THE REPUBLIC OF TURKEY
BAHCESEHIR UNIVERSITY

EXPLORING THE FACTORS THAT AFFECT STUDENTS' ACCEPTANCE OF AND INTENTION TO USE LEARNING MANAGEMENT SYSTEMS IN HIGHER EDUCATION

Master's Thesis

MUHAMAD ABAS FATIH

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ABSTRACT

EXPLORING THE FACTORS THAT AFFECT STUDENTS' ACCEPTANCE OF AND INTENTION TO USE LEARNING MANAGEMENT SYSTEMS IN HIGHER EDUCATION

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Information Technology

Supervisor: Asst.Prof. Dr. Pinar SARISARAY BÖLÜK

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In recent years, most universities and training organizations have used various learning management systems to make learning process easier. These systems serve a lot of different functions such as providing course material, keeping course records etc. so as to support and enhance the education process. In this thesis, our goal is to examine the factors affecting computer software engineering student's perceptions of using a learning management system platform as a main teaching and learning tool in their study program. In order to carry out this goal, we have collected 242 student data through a survey in Iraq. The study integrates two different models –Technology Acceptance Model and the DeLone and McLean Information Systems Success Model – to explore the influence of quality features, perceived ease of use, and perceived usefulness on students' satisfaction and intention to use an e-learning platform (LMS Moodle).

The performance results validate that our model is able to describe the acceptance metrics of learning management systems by students. The results reveal that the external variables are stronger predictors of learners' perceptions of usefulness, their intention to

use the learning management system, and their satisfaction. Moreover, they show that female and male perceptions of using the Moodle system are significantly distinct. The female students' acceptance of learning management systems is higher than the male ones' acceptance; while the female students spend more time using learning management systems per day compared to the male students. The students perceive that the relevant learning management system (Moodle) is useful and easy to use during adopting this new technology in their education environment.

Keywords: Learning Management System, Technology Acceptance Model, DeLone and McLean Model, Higher Education, Moodle System.

ÖZET

YÜKSEK EĞİTİMDE ÖĞRENME YÖNETİM SİSTEMLERİ KULLANIMI ÖĞRENCİLERİN KABUL VE NİYETİ ETKİLEYEN FAKTÖRLER

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Son yılarda çoğu üniversite ve eğitim kurumları eğitim sürecinin daha kolay hale getirecek farklı öğretim yönetim sistemleri kullanmaktadırlar. Bu sistemler eğitim öğretim sürecini destekleyip daha iyi hale getirmek için ders materyali sunmaktan, dersle ilgili kayıtlar tutmaya kadar bir çok farkli fonksiyonları içermektedir. Bu tezde amaç yazılım mühendisliği öğrencilerinin, kendi eğitim süreçlerinde öğretim yönetim sistemlerinin sunduğu öğrenme platformunu kullanma eğilimlerini etkileyen faktörler incelenmektedir. Bu hedefi gerçeklemek için, 242 öğrenci ile bir anket çalışması yapılarak veri toplanılmıştır. Çalışmada iki farklı model (Teknoloji Kabul Modeli ve DeLone-McLean Bilisim Basari modelleri) öğrencilerin memnuniyetinde etkisi olan çeşitli faktörlerin ortaya çıkarılması için birbirine entegre edilmiştir. Öğrenci memnuniyetlerinde etken olarak LMS-Moodle öğrenme platformunun kalitesi, kulanım kolayligi gibi faktörler göz önüne alınmıştır.

Çalışmanın sonucunda geliştirilen modelin, öğrencilerin öğretim yönetim sistemini kullanma isteklerini ve kullanım memnuniyetlerini artıracak faktörleri belirleyebileceği doğrulanmaktadir. Araştırma bulguları dış değişkenlerinin; fayda algılarından, öğretim yönetim sistemini kulanma niyetlerinden ve tatminlerinden daha güçlü olduğunu ortaya koymaktadir. Ayrıca bulgulara göre Moodle sistemi kullanımında kadın ve erkek

algıları önemli derecede farklılık göstermektedir. Sisteme adaptasyon sırasında kız öğrenciler erkek öğrencilere göre öğretim yönetim sisteminde daha fazla vakit harcamaktadirlar.

Eğitim ortaminda bu yeni teknoloji benimsendiği zaman, öğrenciler yönetim sisteminin (Moodle) kullanışlılığı algılamakta ve eğitim öğretim süreçlerinin bir parçası haline getirmektedirler.

Anahtar Kelimeler: Ogrenim Yonetim Sistemi, Teknoloji Kabullenme Modeli, DeLone ve McLean IS Modeli, Yuksek Egitim, Moodle Sistemi

CONTENTS

TABLES

FIGURES

ABBREVIATIONS

AMOS	:	Analysis of Moment Structure
BAU	:	Bahcesehir University
CMS	:	Content Management System
DL&ML	:	Delone and McLean Model
IS	:	Information System
LCMS	:	Learning Content Management System
LMS	:	Learning Management System
MOODLE	:	Modular Object Oriented Distributed Learning Environment
SEM	:	Structural Equation Model
SPSS	:	Statistical Package For Social Science
TAM	:	Technology Acceptance Model
UKH	:	Univerity of Kurdistan Hawler
VLE	:	Virtual Learning Environment
VLS	:	Virtual Learning System
WBL	:	Web-Based Learning

1. INTRODUCTION

1.1 BACKGROUND

In recent years, the development of technological devices has changed techniques, strategies, methods of teaching, and learning processes in educational organizations (Pishva 2010). Computers and the internet have become important and necessary at universities and in educational institutes, as well as in training courses. They provide teachers (and learners) with more choices in order to be able to teach (and learn) more effectively (Ngai, Poon et al. 2007). Pishva (2010) states that communication between students and lecturers have been facilitated by the integration of technology into the educational environment. According to the results of a survey about internet usage conducted at the Georgia Technology College of Computing, individuals' primary uses of the internet include schooling, communication, marketing, amusement, personal information, and time wasting (Moon and Kim 2001). This indicates that the internet affects all of an individual's life.

There are many higher education institutions that are cooperating this system to provide the necessity of learners in this new digital era, while teachers have integrated information and communication technologies (ICT) into the teaching process through what is called a "learning management system" (LMS) (Al-Busaidi and Al-Shihi 2012). It is now common to find LMSs in use in private and public universities. Electronic learning (e-learning) has become an essential facilitator in the teaching and learning process.

"E-learning platform" is another term for LMS. According to different perspectives, concepts such as "Course Management System" (CMS), "Virtual Learning Environment" (VLE), "Learning Content Management System" (LCMS), "Virtual Learning System" (VLS), "Learning Portal", "Electronic Learning Platform", and "Digital Learning" might be used as alternatives to "LMS" (Chung, Pasquini et al. 2013). An LMS can be defined as "a learning technology system that uses a web browser as the primary means of interaction with the learner" (Pishva 2010). This system works as a platform to assist in teaching and learning activities in higher education. It helps teachers and learners to manage the normal learning objectives as

well to as use modern insights to conduct classes and deliver course materials (Wichadee 2015). Learning management systems consist of various features that help faculty members to share different learning materials and to make possible both synchronous and asynchronous communication with their students. Nowadays, the majority of higher education institutes and universities use LMSs to support traditional (face-to-face) education and online learning (Mtebe and Raisamo 2014).

Basically, LMSs focus on three important areas: study skills, communication, and productivity.. Broadly speaking, these include exams, online documents, homework, and other responsibilities. Exams or quizzes can be used to set questions and mark them later. They are also used to evaluate students' progress and improvement. The communication tool is regarded as an environment that enables teachers and learners to connect with each other. The most typical instrument for this tool is an announcement. This is used to give all students new information about a course, including the latest news and notices of future events. Another communication tool is a discussion board, on which both teachers and students can post messages and read comments. In this tool, the lecturers are authorized to upload content to the site; arrange the course materials; open discussion groups; and control information, which includes the option to delete unsuitable or unrelated discussions (Mtebe and Raisamo 2014). Lastly, the final instrument in an LMS is a productivity tool. It contains a calendar, documentation and how to control these tools, improvements, and surveys. The documentation allows for the downloading and uploading of any documents by the teachers or learners, as long as they are connected to the internet. The calendar is used to allow students to learn how to manage their time. Usually, instructors specify activities on a calendar. The teachers assess their students based on their daily participation. Finally, the survey is used to gather students' opinions, which can later be shown in graphs (Wichadee 2015).

The Modular Object-Oriented Distributed Learning Environment (henceforth "Moodle") is one of the most popular open-source LMS platforms used by academic institutions today. It is the most user-friendly and flexible open-source courseware product available, since it has excellent documentation and strong support for administration and security, and it is evolving towards SCORM standards. It is commonly used due to its simplicity and modular facilitation of enhancements and extensions (Zakaria and Daud 2013).

With reference to what has been mentioned above, one can state that the present study concentrates on determining the factors that affect students' use of technological devices, since the students are the main concern in LMSs. Moreover, the study aims to explore the factors that affect students' satisfaction and attention while using the Moodle platform as an LMS in higher education. To investigate this, two different models – the Technology Acceptance Model (TAM) and the DeLone and McLean (DL&ML) success model – are combined. Thus, the present study integrates two different models so as to evaluate students' perspectives of LMSs in higher education.

