e:** *The influence of facilitating conditions on the actual usage of the LMS by public university students will be moderated by experience, such that the influence will be stronger in students with limited experience.*
    - **H11f:** *The influence of facilitating conditions on the actual usage of the LMS by private university students will be moderated by experience, such that the influence will be stronger in students with limited experience.*
    - **H12a:** *The influence of perceived usefulness on the behavioral intention of public university students to use the LMS will be moderated by age such that the influence will be stronger in younger students.*
    - **H12b:** *The influence of perceived usefulness on the behavioral intention of private university students to use the LMS will be moderated by age such that the influence will be stronger in younger students.*
    - **H12c:** *The influence of perceived ease of use on the behavioral intention of public university students to use the LMS will be moderated by age such that the influence will be stronger in older students.*
    - **H12d:** *The influence of perceived ease of use on the behavioral intention of private university students to use the LMS will be moderated by age such that the influence will be stronger in older students.*
    - **H12e:** The influence of s*ocial influence on the behavioral intention of public university students to use the LMS will be moderated by age such that the influence will be stronger in older students.*
    - **H12f:** The influence of s*ocial influence on the behavioral intention of private university students to use the LMS will be moderated by age such that the influence will be stronger in older students.*
    - **H12g:** *The influence of facilitating conditions on the actual usage of the LMS by public university students will be moderated by age, such that the influence will be stronger in older students.*
    - **H12h:** *The influence of facilitating conditions on the actual usage of the LMS by private university students will be moderated by age, such that the influence will be stronger in older students.*

To investigate the effects of the moderators on the hypothesized relationships, multi-group analysis was used. Multi-group analysis involves the creation of subsamples from the original sample and then running the same analysis as done previously with the parent sample using the same structural model. Finally, the path coefficients for the subgroup pairs will then be compared against each other in order to solicit for the support of the respective hypothesis.



### Figure 6. 6: Structural model for the hypothesis testing of the moderators

The structural model shown in Figure 6.6 was used to determine the path coefficients of the relationships hypothesized, and significance was established via the z-score.

### Public University Sample

This section presents the findings of the moderating effect of the demographic factors (gender, age, and experience) on the some of the factors responsible for the public university student’s behavioral intention to use the LMS.

### Gender

In the public university sample, gender, which is categorical in nature, was divided into 2 groups, male and female. Male was coded as 1 and female coded as 2. From a total of 738 students in the public university sample, 481 were males while the remaining 257 were females. As mentioned earlier, multi-group analysis was used; therefore, for each group, data fit tests were carried out as well as reliability and validity tests. Table 6.10, 6.11, 6.12, and table 6.13 show the results of the data fit tests and the reliability and validity tests for both the public university male and female student samples. The results show a good fit (table 6.10 and table 6.12) as all measured indices are within the recommended value and reliability is established as all the CR values are over 0.7. Also, convergent validity is supported as the AVE values are above 0.5, and CR is higher than the corresponding AVE values. Finally, as the MSV values are less than the corresponding AVE values, discriminant validity is established.

### Table 6. 10: Goodness of fit indices for the public university (male Students)

|  |  |
| --- | --- |
| CMIN/Df | 3.19 |
| RMR | 0.027 |
| GFI | 0.904 |
| AGFI | 0.869 |
| NFI | 0.912 |
| CFI | 0.937 |
| PNFI | 0.744 |
| RMSEA | 0.068 |

***Table 6. 11: Factor correlation matrix for the public university (male Students)***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CR** | | **AVE** | **MSV** | **BI** | **FC** | **PEOU** | **PU** | **AU SI** | |
| **BI** | 0.86 | 0.61 | 0.33 | **0.78** |  |  |  |  |  |
| **FC** | 0.91 | 0.77 | 0.02 | 0.10 | **0.88** |  |  |  |  |
| **PEOU** | 0.75 | 0.70 | 0.33 | 0.57 | 0.03 | **0.70** |  |  |  |
| **PU** | 0.87 | 0.63 | 0.02 | 0.11 | 0.00 | 0.13 | **0.79** |  |  |
| **AU** | 0.94 | 0.90 | 0.02 | 0.16 | 0.15 | 0.05 | -0.05 | **0.95** |  |
| **SI** | 0.91 | 0.72 | 0.22 | 0.47 | 0.09 | 0.45 | -0.15 | 0.10 | **0.85** |

### Table 6. 12: Goodness of fit indices for the public university (Female Students)

|  |  |
| --- | --- |
| CMIN/Df | 1.925 |
| RMR | 0.023 |
| GFI | 0.902 |
| AGFI | 0.867 |
| NFI | 0.896 |
| CFI | 0.946 |
| PNFI | 0.731 |
| RMSEA | 0.06 |

***Table 6. 13: Factor correlation matrix for the public university (female Students)***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **CR** | **AVE** | **MSV** | **BI** | **FC** | **PEOU** | **PU** | **AU** | **SI** |
| **BI** | 0.90 | 0.69 | 0.35 | **0.83** |  |  |  |  |  |
| **FC** | 0.91 | 0.78 | 0.03 | 0.04 | **0.88** |  |  |  |  |
| **PEOU** | 0.73 | 0.68 | 0.35 | 0.59 | -0.01 | **0.69** |  |  |  |
| **PU** | 0.78 | 0.67 | 0.05 | 0.05 | 0.03 | 0.22 | **0.69** |  |  |
| **AU** | 0.79 | 0.65 | 0.07 | 0.26 | 0.16 | 0.27 | 0.16 | **0.81** |  |
| **SI** | 0.90 | 0.69 | 0.28 | 0.50 | 0.03 | 0.53 | -0.01 | 0.21 | **0.83** |

The multi-group analysis result is shown in table 6.14. There was no support that gender moderates any of the hypothesized relationships in the public university sample. Thus H10a, H10c, and H10e were all rejected as gender does not moderate the relationship of PU, PEOU, and SI on the public university students’ behavioral intention to use the LMS.

***Table 6. 14: Gender multi-group analysis for the public university sample***

## Hypothesis Relationship

**Gender: Male Gender: Female**

## z-

**Estimate P Estimate P**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | **score** |  |
| **H10a** | PU |  | BI | 0.105 | 0.032 | -0.072 | 0.454 | -1.640 | **Rejected** |
| **H10c** | PEOU |  | BI | 0.562 | 0.000 | 0.654 | 0.000 | 0.604 | **Rejected** |
| **H10e** | SI |  | BI | 0.226 | 0.000 | 0.209 | 0.001 | -0.234 | **Rejected** |

## Result

### Age

In the public university sample, age, which is categorical in nature, was divided into 2 groups, under 25 years of age (younger students) and over 25 years of age (older students). Younger students were coded as 1 and older students coded as 2. From a total of 738 students in the public university sample, 247 were younger students, while the remaining 491 were older students. As mentioned earlier, multi-group analysis was used; therefore, for each group, data fit tests were carried out as well as reliability and validity tests. Table 6.15, 6.16, 6.17, and table 6.18 show the results of the data fit tests and the reliability and validity tests for both the public university younger and older students’ samples. The results show acceptable fit indices (table 6.15 and table 6.17) as all measured items are within the recommended value and reliability is established as all the CR values are over 0.7. Also, convergent validity is supported as the AVE values are above 0.5, and CR is higher than the corresponding AVE values. Finally, as the MSV values are less than the corresponding AVE values, discriminant validity is established.

### Table 6. 15: Goodness of fit indices for the public university (younger Students)

|  |  |
| --- | --- |
| CMIN/Df | 1.875 |
| RMR | 0.026 |
| GFI | 0.898 |
| AGFI | 0.862 |
| NFI | 0.902 |
| CFI | 0.951 |
| PNFI | 0.736 |
| RMSEA | 0.06 |

***Table 6. 16: Factor correlation matrix for the public university (younger students)***

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **CR** | **AVE** | **MaxR(H)** | **BI** | **FC** |  | **PEOU PU** | **AU** | **SI** |  |
| **BI** | 0.89 | 0.68 | 0.91 | **0.82** |  |  |  |  |  |  |
| **FC** | 0.92 | 0.80 | 0.96 | 0.12 |  | **0.89** |  |  |  |  |
| **PEOU** | 0.74 | 0.69 | 0.96 | 0.54 |  | 0.06 | **0.70** |  |  |  |
| **PU** | 0.86 | 0.60 | 0.97 | 0.18 |  | 0.04 | 0.14 **0.77** |  |  |  |
| **AU** | 0.81 | 0.68 | 0.98 | 0.23 |  | 0.25 | 0.13 0.11 | **0.83** |  |  |
| **SI** | 0.90 | 0.70 | 0.98 | 0.49 |  | 0.16 | 0.48 -0.08 | 0.12 |  | **0.84** |

### Table 6. 17: Goodness of fit indices for the public university (older Students)

|  |  |
| --- | --- |
| CMIN/Df | 2.948 |
| RMR | 0.022 |
| GFI | 0.914 |
| AGFI | 0.884 |
| NFI | 0.915 |
| CFI | 0.942 |
| PNFI | 0.746 |
| RMSEA | 0.063 |

***Table 6. 18: Factor correlation matrix for the public university (older students)***

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **CR** | **AVE** | **MaxR(H)** | **BI** | **FC** |  | **PEOU PU** | **AU** | **SI** |  |
| **BI** | 0.87 | 0.62 | 0.89 | **0.79** |  |  |  |  |  |  |
| **FC** | 0.90 | 0.76 | 0.95 | 0.05 |  | **0.87** |  |  |  |  |
| **PEOU** | 0.74 | 0.69 | 0.95 | 0.60 |  | 0.00 | **0.70** |  |  |  |
| **PU** | 0.83 | 0.55 | 0.96 | 0.05 |  | 0.01 | 0.16 **0.74** |  |  |  |
| **AU** | 0.87 | 0.78 | 0.79 | 0.18 |  | 0.15 | 0.09 -0.02 | **0.88** |  |  |
| **SI** | 0.91 | 0.72 | 0.94 | 0.48 |  | 0.01 | 0.49 -0.11 | 0.13 |  | **0.85** |

The multi-group analysis result is shown in table 6.19. There were 4 hypotheses posed with regards to age as a moderator of the influence of the acceptance factors on behavioral intention and actual usage. Only the relationship between PU on BI was found to be moderated by age; thus, hypothesis H12a was supported as the relationship is stronger in younger students. There was no significant difference in the relationship between older and younger students perceived ease of use and social influence on their behavioral intention to use the LMS. Similarly, there was no significant difference between public university older and younger students’ perception of facilitating conditions on their actual use of the LMS. Therefore, the relationships H12c, H12e, and H12g were all rejected.

***Table 6. 19: Age multi-group analysis for the public university sample***

## Hypothesis Relationship

**Age: Old Age: Young**

## Estimate P Estimate P z-score

**Result**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **H12a** | PU |  | BI | -0.007 | 0.901 | 0.193 | 0.013 | 2.122\*\* | **Supported** |
| **H12c** | PEOU |  | BI | 0.630 | 0.000 | 0.505 | 0.000 | -0.850 | **Rejected** |
| **H12e** | SI |  | BI | 0.196 | 0.000 | 0.255 | 0.000 | 0.802 | **Rejected** |
| **H12g** | FC |  | AU | 0.171 | 0.001 | 0.183 | 0.002 | 0.156 | **Rejected** |

### Experience

In the public university sample, experience which is categorical in nature was divided into 2 groups, students who have used the LMS for under 1 year (low experience) and students who have used the LMS for over 1 year (high experience). Low experience students were coded as 1 and those grouped as high experience students coded as 2. From a total of 738 students in the public university sample, 347 were low experience students while the remaining 391 were grouped as high experience students. As mentioned earlier, multi-group analysis was used; therefore, for each group, data fit tests were carried out as well as reliability and validity tests. Table 6.20, 6.21, 6.22, and table 6.23 show the results of the data fit tests and the reliability and validity tests for both the public university younger and older students’ samples. The results show acceptable fit indices (table 6.20 and table 6.22) as all measured items are within the recommended value and reliability is established as all the CR values are over 0.7. Also, convergent validity is supported as the AVE values are above 0.5, and CR is higher than the corresponding AVE values. Finally, as the MSV values are less than the corresponding AVE values, discriminant validity is established.

### Table 6. 20: Goodness of fit indices for the public university (high experience)

|  |  |
| --- | --- |
| CMIN/Df | 2.312 |
| RMR | 0.024 |
| GFI | 0.918 |
| AGFI | 0.889 |
| NFI | 0.992 |
| CFI | 0.954 |
| PNFI | 0.752 |
| RMSEA | 0.058 |

***Table 6. 21: Factor correlation matrix for the public university (high experience)***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **CR** | **AVE** | **MSV** | **BI** | **FC** | **PEOU** | **PU** | **AU** | **SI** |
| **BI** | 0.879 | 0.646 | 0.373 | **0.804** |  |  |  |  |  |
| **FC** | 0.913 | 0.777 | 0.029 | 0.103 | **0.882** |  |  |  |  |
| **PEOU** | 0.761 | 0.516 | 0.373 | 0.611 | 0.053 | **0.719** |  |  |  |
| **PU** | 0.845 | 0.578 | 0.022 | 0.122 | 0.000 | 0.085 | **0.760** |  |  |
| **AU** | 0.869 | 0.773 | 0.029 | 0.167 | 0.169 | 0.095 | 0.025 | **0.879** |  |
| **SI** | 0.917 | 0.734 | 0.260 | 0.468 | 0.021 | 0.510 | -0.149 | 0.105 | **0.857** |

### Table 6. 22: Goodness of fit indices for the public university (low experience)

|  |  |
| --- | --- |
| CMIN/Df | 2.323 |
| RMR | 0.022 |
| GFI | 0.905 |
| AGFI | 0.872 |
| NFI | 0.902 |
| CFI | 0.941 |
| PNFI | 0.736 |
| RMSEA | 0.062 |

***Table 6. 23: Factor correlation matrix for the public university (low experience)***

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **CR** | **AVE** | **MSV** | **BI** | **FC** | **PEOU** | **PU** | **AU** | **SI** |  |
| **BI** | 0.87 | 0.62 | 0.28 |  | **0.79** |  |  |  |  |  |
| **FC** | 0.91 | 0.76 | 0.03 |  | 0.03 **0.87** |  |  |  |  |  |
| **PEOU** | 0.71 | 0.66 | 0.28 |  | 0.53 -0.04 | **0.68** |  |  |  |  |
| **PU** | 0.83 | 0.56 | 0.06 |  | 0.06 0.05 | 0.25 | **0.75** |  |  |  |
| **AU** | 0.83 | 0.71 | 0.05 |  | 0.22 0.19 | 0.13 | 0.02 | **0.84** |  |  |
| **SI** | 0.90 | 0.69 | 0.24 |  | 0.49 0.09 | 0.43 | -0.05 | 0.15 |  | **0.83** |

The multi-group analysis result is shown in table 6.24. There were 3 hypotheses posed with regards to experience as a moderator of the influence of the acceptance factors on behavioral intention and actual usage. There was no significant difference in the relationship between low and high experienced students’ perceived ease of use and social influence on their behavioral intention to use the LMS. Similarly, there was no significant difference between public university low and high experienced students’ perception of facilitating conditions on their actual use of the LMS. Therefore, the relationships H11a, H1c, and H11e were all rejected.

***Table 6. 24: Usage experience multi-group analysis for the public university sample***

## Experience:

**High**

## Experience:

**Low**

## Hypothesis Relationship

**z-**

## Results

**Estimate P Estimate P**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | **score** |  |
| **H11a** | PEOU |  | BI | 0.636 | 0.000 | 0.547 | 0.000 | -0.633 | **Rejected** |
| **H11c** | SI |  | BI | 0.199 | 0.000 | 0.241 | 0.000 | 0.608 | **Rejected** |
| **H11e** | FC |  | AU | 0.161 | 0.003 | 0.193 | 0.001 | 0.401 | **Rejected** |

### Private University Sample

This section presents the findings of the moderating effect of the demographic factors (gender, age, and experience) on the some of the factors responsible for the private university student’s behavioral intention to use the LMS.

### Gender

In the private university sample, gender, which is categorical in nature, was divided into 2 groups, male and female. Male students were coded as 1 and, female students coded as 2. From a total of 378 students in the private university sample, 231 were male students, while the remaining 147 were female students. As mentioned earlier, multi-group analysis was used; therefore, for each group, data fit tests were carried out as well as reliability and validity tests. Table 6.25, 6.26, 6.27, and table 6.28 show the results of the data fit tests and the reliability and validity tests for both the

public university younger and older students’ samples. The results show acceptable fit indices (table 6.25 and table 6.27) as all measured items are within the recommended value and reliability is established as all the CR values are over 0.7. Also, convergent validity is supported as the AVE values are above 0.5, and CR is higher than the corresponding AVE values. Finally, as the MSV values are less than the corresponding AVE values, discriminant validity is established.

### Table 6. 25: Goodness of fit indices for the private university (male)

|  |  |
| --- | --- |
| CMIN/Df | 2.013 |
| RMR | 0.032 |
| GFI | 0.904 |
| AGFI | 0.867 |
| NFI | 0.905 |
| CFI | 0.938 |
| PNFI | 0.717 |
| RMSEA | 0.066 |

***Table 6. 26: Factor correlation matrix for the private university (male students)***

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **CR** | **AVE** | **MSV** | **BI** | **SI** |  | **FC PU** |  | **AU** | **PEOU** |
| **BI** | 0.88 | 0.72 | 0.29 | **0.85** |  |  |  |  |  |  |
| **SI** | 0.90 | 0.74 | 0.09 | 0.21 |  | **0.86** |  |  |  |  |
| **FC** | 0.84 | 0.63 | 0.13 | 0.30 |  | -0.20 | **0.79** |  |  |  |
| **PU** | 0.74 | 0.59 | 0.29 | 0.54 |  | 0.15 | 0.07 | **0.70** |  |  |
| **AU** | 0.88 | 0.79 | 0.21 | 0.46 |  | 0.14 | 0.35 | 0.29 | **0.89** |  |
| **PEOU** | 0.81 | 0.53 | 0.09 | 0.26 |  | 0.30 | -0.05 | 0.17 | 0.19 | **0.73** |

### Table 6. 27: Goodness of fit indices for the private university (female students)

|  |  |
| --- | --- |
| CMIN/Df | 1.789 |
| RMR | 0.026 |
| GFI | 0.863 |
| AGFI | 0.911 |
| NFI | 0.922 |
| CFI | 0.91 |
| PNFI | 0.666 |
| RMSEA | 0.074 |

***Table 6. 28: Factor correlation matrix for the private university (female students)***

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **CR** | **AVE** | **MSV** | **BI** | **SI** |  | **FC PU** |  | **AU** | **PEOU** |
| **BI** | 0.86 | 0.67 | 0.26 | **0.82** |  |  |  |  |  |  |
| **SI** | 0.81 | 0.59 | 0.03 | 0.06 |  | **0.77** |  |  |  |  |
| **FC** | 0.79 | 0.56 | 0.08 | 0.14 |  | -0.09 | **0.75** |  |  |  |
| **PU** | 0.78 | 0.55 | 0.13 | 0.36 |  | 0.04 | 0.29 | **0.74** |  |  |
| **AU** | 0.81 | 0.67 | 0.02 | 0.13 |  | -0.11 | 0.05 | 0.15 | **1.11** |  |
| **PEOU** | 0.85 | 0.59 | 0.26 | 0.51 |  | 0.17 | -0.03 | 0.29 | 0.08 | **0.77** |

The multi-group analysis result is shown in table 6.29. There were 3 hypotheses posed with regards to gender as a moderator of the influence of the acceptance factors on behavioral intention. Only the relationship between PEOU on BI was found to be moderated by gender; thus, hypothesis H10d was supported as the relationship is stronger (0.464) in female students compared to the male students (0.164), also for both groups, the relationship between PEOU and BI is significant. There was a significant difference in the relationship between male and female students’ perceived usefulness on their behavioral intention to use the LMS, but the hypothesis (H10b) was rejected as the relationship is stronger for male students. There was no support for the final hypothesis (H10f), the relationship between SI and BI, as the difference was not significant, thereby rejecting H10f.