1.2 RESEARCH MOTIVATION

Modern societies live in a technological age, where electronic transactions such as email, e-banking, e-commerce, and e-learning are becoming more and more widespread (Padilla-MeléNdez, Del Aguila-Obra et al. 2013). One of new education methods that has emerged from using these new technologies are e-learning systems, or LMSs. It should be able to integrate, organize and standardize learning; In academic organizations, LMSs are identified as resources for improving cooperation and communication between stakeholders such as professors (teachers), students, administrators, and management. Academic organizations should choose the right package that suits their specific requirements and needs. An LMS becomes an essential tool to deliver learning material electronically, in order to reach students in different places and at different times (Kritzinger and Von Solms 2006).

Currently, different types of LMSs are utilized by faculty members in higher education. Some universities use departmental websites; while others use commercial LMSs such as college- WebCT, and Blackboard. Some others use open-source LMSs (e.g. Moodle and Sakai) (Chen, Lee et al. 2012).

When reviewing the existing literature, it was found that there are several advantages of e-learning systems. A well-designed e-learning system is cost-effective, collaborative and interactive, retainable, and learner-centred. It can also provide advantages like up-to-date learning materials, timely access to resources, and easy access to a wider range of resources (Mohsen Allameh and Abbasi 2010, Lwoga 2014). Nevertheless, these advantages will not be maximized if students are not willing to adopt the system. Clearly, to determine whether an LMS is successful in a class, the students' reaction to

the LMS and the defects of the system must be examined. If the students do not cope well with the system, this shows that it is unsuccessful (Davis, 1993).

The TAM model was developed by Davis et al. (1986) to explain computer usage behaviour, and is based on the Theory of Reasoned Action (TRA). The TRA was introduced by Martin Fishbein and Icek Ajzen in 1975. It is one of three classic models of social psycholog with deals with the attitude of LMS users. This model aims to describe the relationship between attitudes and behavioral intention (BI) in peoples' actions. The TRA is used to predict how individuals will behave based on their pre-existing attitudes and BIs. An individual's decision to enact a particular behaviour depends on what the individual expects to happen as a consequence of enacting the behaviour. The TAM is a popular model to investigate IS, and it is successfully provided that the task the factors that affect utilisation of an information system and functionality of the system.

The IS success model (or DL&ML success model) is an IS theory which aims to provide a general understanding of IS success by recognizing, defining, and describing the relationships between the different dimensions of success that are generally evaluated. The theory was originally developed by William H. DeLone and Ephraim R. McLean in 1992.

1.3 PROBLEM STATEMENT

These days, university students tend to use the internet and their personal computers more often than LMSs to complete their assignments and activities and to keep up with day-to-day classroom issues. Furthermore, in most Iraqi university systems, there are many e-learning system tools, and it is not clear if the students are not familiar with e-learning systems during their educational careers. Furthermore, according to previous studies focusing on what students believe and their feelings about the use of e-learning programs, students do not have not enough information about using software programs (KAKBRA 2013).

1.4 RESEARCH QUESTIONS

This study focuses on the following research questions:

1. What are students' perceptions of using the LMS Moodle in higher education?
2. What are the relationships between perceived ease of use, perceived usefulness, satisfaction, and BI to use the LMS?
3. What are the factors that affect student's satisfaction, perceived usefulness and BI to use LMS in universities?

1.5 RESEARCH OBJECTIVES

The purpose of this study is (a) to identify key determinants of learners' BI in the context of the LMS Moodle, and (b) to examine the contributory factors to students' perceptions of the quality of and their satisfaction with the LMS system.. The study also aims to help educational administrators to achieve their goals by responding to learners' needs. It also aims to improve current online course programs, and to reassess the resources and learning technologies upon which higher education institutions have relied.

1.6 THESIS ORGANIZATION

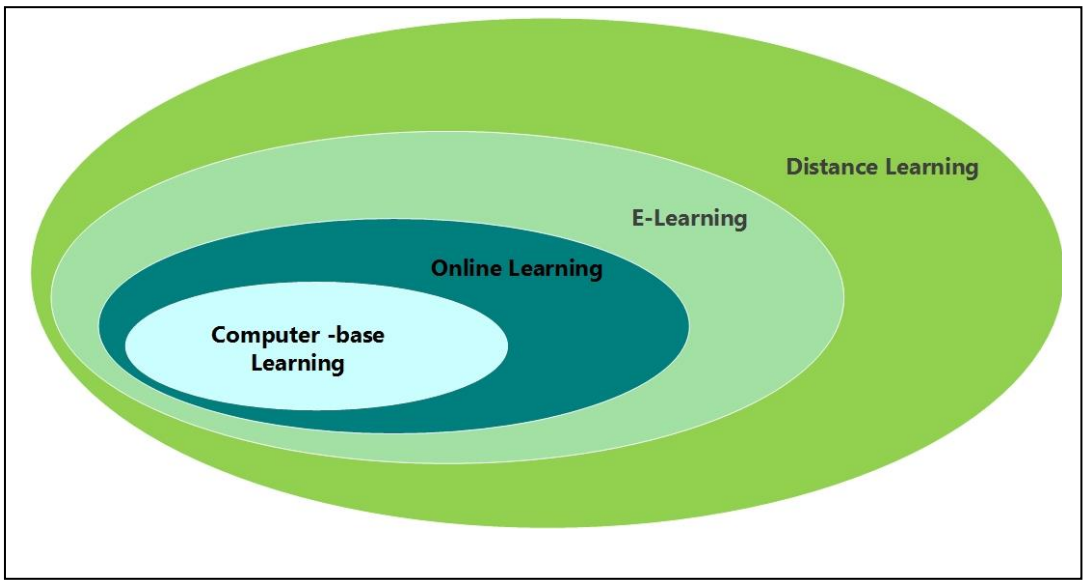
This study consists of five sections. Section I is an introductory section which contains the research introduction, research motivation, problem statement, thesis contribution, aims, and research questions. Section II contains the literature review. This chapter consists of two main sections to cover the definition of LMSs, the development of LMSs and their increasing use in education, and some of the appropriate models in investigating students' satisfaction with LMSs and their intention to continue using them. Section III is a methodological section which includes the research process, research design, research population, sampling method, questionnaire development, pilot study, and research hypotheses. The data analysis is presented in section IV, which includes discussions of the preliminary data analysis, descriptive statistics, the confirmatory factor analysis (CFA), and the structural equation modeling (SEM). A discussion, conclusions, and recommendations for further studies are provided in section V.

2. LITERATURE REVIEW

2.1 INTRODUCTION

In the last decade, e-learning technology has grown tremendously, and it has been integrated into training and education processes. E-learning can be described as electronic instruction delivery via intranet, internet, or multimedia platforms like DVDs or CD-ROMs (O'Neill, Singh et al. 2004). Many users can access direct internet connections. E-learning is often referred to as "web-based learning" (WBL) (Hall 2003). E-learning has been introduced as all forms of electronically-supported learning, teaching and instruction, which are all described by their characters and their aim are to influence the construction of knowledge with reference to individual training, skills, experience, and the knowledge of the learner. So, information and communication systems, no matter whether they are implemented on a network, are used to conduct a learning process as a specific media electronic tool.

Figure 2.1: Scope of e-learning.



Several studies utilize various terms instead of “e-learning”, such as “computer-based learning”, “computer-aided learning”, “computer-assisted instruction”, “technology-enhanced learning” (TEL), “advanced distributed learning” (ADL), “web-based instruction” (WBI), “online learning” (OL), “open/flexible learning” (OFL), “network learning”, and “distance learning”.

It is difficult to define the term “e-learning”, because of the interchangeability of the terms “e-learning” and “distributed learning”. The constant factor in all of these terms is the adoption of technology in the teaching and learning process (Ngai, Poon et al. 2007). According to Anderson (2008), the definition of “online learning” is the delivery of teaching over the internet. The definition of “e-learning according to (Welsh et al. (2003), is the delivery of teaching and learning over the internet and intranet. The next definition of “e-learning”, according to Megías et al. (2005), is as follows: e-learning includes all multimedia technologies, in addition to the intranet and the internet, as delivery media. According to Wanberg (2003), “e-learning” incorporates all educational activities accomplished by individuals or groups either online or offline, synchronously or asynchronously, via networked or standalone computers and other electronic devices.

E-learning is basically a network-enabled of skills and information transmission. It refers to the utilization of applications, programs to learn. This kind of learning is used by educational organizations to improve and support classroom teaching, and to offer a variety of courses to a larger number of students around the world. E-learning can be self-paced or lecturer-led, and involves media in the form of written texts, images, audio, animations, and video. E-learning has created new markets for teaching and learning materials and supplies, and has attracted the attention of academic institutions as well as companies supplying them in different sectors – computer manufacturers, software producers, publishing houses, and special training providers (Anderson 2008).

In e-learning systems, many software applications are commonly developed using Web 2.0 tools; for instance, mobile learning applications, Twitter, YouTube, Facebook, Slideshare, Picasa, MediaWiki, etc. In education, this software is used to assist instructors in monitoring learners’ activities. Defined specifically, e-learning is based not only on distributed learning, online learning, virtual learning, and web-based or networked learning, but also on testing and assessing the feedback, intervention and

interaction between teacher and student on many platforms in e-learning environments (Alowayr and Badii 2014).