***Table 6. 29: Gender multi-group analysis for the private university sample***

## Hypothesis Relationship

**Gender: Male Gender: Female**

## Estimate P Estimate P z-score

**Result**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **H10b** | PU |  | BI | 0.868 | 0.000 | 0.284 | 0.035 | -2.929\*\*\* | **Rejected** |
| **H10d** | PEOU |  | BI | 0.164 | 0.031 | 0.464 | 0.000 | 2.417\*\* | **Supported** |
| **H10f** | SI |  | BI | 0.163 | 0.026 | -0.021 | 0.821 | -1.573 | **Rejected** |

### Age

In the private university sample, age, which is categorical in nature, was divided into 2 groups, under 25 years of age (younger students) and over 25 years of age (older students). Younger students were coded as 1 and older students coded as 2. From a total of 378 students in the public university sample, 212 were younger students, while the remaining 166 were older students. As mentioned earlier, multi-group analysis was used; therefore, for each group, data fit tests were carried out as well as reliability and validity tests. Table 6.30, 6.31, 6.32, and table 6.33 show the results of the data fit tests and the reliability and validity tests for both the public university younger and older students’ samples. The results show acceptable fit indices (table 6.30 and table 6.32) as all measured items are within the recommended value and reliability is established as all the CR values are over 0.7. Also, convergent validity is supported as the AVE values are above 0.5, and CR is higher than the corresponding AVE values. Finally, as the MSV values are less than the corresponding AVE values, discriminant validity is established.

### Table 6. 30: Goodness of fit indices for the private university (older students)

|  |  |
| --- | --- |
| CMIN/Df | 1.958 |
| RMR | 0.024 |
| GFI | 0.882 |
| AGFI | 0.832 |
| NFI | 0.833 |
| CFI | 0.908 |
| PNFI | 0.653 |
| RMSEA | 0.076 |

***Table 6. 31: Factor correlation matrix for the private university (older students)***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **CR** | **AVE** | **BI** | **SI** | **FC** |  | **PU** | **AU** | **PEOU** |
| **BI** | 0.85 | 0.65 | **0.80** |  |  |  |  |  |  |
| **SI** | 0.83 | 0.63 | 0.20 |  | **0.79** |  |  |  |  |
| **FC** | 0.86 | 0.66 | 0.27 |  | -0.16 | **0.82** |  |  |  |
| **PU** | 0.74 | 0.59 | 0.64 |  | 0.20 | 0.25 | **0.70** |  |  |
| **AU** | 0.82 | 0.70 | 0.30 |  | 0.10 | 0.28 | 0.25 | **0.84** |  |
| **PEOU** | 0.80 | 0.52 | 0.23 |  | 0.23 | 0.08 | 0.22 | 0.15 | **0.72** |

### Table 6. 32: Goodness of fit indices for the private university (younger students)

|  |  |
| --- | --- |
| CMIN/Df | 2.161 |
| RMR | 0.023 |
| GFI | 0.885 |
| AGFI | 0.837 |
| NFI | 0.877 |
| CFI | 0.929 |
| PNFI | 0.688 |
| RMSEA | 0.074 |

***Table 6. 33: Factor correlation matrix for the private university (younger students)***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **CR** | **AVE** | **BI** | **SI** |  | **FC PU** |  | **AU** | **PEOU** |
| **BI** | 0.90 | 0.75 | **0.87** |  |  |  |  |  |  |
| **SI** | 0.89 | 0.72 | 0.15 |  | **0.85** |  |  |  |  |
| **FC** | 0.79 | 0.56 | 0.20 |  | -0.13 | **0.75** |  |  |  |
| **PU** | 0.77 | 0.54 | 0.29 |  | 0.09 | 0.02 | **0.73** |  |  |
| **AU** | 0.90 | 0.82 | 0.37 |  | 0.09 | 0.27 | 0.28 | **0.90** |  |
| **PEOU** | 0.84 | 0.58 | 0.44 |  | 0.28 | -0.17 | 0.24 | 0.13 | **0.76** |

The multi-group analysis result is shown in table 6.34. There were 4 hypotheses posed with regards to age as a moderator of the influence of the acceptance factors on behavioral intention to use the LMS. Only the relationship between PU on BI was found to be moderated by age to a significant level thus hypothesis H12b was supported as the relationship is stronger (0.934) in the older students group compared to the younger students (0.312), also for both groups, the relationship between PU and BI is significant. There was a significant difference in the relationship between older and younger students’ perceived ease of use on their behavioral intention to use the LMS, but the hypothesis (H12d) was rejected as the relationship is stronger for younger students. While the estimates for H12f and H12h were stronger for the older students, both hypotheses were rejected, as the difference between the 2 groups is not significant.

***Table 6. 34: Age multi-group analysis for the private university sample***

## Hypothesis Relationship

**Age: Old Age: Young**

## Estimate P Estimate P z-score

**Results**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **H12b** | PU |  | BI | 0.934 | 0.000 | 0.312 | 0.008 | -2.843\*\*\* | **Supported** |
| **H12d** | PEOU |  | BI | 0.074 | 0.405 | 0.485 | 0.000 | 3.311\*\*\* | **Rejected** |
| **H12f** | SI |  | BI | 0.100 | 0.288 | 0.049 | 0.510 | -0.428 | **Rejected** |
| **H12h** | FC |  | AU | 0.318 | 0.000 | 0.291 | 0.002 | -0.206 | **Rejected** |

### Experience

In the private university sample, experience, which is categorical in nature, was divided into 2 groups, students who have used the LMS for under 1 year (low experience) and students who have used the LMS for over 1 year (high experience). Low experience students were coded as 1 and those grouped as high experience students coded as 2. From a total of 378 students in the public university sample, 224 were low experience students while the remaining 154 were grouped as high experience students. As mentioned earlier, multi-group analysis was used; therefore, for each group, data fit tests were carried out as well as reliability and validity tests. Table 6.35, 6.36, 6.37, and table 6.38 show the results of the data fit tests and the reliability and validity tests for both the public university younger and older students’ samples. The results show acceptable fit indices (table 6.35 and table 6.37) as all measured items are within the recommended value and reliability is established as all the CR values are over 0.7. Also, convergent validity is supported as the AVE values are above 0.5, and CR is higher than the corresponding AVE values. Finally, as the MSV values are less than the corresponding AVE values, discriminant validity is established.

### Table 6. 35: Goodness of fit indices for the private university (high experience)

|  |  |
| --- | --- |
| CMIN/Df | 1.391 |
| RMR | 0.027 |
| GFI | 0.896 |
| AGFI | 0.857 |
| NFI | 0.861 |
| CFI | 0.956 |
| PNFI | 0.698 |
| RMSEA | 0.051 |

***Table 6. 36: Factor correlation matrix for the private university (high experience)***

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **CR** | **AVE** | **MSV** | **BI** | **SI** |  | **FC PU** |  | **AU** | **PEOU** |
| **BI** | 0.85 | 0.66 | 0.31 | **0.81** |  |  |  |  |  |  |
| **SI** | 0.86 | 0.67 | 0.06 | 0.19 |  | **0.82** |  |  |  |  |
| **FC** | 0.84 | 0.64 | 0.16 | 0.41 |  | -0.06 | **0.80** |  |  |  |
| **PU** | 0.71 | 0.56 | 0.31 | 0.56 |  | 0.16 | 0.14 | **0.68** |  |  |
| **AU** | 0.82 | 0.69 | 0.15 | 0.39 |  | 0.09 | 0.30 | 0.14 | **0.83** |  |
| **PEOU** | 0.78 | 0.50 | 0.07 | 0.07 |  | 0.25 | -0.08 | 0.26 | 0.16 | **0.71** |

### Table 6. 37: Goodness of fit indices for the private university (low experience)

|  |  |
| --- | --- |
| CMIN/Df | 2.015 |
| RMR | 0.023 |
| GFI | 0.897 |
| AGFI | 0.853 |
| NFI | 0.888 |
| CFI | 0.939 |
| PNFI | 0.696 |
| RMSEA | 0.067 |

***Table 6. 38: Factor correlation matrix for the private university (low experience)***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **CR** | **AVE** | **MSV** | **BI** | **SI** | **FC** | **PU** | **AU** | **PEOU** |
| **BI** | 0.890 | 0.730 | 0.270 | **0.854** |  |  |  |  |  |
| **SI** | 0.870 | 0.691 | 0.071 | 0.158 | **0.832** |  |  |  |  |
| **FC** | 0.808 | 0.587 | 0.120 | 0.115 | -0.215 | **0.766** |  |  |  |
| **PU** | 0.781 | 0.551 | 0.174 | 0.417 | 0.097 | 0.183 | **0.742** |  |  |
| **AU** | 0.899 | 0.821 | 0.120 | 0.313 | 0.052 | 0.346 | 0.213 | **0.906** |  |
| **PEOU** | 0.847 | 0.589 | 0.270 | 0.520 | 0.267 | -0.049 | 0.211 | 0.074 | **0.767** |

The multi-group analysis result is shown in table 6.39. There were 3 hypotheses posed with regards to experience of use as a moderator of the influence of the acceptance factors on behavioral intention and actual usage. Only the relationship between PEOU on BI was found to be moderated by usage experience to a significant level thus hypothesis H11b was supported as the relationship is stronger (0.491) in less experienced students compared to the students with more experience (- 0.089). There was no support for H11d and H11f as the differences between the 2 groups is not significant.

***Table 6. 39: Usage experience multi-group analysis for the private university sample***

## Hypothesis Relationship

**Experience: High**

## Experience:

**Low Results**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | **Estimate** | **P** | **Estimate** | **P** | **z-score** |  |
| **H11b** | PEOU  | BI | -0.089 | 0.388 | 0.491 | 0.000 | 4.518\*\*\* | **Supported** |
| **H11d** | SI  | BI | 0.186 | 0.077 | 0.030 | 0.657 | -1.243 | **Rejected** |
| **H11f** | FC  | AU | 0.365 | 0.000 | 0.277 | 0.001 | -0.639 | **Rejected** |

## Chapter Summary

This chapter tests the hypotheses proposed in chapter 3, but in order to test the hypotheses, certain tests were performed to ensure that the data collected fits the model and that the data was reliable and valid. Based on the confirmatory factor analysis, 9 items were removed from both the public sample (PU1, IQ1, AU3, SQ2, LV2, FC4, CQ4, CQ5, and PEOU4) and the private sample (PU1, IQ1, AU3, SI4, LV5, BI4, PU4, IQ5, and FC2). Goodness-of-fit tests, as well as convergent and discriminant validity tests, were also performed on the measurement, and structural models and, all values obtained were found to be within the recommended values.

The structural model was evaluated so as to test the construct relationships hypothesized in the conceptual model. The path models indicated that for the public university, 7 out of 12 hypotheses were supported while in the private university sample, 10 out of the 12 hypotheses were accepted. Table 6.40 summarizes the hypotheses tested and the results obtained for both samples.

***Table 6. 40: Summary of the direct hypotheses results***

## SUMMARY OF RESULTS

**Research Hypothesis**

## Public University

**Private University**

(H1a, b) System quality will have a positive and significant influence on students’ perceived usefulness.

Not Supported Supported

(H1c, d) System quality will have a positive and significant influence on students’ perceived ease of use.

Supported Supported

(H2a, b) Instructor quality will have a positive and significant influence on students’ perceived usefulness.

Not Supported Supported

(H3a, b) Course quality will have a positive and significant influence on students’ perceived usefulness.

Not Supported Not Supported

(H4a, b) Perceived usefulness will have a positive and significant influence on students’ behavioral intention to use the LMS.

Not Supported Supported

(H5a, b) Perceived ease of use will have a positive and significant influence on students’ perceived usefulness of the LMS

Supported Supported

(H5c, d) Perceived ease of use will have a positive and significant influence on students’ behavioral intention to use the LMS.

Supported Supported

(H6a, b) Learning value will have a positive and significant influence on students’ behavioral intention to use the LMS.

Not Supported Not Supported

(H7a, b) Social influence will have a positive and significant influence on students’ behavioral intention to use the LMS.

Supported Supported

(H8a, b) Facilitating conditions will have a positive and significant influence on students’ behavioral intention to use the LMS.

Supported Supported

(H8c, d) Facilitating conditions will have a positive and significant influence on students’ actual usage of the LMS.

Supported Supported

(H9a, b) Students’ behavioral intention will have a positive and significant influence on their actual usage of the LMS.

Supported Supported

After testing the direct relationships, the next step was to test the effects of the moderating variables on the hypothesized relationships. Table 6.41 summarizes the effects the moderating variables have on the relationships hypothesized for both samples. The next chapter presents the discussion, which is based on the results obtained in this section.

***Table 6. 41: Summary of the moderating effects on the hypotheses results***

## SUMMARY OF RESULTS

**Research Hypothesis**

## Public University

**Private University**

(H10a,b) The influence of perceived usefulness on the behavioral intention of students to use the LMS will be moderated by gender such that the influence will be stronger in male students.

Not Supported Not Supported

(H10c, d) The influence of perceived ease of use on the behavioral intention of students to use the LMS will be moderated by gender such that the influence will be stronger in female students.

Not Supported Supported

(H10e, f) The influence of social influence on the behavioral intention of students to use the LMS will be moderated by gender such that the influence will be stronger in female students

Not Supported Not Supported

(H11a, b) The influence of perceived ease of use on the behavioral intention of students to use the LMS will be moderated by experience such that the influence will be stronger in students with limited experience.

Not Supported Supported

(H11c, d) The influence of social influence on the behavioral intention of students to use the LMS will be moderated by experience such that the influence will be stronger in student with limited experience.

Not Supported Not Supported

(H11e, f) The influence of facilitating conditions on the actual usage of the LMS by students will be moderated by experience, such that the influence will be stronger in students with limited experience.

Not Supported Not Supported

(H12a, b) The influence of perceived usefulness on the behavioral intention of students to use the LMS will be moderated by age such that the influence will be stronger in younger students.

(H12c, d) The influence of perceived ease of use on the behavioral intention of students to use the LMS will be

Supported Supported

Not Supported Not Supported

moderated by age such that the influence will be stronger in older students.

(H12e, f) The influence of social influence on the behavioral intention of students to use the LMS will be moderated by age such that the influence will be stronger in older students.

Not Supported Not Supported

(H12g, h) The influence of facilitating conditions on the actual usage of the LMS by students will be moderated by age, such that the influence will be stronger in older students.

Not Supported Not Supported

# CHAPTER 7: DISCUSSION

## 7.1 Introduction

The 2 previous chapters presented the findings of the analysis conducted on the conceptual model in order to determine the factors responsible for the acceptance of the LMS used by students of public and private universities in northern Nigeria. Based on the two-step approach as recommended by Hair et al. (2015), confirmatory factor analysis (CFA) was used to evaluate the validity of the constructs used in the conceptual model and to test the model fit. The next step involved the application of structural equation modeling (SEM) to examine the hypothesized relationships between the constructs in the conceptual model and also to examine the effect of the moderating variables on some of the hypothesized relationships. The aim of this chapter is to discuss and provide a comprehensive explanation of the observations found in Chapters 5 and 6 based on the aims and objectives of this study.

The discussion chapter is grouped into 5 sections. Section 7.2 is dedicated to understanding the effects of the 3 quality antecedents on the usefulness and ease of use of the LMS in both the public and private university. Section 7.3 and 7.4 discusses how the behavioral, social, and organizational factors influence the public and private students’ intention to use the LMS as well as the determinants on actual usage of the LMS. Section 7.5 focuses on explaining the effects the moderators have on the selected relationships in the structural model. This is followed by section

7.5 where a detailed discussion is given on the comparison between public and private universities use of learning management systems.

## Discussion on the Indirect Determinants of behavioral intention: eLearning quality Antecedents

Nigerian students identified three quality antecedents in this study as being important factors that contribute towards the acceptance of LMS’. The quality antecedents are system quality, instructor quality, and course quality. This section is dedicated to discussing the relationships between the quality antecedents and the students’ perceived ease of use and perceived usefulness of the LMS. Figure 7.1 depicts the relationship between the quality factors and the students’ perceptions of the usefulness and ease of use of the system.

H3a,b

H2a,b

H1a,b

H1cd

Perceived Ease of Use

System Quality

Instructor Quality

Perceived Usefulness

Course Quality

### Figure 7. 1: Relationship between the quality antecedents and the students’ perceived ease of use and perceived usefulness of the LMS

Figure 7.1 shows that there are 4 paths to test for each sample (i.e., public and private university sample), thus making a total of 8 paths to test. The results of the 8 relationships are shown in table 7.1, and the findings indicate that out of the 8 paths tested, only 4 were supported. 3 of the supported relationships were in the private university sample, while just 1 relationship was supported in the public university sample.