The delivery technique and materials must be considered in order for the tool to be successful in the teaching and learning process (Kulshrestha and Kant 2013). E-learning in education can use two methods. These are synchronous and asynchronous e-learning (Lwoga 2014). Importantly, before selecting an e-learning technique, the implementer responsible for choosing a suitable method must consider the intended objectives. The content used in a particular kind of learning should align with the purpose to be achieved.

There are different kinds of e-learning. Asynchronous e-learning is "the kind of E-learning system where students study at their free time; according to their own pace and it does not demand the simultaneous assistance of teachers and students" (Kulshrestha and Kant 2013). Asynchronous e-learning is ordinarily facilitated by media such as online discussion groups or forums, email, bulletin boards, etc. In this e-learning method, the educational materials used may consist of video, text, animation, graphics, audio, or a mixture of some or all of these types, so as to make learning more attractive and easier. The key attribute of asynchronous e-learning is the flexibility it offers to students in terms of study times and locations.

Synchronous e-learning is "the kind of E-learning where students and professors associate simultaneously and their communications happen in real time" (Kulshrestha and Kant 2013). Commonly, this e-learning method is developed by media such as teleconferencing, online chat programs, video conferencing, etc. The synchronous e-learning method is similar to teacher-led classroom education, due to the real-time communications that occur between student and teacher or among students. The difference between synchronous e-learning and traditional classroom learning is that the former is independent of the geographical location of the student or the teachers.

An e-learning platform is a software application that integrates different management tools, communication, evaluation, monitoring, etc., with the aim of providing technological support to teachers and students to optimize the various phases of the teaching and learning process. Either the educational process is completely remote.

The main features of e-learning platforms are:

1. Authentication
2. Generating content
3. Viewing content
4. Different media with a teacher / tutor
5. Carrying out activities such as tasks and group work
6. Report of the activities undertaken by the pupil
7. Evaluation tools

This study concentrates on the LMS e-learning system used by the University of Kurdistan-Hawler (UKH) called "UKH platform". UKH platform is an asynchronous e-learning platform (Moodle platform) by means of which UKH learners are able to access. On the UKH website, learners are able to discuss diverse topics by posting messages on forums. Online chatting, getting course materials and more will be discussed in detail in Section 2.2.

2.2 LEARNING MANAGEMENT SYSTEMS

The term "LMS" is a global term for a computer system particularly developed for managing online courses, sharing course materials, and permitting collaboration between learners and instructors. An LMS permits academic staff to manage every aspect of a course, from the registration of learners to the storing of examination results. It also allows academic staff to accept assignments digitally and to keep in touch with their learners. In essence, the LMS is the backbone of most e-learning platform activities.

Many enterprise technologies emerging directly from the e-learning industry use LMSs. In the late 1990s, the first LMS came on the market when traditional classroom experiences were being "ported" online, redesigned for computer-mediated delivery, and distributed via the internet. Commercial LMSs were built for the challenges that come from creating, disseminating, and managing digital learning content, and evaluating those experiences. The internet was in its infancy in 1997, and the dominant web browser was Netscape 4.0. Blackboard and Saba were some of the fundamental shareholders in the emerging LMS market.

Learning management systems have enabled a modern approach to supervising learner education in both synchronous and asynchronous forms. In any LMS system, teachers can build and administer educational courses more rapidly and easily than is allowed by traditional systems. This makes it easier to exchange information with learners over the network, engage learners in online discussions via the forums, and also to evaluate learner performance (Salyers, Carter et al. 2014). Learners using LMS systems have the ability to access lecture notes and use interactivity and the communication features in their education activities (Saba 2012).

Technically, an LMS is a server-based or cloud-based software program that interfaces with a database that includes data and information about stakeholders (teachers, students and administrators), course materials, content, and other data systems designed for e-commerce, human resources, payroll and student records (Piña 2010). An LMS provides a place for teaching and learning to occur within an integrated environment (Motaghian, Hassanzadeh et al. 2013). According to Schmidt (2005), these systems allow educational organizations to offer a massive number of fully online or blended/hybrid (using a combination of online and face-to-face) courses. Face-to-face courses that utilize an LMS to supplement activities are often referred to as "web-enhanced courses".

Learning management systems play a central role in the web-based e-learning scenario. The systems are combined with learning content and learners in a standardized manner. They manage users, teaching materials, and learning events. They manage learning progress and keep track of learning performance (Sejzi and Arisa 2013). According to Saba (2012), an LMS is a software application system invented to facilitate administrative tasks as well as student participation in e-learning materials. Cole and Foster (2007) have also stated that "LMSs as "Digital Learning Environments", "CMSs", or "Electronic Learning Environments". In Gibbons (2005), LMSs are referred to by various names, including "CMSs", "VLEs", and "E-learning courseware".

Hamid (2001) presents this alternative definition: An LMS is software that automates the administration of training events. All LMSs manage the login of registered users, manage course catalogues, record data from learners, and provide reports to management. There used to be a distinction between LMSs and more powerful integrated LMSs. That distinction has now disappeared. The term "LMS" is now used to

describe a wide range of applications that track student training and may or may not include functions such as:

a. Authoring
b. Classroom management
c. Competency management
d. Knowledge management
e. Certification or compliance training
f. Personalization
g. Mentoring
h. Chat
i. Discussion boards

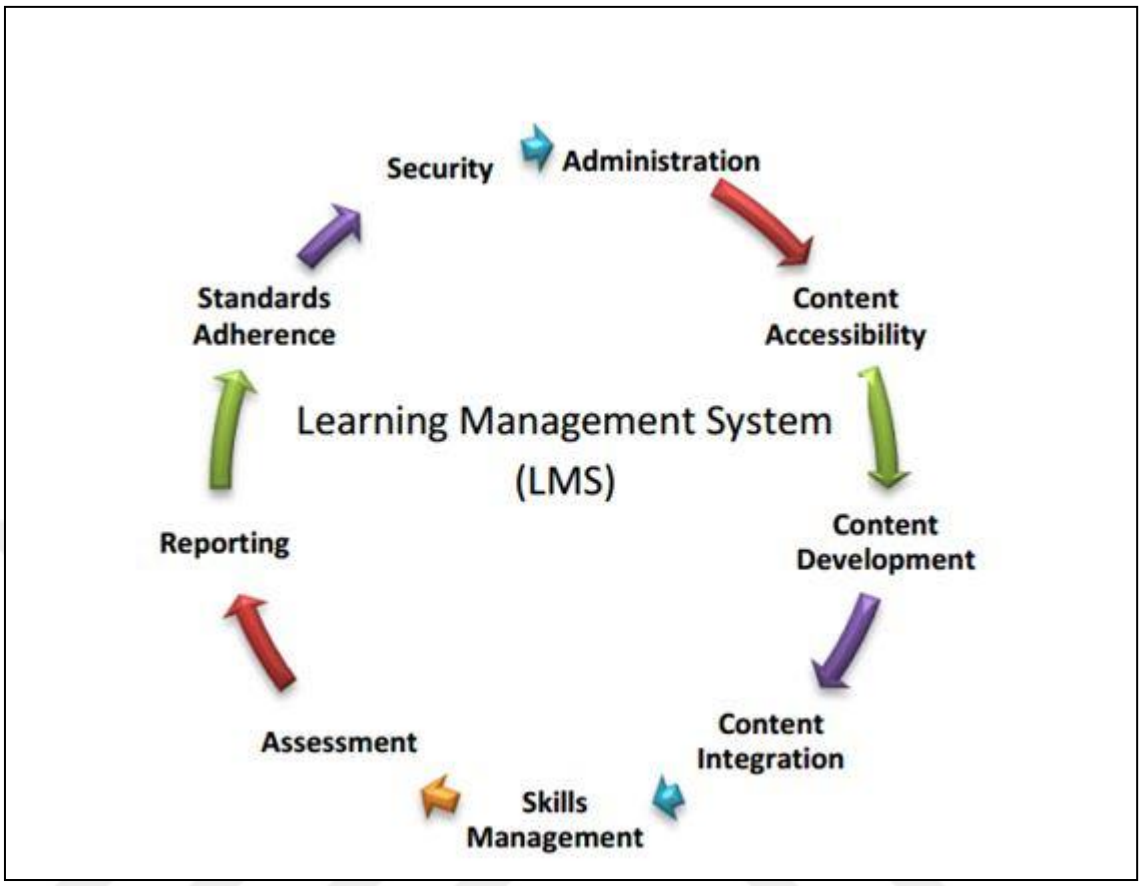
Learning management systems are web-based applications, running on a server and accessible with a web browser from any place with an internet connection. These systems give educators the tools to create online course websites, and provide access to learning materials. The term "LMS" refers to a wide range of systems that can be used by assistants, teachers, and students. The services provided by LMSs include the following: performance management; study schedule documentation; access control; and provision of learning content, communication facilities and assessments (Alowayr and Badii 2014).

According to current reports, more than ninety five percent of American universities and colleges have adopted one or more LMS systems, and the same rate applies to British institutions and universities. The trend of using LMSs also applies in the Middle East. A survey has found that 26 Arab universities have adopted an LMS as a learning environment to assist in providing blended learning (Alharbi and Drew 2014).

The current LMS market offers various e-learning platforms that have been used in teaching and learning processes. A free e-learning system with the technical requirements of supporting Apache, My-SQL, and PHP, as well as the diverse partners' languages, is desirable b previous practioners.

Ellis (2009) states that the main functional characteristics of an LMS include administration tools, content development, content accessibility, content integration, assessment capabilities, skills management, reporting, standards adherence, and security. Figure 2.2 represents an LMS with its typical functionalities.

Figure 2.2: Main functional characteristics of an LMS



The administration of E- Learning department is effective LMS element that must be enabled to manage user registration and profiles, define roles, set curricula, author courses, and manage content and user payments.

"Content accessibility" refers to the techniques that facilitate the delivery of content, both online and in class. Delivery techniques can be divided into three methods: self-paced, instructor-led, and hybrid. Content development aims to protect, writing, and documenting the learning content. In content integration, a significant amount of support will be provided for external systems. Skills management evaluates the skills of the learners by using different feedback tools. Assessment capabilities derive from the examination of the delivered learning content to the e-learners. In other words, an LMS is an application for tracking, documenting, reporting and delivering electronic educational technology. The system's most important purpose is to build a successful system in reporting in terms of quantity and quality. In addition, LMSs promote standards such as the Shareable Content Object Reference Model (SCORM), which is a

standard to manage course content in order to achieve learning objectives. In the end, security – both in terms of the personal information of users and proprietary content – is a crucial norm for evaluating any data system. System security requires user authorization and data protection.

2.2.1 Modular Object-Oriented Dynamic Learning Environment (MOODLE)

Moodle is open-source LMS software, also known as a "CMS", "e-learning platform", or "VLE". Moodle was developed in 1999 by Martin Dougiamas, who was at the time a recent graduate from an Australian university. Moodle is designed to equip instructors and students with a secure and integrated system to generate personalised learning environments. The Moodle platform's code has been creating using PHP programming. It is a free scripting language that was basically developed to create dynamic web pages. As mentioned above, "Moodle" stands for "Modular Object-Oriented Dynamic Learning Environment". It is a web-based application that supplies educators with education tools to build online classrooms and dynamic websites for learners. Learners can learn individually without teachers by using Moodle; for example, by completing exercises and reading lecture materials. It allows educators to build education activities (e.g. quizzes, forums, wikis, and writing assignments), and to make resources available (e.g. videos, files, and web pages). Another function of Moodle is to hold up a social organization in terms of educational psychology, the moodle which includes constructionism, social constructivism, constructivism, and connected and separate. With its mixture of educational psychology and web technology, it has become a familiar mechanism for supporting online learning environments (Patel, et al. 2013).

2.3 THEORETICAL FRAMEWORK

2.3.1 Introduction

Several kinds of research have discussed the advantages of e-learning platforms (Piccoli, Ahmad, &Ives, 2001; Ong, Lai, & Wang, 2004). However, despite growing usage, underutilization remains a problem (Ong, Lai, & Wang, 2004; Martinez-Torres et al.2008). If students fail to utilize e-learning systems or LMSs, the advantages of such systems will not be realized. Researchers have attempted to find a solution to this problem by examining individuals' decisions regarding whether to adopt LMSs that seem to promise substantial advantages (Padilla-MeléNdez, Del Aguila-Obra et al. 2013). There are many studies of user perceptions that aim to understand the factors associated with promoting the utilization of these systems. These studies have become essential to promoting understanding and to predicting the acceptance and utilization of e-learning systems (Lee, Hsieh et al. 2011).

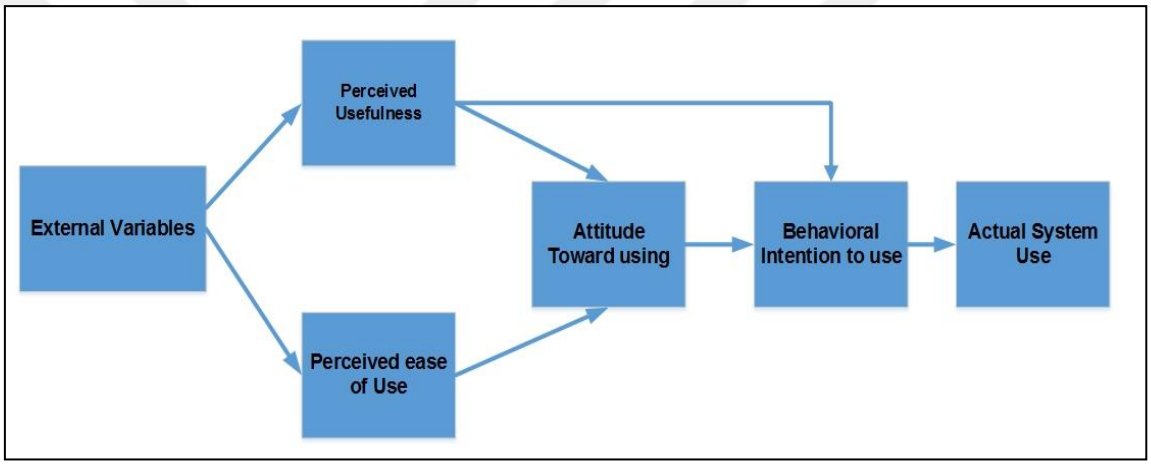
Previous studies have attempted to explain the determinants and mechanisms of users' (teachers' and students') adoption decisions on the basis of the TAM model, with the certainty that the adoption procedure affects the performance of technology systems, and partly determines whether they will be successful (Venkatesh and Davis 2000).

This study contributes to the TAM literature by studying the relationships between the TAM model and the IS success model variables. The researcher proposes to measure the influence of motivational determinants on TAM constructs using DL&ML as a background theory. Therefore, six factors were employed: instructor quality, system quality, technical support, service quality, information quality, and perceived ease of use (PEOU). As determinants of user satisfaction, perceived usefulness (PU) and BI were used. This empirical research could be beneficial for developing and examining theories related to e-learning system acceptance. It could also be useful to practitioners to help them understand strategies for designing and improving LMSs.

2.3.2 The Technology Acceptance Model

The TAM is an extension of the TRA, which was introduced by Davis (1989) to predict individuals' adoption and utilization of IT (see Figure 3). According to Davis (1989), individuals' BIs are determined by two options \regarding utilization: (1) PU, which is described as the degree to which a person believes that using a particular system would enhance his or her job "performance, and (2) PEOU, which is defined as the degree to which a person believes that using a particular system would be free of effort (Davis, 1989).

Figure 2.3: The Technology Acceptance Model



Over the last two decades, the TAM has been empirically validated and supported by many researchers (e.g. Park 2009;Al-Aulamie 2013; and (Van Raaij and Schepers 2008)). According to Venkatesh and Bala (2008), the TAM is able to consistently explain forty percent of the variance in individuals' BIs.

Furthermore, the TAM is concerned with the system features that affect individual acceptance. Figure 2.3 presents the original TAM. Attitude was eliminated from the final model for the following reasons (taken from Davis et al. 1989):

1. The relation between the two opinions that have been described before is stronger than the one between attitudes and BI.

2. Attitude cannot mediate between PEOU and BI.

Generally, the development of the TAM can be divided into three main stages: adoption, validation, and extension (Han, 2003). These are explained below.

A. The adoption phase: The adoption stage which dealswith the parsimonious of the TAM. Davis et al. aimed to create a theoretically justified model that is able to predict and describe a user's BI in the IS and IT contexts. The TAM has been applied to confirm a developed technology system. The results of these studies verified the use of the TAM with reference to the selected technologies in various IS contexts (see Table 2.1).

Table 2.1: Summary of TAM studies in different IT contexts (Han 2003)

Information Systems/Organizations	Example/Country	Author/s
Key office IS applications	Spreadsheet Lotus 1-2-3 • WordPerfect • Word • Excel	(Mathieson,1991; Adams et al., 1992; Hendrickson et al., 1993; Segars and Grover, 1993; Taylor and Todd, 1995a; Taylor and Todd, 1995b; Chau, 1996; Venkatesh and Davis, 1996; Doll et al., 1998)
Key office IS applications	Email • Voice mail • Customer dial-up system	(Adams et al., 1992; Segars and Grover, 1993; Subramanian, 1994; Straub et al., 1995; Szjna, 1996; Venkatesh and Davis, 1996; Gefen and Straub, 1997)
Database systems		(Hendrickson et al., 1993;

	----------	Szajan, 1994; Doll et al., 1998; Venkatesh et al., 2003)
Workstations	----------	(Moore and Benasat, 1991; Lucas and Spitler,1999
Microcomputers	----------	(Igbria et al., 1995; Igbaria et al., 1996; Agarwal and Prasad, 1999)
Internet-related IS applications	Internet-related IS applications • Internet • Internet information services • Online services • Virtual workplace systems • Digital libraries	(Venkatesh and Moriis, 2000; Agarwal and Prasad, 1998; Parthasarathy and Bhattacherjee, 1998, Venkatesh, 1999; Chau and Hu, 2001)
Financial institution	America	(Straub et al, 1995)
Integrated Steel	Company	• Canada (Montazemi et al., 1996
Public tertiary	Hospitals	• Hong Kong (Hu et al.,1999)

***Source*:** Al-Aulamie, (2013) Enhanced technology acceptance model to explain and predict learners' behavioural intentions in learning management systems.