In both samples, there was no support for the relationship between course quality and the usefulness of the LMS. However, in both samples, the system quality was found to influence the students’ perceived ease of using the system. Also, the relationship is stronger in the public university sample (γ=0.209\*\*\*). With regards to the relationship between system quality and the students’ perceived usefulness of the LMS, the relationship was positive and significant in the private sample only. Finally, instructor quality, in the private sample (γ=0.110\*\*), influenced students’ perception of the usefulness of the LMS.

In summary, the findings thus far indicate that there is a difference between the private and public university students in terms of the system quality, course quality, and instructor quality.

### Table 7. 1: Summary of the quality antecedent’s hypotheses tests

Hypothesis Relationship

Path Coefficient

P Result

University Type

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| H1a | SQ |  | PU | -0.008 | 0.847 | Not Supported | Public |
| H1b | SQ |  | PU | 0.107 | \* | Supported | Private |
| H1c | SQ |  | PEOU | 0.209 | \*\*\* | Supported | Public |
| H1d | SQ |  | PEOU | 0.135 | \*\* | Supported | Private |
| H2a | IQ |  | PU | 0.024 | 0.546 | Not Supported | Public |
| H2b | IQ |  | PU | 0.110 | \*\* | Supported | Private |
| H3a | CQ |  | PU | -0.361 | \*\*\* | Not Supported | Public |
| H3b | CQ |  | PU | 0.028 | 0.637 | Not Supported | Private |

The following subsections provide an in-depth discussion on the relationships illustrated in Figure

7.1 and table 7.1.

### System quality (SQ) and perceived usefulness (PU)

System quality was adopted from the DeLone, and McLean IS success model (DeLone & McLean, 1992; DeLone & McLean, 2003) and adapted to the context of eLearning. For the purpose of this research, system quality measures the students' perceptions of the functionality, reliability, usability, and efficiency of the LMS. In the DeLone and McLean IS success model, system quality influences behavioral intention and user satisfaction. In this study, however, the relationship is hypothesized to influence both perceived usefulness and perceived ease of use as it is believed that the higher the LMS quality, the more likely the LMS will be useful and easier to use by the students. This relationship is also supported by prior research, in the context of eLearning, (Shah & Attiq, 2016; Yang et al., 2017; Cheng, 2012; Choi et al., 2007; Pituch & Lee, 2006).

In both samples, and out of the 3 quality antecedents in the relationship with PU, SQ was the highest contributor to the explained variance of PU. But mixed results were obtained in this study based on the relationship between SQ and PU. Hypothesis H1a (public sample) was rejected while H1b (private sample) was accepted supporting previous research (Shah & Attiq, 2016; Yang et al., 2017).

### System quality and perceived ease of use

System quality was also hypothesized to have a positive and significant influence on PEOU. This relationship suggests that the higher the quality of the LMS, the easier it is for the students to use the system. This relationship is also supported by prior research, in the context of eLearning (Calisir et al., 2014: Chen, 2010; Cheng, 2012; Lwoga, 2014; Alsabawy et al., 2016).

Both samples support this relationship meaning that both sets of students believe that the ease of using the LMS is determined by the quality of the system; thus, H1c and H1d were both supported by the respective samples.

### Instructor quality (IQ) and perceived usefulness (PU)

Instructor quality captures the students’ perception of the instructor’s response time, teaching style, explanation, and helps towards students through their (students) use of LMS. According to Cheng (2012), instructors are important in the influencing learners’ behavior in the learning process as well as in using the eLearning system. Cheng, (2012) also states that “learners’ perceived satisfaction towards e-learning is positively affected by the instructor’s attitude that relates to the instructor’s response timeliness, teaching style, and explanation/help towards learners via the internet.” (Cheng, 2012, p.369).

In our study, IQ is hypothesized to influence the perceived usefulness of the LMS due to the role the instructor plays in the use of the LMS. This relationship also supports previous studies where IQ has been found to significantly influence PU (Lee et al., 2009; Cheng, 2012; Lwoga, 2014). The results from the hypotheses testing indicate that the private university students believe that their instructors contribute towards the usefulness of the LMS therefore hypothesis H2b is supported. There was no support for hypothesis H2a, meaning that the public university students do not believe that their instructors contribute towards the use of the LMS. This can possibly be explained by the fact that in the public universities, there is very little contact between the students and the instructors via the LMS, as highlighted in table 5.25. Tasks such as grading, discussion forums, announcements, and presentation slide are rarely or never used at all.

### Course quality and perceived usefulness

Course quality encompasses the students’ perceptions of the value of the course resources and the design of the course in order to meet the students learning requirements. Based on DeLone and

McLean IS success model, one of the success factors identified was the quality of the information produced by the system. According to DeLone and McLean (2003), “information quality was measured in terms of accuracy, timeliness, completeness, relevance, consistency” some of these measures would not apply in the context of eLearning systems and as such prior researchers have re-specified the information quality construct. An example is a study done by Cheng (2012), where he extended the D&M ISS model with constructs from TAM, Cheng (2012) combined course content quality and course design quality to form information quality in his study on the effects of quality antecedents on eLearning acceptance. The findings from Cheng’s study showed that “course content quality has significant effects on perceived usefulness and perceived ease of use while course design quality has a significant effect on perceived ease of use but and an insignificant effect on perceived usefulness. This study adopted the relationship between CQ and PU in our model but discarded the relationship between CQ and PEOU as there was no support in prior literature to support the significance of the relationship. Other researchers have supported the relationship between CQ and PU (Yang et al., 2017; Lwoga, 2014; Cheng, 2012).

In our study, the relationship between CQ and PU was not supported in the public university, even though the relationship is significant, it was rejected as the relationship was negative (γ =- 0.361\*\*\*). In the private university sample, the relationship was positive but not significant, thus rejecting hypotheses H3a and H3b. This indicates that both sets of students do not believe that the design and content of the courses contribute towards the usefulness of the LMS, which is an unexpected result. The reason could be that the course content and design in both sets of universities are poor and that the students do not attribute the usefulness of the LMS to the design and content of their respective courses.

## Discussion on the Direct Determinants of behavioral intention

This section discusses the students’ individual perceptions that lead to their behavioral intention to use their respective LMS. It discusses the results from the hypotheses tested by structural equation modeling on the model shown in Figure 7.2. A total of 6 hypotheses were tested in each sample (i.e., 12 hypotheses for both samples), and support was found for 9 relationships out of which 5 were in the private university while the remaining 4 in the public university sample.

H6a,b

H5a,b

H4a,b

H5c,d

9a,b

H

H7a,b

H8a,b

H8c,d

Facilitating Conditions

Actual Usage

Behavioral Intention

Perceived Ease of Use

Learning Value

Social Influence

Perceived Usefulness

### Figure 7. 2: Relationship between the individual perceptions and the students’ behavioral intention to use the LMS

* + 1. ***Perceived usefulness (PU)***

PU is one of the dependent constructs used in this study and derived from the Technology Acceptance Model (TAM). It is defined as “the degree to which a person believes that using a particular system would enhance his/her job performance” (Davis, 1989). In this study, PU is the student's perception that using the LMS will enhance learning effectiveness and performance. Similar to TAM, this study adopts the relationship between PU and BI.

With regards to the relationship between PU and BI, this study observed mixed results. In the public university sample, the relationship was not supported as p>0.1. This result is contrary to TAM (Davis, 1989) and other studies in the context of the acceptance of LMS’ and other eLearning systems (Elkaseh et al., 2016; Al-Gahtani, 2016). While this result is unexpected, an explanation could be found in table 5.25 which indicates that basic eLearning functionalities are absent in the public university LMS’s as the students claim that tasks such as grading, discussion forums, announcements and presentation slide are rarely or never used at all.

On the other hand, the relationship between PU and BI is supported in the private university sample (γ =0.366). The relationship to BI is also the strongest when compared to PEOU, LV, SI, and FC. This result shows that the private university students believe that the LMS is useful for their educational needs, and as a result, the LMS is more likely to be accepted.

In summary, H4a was rejected, and H4b supported. This could indicate that the use of generalized LMS (e.g. Canvas) as opposed to specific proprietary LMS (e.g. NOUN platform) are more likely to be useful to students educational needs.

### Perceived ease of use (PEOU)

PEOU is defined as "the degree to which a person believes that using a particular system would be free from effort" (Davis 1989). In the context of this study, PEOU is the students’ perception that learning to use the LMS is easy. PEOU, also derived from TAM, is hypothesized to have a positive and significant relationship with PU and BI (Davis, 1989). In the context of eLearning systems, other researchers have also supported the relationship between PEOU and PU (Mohammadi, 2016; Shah and Attiq, 2016) and also PEOU and BU (Ibrahim et al., 2017; Shah & Attiq, 2016; Alsabawy et al., 2016; Calisir et al., 2014).

The results observed in this study support both relationships in both samples. In the public university sample, PEOU has a positive and significant influence on PU (γ = 0.093\*\*) and BI (γ = 0.456\*\*\*) in the public university sample. PEOU also has the strongest contribution to the students’ behavioral intention to use the LMS in the public university sample when compared to PU, LV, FC, and SI.

In the private university sample, PEOU also has a positive and significant influence on PU (γ = 0.169\*\*\*) and BI (γ = 0.265\*\*\*). The relationship between PEOU and PU is stronger in the private university sample indicating that the private university students have a stronger belief that the ease of using the LMS contributes positively towards how useful the LMS is to their studies. In the relationship between PEOU and BI, the relationship is stronger in the public university sample indicating that the public university students attribute the ease of using the system to their behavioral intentions to use the LMS more than the private university students.

In summary, hypotheses H5a, H5b, H5c, and H5d were all supported, and the results empirically validate the relationship between PEOU with PU and BI in the context of eLearning acceptance in developing countries.

### Learning value (LV)

Learning value is defined as the total benefits obtained by the effort and time spent by students using the eLearning systems. To the best of our knowledge, this construct has only been used in one study where it used in the context of eLearning acceptance. It replaced price value in the extended unified theory of acceptance and use of technology (UTAUT) theory as the researcher, Ain et al. (2016), did not believe that students attribute monetary value towards the use of eLearning systems but instead the students placed emphasis on the time and effort invested in using the eLearning system to enhance their educational needs.

In both samples (private and public universities), there was no support for the relationship between LV and BI. This is contrary to the findings by Ain et al. (2016) and indicates that both sets of Nigerian students do not believe that the LMS provides benefits based on the time and effort they spend on the system. This can be explained in the public sample as these set of students do not use most of the functionality of an LMS, the students also did not believe that the LMS is useful for their educational needs.

In the private sample, the relationship, though not significant, was positive as opposed to the public sample where the relationship was negative and insignificant. As a result, both H6a and H6b were rejected.

### Social influence (SI)

Social influence was derived from the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003). It is similar to subjective norm and is defined as “the degree to which an individual perceives that important others believe he or she should use the new system.” (Venkatesh et al., 2003, p.451). In the context of our study, SI is the social pressure emanating from the university environment (i.e., fellow students, instructors, and the university administration) which besieges students and influences their behavioral intention to use the LMS.

In both samples, the relationship between SI and BI were positive and significant. In the public university sample, SI has the second strongest relationship (γ = 0.321\*\*\*) with BI and the

relationship is stronger in comparison to the one found in the private university sample (γ = 0.321\*). The results give empirical support to the UTAUT theory by Venkates et al. (2003) as well as similar studies on the acceptance of eLearning systems (El-Masri & Tarhini, 2017; Ain et al., 2016; Fidani & Idrizi, 2012; Raman et al., 2014; Decman, 2015).

The results observed in the relationship between SI and BI show that Nigerian students from both samples believe that the pressure on them by their colleagues, instructors, and the university administration influence their use of the LMS.

In summary, hypotheses H7a and H7b are supported.

### Facilitating conditions (FC)

FC is defined as “the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system” (Venkatesh et al., 2003, p.453). In our study, FC is an organizational factor that refers to the availability of the technology infrastructure, time, and support required by the students to facilitate the use of the LMS. FC was adopted from UTAUT (Venkatesh et al., 2003), where the significant relationship between FC and BI was established.

Our results show that for both samples, the relationship between FC and BI were positive and significant; thus, hypotheses H8a and H8b were both supported. In the private university, the relationship is stronger (γ = 0.226\*\*\*) when compared to that of the public university (γ = 0.073\*).

Both relationships were supported which validates the UTAUT model as well as prior studies in the context of eLearning systems acceptance (Yakubu & Dasuki, 2018a; Salloum & Shaalan, 2018; El-Masri & Tarhini, 2017).

This result shows that both sets of students believe that the resources required to effectively use the LMS are available, although the availability is higher in the private university sample.

## Discussion on the direct determinants of actual usage

This section discusses the relationships between FC and BI on the actual usage of the LMS by the students. It discusses the results from the hypotheses tested by structural equation modeling on the

model shown in Figure 7.2. A total of 2 hypotheses were tested in each sample (i.e., 4 hypotheses for both samples), and support was found for all 6 relationships.

H9a,b

H8c,d

Facilitating Conditions

Actual Usage

Behavioral Intention

### Figure 7. 3: Relationship between facilitating conditions and behavioral intention on actual usage of the LMS

* + 1. ***Facilitating conditions (FC)***

FC is defined as “the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system” (Venkatesh et al., 2003, p.453). As earlier stated, FC is an organizational factor that refers to the availability of the technology infrastructure, time, and support required by the students to facilitate the use of the LMS. FC was adopted from UTAUT (Venkatesh et al., 2003), where the significant relationship between FC and actual usage (AU) was established.

Our results show that for both samples, the relationship between FC and AU were positive and significant; thus, hypotheses H8c and H8d were both supported. In the private university sample, the relationship between FC and AU is almost twice stronger (γ = 0.225\*\*\*) when compared to that of the public university (γ = 0.157\*\*\*).

Both relationships were supported which validates the UTAUT model, and the results indicate that both sets of students believe that the resources required to effectively use the LMS are available and influence the students' usage of the LMS, although the strength of the relationship is higher in the private university sample.

### Behavioral intention (BI)

Behavioral intention is an individuals’ intention to use a particular technology for various undertakings. The relationship between BI and AU has been established in various theories such as theory of reasoned action (Ajzen & Fishbein, 1975), theory of planned behavior (Ajzen, 1985), technology acceptance model (Davis, 1989) and unified theory of acceptance and use of technology (Venkatesh et al., 2003).

As with prior studies, especially in the context of eLearning (Yakubu & Dasuki, 2018; Ain et al., 2015; Tarhini et al., 2013; Mohammadi, 2015), it is expected that there will be a statistically significant relationship between behavioral intention and the actual usage of LMS by Nigerian students. Our results confirm this relationship in both samples as the relationship between BI and AU were positive and significant; thus, hypotheses H9a and H9b were both supported. In the private university, the relationship between BI and AU is almost twice stronger (γ = 0.307\*\*\*) than that of the public university (γ = 0.157\*\*\*).

Both relationships were supported which validates the UTAUT, TRA, TAM and TPB models and the results indicate that for both sets of students if they have a strong intention to use the LMS, then it is very likely that they will use it, more so for the private university students.

## Effect of the moderators

This section discusses the findings of the moderating effect of the demographic factors: gender, age, and experience in using the LMS; on the relationships between some of the constructs in the public and private university models.

### Gender

In the public sample, the variance explained (i.e., squared multiple correlations or R2) for BI and AU are 56.1% and 46% respectively for the male students and for the female students the variance

explained for BI and AU 44.6 and 34.6% respectively indicating a moderate data fit in both samples.

Based on the effect of gender as a moderator on some of the direct determinants (PU, PEOU, and SI) of BI, for the male group, the strongest path coefficient observed was between PEOU and BI while the lowest observed was between PU and BI. In the female group, PEOU also has the strongest path coefficient, while the lowest coefficient observed is PU. These results indicate that both male and female groups believe that the LMS used in their respective institutions are easy to use and is the most significant factor that influences the students’ behavioral intention to use the LMS. Both groups of students also believe that their colleagues, instructors, and the university administration influence their use of the LMS and that they are more influenced by this in comparison to their perceived usefulness of the LMS.

Table 6.14 indicates that for the relationship between PEOU and BI, there is no significant difference between male and female students; hence, there is no support for hypothesis H10c. Similarly, H10a and H10e were rejected as there was no significant difference between the male and female groups in the relationships PU BI and SI  BI, respectively. In summary, gender does not moderate the relationship between PEOU  BI, PU BI and SI  BI.

In the private sample, the variance explained (i.e., squared multiple correlations or R2) for BI and AU are 65% and 62.1% respectively for the male students and for the female students the variance explained for BI and AU 64.6 and 59.8% respectively indicating a good data fit in both samples.

Based on the effect of gender as a moderator of the direct determinants (PU, PEOU, and SI) of BI, for the male group, the strongest path coefficient observed was between PU and BI while the lowest observed was between PEOU and BI. This result is the exact opposite of the findings in the male public university students’ sample. In the female group, PEOU has the strongest path coefficient, while the lowest coefficient observed is SI. These results indicate that the male students in the private universities perceived usefulness of the LMS is the most significant contributor to their behavioral intention to use the LMS for the female group PEOU is the highest contributor to their behavioral intention to use the LMS. The male group believes that their colleagues, instructors, and the university administration influence their use of the LMS while this is the opposite for the female group where the path coefficient is negative (-0.021).

Table 6.29 indicates that for the relationship between PEOU and BI, there is a significant difference between male and female students, and the influence is stronger in the female group; hence, hypothesis H10d is supported. There was no support for H10b and H10f as the difference in their path coefficients was not statistically significant between the male and female groups in the relationships PU BI and SI  BI. In summary, gender does not moderate the relationship between PU BI and SI  BI.

### Age

In the public sample, the variance explained (i.e., squared multiple correlations or R2) for BI and AU are 58.2% and 64% respectively for the older students and for the younger students the variance explained for BI and AU 54.6 and 64.6% respectively indicating a moderate data fit in both samples.

Based on the effect of age as a moderator of the direct determinants (PU, PEOU, and SI) of BI and (FC) of AU, for the older group, the strongest path coefficient observed was between PEOU and BI while the lowest observed was between PU and BI. In the younger group, PEOU also has the strongest path coefficient, while the lowest coefficient observed is PU. These results indicate that both age groups believe that the LMS used in their respective institutions are easy to use and is the most significant factor that influences the students’ behavioral intention to use the LMS. Both groups of students also believe that their colleagues, instructors, and the university administration influence their use of the LMS and that they are more influenced by this in comparison to their perceived usefulness of the LMS. Also, both age groups agree that their respective institutions have the technological and organizational infrastructure required to support their use of the LMS.

Table 6.19 indicates that all the relationships hypothesized to be moderated by age were observed to have higher path coefficients for the younger students in comparison to the older students except for the relationship between PEOU and BI. Table 6.19 also shows that for the relationship between PEOU and BI, there is a significant difference between older and younger aged students; hence, hypothesis H12a is supported. Unfortunately, H12c, H12e, and H12g were rejected as there was no significant difference between the older and younger age groups in the relationships PU  BI, SI  BI and FC  AU, respectively. In summary, gender moderates the relationship between PEOU  BI, but does not moderate the relationships PU  BI, SI  BI and FC  AU.

In the private university sample, 4 relationships were tested (PU  BI, PEOU  BI, SI  BI and FC  AU). The variance explained (i.e., squared multiple correlations or R2) for BI and AU are 66.1% and 70% respectively for the young students and for the older students the variance explained for BI and AU 64.4% and 64.6% respectively indicating a moderate data fit in both samples.

Based on the effect of age as a moderator of the direct determinants (PU, PEOU, and SI) of BI, for the young group, the strongest path coefficient observed was between PEOU and BI while the lowest observed was between SI and BI. In the older group, PU has the strongest path coefficient, while the lowest coefficient observed is PEOU  BI. These results indicate that in younger students in the private universities attribute the ease of using the LMS as the being more influential to their behavioral intention to use the LMS while for the older students, the usefulness of the system is the more contributing factor. In all of the relationships, the influence of the moderator is stronger except in the relationship between PEOU and BI, while the difference in this relationship (PEOU  BI) is statistically significant, the hypothesis was not supported, as the influence is stronger in the younger student’s sample; hence hypothesis H12d is rejected. H12f and H12h were also rejected, as there was no significant difference in the path coefficients of the relationships SI

 BI and FC  AU. The relationship between PU and BI is moderated by age as there is a statistically significant difference between the path coefficients and the influence is stronger in the older students; hence, H12b is supported. In summary, age moderates the relationship PU BI, but not the relationships PEOU  BI, SI  BI and FC  AU.

### Experience in using the LMS

With regards to experience, 2 groups were created; those who have used the LMS for under 1 year were termed low experienced users while those who have used the LMS for over 1 year were referred to as high experience users. In the public sample, the variance explained (i.e., squared multiple correlations or R2) for BI and AU are 67% and 62% respectively for the student's low experienced users and for the highly experienced students the variance explained for BI and AU are 64.6 and 63% respectively indicating a good data fit in both samples.

Based on the effect of the experience of using the LMS as a moderator of the direct determinants (PEOU and SI) of BI and FC on AU, for the low experience students’ group, the strongest path coefficient observed was between PEOU and BI while the lowest observed was between FC and

AU. In the high experience students’ group, PEOU also has the strongest path coefficient while the lowest coefficient observed is also FC on AU. These results indicate that both low and high experience groups believe that the LMS used in their respective institutions are easy to use and is the most significant factor that influences the students’ behavioral intention to use the LMS. The strength of the path coefficient for the PEOU  BI relationship is stronger in the high experience group meaning the more the students use the LMS, the easier it is to use the system which in turn enhances the likelihood of the students’ behavioral intention to use the LMS.

Both groups of students also believe that their colleagues, instructors, and the university administration influence their use of the LMS and the strength of the path coefficient is higher for low experience users as shown in table 6.24.

Table 6.24 also indicates that for the relationship between PEOU and BI, though there is a difference between low experience and high experience students, the difference is not statistically significant; hence there is no support for hypothesis H11a. Similarly, H11c and H11e were rejected as there was no statistically significant difference between the low and high experience groups in the relationships SI  BI and FC  AU. In summary, experience in using the LMS does not moderate the relationships between PEOU  BI, SI  BI and FC  AU.

In the private sample the variance explained (i.e., squared multiple correlations or R2) for BI and AU are 43% and 51% respectively for the more experienced users of the LMS and for those with less experience, the variance explained for BI and AU 37% and 34.6% respectively indicating a moderate data fit in both samples.

Based on the effect of LMS usage experience as a moderator of the direct determinants (PEOU and SI) on BI and FC on AU, for the highly experienced users, the strongest path coefficient observed was between PEOU and BI while the lowest observed was between SI and BI. In the low experience group, PEOU also has the strongest path coefficient, while the lowest coefficient observed is SI. These results indicate that both groups believe that the LMS used in their respective institutions are easy to use and is the most significant factor that influences the students’ behavioral intention to use the LMS. Both groups of students also believe that their universities have the technological and organizational resources required to facilitate the use of the LMS.

Table 6.39 indicates that for the relationship between PEOU and BI, there is a statistically significant difference between low and high experience users of the LMS; hence, hypothesis H11b was supported by the multi-group analysis. Unfortunately, H11d and H11f were not supported as there was no significant difference between both groups in the relationships SI  BI and FC  AU. In summary, usage experience moderates the students’ perceived ease of using the LMS for the private university students but has no moderating effect on the relationship between SI  BI and FC  AU.

## Discussion on the comparison between public and private universities

In order to compare the 2 samples (public and private university students), a T-test was used to investigate the similarities and differences between the public and private university students’ perceptions of using their respective LMS. The results from the T-test are presented in table 5.22 and will aid in answering one of the research questions posed by this study, which is to identify and understand the observed differences between the two samples. This section is dedicated to discussing the results of the t-test for each construct in the conceptual model.

With regards to the student’s perception of the system quality of the LMS, we hypothesized that the SQ mean will be significantly lower in the private university sample. This was not supported, as the mean score is 1.6030 for the public university sample and 1.6706 for the private university sample. The means, for SQ in both samples, show that the LMS is functional and reliable in terms of usability but to a higher degree in the public university sample. Considering that the SQ mean is slightly lower in the public university sample, and the difference is not statistically significant (t = -1.655, p > 0.5) there is no support for hypothesis H13a.

In terms of the student’s perception of the instructor quality, it was hypothesized that the IQ mean will be significantly lower in the private university sample. This was fully supported as the mean score is 3.3566 for the public university sample and 1.6212 for the private university sample. The means, for private university sample, suggests that the students believe that the instructor quality is high whereas, in the public university sample, the students are neutral in their responses towards the instructor’s quality. As mentioned earlier the results show that the IQ mean is lower in the

private university sample, and the difference is statistically significant (t = 31.781, p < 0.001) therefore, hypothesis H13b is supported.

This study hypothesizes that the CQ mean will be significantly lower in the private university sample. This was fully supported as the mean score is 2.9930 for the public university sample and 2.0222 for the private university sample. The means that for both samples, the students agree that the course content is up to date and sufficient and that the course design is flexible for their learning needs. The private university students tend to agree more as is observed by their means being lower. Since the results show that the CQ mean is lower in the private university sample, and the difference is statistically significant (t = 16.753, p < 0.001); therefore, hypothesis H13c is supported.

In terms of the student’s perceived usefulness of the LMS, we hypothesized that the PU mean will be significantly lower in the private university sample. This was partially supported as the mean score is 1.3846 for the public university sample and 1.3614 for the private university sample. The means, for PU in both samples, show that the LMS is useful for the students’ performance and learning effectiveness but to a higher degree in the private university sample. Since the results in table 5.22 suggest that the PU mean is slightly lower in the private university sample, but the difference is not statistically significant (t = 0.959, p > 0.5) therefore there is no support for hypothesis H13d.

In the context of the student’s perceived ease of using the LMS, this study hypothesizes that the PEOU mean will be significantly lower in the private university sample. This was fully supported as the mean score is 1.5241 for the public university sample and 1.4438 for the private university sample. This means that for both samples, the students agree that the LMS is easy to use. The private university students tend to agree more as is observed by their means being lower. Since the results show that the PEOU mean is lower in the private university sample, and the difference is statistically significant (t = 0.012, p < 0.05); therefore, hypothesis H13e is supported.

With regards to the student’s perceived value obtained by using the LMS, this study hypothesizes that the LV mean will be significantly lower in the private university sample. This was not supported as the mean score is 1.9808 for the public university sample and 3.1233 for the private university sample. This means that the public university students agree more than the private

university students that there is value obtained by using the LMS for their educational needs. Since the results show that the LV mean is lower in the public university sample, but the difference is statistically significant (t = -23.5212, p < 0.001) hypothesis H13f is not supported.

In terms of the influence of the significant others on the students to use the LMS, we hypothesized that the SI mean will be significantly lower in the public university sample. This was not supported as the higher mean score is 1.6602 for the public university sample in comparison to 1.6343 for the private university sample. The means, for SI in both samples, suggest that the use of the LMS is somewhat dependent on the influence of the social interactions between the students and their peers, instructors, and school administration but to a higher degree in the private university sample. As mentioned earlier the SI mean is slightly lower in the private university sample, and the difference is not statistically significant (t = 0.623, p > 0.5) therefore there is no support for hypothesis H13g.

In the context of the facilitating conditions to support the use of the LMS, this study hypothesizes that the FC mean will be significantly lower in the private university sample. This was fully supported as the mean score is 1.6894 for the public university sample and 1.5840 for the private university sample. This means that for both samples, the students agree that the organizational and technological resources required to use the LMS exists. The private university students tend to agree more as is observed by their means being lower. Since the results show that the FC mean is lower in the private university sample, and the difference is statistically significant (t = 2.654, p < 0.01); therefore, hypothesis H13h is supported.

With regards to the student’s behavioral intention to use the LMS, this study hypothesizes that the BI mean will be significantly lower in the private university sample. This was not supported as the mean score is 1.4746 for the public university sample and 1.5020 for the private university sample. This means that the public university students agree more than the private university students that they intend to use the LMS for their educational needs. Since the results show that the BI mean is lower in the public university sample, and the difference is not statistically significant (t = -0.683, p > 0.05) hypothesis H13i is not supported.

In the context of the actual usage of the LMS, this study hypothesizes that the AU mean will be significantly lower in the private university sample. This was fully supported as the mean score is

1.4995 for the public university sample and 1.3959 for the private university sample. This means that for both samples, the students agree that they frequently use the LMS and depend on it for their learning needs. The private university students tend to agree more as is observed by their means being lower. Since the results show that the AU mean is lower in the private university sample, and the difference is statistically significant (t = 3.376, p < 0.01); therefore, hypothesis H13j is supported.

## Discussion on the comparison between students’ use of the LMS functions

The final section of the survey question required students to respond to their use of certain functions of the LMS. This study identified the following functionalities of popular LMS’ in order to solicit for the responses from the students: Announcements, Discussion forums, Assignments, Links to online resources, Lecture note and the course syllabus. For each of the functionalities of the LMS listed, students could respond from 1 of five options, namely: frequently used, moderately used, used to some extent, rarely used and never used. These options were coded as 1, 2, 3, 4, and 5, respectively. In chapter 5, the results were presented in Table 5.24, Table 5.25, Table 5.26, and Table 5.27. This section gives a detailed discussion based on the observed results.

In the public university sample, all of the students’ responses for each of the functionalities were on “never used” except for discussion forums (37.3%) and links to online resources (38.4%) where the highest percentage of responses was on rarely used. For the assessments, lecture notes and syllabus were observed to have over 50% of the students claiming that the functionalities were not used. These findings are supported by the average means which are between 3.8651 (class announcements) and 4.243 (lecture notes)

In the private university sample, for assignments, lecture notes, and syllabus’, moderate usage captured the highest responses (over 50%). While most students (56.4) believe they use the links to online resources to some extent. 63.4% never use the announcements, and 56.5% rarely use the discussion forums. These findings are supported by the average means which range from 2.245 (Syllabus and handbook) to 4. 4783 (class announcements)

With regards to the differences in both samples on the tasks done using the LMS, Table 5.27 reveals statistically significant differences in all of the functionalities. As hypothesized in chapter

3, the use of the functionalities: class assignments, links to online resources, lecture notes, and syllabus were observed to be significantly higher in the private universities. On the other hand, the use of announcements and discussion forums was significantly higher in the public university sample. This suggests that the public university students use the LMS more for announcements and discussion while the private university students use the LMS to a greater extent for class assignments, links to online resources, lecture notes, and syllabus.

The most significant difference between the 2 samples is found in the use of the LMS to access the syllabus and course handbook, while the least significant difference is in the use of the discussion forums. These findings are significant as there is a paucity of studies that investigate the existing usage of the functionalities of LMS’ in developing countries, more specifically, in Nigeria.

## Conclusion

In summary, this chapter discussed in detail the key findings of the results analysis and the analysis of the structural model. In chapter 3, three sets of hypotheses were developed based on models used to investigate the acceptance and success of technology. The first set of hypotheses discusses the relationships between the indirect determinants (quality antecedents) of behavioral intention on PU and PEOU. Next, the relationships between the direct determinants (PEOU, PU, LV, SI, and FC) of BI was examined and reasons were given to the observed findings of the analysis. This aided our understanding of the various factors responsible for the behavioral intentions to use the LMS by students of the private and public university, which in turn leads to the actual usage of the LMS. This was followed by a discussion of the second set of hypotheses, which are the effects of the moderators: age, gender, and experience have on selected relationships in the structural model.

The third set of hypotheses discussed was the mean comparisons of all the latent variables used in the structural model and the chapter concluded by comparing the differences in how public and private university students use the LMS based on their usage of the main functionalities of LMS’.

In the next chapter (Chapter 8), an overview of this study will be presented, highlighting important observations. The chapter will also discuss the implications of this research to the existing body

of knowledge with regards to the methodology, theory, and practice. Finally, the limitations of the study were discussed as well as the directions for future research.

# CHAPTER 8: CONCLUSION, CONTRIBUTIONS, LIMITATIONS, AND FURTHER RESEARCH

## Introduction

The final chapter, chapter 8, aids in bringing this research to a conclusion. Section 8.2 summarizes the entire study based on the chapters presented earlier. Section 8.3 presents the implications of the research observations in the context of theory and practice. This is followed by section 8.4, where the limitations identified in this research are discussed, and in section 8.5, the directions for future research were deliberated.

## Overview of the Research

This section of chapter 8 gives a brief summary of the previous 7 chapters.

Chapter 1 introduces the study by identifying the research problem. In summary, it is observed that the assessment of eLearning systems acceptance in higher education institutions is a challenge in Nigeria. This is partly because most of the institutions do not have the infrastructure required to support the use of such technologies and as such, do not have the technologies in place. The research aims at developing and testing a conceptual model that explains the elements that influence Nigerian students’ behavioral intention to use learning management systems in Nigerian universities. The proposed research model is built upon empirically tested theories that explain the behavioral intentions of users and IS Success factors. The scope includes a mixture of private and public universities in northern Nigeria that use a learning management system.

Chapter 2, the review of literature, discusses the different types of eLearning modes and also covers the benefits of using an LMS. The chapter examines the structure of Nigerian universities, the challenges they face, and how the use of an LMS can help overcome some of the challenges. A review of the different models and theories used in the study of technology acceptance and information systems success and then how these theories have been applied in the context of eLearning. Finally, the chapter concludes with prior studies conducted by the researcher that have guided this dissertation.

Chapter 3 focuses on using the theories reviewed in chapter 2 to develop the conceptual model and relationships between the identified constructs in the model. The chapter also groups the constructs into eLearning specific factors (course quality, instructor quality and system quality) and individual perception factors (learning value, facilitating conditions, perceived ease of use, perceived usefulness and social influence). The chapter also identifies age, gender, and experience as moderating variables that could have an effect on some of the relationships. Finally, the hypotheses to be tested based on the conceptual model were listed and grouped based on the aims and objectives of the study.

Chapter 4 starts by identifying and justifying the use of a positivist paradigm based on the ontological, epistemological, and methodological views of the researcher. A quantitative approach was selected as the method of inquiry as this is the most suited method to empirically validate the research hypotheses. A survey approach was selected to collect responses from the respondents, and the convenient sampling method was chosen in order to solicit responses from the students. Furthermore, the sample frame and size, as well as response rates, were discussed with justification given for the choices made. The questionnaire was developed and tested via a pilot study, and the data obtained was analyzed using IBM SPSS version 21 and AMOS version 21. The method of analysis chosen for this study was a two-stepped approach as recommended by Hair et al. (2010) involving confirmatory factor analysis and structural equation modeling (SEM). The chapter concluded by providing the procedures used to ensure that the study was conducted in an ethical manner.

Chapter 5 presents the results of the preliminary data analysis in which Microsoft Excel and SPSS version 21.0 were used to perform data screening, frequency analysis, descriptive analysis, and t- tests in order to prepare the data for further analysis as well as to report preliminary findings obtained from some of the tests.

Chapter 6 tests the hypotheses proposed in chapter 3. Firstly, certain tests were performed to ensure that the data collected fits the model and that the data was reliable and valid. Goodness-of-fit tests, as well as convergent and discriminant validity tests, were also performed on the measurement, and structural models and all values obtained were found to be within the recommended values. The structural model was evaluated so as to test the construct relationships hypothesized in the conceptual model. The path models indicated that for the public university, 7 out of 12 hypotheses

were supported while in the private university sample, 10 out of the 12 hypotheses were accepted. For all the constructs used in the conceptual model, a t-test of the mean scores was carried out to see if there were differences between the public and private university samples, out of 10 hypotheses tested, all ten were supported. The final set of hypotheses to test was the effect of the moderators, 20 hypotheses were tested, and support for only 4 hypotheses was found.

Chapter 7 discusses in detail the key findings of the results analysis and the analysis of the structural model. This chapters’ discussion helps in understanding the various social, organizational, and individual factors that influence students’ behavioral intention to use eLearning systems in Nigerian universities. The chapter also discusses the similarities and differences between public and private student’s university students use of LMS’.

## Research Contribution

This study makes a number of significant contributions to theory and practice in the context of students’ acceptance of eLearning systems, particularly Nigerian students. This section summarizes some of the identified contributions made by this research.

### Theoretical Contributions

The aim of this study is to develop and test a conceptual model that aims at understanding the factors responsible for the acceptance of LMS’ in northern Nigerian public and private universities. The first identified contribution to theory is the analysis, carried out in Chapter 2, of the technology acceptance models and the information systems success model. This study critically reviews literature pertinent to achieving the aims and objectives of the study by first reviewing all the theories that explain the acceptance of technology by individuals. Then a review of how these theories have been applied in the context of eLearning systems acceptance and identify that the 3 most widely used theories (in order of use) are the technology acceptance model (TAM), the unified theory of acceptance and use of technology (UTAUT) and the DeLone and McLean IS success model.