B. The validation phase: This phase is divided into two sections. The first one is about the psychometric properties of the TAM's main constructs, PU and PEOU. Davis (1989) has produced a set of variables to measure the two constructs. Table 2.2 below shows some examples of measures to estimate PU and PEOU (Han 2003).

Table 2.2: Examples of measures to estimate PU and PEOU

Constructs	Measures
Perceived Usefulness (PU)	The system improves individuals' job performance.
	It pushes the individual to accomplish tasks faster.
	The system increases individuals' productivity.
	The system strengthens job effectiveness.
Perceived Ease of Use (PEOU)	Learning how to use the system would be easy for me.
	I would find it easy to get the system to do what I want it to do.
	It would be easy for me to become skillful at using the system.
	I would find the system easy to use.

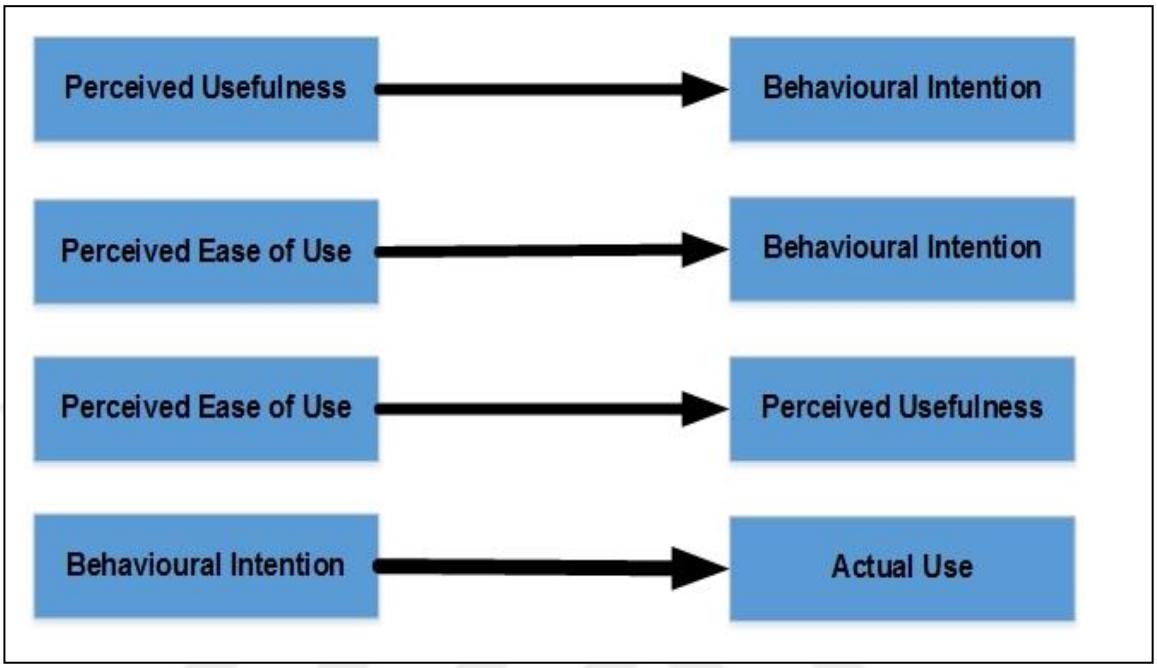
Source: Al-Aulamie, (2013) Enhanced technology acceptance model to explain and predict Learners' behavioural intentions in learning management systems.

More than one type of variable is used to measure PU and PEOU. Many of the TAM model's construct measures have been tested and assessed in studies. For example, Davis et al. (1989) have evaluated the TAM using the Write-One program, collecting data from 107 MBA students at the Michigan Business School. Four measures were used for the PU and PEOU constructs. The results show a good level of convergent and separated validity for the selected measures. Chin and Todd (1995) have investigated the psychometric properties of the Technology Acceptance Model (TAM)'s scales. Chin and Todd's partners applied Davis's way of confirming the validity of PEOU and PU to some different technologies in two studies. The first one used email and voicemail, and the second used word processors, spreadsheets and graphics. Both studies emphasized the reliability and validity of the PU and PEOU scales.

The second section of the validation phase involves validating the causal links between the TAM's constructs and any external variables influencing PU and PEOU.

Between the TAM's constructs, there are four causal links :

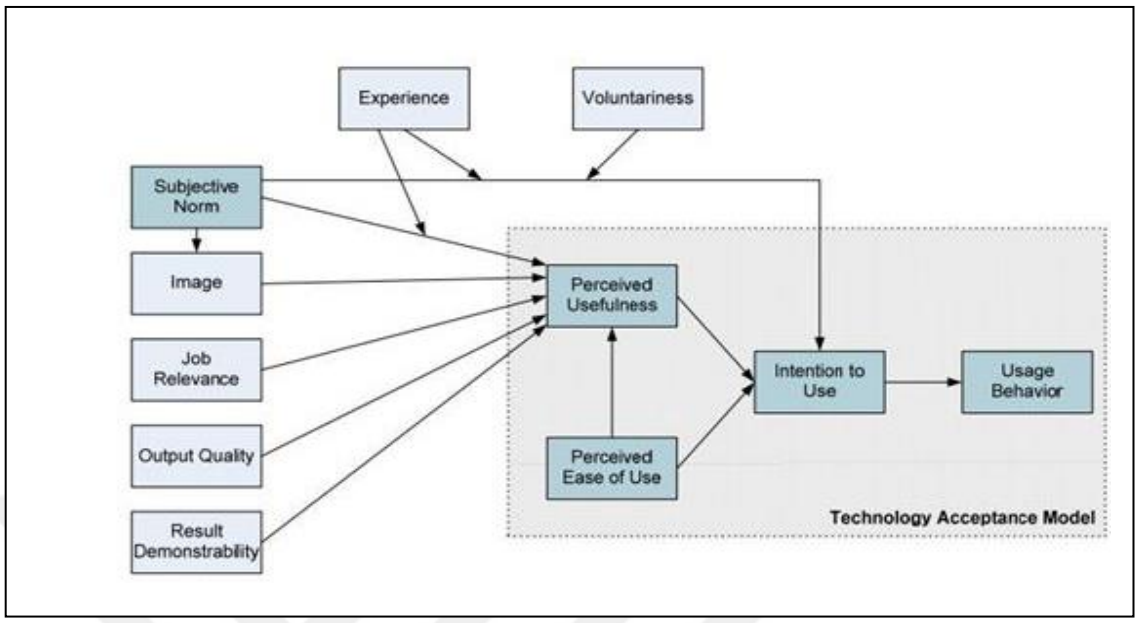
Figure 2.4: The Technology Acceptance Model's four causal links



Most of these causal links have been examined the consentient results with the original version of the TAM, without the causal link running from PEOU towards BI. Those relationship has been inconsistent, and therefore requires further investigation (Venkatesh and Morris, 2000; Al-Aulamie 2013).

C. **The extension phase:** According to Han (2003), the last phase of the TAM is the extension phase. There are studies that have extended the TAM over the years by adding external items. Firstly, Venkatesh and Bala (2008) proposed two extensions of the TAM. The first extension (i.e. TAM 2) was concentrated on identifying determinants of PU. Venkatesh and Davis (2000) added five variables to the original TAM. These were subjective norm, image, relevance, output quality, and result demonstrability. The researchers tested the extended model in four business organizations. The results showed that PU was a robust determinant of BI.

Figure 2.5: Updated Technology Acceptance Model 2



Source: Venkatesh and Davis, (2000) a theoretical extension of the technology acceptance model

The next extension (i.e. TAM 3) was focused on proposed determinants of PEOU. The variables proposed by Venkatesh (2008) included the perception of external control, computer anxiety, computer self-efficacy, computer playfulness, perceived enjoyment, and objective usability.

Integrating the determinants of the TAM2 and TAM3 added more spread out and understandable to the extended model (Venkatesh and Bala 2008). However, the original TAM worked better than TAM2 and TAM3 with respect to the explained variance in BI (Tang and Chen 2011). Furthermore, the function of the moderating variables is to moderate the model's inconsistencies by recognizing situational differences. Venkatesh et al. (2003) have tested eight models, and they have found that the predictive validity of six of eight models increased significantly after the addition of moderating variables. Furthermore, Chin et al. (2003) have verified that moderating variables have an important effect on TAMs ((i.e. age, gender, computer, experience, and voluntariness) as commonly-utilized in technology acceptance studies.

In studies on technology acceptance, the principal consideration in determining external variables is the study's unique context. This requires more knowledge of the potential variables that can impact IT acceptance.

Such variables can be used to extend the TAM and to address the unique characteristics of the research. The initial extensions of the TAM have been developed with reference to business organizations; therefore, the external variables addressed this environment. According to Venkatesh and Davis (2000), external variables like image, job relevance, and output quality have been used to extend the TAM in business settings. Since the development of the TAM, several studies have tried to test employees' acceptance of IT by identifying external variables that are more relevant to the business domain. Some of these variables include tenure in workforce, role with regards to technology, task-technology fit, and the workplace discussion exchange (Al-Aulamie 2013).