Furthermore, we investigate the number and type of studies that have been carried out in Nigeria, in the context of students’ acceptance of eLearning, and discover that the studies are very limited and do not capture the important predictors of LMS acceptance such as the eLearning quality

antecedents identified. The literature reviewed in Chapter 2 indicates that the eLearning aspects (instructor quality, course quality, and system quality) are significant factors that must be considered. Therefore, another contribution to theory is the incorporation of these 3 factors into the conceptual model. To the best of our knowledge, there have been no prior studies on the acceptance of eLearning that has incorporated these 3 factors as well as the behavioral belief factors in order to explain and compare students’ acceptance of LMS’ in 2 different samples, e.g. public and private university.

To the best of our knowledge, this research is the only study in Nigeria that investigates the effect of demographic moderators, age, gender, and experience, on the determinants of student’s behavioral intentions to use an LMS. This was taken into consideration based on the effect of the moderators, identified by Venkatesh et al. (2003), on certain relationships. Our findings indicate partial support for the moderated relationships. For instance, the influence of perceived usefulness on the behavioral intention of students to use the LMS is moderated by age such that the influence will be stronger in younger students; this was observed in both the public and private university samples.

### Practical Contributions

The results of this research study have many practical contributions for various stakeholders such as the software designers/developers, school administration, and university accrediting bodies such as the National University Commission (NUC).

One of the aims of this study is to identify the factors responsible for the acceptance of LMS’ by Nigerian students. The first contribution to practice is captured in the literature review section where some of the challenges involved in Nigerian universities are highlighted and how the use of LMS’ can help to overcome some of these challenges (Section 2.3.2 and 2.3.3). LMS’ can be used to overcome challenges such as plagiarism detection, getting rid of obsolete teaching practices, and producing students who are IT literate. These are some of the benefits identified by the use of LMS in Nigerian universities. Governing bodies such as the National University Commission (NUC) and fund intervention agencies like the Tertiary Education Trust Fund (TeTFund) can use this information to enforce the use of LMS as a way of improving the standard of education in Nigeria.

While most studies carried out in Nigeria investigate the acceptance of eLearning tools in general, this study is the most comprehensive study in the context of LMS acceptance by students in Nigeria. In this research, 4 schools that heavily use LMS’ for teaching and learning were looked at, and in 2 different types of universities with different funding structures. The different types of universities are for-profit universities (private-owned) and public service (government-owned) universities. Our results show that there is a difference in the acceptance of LMS’ by their respective students, and the acceptance level is higher in private universities when compared to public universities. The behavioral intention of private university students to use the LMS is almost double than that of the public university students.

Based on the behavioral belief factors, PEOU had the highest path coefficient, in both samples, in relation to behavioral intention to use the LMS. This means that the main reason that contributes towards the use of the system is due to how easy it is to use the system. This study expected that, like similar studies, the main contributing factor should be the usefulness of the system as this would mean that the LMS is useful for the students learning needs. Unfortunately, in the public sample, the relationship between PU and behavioral intention is not significant. Based on this finding, the university administration, instructors, and perhaps system developers should work towards improving the usefulness of the system. In the private sample, the relationship between PU and behavioral intention is significant; this might be because the private schools use an LMS that has been tried and tested in developed countries unlike the proprietary systems used in the public universities. Also, considering that PEOU has the highest path coefficient, in both samples, in relation to behavioral intention to use the LMS, software developers and designers can build LMS’ that is user-friendly. Practically, “off-the-shelf” LMS’ should be targeted by universities planning to adopt an LMS. These have been tried and tested with frequent updates to address limitations over the years. For universities that want to build proprietary LMS’, the software developers can either model their applications to be similar in functionality to “off-the-shelf” LMS’ or build LMS’ that are easy to use and will be useful for the students.

Another behavioral belief factor to consider is the facilitating conditions. “Facilitating conditions are defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system” (Venkatesh et al., 2003). Our findings indicate that the path coefficient for FC is higher, in the relationship with BI and AU, in the private

university sample as compared to the public university sample. This could be because the private institutions are smaller and find it easier to provide the infrastructure (technical and organizational) required in facilitating the use of an LMS. Thus, public schools should invest in ensuring that such facilities are provided in such a way that the students have access to resources such as Internet bandwidth, computers and technical support to assist in the use of eLearning tools.

Finally, in terms of the use of LMS functionality, the results from this study show that the private university students use more of the functions of a typical learning management system. To be specific, the use of the assignment’s module, the course syllabus, lecture notes and links to other online resources are some of the functions that are used more frequently by the students of the private university. In both samples, class announcements and discussion forums are rarely or never used. All of these functions have been identified by prior research to provide for individualized/personalized learning for the students, which helps in shifting from the obsolete teaching methods to a student-centered learning environment. Instructors and school administration can ensure training is done on how to use these functions to aid with instruction. TeTFund can sponsor instructors on eLearning courses that will help to train the instructors on the use of LMS for effective teaching purposes.

## Limitations

This research is limited by the following observations:

1. The results of the study and their propositions are from universities in northern Nigeria only. Therefore, generalization of the results for all Nigerian public and private universities must be made carefully.
2. All studies based on questionnaires and surveys are limited by the individuals’ responses. These limitations are the ability to accurately self-report and the ability to recollect memories reliably.
3. The study does not take into account the fact that student’s views on using the system will be altered over a period of time as they are trained and gain experience. This longitudinal effect has been highlighted by Venkatesh et al. (2003) and Mathieson et al. (2001). Future

research could study a student’s perception of using eLearning systems at different stages, for example, as a beginner, an intermediate user and as an expert.

1. Not all identified constructs and relationships from the theories reviewed are used, for example, Anxiety and Self Efficacy. While prior research has shown that these factors do not contribute to the acceptance of technology (Venkatesh et al., 2003), they could possibly be found to be significant in influencing Nigerian student’s acceptance of LMS’.
2. The use of the LMS’ is mandatory in all of the institutions as such; the study will not capture the moderating effect of mandatory versus voluntary usage.
3. The instructor’s perception of the use of LMS is not captured by the study. This is important due to the vital role played by the instructor in the use of the LMS by the students.
4. As the students will have more than one instructor, reporting their perception of the instructors’ influence on the course might be confusing as they might have instructors with varying influence on their courses.
5. This study is based on quantitative methods, and although these methods stem from strong theoretical backgrounds, a different approach (such as qualitative or mixed-method approaches) might provide a deeper understanding of the investigated phenomena.
6. With regards to the effect of the moderators on the behavioral belief factors, not all factors were tested, only PU, PEOU, FC, and SI were tested based on the relationships adopted from the UTAUT framework.

## Future Research

This dissertation developed a model that provides a systematic way to understand the acceptance of LMS’ by university students. Based on some of the limitations listed in the previous section, there are several areas to explore with regards to future research. One of such areas to explore is the acceptance of eLearning systems, specifically LMS’, by university instructors. This is important because the instructor’s play a vital role in using the LMS to aid the learning needs of students. Therefore, the factors that contribute towards the instructors’ acceptance and use of the LMS should be examined and understood.

The research model used in this study was tested in a developing country where eLearning is still at an infancy stage. Future research can use our conceptual model in developed countries where

eLearning use is mature. Also, while our model was used to examine 2 different settings, in terms of the way they are funded, the model can be used to examine different institutions based on other factors such as culture. Other than the settings, future research could compare the acceptance of open source and proprietary LMS’.

It is also recommend testing the model in voluntary environments as opposed to our study, which was carried out in environments where the use of LMS’ is mandatory for all students. Based on prior research (Venkatesh et al., 2003), mandatory/voluntary use will have a moderating effect on some of the relationships identified in our model.

Future research should replicate the study using different e-learning tools or platforms. While we focused on LMS’ in this study, there exists a vast array of eLearning tools, and our model can be used to examine the acceptance of eLearning tools such as mobile devices used in mLearning and authoring tools such as Adobe Captivate.

This research only studied the effect of the moderators on PU, PEOU, FC, and SI on the students’ behavioral intention to use the LMS as adopted from the UTAUT model. While there was only partial support for the hypotheses posed based on the effect of the moderators, it is possible that the moderators will have an effect on other relationships that were not tested, especially on the eLearning aspects (SQ, IQ, and CQ).

This research can also be extended by integrating other potential constructs other than the ones that were used in this study. Constructs that have been used in the study of eLearning acceptance such as learning skills, habit (Ain et al., 2016), anxiety (Saadé & Kira, 2009; Al-Gahtani, 2016) and self-efficacy (Al-Gahtani, 2016) can be used to understand and explain the acceptance of LMS’ specifically in Nigeria.

A cross-sectional approach was used in obtaining the data. Future research can adopt an approach where longitudinal data are used to investigate the factors responsible for influencing students’ acceptance of LMS. For instance, 3 sets of surveys can be used to obtain responses from the students at different stages of their use of the LMS, i.e., after initial exposure to the LMS, after a semester of using the LMS and after 2 semesters of using the LMS. This will help in understanding how the different factors change over time.

Considering the background on the length of time each university has used the LMS could also provide some useful insights. For example, it is expected that the longer a university uses an LMS, the more likely it is for the LMS to be accepted. This is because the instructors will become more comfortable with using the system, and with time the facilitating conditions required for the support of using the LMS will increase/improve. Therefore, further studies can investigate the student’s acceptance of LMS’ based on the length of time the university has used the LMS.

Finally, this study is based purely on quantitative methods and analysis, and as a result, only general assumptions can be made based on the findings, which are not very accurate. The study can be strengthened by the use of methods that involve direct observations of, or by interviewing, the students which would result in more accurate and reliable findings that will provide a deeper understanding of why students accept and use LMS’.

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Cengage Learning.

# APPENDIX A: SURVEY QUESTIONNAIRE

**A SURVEY ON THE ACCEPTANCE OF LEARNING MANAGEMENT SYSTEMS (LMS): A PERSPECTIVE OF NIGERIAN STUDENTS**

A *learning management system* (LMS) is a software application for the administration, documentation, tracking, reporting, and delivery of educational courses or *training* programs.

## Section 1: Demographic Information

1. What is the name of your Institution?
2. What is your age?

🗌 Under 25

🗌 Over 25

1. What is your gender?

🗌 Male

🗌 Female

1. Educational Level

🗌 Undergraduate

🗌 Postgraduate

1. How long have you used the LMS?

🗌 Less than 1 year

🗌 Over 1 year

1. Have you been trained on using the Learning management system

🗌 Yes

🗌 No

### Please select the appropriate response for each of the statements in section 2 to indicate your level of agreement or disagreement with your perception on the use of your learning management system.

**Section 2: Students Perception of the use of Learning Management Systems**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Perceived Usefulness** | **Strongly Agree** | | **Moderately Agree** | | **Neutral** | **Moderately Disagree** | **Strongly Disagree** |
| Using the LMS will allow me to  accomplish learning tasks more quickly |  | |  | |  |  |  |
| Using the LMS will improve my learning performance |  | |  | |  |  |  |
| Using the LMS will increase my learning productivity |  | |  | |  |  |  |
| Using the LMS will enhance my effectiveness in learning |  | |  | |  |  |  |
| Using the LMS will be useful in my studies |  | |  | |  |  |  |
| **Perceived Ease of Use** | | | | | | | |
| My interaction with the LMS is clear and  understandable. |  | |  | |  |  |  |
| It would be easy for me to become skillful  at using the LMS |  | |  | |  |  |  |
| I find the LMS easy to use |  | |  | |  |  |  |
| Learning to operate the LMS is easy for me |  | |  | |  |  |  |
| **Learning Benefits** | | | | | | | |
| Learning via the LMS is worth more than  the time and effort given to it | |  | |  |  |  |  |
| Using the LMS offers access to updated curriculum | |  | |  |  |  |  |
| The LMS is very flexible as I can access it at any time or place. | |  | |  |  |  |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| The LMS provides opportunities for relations between learners and the instructors (i.e., group discussions) | |  | |  |  |  |  |
| The LMS somewhat allows me  to study at my own pace | |  | |  |  |  |  |
| **Instructor Quality** | | | | | | | |
| The instructor communicates well via the  LMS | |  | |  |  |  |  |
| The instructor's attitude is beneficial to my learning via the LMS | |  | |  |  |  |  |
| The instructor promptly responds to me via the LMS. | |  | |  |  |  |  |
| The instructor frequently updates resources for learners on the LMS | |  | |  |  |  |  |
| The instructor is knowledgeable in using the LMS | |  | |  |  |  |  |
| **Social Influence** | **Strongly Agree** | | **Moderately Agree** | | **Neutral** | **Moderately Disagree** | **Strongly Disagree** |
| My instructors encourage me to use the  LMS |  | |  | |  |  |  |
| My classmates encourage me to use the LMS |  | |  | |  |  |  |
| The university management encourages me to use the LMS |  | |  | |  |  |  |
| Generally speaking, I do what my lecturer thinks I should do |  | |  | |  |  |  |
| **Facilitating Conditions** | | | | | | | |
| I have the resources necessary to use the  LMS (e.g., technology and time) |  | |  | |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| I have the knowledge necessary to use the LMS |  |  |  |  |  |
| The LMS is not compatible with other systems I use |  |  |  |  |  |
| A specific person or group is available to assist me with issues I have with the LMS |  |  |  |  |  |
| **System Quality** | | | | | |
| The functionality of the LMS allows me  to complete my learning tasks |  |  |  |  |  |
| Overall, the LMS is highly reliable with minimal downtime |  |  |  |  |  |
| It is easy to learn how to use the LMS |  |  |  |  |  |
| The LMS is efficient in allowing me to complete my tasks |  |  |  |  |  |
| **Course Quality** | | | | | |
| The level of difficulty of using the  learning content is appropriate. |  |  |  |  |  |
| The delivery schedule of the learning content is flexible |  |  |  |  |  |
| The LMS can provide me with individualized learning management. |  |  |  |  |  |
| The LMS often provides updated information. |  |  |  |  |  |
| The LMS provides me with sufficient learning content. |  |  |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Behavioral Intentions** | **Strongly Agree** | **Moderately Agree** | **Neutral** | **Moderately Disagree** | **Strongly Disagree** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| I intend to use the LMS this semester |  |  |  |  |  |
| I predict I will use the LMS next semester |  |  |  |  |  |
| I plan to use the LMS frequently for my coursework |  |  |  |  |  |
| When given the chance I will always try to use the LMS |  |  |  |  |  |
| **Usage Behavior** | | | | | |
| I use the LMS frequently |  |  |  |  |  |
| I depend on the LMS for my studies |  |  |  |  |  |
| I use many functions of the LMS |  |  |  |  |  |

**Section 3: Frequency of using LMS Functions**

Please indicate, with a tick, the extent to which you use the LMS to accomplish the following tasks

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Never | Rarely | To some extent | Moderately | Frequently |
| Class announcements |  |  |  |  |  |
| Discussion Forums |  |  |  |  |  |
| Assessments (Assignments, quizzes and tests) |  |  |  |  |  |
| Links to online resources |  |  |  |  |  |
| Lecture Notes and presentation slides |  |  |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Syllabus and course handbook |  |  |  |  |  |

# APPENDIX B: CONSENT LETTER

## American University of Nigeria – Institutional Review Board

*Human Subjects Protections*

## Adult Consent Form

Hello, my name is Nasiru Yakubu, and I am a staff in the Information Systems Department at the American University of Nigeria in Yola. I am conducting a research study titled “**ACCEPTANCE OF LEARNING MANAGEMENT SYSTEMS: A PERSPECTIVE OF**

**NIGERIAN STUDENTS**.” You have been selected to participate in this study because you are a registered student of a higher education institution in Nigeria.

The purpose of this research study is to examine the determinants for the successful use of technology for teaching and learning. In this research, the technology under investigation is known as a learning management system (LMS). A *learning management system (*LMS) is a software application for the administration, documentation, tracking, reporting, and delivery of educational courses or *training* programs.

If you agree to take part in this study, you will be asked to complete the responses in the attached survey which pertain to your perception on the use of technology to study and learn at your institution. The survey will not last more than 5 minutes to complete.

I believe there are no known risks associated with this research study; however, as with any survey- related activity, the risk of a breach of confidentiality is always possible. To the best of my knowledge, your answers in this study will remain confidential. I will minimize any risks by ensuring that all collected data is used solely for the purpose of this research and will be stored on a secure system. Access to the data on this survey platform will only be accessible by me.

Your participation in this study is completely voluntary, and you can withdraw at any time.

By participating in the survey, you are indicating that you are at least 18 years old, have read and understood this consent form, and agree to participate in this research study.

Please keep a copy of this form for future use and reference. My contact information, as well as that of my university, is listed below in case you need to ask questions about this study in the future.