As reported by Venkatesh and Davis (2000), the main effective method to identify external variables that uses the relevant study. This work will assist in developing a theoretical rationale for the causal relationships between the model's variables, which leads to the formulation of the study's hypotheses. Hypotheses are required in these types of studies because they establish the relationships between the model's variables. Additionally, each hypothesis will be supported by literature to define the relationships between the model's variables. The hypotheses will enable the prediction path from the independent variable towards the dependent variable to be tested (i.e. regression analysis). Moreover, Venkatesh and Davis (2000) have pointed out that the relationship between the model's variables must be hypothesized to measure the external variables' influence on the TAM constructs (i.e. PU, PEOU, and BI).

The TAM has been used in a variety of studies to explore the factors influencing individuals' use of new technology (Venkatesh and Davis, and Mohammadi, 2015). Perceived usefulness is also considered to be directly influenced by PEOU (Mohammadi, 2014). Appendix D shows the most relevant studies in the area of e-learning usage.

Many studies have been conducted in different countries to evaluate the acceptance of new or innovative technologies in general, in addition to studies on the critical factors influencing the adoption of LMSs, whether it is used in the education field (institutions or universities). Asiri et al. (2012) have introduced a theoretical framework based on two theories, namely the TRA and the TAM, to investigate factors affecting the attitude of Saudi Arabian faculty members towards using their LMS (Jusur LMS). Jusur LMS is

one of the e-learning management tools utilized in Saudi Arabian public universities. The factors of this framework are shown in Appendix D.

Babić (2012) has presented an overview of theories and models of the acceptance of e-learning technology and innovation, where he has singled out categories of motivational factors based on existing research results focusing on academic teachers' acceptance of e-learning in blended learning environments. This can serve as a foundation for theoretical models in future empirical studies. These factors are shown in Appendix D.

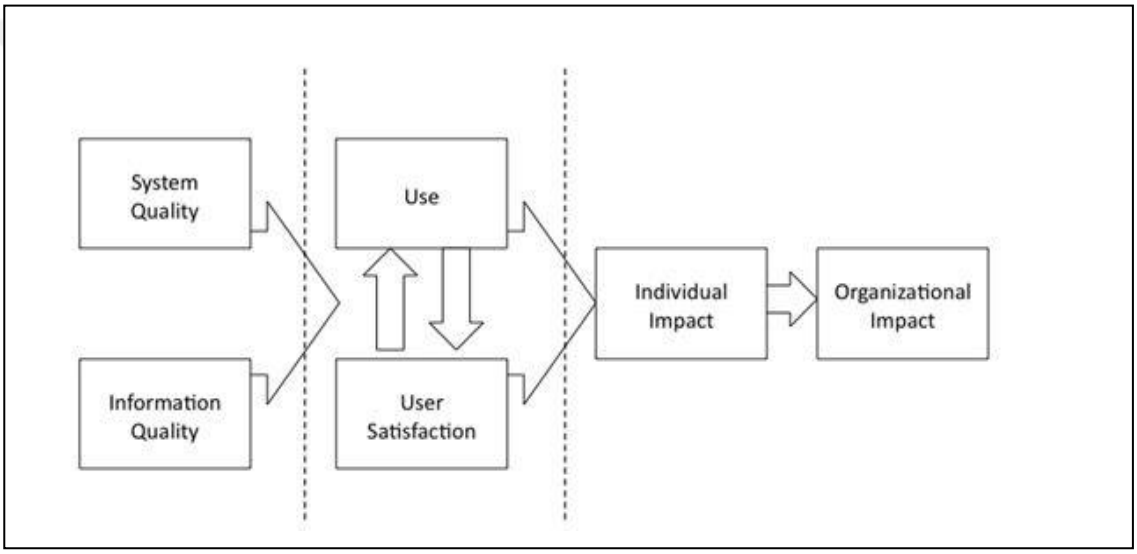
Al-Harbi (2011) has extended the TAM to examine students' acceptance of e-learning in Saudi Arabia universities. The researcher has extended TAM with eight variables which can be categorized as follows: institutional influence, social influence, individual characteristics, institutional influence, and system characteristics. The study's results have shown that PEOU and PU are compatible with the original TAM.

Due to increased attention on the use of LMSs within educational organizations in South Korea, Park (2009) has evaluated students' acceptance of LMSs in Korean higher education. The researcher has used TAM with three external variables: learning self-efficacy, subjective norms, and system accessibility. The study's results have revealed that both e-learning self-efficacy and subjective norm play an important role in affecting attitudes towards e-learning and BI to use e-learning. System accessibility has a direct effect on attitudes towards e-learning (see Appendix D).

2.3.3 Delone and Mclean Model

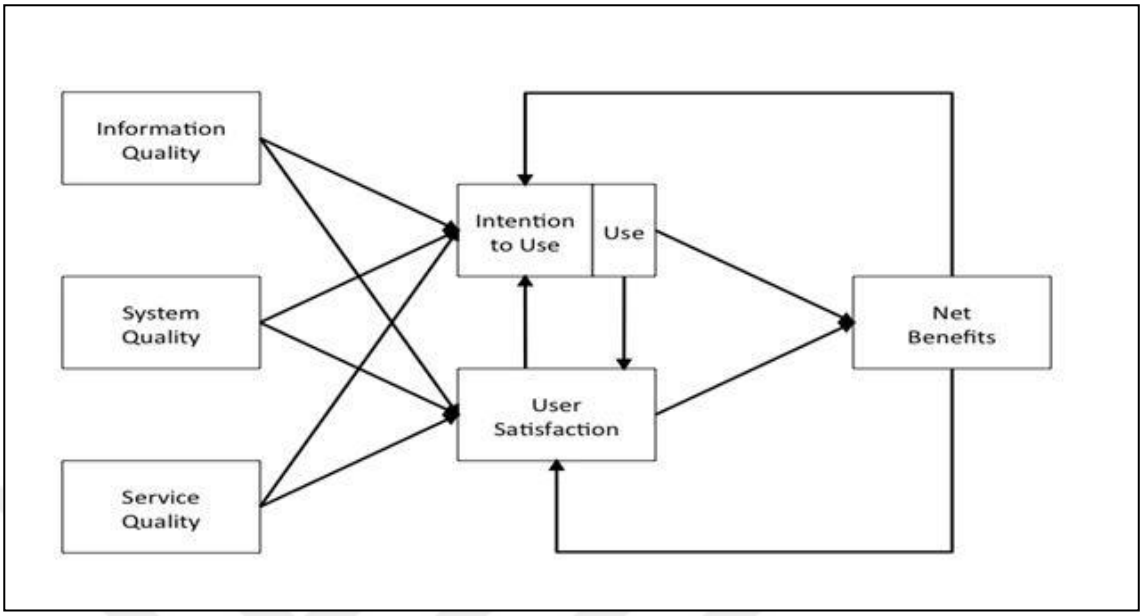
DeLone and McLean's IS success model is an IS assumption that explores the present general understanding of IS success by explaining, recognizing, and describing the relationships between six important dimensions of success according to which data systems are universally assessed (Khayun and Ractham 2011). This model is possibly one of the most-cited models in the field of IS. The six factors which make up the 1992 success model are user satisfaction, use, the quality of the system, the quality of information, individual impact, and organizational impact (DeLone and McLean 1992).

Figure 2. 6: DeLone and McLean (1992)



DeLone and McLean (2003) have suggested an updated DL&ML success model, which is based on the empirical and theoretical contributions of researchers who have tested or discussed the original model between 1993 and mid-2002. During this period, 285 papers and journal articles on the subject were produced. DeLone and McLean (2003) add ‘service quality’ as a new dimension of IS success, and collapse ‘individual impact’ and ‘organizational impact’ into a single impact variable called ‘net benefits’. Therefore, the updated model consists of six interrelated dimensions of IS success: information quality, system quality, service quality, use, user satisfaction, and net benefits (as shown in Figure 2.7).

Figure 2.7: DeLone and McLean (2003)



Holsapple and Lee-Post (2006) have developed the DL&ML model by creating a new success model to evaluate e-learning systems. They have provided success metrics for evaluating the Blackboard e-learning platform. The success factors that were used for the evaluation of the LMS were adopted from the DL&ML model. They thought it was necessary to implement holistic and general models for the evaluation of e-learning systems.

Lee (2010) has also suggested a new model for evaluating e-learning based on socio–technical systems theory. This model evaluated distance learning from the teacher's perspective. Distance learning is viewed as a socio-technical system. The authors have been conducted DL&ML model to discuss the need for a systematic approach to e-learning modelling.

System quality, information quality, and service quality are the first three dimensions of evaluation in the DL&ML model. System quality has been assessed the system's specifications and the usage of platform effectiveness like flexibility, stability, consistency, safety, responsiveness, and user-friendliness. The quality of information is based on course content quality and can apply success metrics such as simplicity, organization, presentation, and currency of course materials. The quality of communication between learners and instructors can be evaluated in terms of the quality

of service. Here, metrics such as preparation, availability, assistance, and organization and clarity of the lectures can be used.

Many studies have explained the role of the DL&ML model in evaluating IS and e-learning systems in the public sector. In addition, several researchers have used the IS success model to investigate the factors that influence LMS and e-learning success.

Chen (2012) has investigated whether quality factors have any effect on learners' desire to use an e-learning system. Chen added quality to the other items of the DL&ML model, and concluded that service, information, system, and instructor quality are important and can be major drivers of the learners' e-learning acceptance.

Saba (2013) has found that information quality, system quality and self-efficacy all influence learners' use, user satisfaction, and self-managed learning behavior. He conducted the influence of LMSs and self-efficacy on learners' results.

Miroslava et al. (2014) have extended the DL&ML model to investigate the factors that have a positive effect on the use of LMSs in Serbian universities. The authors focused on evaluating the success of e-learning systems. The results of this research presented the course that was applied on both systems (traditional and online) in three different aspects: IT, system design, and system management. In addition, the results have shown that service quality, system quality, and information quality strongly effect student satisfaction. See Appendix D

2.4 THE RESEARCH MODEL AND HYPOTHESES

The model in this study was constructed as a consequence of a comparison between the DL&ML model and the TAM. Firstly, the TAM focuses on estimating users' behavior by using PEOU and PU as central variables in the usage aspect and measuring the actual use of LMS platforms. By auditing a few studies in a written survey, the TAM does not gauge overall system quality; even it has the solid impact on user behavior.

As stated by Dishaw and Strong (1998), the TAM's shortcoming is that it does not consolidate the technology and the task attributes in estimating the acceptance of system information. Moreover, the IS success model is strongly related to the user satisfaction to utilize, system utilization, and net advantage. As indicated by Urbach et.al. (2009), some authors have argued that the IS success model is fragmented, and have recommended that additional measures ought to be incorporated into the model. Several of those authors have built suggestion models of achievement. Regardless of all criticisms and its shortcomings, the IS success model still prevails as a model for measuring the success of an IS. According to prior studies, there are many models that have been used to explore e-learning user behavior patterns such as the TAM, the Unified Theory of Acceptance and Use of Technology model (UTAUT), the DL&ML IS success model, and Innovation Diffusion Theory (IDT). Most researchers have taken the barriers and drivers of adapting e-learning into consideration (Al-Harbi (2011); Park (2009); Alharbi & Drew (2014); FINDIK&ÖZKAN (2013)). In this research, I aim to develop a new model by integrating the DL&ML model and the TAM in order to predict individuals' actual use of LMSs in two Iraq universities. As Li et al. (2012) have noted, "Testing the relationship between user experiences in using e-learning, user perceptions, and their BI to use e-learning is necessary, because system is a significant indicator "of the success of a system. Mohammadi (2015) has attempted to evaluate e-learning system success in universities in Iran. This author has combined the TAM and the DL&ML model to investigate the factors that affect e-learning success. The model in this research consisted of six factors: service quality, educational quality, technical system support, information quality, PEOU and PU. The SEM and path examination were used to inspect the study's model. It was found that user satisfaction and BI to use both positively affect the utilization of e-learning systems.

Almarashdeh et al. (2010) have introduced a new model by integrating the TAM and the DL&ML model. This model has been used to evaluate e-learning systems in Malaysian universities. The model consists of three aspects: system design (system quality, information quality, service quality, PEOU, and PU); system usage (BI, user satisfaction, and system use); and system outcome (net benefit). The results of this research showed that all factors have a positive effect on BI and user satisfaction.

Figure 2. 8: Research model

In technology acceptance research, hypotheses are required to run the relationships between the model variables (Park, 2009; Liu et al., 2010; Al-Harbi, 2011; Al-Aulamie, 2013; Ghazali and Hasnida, 2015; Padilla-Meléndez et al., 2013). The hypotheses of a study are used to check the individual relationships between variables in terms of their significance level and prediction value (i.e. standardized coefficient). This method is popular in dedicative studies, where the research hypotheses are first introduced and then examined. The following sections motivate the study's hypotheses in relation to each identified variable.

2.4.1 Information Quality

Information quality can be described as "users' perception of the quality of information presented on a Website" (Delone and McLean, 2003) or "the extent to which complete, accurate, and timely information is provided to the customer in the electronic service interface" (Liu, 2010). Delone and McLean (2003) have shown the significance of information relevance, timeline, and the accurate of IS success. In addition, information quality has been found to be a crucial variable in determining users' satisfaction (Cheng (2012); Wang and Chiu (2011); Raspopovic, Miroslava, et al (2014); Saba (2013) and Mohammadi 2015). McAvinia et al. (2004) have drawn attention to the fact that website content and function are thought to be the principle determinants of learners' appreciation of a website. Learners decided the importance of site content and usefulness to fifty-eight percent, followed by appearance and convenience with ten percent and twenty-six percent, respectively.

Yanjun et al. (2010) have also investigated learners' willingness to use an online open source. The results showed that the best prediction of the learners' utilization was information quality. This was more important than PU. Be that as it may, Liu (2010) has discovered that despite the fact that data quality is critical, PU remained the most important determinant of procurement intention.

An LMS platform with valid content permits students to perceive the value of a system (Tseng and Hsia 2008). If the information provided by an IS is ambiguous, incomplete, or inaccurate, this might reduce users' chance of accepting the system (Liao et al., 2006). Learning management systems can offer a variety of content for students, but whether information quality affects students' acceptance requires further investigation.

Hence, this study investigates the importance of information quality in relation to students' acceptance of LMSs in two different universities. Three hypotheses have been developed.

A. **Hypothesis (H1a):** Information quality has a significant effect on student satisfaction.
B. **Hypothesis (H1b):** Information quality has a significant positive effect on students' BI to use an LMS.
C. **Hypothesis (H1c):** Information quality has a significant effect on PU.

2.4.2 Instructor Quality

It is clear from the results of past studies that the quality of an instructor is an essential determinant for an LMS as an example (Liaw et al. 2007; Sun et al. 2008; Ozkan and Koseler 2009). According to Cheng (2012), instructors are important for developing learners' behavior in e-learning courses, and thus their attitudes may influence learners' behavior. Metrics of instructor quality include the instructor's response timeliness, explanation/help, and teaching style using the e-learning system (Cheng, 2012). Previous studies have found that teachers' attitudes towards e-learners had a significant positive relationship with the PU of the e-learning system. In learning situations, instructors ought to have enough time to speak with students during teaching process (Lee et al., 2009). Webster and Hackley (1997) have stated those educators' attitudes towards a technology, their styles of teaching, and their control over the technology impact learning results. Moreover, Volery and Lord (2000) have suggested that educators' attitude towards technology-mediated distance-learning systems ought to be considered when evaluating these systems. In this study, instructor quality is expected to positively affect learners' satisfaction, their BI to use the LMS, and the PU of the LMS. Hence, the following hypotheses are proposed:

A. **Hypothesis (H2a):** The quality of instruction has a significant effect on student satisfaction.
B. **Hypothesis (H2b):** The quality of instruction has a significant effect on students' attitudes toward using LMSs.
C. **Hypothesis (H2c):** The quality of instruction has a significant effect on PU.

2.4.3 Service Quality

Service quality refers to the overall support provided by the service provider, such as the ICT department, outsourced services, or the relevant unit in an organization (Delone and Mclean, 2004). Service quality constitutes the quality of the support that users receive from the IS, such as training and helpdesk services (Chang, Wang et al. 2009). In this study, service quality refers to the support provided by ICT technical staff. Measures for service quality include effectiveness, responsiveness, and the availability of technical support personnel (Delone and Mclean, 2004). Cheng (2012) has found service quality to be a useful determinant of perceived usefulness in e-learning systems usage. Various researchers have shown that service quality is a significant predictor of user satisfaction regarding e-learning systems (Chang, Wang et al. 2009; Ramayaha and Lee 2012; Lin et al. 2011). In this study, service quality is expected to positively affect learners' satisfaction, BI to use LMS, and PU. Hence, the following hypotheses are proposed:

A. **Hypothesis (H3a):** Service quality has a significant effect on student satisfaction.
B. **Hypothesis (H3b):** Service quality has a significant positive effect on students' BI to use an LMS.
C. **Hypothesis (H3c):** Service quality has a significant effect on PU.

2.4.4 Technical System Quality

Hofmann (2002) has characterized technical support as "knowledgeable people helping the users of computer software and hardware products". This can incorporate hotlines, machine-readable support knowledge bases, online support services, faxes, automated phone voice reaction systems, remote control software, and other facilities. Some past studies have found that there are different external factors that, by implication, affect the acceptance of technology through perceived convenience and PU (Szajna, 1996; Davis et al., 1989).

In this study, technical support is assumed to be one such external factor influencing the acceptance of LMSs in higher education. Technical support is one of the important factors in the acceptance of technology for teaching (Hofmann 2002) and in user satisfaction (Mirani and King 1994). Technical support has been found to have a

significant positive influence on learner satisfaction in e-learning contexts (Wang & Chiu, 2011; Islam, 2012; Hassanzadeh 2012; Mohammadi 2014; Mohammadi 2015); and on BI to use LMSs (Chung and Kwon 2009; Teo 2011; Ngai et al. 2007). In this study, technical support was hypothesized to have a positive effect on users' satisfaction, PU, and BI to use LMSs. In particular, the relevant hypotheses are as follows:

A. **Hypothesis (H4a):** Technical support has a significant effect on student satisfaction.
B. **Hypothesis (H4b):** Technical system quality has a significant effect on students' BI to use an LMS.
C. **Hypothesis (H4c):** Technical support has a significant effect on PU.