* Name: M Nasiru Yakubu
* Institution: American University of Nigeria
* 98 Lamido Zubairu Way, YolaTownship Bypass, Adamawa State, Nigeria
* Address: Telephone: +234 805 7032980
* E-mail: [yakubu.m@aun.edu.ng](mailto:yakubu.m@aun.edu.ng)

If you feel like speaking to someone else about the research and the findings, you may contact the AUN Institutional Review Board at [irb@aun.edu.ng.](mailto:irb@aun.edu.ng)

**Please keep this copy for your own reference.**

# APPENDIX C: IRB CERTIFICATE REQUIREMENTS

## Human Research Certificate

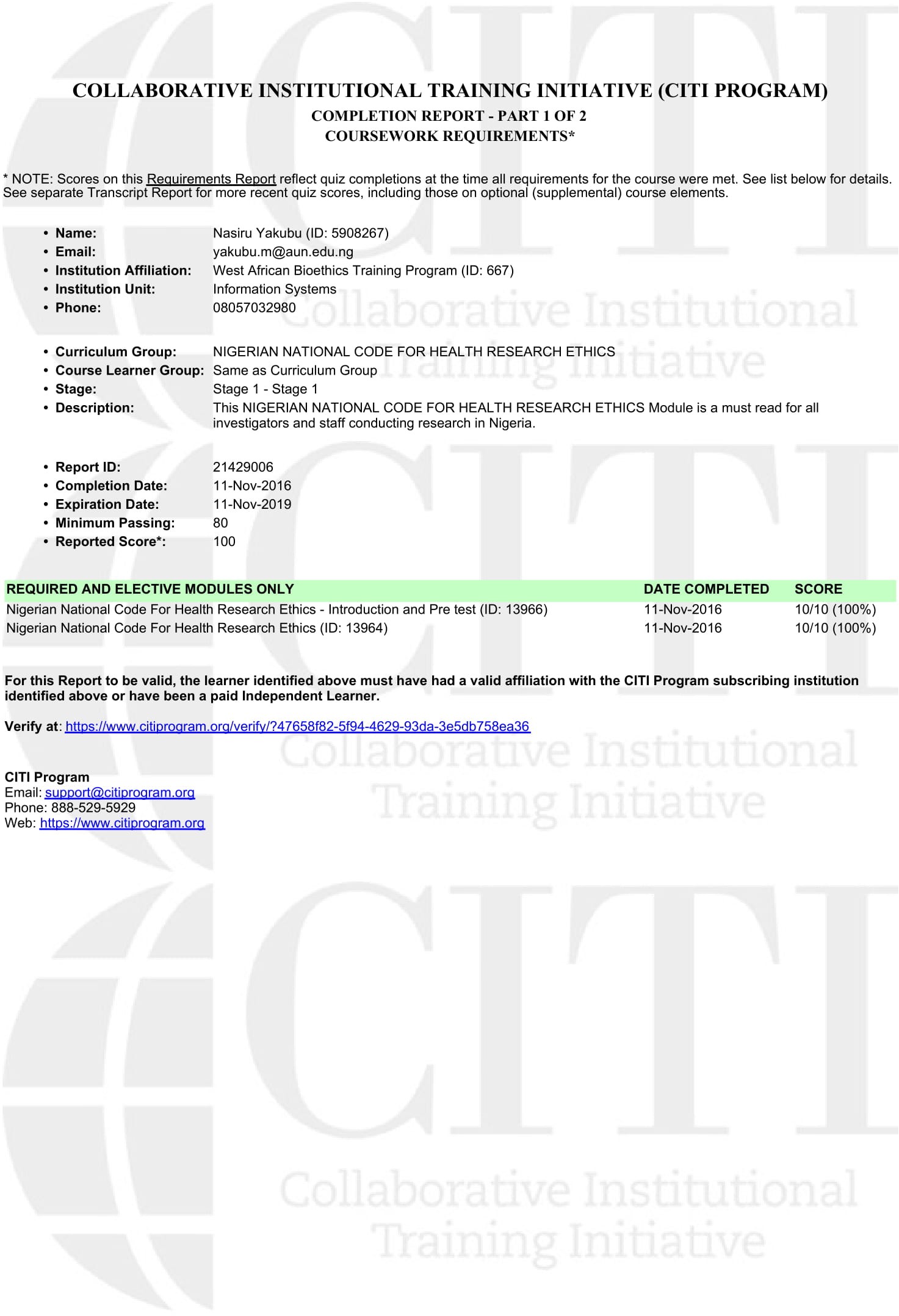
## Human Research Transcript



## Human Research Results



## Nigerian National Code for Health Research Ethics Certificate





## IRB Approval

**Dear Mohammed Nasiru Yakubu**

Thank you for sending your relevant application documents to the AUN IRB. The AUN IRB assessment process for your application is now complete. Your study titled “**Acceptance of Learning Management Systems: Perspectives of Nigerian Students** has been approved. Congratulations.

Please find, below, relevant details regarding the approval:

## Protocol Title: Acceptance of Learning Management Systems: Perspectives of Nigerian Students.

**Protocol Number:** PRO-19-03-13.

**Approval Code:** AUN-19-03-13

**Effective Date:** 13-03-2019.

**Expiration Date:** 13-03-2020

**AUN IRB Review Action:** Approved with minor modifications.

*In addition, please note the following conditions associated with the approval:*

1. *Approval by the AUN IRB for this protocol will lapse after one year, on 13-03-2020.*
2. Approval by the AUN IRB does not guarantee access to any particular site, individual, or data. It is your responsibility, as principal investigator and guided by your Faculty Advisor, to make the appropriate contacts and obtain written permission(s) from any cooperating institutions and the consent of study subjects before conducting your research. Participation in this research must be strictly voluntary, and the informed-consent document and process, as approved by the AUN IRB, must be followed.
3. You must conduct your research in accordance with this AUN IRB-approved protocol. An amendment must be submitted to the AUN IRB and approved *prior* to making any changes to your research.
4. The AUN IRB has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

We wish you the best of success as you conduct your research.

If you have any questions or need further help, please contact the AUN IRB office at [irb@aun.edu.ng.](mailto:irb@aun.edu.ng)

Sincerely,

**Professor Linus Osuagwu, Chair, AUN IRB, American University of Nigeria.**

L**inus Osuagwu, B.Sc.Tech (FUTO), M.Sc, PhD (UNILAG)**

**Professor of Marketing, & Former Dean, School of Business & Entrepreneurship, American University of Nigeria.**

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**VOIP: 1092.**

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**Skype ID: linus.osuagwu Twitter: @LinusOsuagwu**

# APPENDIX D: OUTLIERS

## Univariate Outliers

**Descriptive Statistics (Public Universities) Descriptive Statistics**

***Table 1: Univariate outliers (Public Universities Sample)***

|  |  |  |
| --- | --- | --- |
| Zscore | Minimum | Maximum |
| Zscore: PU1 | -.87292 | 3.59047 |
| Zscore: PU2 | -.59867 | 2.53481 |
| Zscore: PU3 | -.61318 | 3.59635 |
| Zscore: PU4 | -.70529 | 3.37708 |
| Zscore: PU5 | -.58326 | 3.09574 |
| Zscore: PEOU1 | -.65852 | 2.88883 |
| Zscore: PEOU2 | -.72135 | 2.37407 |
| Zscore: PEOU3 | -.96355 | 3.48083 |
| Zscore: PEOU4 | -.79667 | 3.13166 |
| Zscore: LV1 | -1.02124 | 3.51213 |
| Zscore: LV2 | -.97621 | 3.80283 |
| Zscore: LV3 | -1.35019 | 3.12316 |
| Zscore: LV4 | -1.09721 | 3.41389 |
| Zscore: LV5 | -1.16177 | 2.30475 |
| Zscore: IQ1 | -2.33915 | 1.06577 |
| Zscore: IQ2 | -1.55598 | 1.22612 |
| Zscore: IQ3 | -1.54905 | 1.36356 |
| Zscore: IQ4 | -1.54052 | 1.25629 |
| Zscore: IQ5 | -1.71382 | 1.06443 |

|  |  |  |
| --- | --- | --- |
| Zscore: SI1 | -.85985 | 2.88761 |
| Zscore: SI2 | -.71318 | 4.16602 |
| Zscore: SI3 | -.78156 | 3.67242 |
| Zscore: SI4 | -.84183 | 2.95411 |
| Zscore: FC1 | -.80652 | 3.02531 |
| Zscore: FC2 | -.85554 | 2.97105 |
| Zscore: FC3 | -.85998 | 2.95563 |
| Zscore: FC4 | -.95651 | 2.72648 |
| Zscore: SQ1 | -.57500 | 2.88911 |
| Zscore: SQ2 | -.86948 | 2.90508 |
| Zscore: SQ3 | -.82595 | 3.65606 |
| Zscore: SQ4 | -.83642 | 3.01355 |
| Zscore: CQ1 | -1.44403 | 1.25735 |
| Zscore: CQ2 | -1.47367 | 1.46769 |
| Zscore: CQ3 | -1.60129 | 1.30228 |
| Zscore: CQ4 | -1.85435 | 1.07138 |
| Zscore: CQ5 | -1.27615 | 2.26445 |
| Zscore: BI1 | -.65573 | 3.27867 |
| Zscore: BI2 | -.61103 | 3.35621 |
| Zscore: BI3 | -.65648 | 3.55643 |
| Zscore: BI4 | -.65130 | 3.51679 |
| Zscore: AU1 | -.73132 | 3.27691 |
| Zscore: AU2 | -.63222 | 3.63526 |
| Zscore: AU3 | -.64253 | 3.16112 |

## Descriptive Statistics (Private Universities)

***Table 2: Univariate outliers (Private Universities Sample)***

|  |  |  |
| --- | --- | --- |
| Zscore | Minimum | Maximum |
| Zscore: PU1 | -.85645 | 4.12413 |
| Zscore: PU2 | -.56484 | 4.21521 |
| Zscore: PU3 | -.57707 | 3.50019 |
| Zscore: PU4 | -.64015 | 3.35948 |
| Zscore: PU5 | -.52798 | 7.29848 |
| Zscore: PEOU1 | -.72219 | 3.43498 |
| Zscore: PEOU2 | -.75635 | 4.74172 |
| Zscore: PEOU3 | -.61275 | 5.07113 |
| Zscore: PEOU4 | -.68853 | 3.98687 |
| Zscore: LV1 | -1.65102 | 1.13131 |
| Zscore: LV2 | -1.66048 | 1.26568 |
| Zscore: LV3 | -1.79089 | 1.11139 |
| Zscore: LV4 | -2.22993 | .87758 |
| Zscore: LV5 | -.82641 | 3.97948 |
| Zscore: IQ1 | -.50151 | 5.33133 |
| Zscore: IQ2 | -.78425 | 3.48115 |
| Zscore: IQ3 | -.91216 | 3.22955 |
| Zscore: IQ4 | -.90305 | 3.92172 |
| Zscore: IQ5 | -1.05785 | 3.83349 |
| Zscore: SI1 | -1.07779 | 4.60031 |
| Zscore: SI2 | -1.05750 | 2.06543 |
| Zscore: SI3 | -1.12351 | 3.45944 |
| Zscore: SI4 | -.69691 | 4.18137 |
| Zscore: FC1 | -1.03403 | 2.48725 |
| Zscore: FC2 | -1.00036 | 2.30213 |
| Zscore: FC3 | -.79527 | 4.27124 |

|  |  |  |
| --- | --- | --- |
| Zscore: FC4 | -1.02448 | 2.91368 |
| Zscore: SQ1 | -.65024 | 4.24110 |
| Zscore: SQ2 | -.85326 | 3.17841 |
| Zscore: SQ3 | -.93583 | 3.28797 |
| Zscore: SQ4 | -.91613 | 3.67059 |
| Zscore: CQ1 | -1.01313 | 3.09677 |
| Zscore: CQ2 | -.96778 | 3.20112 |
| Zscore: CQ3 | -1.26249 | 2.81632 |
| Zscore: CQ4 | -1.08909 | 3.09035 |
| Zscore: CQ5 | -1.11736 | 3.18139 |
| Zscore: BI1 | -.65995 | 3.37989 |
| Zscore: BI2 | -.66395 | 3.53644 |
| Zscore: BI3 | -.71329 | 4.05879 |
| Zscore: BI4 | -.76619 | 2.99510 |
| Zscore: AU1 | -.51961 | 4.78887 |
| Zscore: AU2 | -.61502 | 4.29647 |
| Zscore: AU3 | -.74307 | 3.99755 |

## Multivariate Outliers

### Table 3: Public University sample of Multivariate outliers

|  |  |  |  |
| --- | --- | --- | --- |
| Observation number | Mahalanobis d-squared | P1 | P2 |
| 267 | 153.738 | .000 | .000 |
| 268 | 102.038 | .000 | .000 |
| 216 | 93.944 | .000 | .000 |

|  |  |  |  |
| --- | --- | --- | --- |
| Observation number | Mahalanobis d-squared | P1 | P2 |
| 176 | 58.101 | .015 | .000 |
| 416 | 56.817 | .020 | .000 |
| 36 | 54.481 | .032 | .000 |
| 104 | 54.038 | .035 | .000 |
| 445 | 53.478 | .039 | .000 |
| 446 | 53.478 | .039 | .000 |
| 447 | 53.478 | .039 | .000 |
| 396 | 53.425 | .039 | .000 |
| 270 | 53.326 | .040 | .000 |
| 166 | 53.092 | .042 | .000 |
| 15 | 52.798 | .044 | .000 |

***Table 4: Private University sample of Multivariate outliers***

|  |  |  |  |
| --- | --- | --- | --- |
| **Observation number** | **Mahalanobis d-squared** | **P1** | **P2** |
| 294 | 89.159 | .000 | .001 |
| 284 | 57.639 | .012 | .000 |
| 71 | 52.940 | .034 | .000 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Observation number** | **Mahalanobis d-squared** | **P1** | **P2** |
| 18 | 52.847 | .035 | .000 |
| 137 | 52.253 | .039 | .000 |
| 215 | 51.507 | .045 | .000 |
| 243 | 44.271 | .162 | .000 |
| 112 | 44.039 | .168 | .000 |
| 75 | 43.952 | .170 | .000 |
| 67 | 43.597 | .180 | .000 |

# APPENDIX E: NORMALITY

### Table 1: Public University sample (Skewness and Kurtosis values)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Items | Mean | Std.  Deviation | Skewness | Kurtosis |
| PU1 | 1.59 | .672 | .770 | -.301 |
| PU2 | 1.38 | .638 | 1.437 | .824 |
| PU3 | 1.29 | .475 | 1.184 | .053 |
| PU4 | 1.35 | .490 | .824 | -.890 |
| PU5 | 1.32 | .544 | 1.501 | 1.315 |
| PEOU1 | 1.37 | .564 | 1.224 | .517 |
| PEOU2 | 1.47 | .646 | 1.065 | -.009 |
| PEOU3 | 1.65 | .675 | .609 | -.473 |
| PEOU4 | 1.61 | .764 | .923 | -.247 |
| LV1 | 1.90 | .882 | .586 | -.402 |
| LV2 | 1.82 | .837 | .800 | .112 |
| LV3 | 2.21 | .894 | .380 | -.004 |
| LV4 | 1.97 | .887 | .416 | -.595 |
| LV5 | 2.01 | .865 | .191 | -1.203 |
| IQ1 | 3.75 | 1.175 | -.463 | -.799 |
| IQ2 | 3.24 | 1.438 | -.129 | -1.361 |
| IQ3 | 3.13 | 1.373 | -.060 | -1.229 |
| IQ4 | 3.20 | 1.430 | -.136 | -1.297 |
| IQ5 | 3.47 | 1.440 | -.438 | -1.136 |
| SI1 | 1.69 | .801 | .779 | -.520 |
| SI2 | 1.59 | .820 | 1.138 | .285 |
| SI3 | 1.70 | .898 | 1.016 | .088 |
| SI4 | 1.67 | .790 | .752 | -.734 |
| FC1 | 1.63 | .783 | 1.107 | .621 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| FC2 | 1.67 | .784 | .990 | .361 |
| FC3 | 1.68 | .786 | .959 | .246 |
| FC4 | 1.78 | .815 | .697 | -.400 |
| SQ1 | 1.33 | .577 | 1.551 | 1.375 |
| SQ2 | 1.69 | .795 | .854 | -.159 |
| SQ3 | 1.74 | .892 | .931 | -.031 |
| SQ4 | 1.65 | .779 | .816 | -.490 |
| CQ1 | 3.13 | 1.481 | .040 | -1.479 |
| CQ2 | 3.00 | 1.360 | .135 | -1.231 |
| CQ3 | 3.21 | 1.378 | -.037 | -1.325 |
| CQ4 | 3.54 | 1.367 | -.398 | -1.130 |
| CQ5 | 2.08 | .847 | -.061 | -1.404 |
| BI1 | 1.50 | .763 | 1.252 | .323 |
| BI2 | 1.46 | .756 | 1.460 | 1.054 |
| BI3 | 1.47 | .712 | 1.234 | .230 |
| BI4 | 1.47 | .720 | 1.303 | .573 |
| AU1 | 1.55 | .748 | 1.113 | .225 |
| AU2 | 1.44 | .703 | 1.408 | 1.011 |
| AU3 | 1.51 | .789 | 1.517 | 1.556 |

***Table 2: Private University sample (Skewness and Kurtosis values)***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Items | Mean | Std.  Deviation | Skewness | Kurtosis |
| PU1 | 1.66 | .763 | .851 | -.173 |
| PU2 | 1.31 | .557 | 1.613 | 1.638 |
| PU3 | 1.26 | .464 | 1.404 | .755 |
| PU4 | 1.32 | .489 | 1.045 | -.263 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| PU5 | 1.26 | .461 | 1.441 | .878 |
| PEOU1 | 1.46 | .635 | 1.171 | .824 |
| PEOU2 | 1.48 | .627 | 1.010 | .269 |
| PEOU3 | 1.41 | .625 | 1.338 | .957 |
| PEOU4 | 1.42 | .588 | 1.049 | .103 |
| LV1 | 3.37 | 1.440 | -.234 | -1.354 |
| LV2 | 3.32 | 1.337 | -.199 | -1.167 |
| LV3 | 3.51 | 1.367 | -.465 | -1.044 |
| LV4 | 3.79 | 1.318 | -.694 | -.762 |
| LV5 | 1.63 | .797 | 1.004 | .407 |
| IQ1 | 1.26 | .534 | 1.919 | 2.770 |
| IQ2 | 1.58 | .798 | 1.186 | .648 |
| IQ3 | 1.78 | .917 | .885 | -.096 |
| IQ4 | 1.67 | .764 | .646 | -1.009 |
| IQ5 | 1.81 | .773 | .471 | -.577 |
| SI1 | 1.74 | .662 | .511 | .004 |
| SI2 | 1.68 | .615 | .330 | -.652 |
| SI3 | 1.72 | .611 | .246 | -.610 |
| SI4 | 1.40 | .567 | 1.039 | .086 |
| FC1 | 1.56 | .562 | .354 | -.849 |
| FC2 | 1.58 | .591 | .443 | -.679 |
| FC3 | 1.45 | .573 | .826 | -.317 |
| FC4 | 1.74 | .751 | .768 | .137 |
| SQ1 | 1.40 | .658 | 1.480 | 1.339 |
| SQ2 | 1.74 | .898 | 1.058 | .548 |
| SQ3 | 1.83 | .879 | .667 | -.500 |
| SQ4 | 1.70 | .786 | .708 | -.613 |
| CQ1 | 1.98 | .972 | .810 | .300 |
| CQ2 | 1.90 | .949 | 1.208 | 1.589 |
| CQ3 | 2.20 | .974 | .587 | .207 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CQ4 | 2.03 | .953 | .662 | .160 |
| CQ5 | 2.01 | .947 | .593 | -.134 |
| BI1 | 1.52 | .808 | 1.363 | .908 |
| BI2 | 1.49 | .775 | 1.323 | .549 |
| BI3 | 1.49 | .711 | 1.161 | .099 |
| BI4 | 1.51 | .733 | 1.151 | .117 |
| AU1 | 1.27 | .510 | 1.755 | 2.234 |
| AU2 | 1.36 | .581 | 1.380 | .897 |
| AU3 | 1.56 | .755 | 1.110 | .289 |

# APPENDIX F: MULTICOLLINEARITY

## Public University Sample

### Perceived Usefulness

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables Entered/Removeda** | | | |
| Model | Variables  Entered | Variables  Removed | Method |
| 1 | CQ, IQ,  SQ, FC, PEOU, LV, SIb |  | Enter |
| a. Dependent Variable: PU | | | |
| b. All requested variables entered. | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Coefficientsa** | | | |
| Model | | Collinearity Statistics | |
| Tolerance | VIF |
| 1 | PEOU | .738 | 1.355 |
| LV | .671 | 1.491 |
| IQ | .992 | 1.008 |
| SI | .631 | 1.586 |
| FC | .671 | 1.490 |
| SQ | .790 | 1.265 |
| CQ | .961 | 1.041 |
| a. Dependent Variable: PU | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Collinearity Diagnosticsa** | | | | | | | | | | | |
| Mod el | | Eigenva lue | Conditi on  Index | Variance Proportions | | | | | | | |
| (Consta  nt) | PEOU | LV | IQ | SI | FC | SQ | CQ |
| 1 | 1 | 7.341 | 1.000 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| 2 | .209 | 5.932 | .00 | .03 | .06 | .00 | .13 | .13 | .08 | .01 |
| 3 | .132 | 7.454 | .01 | .00 | .05 | .13 | .07 | .13 | .02 | .22 |
| 4 | .098 | 8.636 | .00 | .19 | .00 | .18 | .00 | .00 | .28 | .24 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 5 | .088 | 9.120 | .00 | .02 | .01 | .12 | .27 | .00 | .46 | .21 |
| 6 | .061 | 10.955 | .00 | .45 | .12 | .25 | .33 | .16 | .00 | .02 |
| 7 | .051 | 11.959 | .00 | .12 | .72 | .03 | .16 | .53 | .06 | .01 |
| 8 | .019 | 19.799 | .98 | .18 | .04 | .27 | .03 | .02 | .10 | .29 |
| a. Dependent Variable: PU | | | | | | | | | | | |

***Perceived Ease of Use***

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables Entered/Removeda** | | | |
| Model | Variables  Entered | Variables  Removed | Method |
| 1 | PU, FC,  IQ, SI,  CQ, SQ,  LVb |  | Enter |
| a. Dependent Variable: PEOU | | | |
| b. All requested variables entered. | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Coefficientsa** | | | |
| Model | | Collinearity Statistics | |
| Tolerance | VIF |
| 1 | LV | .670 | 1.492 |
| IQ | .990 | 1.011 |
| SI | .775 | 1.291 |
| FC | .671 | 1.489 |
| SQ | .768 | 1.303 |
| CQ | .901 | 1.110 |
| PU | .871 | 1.139 |
| a. Dependent Variable: PEOU | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Collinearity Diagnosticsa** | | | |
|  |  |  | Variance Proportions |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mod el | | Eigenva lue | Conditi on  Index | (Consta nt) | LV | IQ | SI | FC | SQ | CQ | PU |
| 1 | 1 | 7.335 | 1.000 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| 2 | .197 | 6.106 | .00 | .06 | .00 | .20 | .13 | .13 | .00 | .00 |
| 3 | .139 | 7.260 | .01 | .04 | .13 | .19 | .13 | .01 | .02 | .09 |
| 4 | .118 | 7.889 | .00 | .01 | .00 | .02 | .01 | .06 | .45 | .15 |
| 5 | .083 | 9.375 | .00 | .01 | .27 | .35 | .01 | .39 | .13 | .00 |
| 6 | .060 | 11.069 | .00 | .00 | .42 | .20 | .01 | .35 | .04 | .38 |
| 7 | .053 | 11.779 | .00 | .85 | .00 | .01 | .67 | .03 | .01 | .01 |
| 8 | .015 | 21.973 | .99 | .03 | .17 | .02 | .01 | .02 | .35 | .38 |
| a. Dependent Variable: PEOU | | | | | | | | | | | |

### Learning Value

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables Entered/Removeda** | | | |
| Model | Variables  Entered | Variables  Removed | Method |
| 1 | PEOU, FC, IQ,  PU, SQ,  CQ, SIb |  | Enter |
| a. Dependent Variable: LV | | | |
| b. All requested variables entered. | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Coefficientsa** | | | |
| Model | | Collinearity Statistics | |
| Tolerance | VIF |
| 1 | IQ | .986 | 1.013 |
| SI | .615 | 1.625 |
| FC | .988 | 1.012 |
| SQ | .771 | 1.297 |
| CQ | .886 | 1.128 |
| PU | .866 | 1.155 |

|  |  |  |  |
| --- | --- | --- | --- |
|  | PEOU | .734 | 1.363 |
| a. Dependent Variable: LV | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Collinearity Diagnosticsa** | | | | | | | | | | | |
| Mod el | | Eigenva lue | Conditi  on Index | Variance Proportions | | | | | | | |
| (Consta  nt) | IQ | SI | FC | SQ | CQ | PU | ***PEOU*** |
| 1 | 1 | 7.345 | 1.000 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | ***.00*** |
| 2 | .184 | 6.311 | .00 | .02 | .19 | .19 | .10 | .03 | .01 | ***.03*** |
| 3 | .128 | 7.567 | .00 | .09 | .11 | .44 | .00 | .02 | .13 | ***.00*** |
| 4 | .116 | 7.949 | .00 | .01 | .00 | .27 | .00 | .44 | .07 | ***.01*** |
| 5 | .095 | 8.776 | .00 | .09 | .07 | .01 | .58 | .02 | .01 | ***.19*** |
| 6 | .066 | 10.555 | .00 | .64 | .03 | .02 | .06 | .11 | .13 | ***.19*** |
| 7 | .050 | 12.090 | .00 | .01 | .60 | .01 | .22 | .00 | .31 | ***.49*** |
| 8 | .013 | 22.516 | .99 | .13 | .00 | .06 | .02 | .38 | .32 | ***.08*** |
| a. Dependent Variable: LV | | | | | | | | | | | |

***Instructor Quality***

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables Entered/Removeda** | | | |
| Model | Variables  Entered | Variables  Removed | Method |
| 1 | LV, PU,  SI, CQ, SQ, PEOU,  FCb |  | Enter |
| a. Dependent Variable: IQ | | | |
| b. All requested variables entered. | | | |

|  |  |  |
| --- | --- | --- |
| **Coefficientsa** | | |
| Model | Collinearity Statistics | |
| Tolerance | VIF |

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | SI | .616 | 1.624 |
| FC | .671 | 1.490 |
| SQ | .769 | 1.300 |
| CQ | .884 | 1.131 |
| PU | .869 | 1.150 |
| PEOU | .735 | 1.360 |
| LV | .670 | 1.493 |
| a. Dependent Variable: IQ | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Collinearity Diagnosticsa** | | | | | | | | | | | |
| Mod el | | Eigenva lue | Conditi on  Index | Variance Proportions | | | | | | | |
| (Consta  nt) | SI | FC | SQ | CQ | PU | PEOU | LV |
| 1 | 1 | 7.340 | 1.000 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| 2 | .209 | 5.933 | .00 | .13 | .13 | .08 | .01 | .00 | .03 | .06 |
| 3 | .122 | 7.765 | .01 | .24 | .13 | .01 | .02 | .23 | .00 | .02 |
| 4 | .119 | 7.855 | .00 | .00 | .04 | .01 | .53 | .08 | .02 | .01 |
| 5 | .091 | 8.988 | .00 | .02 | .01 | .67 | .00 | .01 | .28 | .01 |
| 6 | .054 | 11.618 | .00 | .11 | .46 | .02 | .00 | .11 | .13 | .66 |
| 7 | .049 | 12.204 | .00 | .50 | .21 | .20 | .00 | .16 | .42 | .21 |
| 8 | .016 | 21.335 | .99 | .00 | .01 | .01 | .44 | .41 | .11 | .02 |
| a. Dependent Variable: IQ | | | | | | | | | | | |

### Social Influence

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables Entered/Removeda** | | | |
| Model | Variables  Entered | Variables  Removed | Method |
| 1 | IQ, FC,  SQ, CQ, PEOU, PU, LVb |  | Enter |
| a. Dependent Variable: SI | | | |
| b. All requested variables entered. | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Coefficientsa** | | | |
| Model | | Collinearity Statistics | |
| Tolerance | VIF |
| 1 | FC | .675 | 1.482 |
| SQ | .926 | 1.080 |
| CQ | .890 | 1.123 |
| PU | .886 | 1.129 |
| PEOU | .922 | 1.084 |
| LV | .670 | 1.493 |
| IQ | .987 | 1.013 |
| a. Dependent Variable: SI | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Collinearity Diagnosticsa** | | | | | | | | | | | |
| Mod el | | Eigenva lue | Conditi  on Index | Variance Proportions | | | | | | | |
| (Consta  nt) | FC | SQ | CQ | PU | PEOU | LV | IQ |
| 1 | 1 | 7.379 | 1.000 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| 2 | .178 | 6.438 | .00 | .24 | .13 | .00 | .02 | .04 | .09 | .01 |
| 3 | .123 | 7.759 | .00 | .05 | .13 | .39 | .02 | .02 | .03 | .06 |
| 4 | .108 | 8.279 | .00 | .00 | .47 | .13 | .12 | .02 | .00 | .16 |
| 5 | .081 | 9.549 | .00 | .00 | .09 | .00 | .18 | .79 | .00 | .01 |
| 6 | .065 | 10.679 | .00 | .05 | .13 | .10 | .32 | .03 | .01 | .59 |
| 7 | .053 | 11.795 | .00 | .65 | .00 | .01 | .02 | .00 | .86 | .02 |
| 8 | .013 | 22.734 | .99 | .01 | .02 | .37 | .32 | .09 | .02 | .13 |
| a. Dependent Variable: SI | | | | | | | | | | | |

***Facilitating Conditions***

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables Entered/Removeda** | | | |
| Model | Variables  Entered | Variables  Removed | Method |

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | SI, IQ,  CQ, LV,  PU, SQ, PEOUb |  | Enter |
| a. Dependent Variable: FC | | | |
| b. All requested variables entered. | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Coefficientsa** | | | |
| Model | | Collinearity Statistics | |
| Tolerance | VIF |
| 1 | SQ | .772 | 1.295 |
| CQ | .884 | 1.131 |
| PU | .864 | 1.157 |
| PEOU | .733 | 1.364 |
| LV | .986 | 1.015 |
| IQ | .986 | 1.013 |
| SI | .619 | 1.617 |
| a. Dependent Variable: FC | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Collinearity Diagnosticsa** | | | | | | | | | | | |
| Mod el | | Eigenva lue | Conditi on  Index | Variance Proportions | | | | | | | |
| (Consta  nt) | SQ | CQ | PU | PEOU | LV | IQ | SI |
| 1 | 1 | 7.378 | 1.000 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| 2 | .177 | 6.461 | .00 | .09 | .05 | .02 | .03 | .06 | .03 | .24 |
| 3 | .121 | 7.815 | .00 | .01 | .35 | .19 | .02 | .01 | .02 | .05 |
| 4 | .101 | 8.547 | .00 | .11 | .03 | .00 | .03 | .59 | .20 | .00 |
| 5 | .094 | 8.854 | .00 | .51 | .07 | .01 | .17 | .18 | .00 | .07 |
| 6 | .065 | 10.681 | .00 | .04 | .13 | .16 | .17 | .08 | .59 | .03 |
| 7 | .051 | 12.082 | .00 | .21 | .00 | .30 | .51 | .00 | .01 | .60 |
| 8 | .013 | 22.636 | .99 | .02 | .37 | .31 | .08 | .06 | .13 | .00 |
| a. Dependent Variable: FC | | | | | | | | | | | |

### System Quality

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables Entered/Removeda** | | | |
| Model | Variables  Entered | Variables  Removed | Method |
| 1 | FC, IQ,  CQ, SI, PU, PEOU,  LVb |  | Enter |
| a. Dependent Variable: SQ | | | |
| b. All requested variables entered. | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Coefficientsa** | | | |
| Model | | Collinearity Statistics | |
| Tolerance | VIF |
| 1 | CQ | .884 | 1.132 |
| PU | .890 | 1.124 |
| PEOU | .733 | 1.365 |
| LV | .673 | 1.487 |
| IQ | .988 | 1.012 |
| SI | .742 | 1.348 |
| FC | .675 | 1.481 |
| a. Dependent Variable: SQ | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Collinearity Diagnosticsa** | | | | | | | | | | | |
| Mod el | | Eigenva lue | Conditi on  Index | Variance Proportions | | | | | | | |
| (Consta  nt) | CQ | PU | PEOU | LV | IQ | SI | FC |
| 1 | 1 | 7.364 | 1.000 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| 2 | .187 | 6.277 | .00 | .00 | .00 | .06 | .07 | .00 | .23 | .16 |
| 3 | .138 | 7.296 | .01 | .02 | .10 | .00 | .04 | .12 | .24 | .12 |
| 4 | .118 | 7.892 | .00 | .49 | .13 | .04 | .01 | .00 | .01 | .01 |
| 5 | .069 | 10.350 | .00 | .09 | .21 | .02 | .02 | .71 | .01 | .07 |
| 6 | .056 | 11.442 | .00 | .00 | .20 | .71 | .06 | .00 | .46 | .03 |
| 7 | .053 | 11.806 | .00 | .02 | .00 | .09 | .78 | .03 | .05 | .59 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 8 | .015 | 22.536 | .99 | .37 | .36 | .08 | .02 | .13 | .00 | .01 |
| a. Dependent Variable: SQ | | | | | | | | | | | |

***Course Quality***

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables Entered/Removeda** | | | |
| Model | Variables  Entered | Variables  Removed | Method |
| 1 | SQ, FC,  IQ, PU, PEOU, LV, SIb |  | Enter |
| a. Dependent Variable: CQ | | | |
| b. All requested variables entered. | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Coefficientsa** | | | |
| Model | | Collinearity Statistics | |
| Tolerance | VIF |
| 1 | PU | .939 | 1.064 |
| PEOU | .747 | 1.339 |
| LV | .672 | 1.489 |
| IQ | .986 | 1.013 |
| SI | .620 | 1.613 |
| FC | .671 | 1.489 |
| SQ | .768 | 1.303 |
| a. Dependent Variable: CQ | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Collinearity Diagnosticsa** | | | | | | | | | | | |
| Mod el | | Eigenva lue | Conditi on  Index | Variance Proportions | | | | | | | |
| (Consta  nt) | PU | PEOU | LV | IQ | SI | FC | SQ |
| 1 | 1 | 7.362 | 1.000 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| 2 | .207 | 5.970 | .00 | .00 | .02 | .07 | .00 | .13 | .15 | .08 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 3 | .138 | 7.300 | .01 | .13 | .00 | .03 | .13 | .16 | .12 | .01 |
| 4 | .097 | 8.701 | .00 | .05 | .13 | .01 | .10 | .08 | .00 | .58 |
| 5 | .072 | 10.133 | .00 | .23 | .28 | .00 | .48 | .02 | .00 | .07 |
| 6 | .054 | 11.634 | .00 | .15 | .08 | .66 | .00 | .09 | .52 | .01 |
| 7 | .049 | 12.217 | .00 | .21 | .43 | .17 | .01 | .52 | .19 | .22 |
| 8 | .021 | 18.818 | .99 | .23 | .05 | .06 | .27 | .00 | .02 | .03 |
| a. Dependent Variable: CQ | | | | | | | | | | | |

## Private University Sample

### Perceived Usefulness

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables Entered/Removeda** | | | |
| Model | Variables  Entered | Variables  Removed | Method |
| 1 | CQ, SI,  FC, SQ,  IQ, LV, PEOUb |  | Enter |
| a. Dependent Variable: PU | | | |
| b. All requested variables entered. | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Coefficientsa** | | | |
| Model | | Collinearity Statistics | |
| Tolerance | VIF |
| 1 | PEOU | .719 | 1.390 |
| LV | .928 | 1.077 |
| IQ | .776 | 1.289 |
| SI | .917 | 1.091 |
| FC | .987 | 1.013 |
| SQ | .965 | 1.036 |
| CQ | .951 | 1.052 |
| a. Dependent Variable: PU | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Collinearity Diagnostics: a | | | | | | | | | | | |
| Mod el | | Eigenva lue | Conditi on  Index | Variance Proportions | | | | | | | |
| (Consta  nt) | PEOU | LV | IQ | SI | FC | SQ | CQ |
| 1 | 1 | 7.406 | 1.000 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| 2 | .164 | 6.724 | .00 | .08 | .05 | .02 | .01 | .02 | .15 | .33 |
| 3 | .130 | 7.550 | .00 | .10 | .01 | .12 | .00 | .00 | .61 | .00 |
| 4 | .092 | 8.964 | .00 | .03 | .10 | .00 | .00 | .27 | .10 | .58 |
| 5 | .077 | 9.783 | .00 | .01 | .15 | .03 | .40 | .33 | .03 | .03 |
| 6 | .065 | 10.669 | .00 | .00 | .34 | .18 | .40 | .17 | .02 | .03 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 7 | .050 | 12.119 | .00 | .73 | .06 | .60 | .09 | .00 | .01 | .00 |
| 8 | .016 | 21.754 | .99 | .06 | .29 | .03 | .09 | .21 | .07 | .03 |
| a. Dependent Variable: PU | | | | | | | | | | | |

***Perceived Ease of Use***

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables Entered/Removeda** | | | |
| Model | Variables  Entered | Variables  Removed | Method |
| 1 | PU, CQ,  SQ, FC,  SI, LV,  IQb |  | Enter |
| a. Dependent Variable: PEOU | | | |
| b. All requested variables entered. | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Coefficientsa** | | | |
| Model | | Collinearity Statistics | |
| Tolerance | VIF |
| 1 | LV | .941 | 1.063 |
| IQ | .927 | 1.078 |
| SI | .934 | 1.071 |
| FC | .955 | 1.048 |
| SQ | .966 | 1.035 |
| CQ | .952 | 1.051 |
| PU | .881 | 1.135 |
| a. Dependent Variable: PEOU | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Collinearity Diagnostics: a** | | | | | | | | | | | |
| Model | Dimens ion | Eigenv alue | Condit ion Index | Varianc e Proporti  ons |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | (Consta  nt) | LV | IQ | SI | FC | SQ | CQ | PU |
| 1 | 1 | 7.441 | 1.000 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
|  | 2 | .153 | 6.985 | .00 | .03 | .00 | .01 | .00 | .42 | .35 | .00 |
|  | 3 | .112 | 8.160 | .00 | .02 | .26 | .03 | .01 | .42 | .21 | .03 |
|  | 4 | .088 | 9.187 | .00 | .11 | .18 | .04 | .34 | .02 | .29 | .00 |
|  | 5 | .078 | 9.741 | .00 | .29 | .04 | .30 | .19 | .03 | .09 | .03 |
|  | 6 | .067 | 10.548 | .00 | .25 | .36 | .41 | .04 | .03 | .03 | .05 |
|  | 7 | .047 | 12.571 | .00 | .02 | .08 | .13 | .30 | .02 | .00 | .74 |
|  | 8 | .015 | 22.504 | .99 | .27 | .06 | .08 | .11 | .06 | .03 | .15 |
| a Dependent Variable: PEOU | | | | | | | | | | | |

### Learning Value

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables Entered/Removeda** | | | |
| Model | Variables Entered | Variables Removed | Method |
| 1 | PEOU, FC, CQ,  SQ, SI,  PU, IQb |  | Enter |
| a. Dependent Variable: LV | | | |
| b. All requested variables entered. | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Coefficientsa** | | | |
| Model | | Collinearity Statistics | |
| Tolerance | VIF |
| 1 | IQ | .761 | 1.313 |
| SI | .907 | 1.102 |
| FC | .954 | 1.048 |
| SQ | .957 | 1.045 |
| CQ | .982 | 1.018 |

|  |  |  |  |
| --- | --- | --- | --- |
|  | PU | .885 | 1.129 |
| PEOU | .733 | 1.365 |
| a. Dependent Variable: LV | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Collinearity Diagnosticsa** | | | | | | | | | | | |
| Mod el | | Eigenval ue | Conditi  on Index | Variance Proportions | | | | | | | |
| (Consta  nt) | IQ | SI | FC | SQ | CQ | PU | PEOU |
| 1 | 1 | 7.437 | 1.000 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| 2 | .152 | 6.987 | .00 | .01 | .01 | .02 | .21 | .52 | .00 | .04 |
| 3 | .128 | 7.624 | .00 | .13 | .00 | .01 | .56 | .03 | .00 | .11 |
| 4 | .092 | 8.997 | .00 | .01 | .01 | .45 | .07 | .31 | .05 | .06 |
| 5 | .073 | 10.106 | .00 | .13 | .76 | .03 | .08 | .01 | .00 | .03 |
| 6 | .052 | 11.960 | .00 | .54 | .01 | .09 | .01 | .01 | .06 | .72 |
| 7 | .048 | 12.507 | .00 | .15 | .11 | .21 | .02 | .00 | .77 | .02 |
| 8 | .019 | 19.983 | .99 | .02 | .11 | .20 | .06 | .11 | .12 | .02 |
| a. Dependent Variable: LV | | | | | | | | | | | |

### Instructor Quality

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables Entered/Removeda** | | | |
| Model | Variables Entered | Variables Removed | Method |
| 1 | LV, SI,  FC, SQ,  CQ, PU, PEOUb |  | Enter |
| a. Dependent Variable: IQ | | | |
| b. All requested variables entered. | | | |

|  |  |
| --- | --- |
| **Coefficientsa** | |
| Model | Collinearity Statistics |

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Tolerance | VIF |
| 1 | SI | .906 | 1.104 |
| FC | .953 | 1.050 |
| SQ | .960 | 1.042 |
| CQ | .953 | 1.049 |
| PU | .892 | 1.121 |
| PEOU | .871 | 1.137 |
| LV | .918 | 1.089 |
| a. Dependent Variable: IQ | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Collinearity Diagnosticsa** | | | | | | | | | | | |
| Mod el | | Eigenval ue | Conditi on  Index | Variance Proportions | | | | | | | |
| (Consta  nt) | SI | FC | SQ | CQ | PU | PEOU | LV |
| 1 | 1 | 7.432 | 1.000 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| 2 | .161 | 6.799 | .00 | .01 | .01 | .26 | .34 | .00 | .07 | .04 |
| 3 | .112 | 8.160 | .00 | .04 | .00 | .64 | .03 | .01 | .26 | .02 |
| 4 | .093 | 8.917 | .00 | .01 | .28 | .04 | .49 | .02 | .11 | .07 |
| 5 | .078 | 9.762 | .00 | .23 | .24 | .01 | .09 | .04 | .02 | .32 |
| 6 | .062 | 10.974 | .00 | .52 | .01 | .00 | .02 | .05 | .41 | .23 |
| 7 | .048 | 12.438 | .00 | .13 | .34 | .01 | .00 | .73 | .04 | .01 |
| 8 | .013 | 22.768 | .99 | .05 | .12 | .04 | .03 | .15 | .09 | .30 |
| a. Dependent Variable: IQ | | | | | | | | | | | |

### Social Influence

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables Entered/Removeda** | | | |
| Model | Variables Entered | Variables Removed | Method |

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | IQ, FC,  SQ, LV,  CQ, PU, PEOUb |  | Enter |
| a. Dependent Variable: SI | | | |
| b. All requested variables entered. | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Coefficientsa** | | | |
| Model | | Collinearity Statistics | |
| Tolerance | VIF |
| 1 | FC | .955 | 1.047 |
| SQ | .966 | 1.035 |
| CQ | .951 | 1.051 |
| PU | .888 | 1.126 |
| PEOU | .739 | 1.354 |
| LV | .921 | 1.085 |
| IQ | .763 | 1.310 |
| a. Dependent Variable: SI | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Collinearity Diagnosticsa | | | | | | | | | | | |
| Mode l | | Eigenvalu e | Conditio n Index | Variance Proportions | | | | | | | |
| (Constan  t) | FC | SQ | CQ | PU | PEOU | LV | IQ |
| 1 | 1 | 7.423 | 1.000 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| 2 | .163 | 6.751 | .00 | .01 | .16 | .33 | .00 | .08 | .05 | .03 |
| 3 | .130 | 7.560 | .00 | .00 | .60 | .00 | .00 | .10 | .01 | .12 |
| 4 | .094 | 8.877 | .00 | .27 | .11 | .52 | .02 | .04 | .05 | .01 |
| 5 | .073 | 10.068 | .00 | .26 | .00 | .11 | .05 | .00 | .53 | .02 |
| 6 | .052 | 11.956 | .00 | .02 | .03 | .00 | .02 | .69 | .01 | .69 |
| 7 | .050 | 12.242 | .00 | .33 | .04 | .00 | .73 | .01 | .00 | .11 |
| 8 | .015 | 22.403 | .99 | .11 | .06 | .03 | .17 | .07 | .33 | .02 |
| a. Dependent Variable: SI | | | | | | | | | | | |

### Facilitating Conditions

|  |  |  |  |
| --- | --- | --- | --- |
| Variables Entered/Removeda | | | |
| Model | Variables Entered | Variables Removed | Method |
| 1 | SI, LV,  SQ, IQ,  CQ, PU, PEOUb |  | Enter |
| a. Dependent Variable: FC | | | |
| b. All requested variables entered. | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Coefficientsa | | | |
| Model | | Collinearity Statistics | |
| Tolerance | VIF |
| 1 | SQ | .957 | 1.045 |
| CQ | .956 | 1.046 |
| PU | .908 | 1.102 |
| PEOU | .717 | 1.394 |
| LV | .920 | 1.087 |
| IQ | .762 | 1.313 |
| SI | .907 | 1.103 |
| a. Dependent Variable: FC | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Collinearity Diagnosticsa | | | | | | | | | | | |
| Mod el | | Eigenval ue | Conditi  on Index | Variance Proportions | | | | | | | |
| (Consta  nt) | ***SQ*** | ***CQ*** | ***PU*** | ***PEOU*** | ***LV*** | ***IQ*** | ***SI*** |
| 1 | 1 | 7.432 | 1.000 | .00 | ***.00*** | ***.00*** | ***.00*** | ***.00*** | ***.00*** | ***.00*** | ***.00*** |
| 2 | .162 | 6.779 | .00 | ***.13*** | ***.41*** | ***.00*** | ***.06*** | ***.06*** | ***.02*** | ***.00*** |
| 3 | .130 | 7.561 | .00 | ***.63*** | ***.00*** | ***.00*** | ***.09*** | ***.01*** | ***.11*** | ***.00*** |
| 4 | .086 | 9.307 | .01 | ***.13*** | ***.50*** | ***.01*** | ***.04*** | ***.30*** | ***.01*** | ***.09*** |
| 5 | .068 | 10.448 | .00 | ***.02*** | ***.04*** | ***.00*** | ***.00*** | ***.17*** | ***.20*** | ***.66*** |
| 6 | .058 | 11.351 | .00 | ***.02*** | ***.00*** | ***.67*** | ***.22*** | ***.08*** | ***.00*** | ***.05*** |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 7 | .050 | 12.232 | .00 | ***.03*** | ***.00*** | ***.08*** | ***.54*** | ***.02*** | ***.64*** | ***.15*** |
| 8 | .016 | 21.838 | .99 | ***.05*** | ***.04*** | ***.24*** | ***.04*** | ***.36*** | ***.02*** | ***.04*** |
| a. Dependent Variable: FC | | | | | | | | | | | |

### System Quality

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables Entered/Removeda** | | | |
| Model | Variables  Entered | Variables  Removed | Method |
| 1 | FC, IQ,  LV, SI,  CQ, PU, PEOUb |  | Enter |
| a. Dependent Variable: SQ | | | |
| b. All requested variables entered. | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Coefficientsa** | | | |
| Model | | Collinearity Statistics | |
| Tolerance | VIF |
| 1 | CQ | .953 | 1.049 |
| PU | .883 | 1.132 |
| PEOU | .722 | 1.385 |
| LV | .918 | 1.089 |
| IQ | .763 | 1.310 |
| SI | .913 | 1.096 |
| FC | .952 | 1.050 |
| a. Dependent Variable: SQ | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Collinearity Diagnosticsa** | | | | | | | | | | | |
| Mod el | | Eigenva lue | Conditi on  Index | Variance Proportions | | | | | | | |
| (Consta  nt) | CQ | PU | PEOU | LV | IQ | SI | FC |
| 1 | 1 | 7.483 | 1.000 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 2 | .158 | 6.886 | .00 | .32 | .00 | .13 | .06 | .06 | .01 | .01 |
| 3 | .098 | 8.738 | .00 | .56 | .02 | .07 | .06 | .05 | .00 | .20 |
| 4 | .080 | 9.693 | .00 | .03 | .02 | .00 | .17 | .04 | .36 | .30 |
| 5 | .068 | 10.480 | .00 | .06 | .06 | .00 | .36 | .23 | .31 | .02 |
| 6 | .052 | 12.034 | .00 | .00 | .13 | .70 | .02 | .45 | .03 | .07 |
| 7 | .047 | 12.561 | .00 | .00 | .60 | .03 | .03 | .16 | .21 | .28 |
| 8 | .015 | 22.499 | .99 | .02 | .16 | .06 | .31 | .01 | .07 | .12 |
| a. Dependent Variable: SQ | | | | | | | | | | | |

***Course Quality***

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables Entered/Removeda** | | | |
| Model | Variables  Entered | Variables  Removed | Method |
| 1 | SQ, FC,  IQ, LV,  SI, PU, PEOUb |  | Enter |
| a. Dependent Variable: CQ | | | |
| b. All requested variables entered. | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Coefficientsa** | | | |
| Model | | Collinearity Statistics | |
| Tolerance | VIF |
| 1 | PU | .876 | 1.132 |
| PEOU | .716 | 1.397 |
| LV | .949 | 1.054 |
| IQ | .763 | 1.310 |
| SI | .905 | 1.106 |
| FC | .958 | 1.044 |
| SQ | .960 | 1.042 |
| a. Dependent Variable: CQ | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Collinearity Diagnosticsa** | | | | | | | | | | | |
| Mod el | | Eigenva lue | Conditi  on Index | Variance Proportions | | | | | | | |
| (Consta  nt) | PU | PEOU | LV | IQ | SI | FC | SQ |
| 1 | 1 | 7.480 | 1.000 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| 2 | .131 | 7.564 | .00 | .00 | .18 | .09 | .13 | .00 | .04 | .19 |
| 3 | .128 | 7.638 | .00 | .00 | .02 | .09 | .00 | .00 | .07 | .68 |
| 4 | .080 | 9.672 | .00 | .04 | .00 | .20 | .00 | .25 | .39 | .01 |
| 5 | .068 | 10.493 | .00 | .06 | .01 | .21 | .21 | .51 | .03 | .05 |
| 6 | .052 | 12.048 | .00 | .16 | .68 | .02 | .42 | .01 | .09 | .00 |
| 7 | .047 | 12.653 | .00 | .60 | .06 | .03 | .21 | .17 | .24 | .02 |
| 8 | .015 | 22.680 | .99 | .13 | .04 | .36 | .02 | .05 | .13 | .04 |
| a. Dependent Variable: CQ | | | | | | | | | | | |

# APPENDIX G: MEASURMENT MODEL

## Public University Sample

**Model Fit Summary CMIN**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model | NPAR | CMIN | DF | P | CMIN/DF |
| Default model | 120 | 1293.325 | 475 | .000 | 2.723 |
| Saturated model | 595 | .000 | 0 |  |  |
| Independence model | 34 | 13987.838 | 561 | .000 | 24.934 |

**RMR, GFI**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | RMR | GFI | AGFI | PGFI |
| Default model | .032 | .906 | .882 | .723 |
| Saturated model | .000 | 1.000 |  |  |
| Independence model | .195 | .386 | .349 | .364 |

**Baseline Comparisons**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model | NFI  Delta1 | RFI  rho1 | IFI  Delta2 | TLI  rho2 | CFI |
| Default model | .908 | .891 | .939 | .928 | .939 |
| Saturated model | 1.000 |  | 1.000 |  | 1.000 |
| Independence model | .000 | .000 | .000 | .000 | .000 |

**Parsimony-Adjusted Measures**

|  |  |  |  |
| --- | --- | --- | --- |
| Model | PRATIO | PNFI | PCFI |
| Default model | .847 | .768 | .795 |
| Saturated model | .000 | .000 | .000 |

|  |  |  |  |
| --- | --- | --- | --- |
| Model | PRATIO | PNFI | PCFI |
| Independence model | 1.000 | .000 | .000 |

**NCP**

|  |  |  |  |
| --- | --- | --- | --- |
| Model | NCP | LO 90 | HI 90 |
| Default model | 818.325 | 715.213 | 929.072 |
| Saturated model | .000 | .000 | .000 |
| Independence model | 13426.838 | 13044.875 | 13815.167 |

**FMIN**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | FMIN | F0 | LO 90 | HI 90 |
| Default model | 1.755 | 1.110 | .970 | 1.261 |
| Saturated model | .000 | .000 | .000 | .000 |
| Independence model | 18.979 | 18.218 | 17.700 | 18.745 |

**RMSEA**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | RMSEA | LO 90 | HI 90 | PCLOSE |
| Default model | .048 | .045 | .052 | .802 |
| Independence model | .180 | .178 | .183 | .000 |

**AIC**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | AIC | BCC | BIC | CAIC |
| Default model | 1533.325 | 1545.290 | 2085.798 | 2205.798 |
| Saturated model | 1190.000 | 1249.330 | 3929.347 | 4524.347 |
| Independence model | 13055.838 | 13059.228 | 13212.372 | 13246.372 |

**ECVI**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | ECVI | LO 90 | HI 90 | MECVI |
| Default model | 2.080 | 1.941 | 2.231 | 2.097 |
| Saturated model | 1.615 | 1.615 | 1.615 | 1.695 |
| Independence model | 19.072 | 18.553 | 19.599 | 19.076 |

**HOELTER**

|  |  |  |
| --- | --- | --- |
| Model | HOELTER  .05 | HOELTER  .01 |
| Default model | 301 | 313 |
| Independence model | 33 | 34 |

## Private University Sample

**Model Fit Summary CMIN**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model | NPAR | CMIN | DF | P | CMIN/DF |
| Default model | 116 | 823.384 | 479 | .000 | 1.719 |
| Saturated model | 595 | .000 | 0 |  |  |
| Independence model | 34 | 6777.630 | 561 | .000 | 12.081 |

**RMR, GFI**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | RMR | GFI | AGFI | PGFI |
| Default model | .032 | .909 | .891 | .732 |
| Saturated model | .000 | 1.000 |  |  |
| Independence model | .160 | .413 | .379 | .390 |

**Baseline Comparisons**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model | NFI  Delta1 | RFI  rho1 | IFI  Delta2 | TLI  rho2 | CFI |
| Default model | .910 | .896 | .945 | .935 | .945 |
| Saturated model | 1.000 |  | 1.000 |  | 1.000 |
| Independence model | .000 | .000 | .000 | .000 | .000 |

**Parsimony-Adjusted Measures**

|  |  |  |  |
| --- | --- | --- | --- |
| Model | PRATIO | PNFI | PCFI |
| Default model | .854 | .750 | .807 |
| Saturated model | .000 | .000 | .000 |
| Independence model | 1.000 | .000 | .000 |

**NCP**

|  |  |  |  |
| --- | --- | --- | --- |
| Model | NCP | LO 90 | HI 90 |
| Default model | 344.384 | 268.795 | 427.839 |
| Saturated model | .000 | .000 | .000 |
| Independence model | 6216.630 | 5954.706 | 6485.017 |

**FMIN**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | FMIN | F0 | LO 90 | HI 90 |
| Default model | 2.184 | .913 | .713 | 1.135 |
| Saturated model | .000 | .000 | .000 | .000 |
| Independence model | 17.978 | 16.490 | 15.795 | 17.202 |

**RMSEA**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | RMSEA | LO 90 | HI 90 | PCLOSE |
| Default model | .044 | .039 | .049 | .982 |
| Independence model | .171 | .168 | .175 | .000 |

**AIC**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | AIC | BCC | BIC | CAIC |
| Default model | 1055.384 | 1079.127 | 1511.832 | 1627.832 |
| Saturated model | 1190.000 | 1311.784 | 3531.262 | 4126.262 |
| Independence model | 6845.630 | 6852.589 | 6979.417 | 7013.417 |

**ECVI**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model | ECVI | LO 90 | HI 90 | MECVI |
| Default model | 2.799 | 2.599 | 3.021 | 2.862 |
| Saturated model | 3.156 | 3.156 | 3.156 | 3.480 |
| Independence model | 18.158 | 17.463 | 18.870 | 18.177 |

**HOELTER**

|  |  |  |
| --- | --- | --- |
| Model | HOELTER  .05 | HOELTER  .01 |
| Default model | 244 | 254 |
| Independence model | 35 | 36 |