2.4.5 System Quality

The desired attributes of the system (LMS) were measured by the system quality in the web environment; for example, ease of use, flexibility, accessibility, reliability, and response time of an e-learning system (Delone and Mclean, 2003). In this study, system quality is defined as the quality consisting of the functions, features, activity, contents, and communication ability of an LMS. Earlier studies have found that system quality has a critical impact on the PU of a wide assortment of ISs; including diverse e-learning systems (including LMSs) and IT (Condie & Livingston, 2007; Park et al. 2012; Fathema & Sutton 2013). Moreover, studies have reported system quality's significant positive effect on users' satisfaction in using different kinds of technologies (e.g. LMSs) (Mohammadi 2015; Almarashdeh et al. 2010); and on individuals' BI to use technologies, specifically in the context of LMSs, blended learning, and various e-commerce systems (Delone & Mclean, 2003; Fathema & Sutton 2013). Three hypotheses were formulated regarding the relationship between system quality and satisfaction, BI and PU. Based on prior literature, the following hypotheses are shown the relationship among the variables and the study features as mentioned above.

A. **Hypothesis (H5a):** System quality has a significant effect on satisfaction.
B. **Hypothesis (H5b):** System quality has a significant effect on students' BI to use an LMS.
C. **Hypothesis (H5c):** System quality has a significant effect on PU.

2.4.6 Perceived Ease of Use

Each perceived ease of use can be counted according to an extent for a user predicts using aimed system that is free of effort (Davise 1986). This is a common acceptance driver of a new application (Venkatesh, 2000). The impact of PEOU on the use of LMSs has been shown in some recent studies (e.g.,Van Raaij and Schepers 2008; Lee et al. 2011; Lee et al. 2009; Sumak et al., 2011). Therefore, the greater the PEOU of an e-learning system, the more positive is the BI to use the system, and thus, the greater the probability that it will be utilized. Moreover, PEOU is expected to indirectly affect intention to use through PU in e-learning "contexts. Perceived ease of use, in this way, is expected to positively affect learners' satisfaction, PU, and intention to utilize LMSs.

A. **Hypothesis (H6a):** PEOU has a significant effect on satisfaction.
B. **Hypothesis (H6b):** PEOU has a significant effect on students' BI to use an LMS.
C. **Hypothesis (H6c):** PEOU has a significant effect on PU.

2.4.7 Perceived Usefulness

Perceived Usefulness is the main construct of the TAM model. The importance of this variable has already been confirmed by many researchers (e.g. Davis 1989; Venkatesh 2000; Venkatesh and Bala 2008). Perceived usefulness refers to "the degree to which a user believes that using a particular system would enhance his or her job performance" (Davis, 1989).

The following studies point out the importance of this factor in determining BI in relation to different ISs. Liu (2010) has found that PU is a noteworthy component of clients' purchase expectations. In the health field, Lai and Li (2010) have researched the elements influencing the approval of a computer support orthopedic surgery framework in hospitals. It was found that PU had a large influence on individuals' intentions to use the system. In the e-learning setting, PU has been found to be an important component in determining students' BI to utilize LMSs (e.g. Van Raaij and Schepers 2008; Lee et al. 2011; Lee et al. 2009; Sumak et al., 2011). Perceived usefulness, in this way, is expected to positively affect intention to utilize LMSs.

A. **Hypothesis (H7a):** PU has a significant effect on students' BI to use an LMS.

2.4.8 Behavior Intention to Use

The BI to use, which is the fundamental area variable distinguished in the research conducted within the framework of the TAM, is defined as the probability moodl that an individual will use an IS. Intention plays an important role in the actual utilization of a new technology (Davis, 1989). Intention to use can also be considered as an attitude (DeLone and McLean, 2003). In the acceptance field, some analysts have examined the relationship between intention to use and actual use in e-learning contexts (e. g., Van Raaij and Schepers 2008; Lee et al. 2011; Lee,oon et al. 2009; Sumak et al., 2011). Delone et al. (2008) have noted that to avoid further complexity, the DL&ML model does not differentiate between system use and intention to use. In their redesigned model; however, intention to use is, for the most part, an individual level develop. Venkatesh and Davis (2003) have confirmed the positive relationship between actual use and intention to use. Therefore, in the context of this study, intention to use is expected to have a positive influence on actual use.

A. **Hypothesis (H8a):** Students' intention to use LMSs has significant effects on actual use of LMSs.

2.4.9 User Satisfaction

User satisfaction is generally used to quantify a system's success. It is defined as the general assessment of individuals' involvement in using a system, and the potential influence of the system. User satisfaction is identified with users' perceptions and states of mind in relation to the use of the system, which is affected by users' attributes and encounters. In some studies (Condie & Livingston, 2007; Park et al. 2012; Fathema & Sutton 2013; Chang, 2013; Petteret 2008) they have described satisfaction as a impact users' BI to use e-learning services. Satisfaction has also been found to have a positive effect on actual use. Kanaani et al. (2012) have found a beneficial effect of satisfaction on the actual use of e-learning systems. Along these lines, satisfaction is expected to positively affect both intention to use and actual use in this study.

A. **Hypothesis (H9a):** Satisfaction has a significant effect on the actual use of LMSs.

3. THE RESEARCH METHODOLOGY

Various methods can be used in research to achieve a study's objectives; for instance, quantitative methods, qualitative methods, and descriptive, inductive, and confirmatory methods. In this study, the TAM was integrated with the IS success model (DL&ML model) to investigate students' acceptance of LMSs in Iraqi universities. This chapter discusses the study's procedure, the design of the research, the population of the study, the sampling approach, data collection, data analysis, and the research hypotheses.

3.1 THE RESEARCH PROCESS

There are two techniques that can be used to answer the research question which are related to deductive and inductive methods. The inductive method refers to the "process where we observe certain phenomena and on this basis arrive at conclusions" (Sekaran 2003). An inductive study begins by observing a phenomenon. It then tries to explain this phenomenon by developing a hypothesis or a theory (Sekaran 2003). The inductive method observes phenomena to better understand the nature of the problem. Based on these observations, a hypothesis or theory can be formulated to explain the phenomenon (Ghazali and Hasnida 2015). Al-Aulamie (2013) describes the following steps of the inductive research process: First, the study detects patterns and regularities in the environment via observations. Second, a hypothesis and theory is formulated based on the "observed patterns. The inductive approach is suited for use in interpreting qualitative data. Teddlie and Tashakkori (2003) have stated that qualitative research is predominantly related to inductive research; whereas quantitative research for hypothesis testing is related to deductive research.

Deductive research is "a set of techniques for applying theories in the real world in order to test and evaluate their validity" (Egan and Lancaster 2005). The deductive approach is a top-down method where the developed hypotheses and theories can either be accepted or rejected through empirical observation (Egan and Lancaster 2005). Symon and Cassell (2012) have indicated that the process of deductive research is "the development of a theory that is subjected to a rigorous test".

This study follows a "deductive research method because the study's aim is to develop a model by combining the TAM and the IS success model to investigate acceptance and continual usage intention in relation to LMSs. Additionally, the developed model will be validated and examined empirically by means of rigorous tests. According to Lancaster (2007), a deductive study should consist of four main steps:

1. **Hypothesis formulation:** The researcher formulates a hypothesis based on previous study and researchers' experiences and ideas in order to solve a problem that has been identified. Knowledge that has been gained should be combined in a logical manner to identify the issue on which the study will focus. For this study, an extensive literature review is conducted in order to investigate current technology acceptance studies.

2. **Operationalization**: The concepts used in hypotheses should be explained specifically, so that they can be measured empirically. This is essential to exclude any complexity in term of what is to be measured and how these measurements will be executed (Burns, 2000). This study combines the TAM with the IS success model in order to investigate students' acceptance and continual usage intention in relation to LMSs. The model consists of 10 variables, and their relationships were defined in 21 hypotheses.

3. **Theory testing observation:** This step involves the study's methodology and design; including the sampling process, model development, data collection, techniques of analysis, and results discussion. The nature of the study explores the study's methodology and design. For this study, a quantitative approach was chosen to validate and test the developed model.

4. **Accepting or rejecting the hypothesis:** The research theory or hypothesis can either be rejected or accepted based on the results. This study will use SEM within IBM SPSS AMOS to perform a confirmatory factor analysis and multiple regression analysis. According to the analysis results for the developed model, the proposed hypotheses will be discussed and evaluated.

3.2 RESEARCH DESIGN

Research design is defined as "the arrangement of condition for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure" (Ghazali and Hasnida 2015). In this research, the questionnaire design was selected based on research objectives. Cresswell (2013) has defined questionnaire research as "a method in a quantitative study in which conducts a questionnaire to a sample or to the whole population of people in order to illustrate the attitudes, behaviours, opinions, or characteristics of the population". There are two types of research methods: qualitative research, and quantitative research. Qualitative research is "an approach to exploring and understanding the meaning individuals or groups ascribe to a social or human problem". Quantitative research refers to "an approach for testing objective theories by examining the relationships between variables. These variables, in turn, can be measured, typically on instruments, so that numbered data can be analyzed using statistical procedures" Cresswell (2013).

A survey research design is used in the present study, because it allows researchers to investigate many topics with a large number of respondents (Cohen, Manion et al. 2013). Surveys can also be seen as a helpful means for answering a different kind of research question (Ghazali and Hasnida 2015). The survey research design has been used in order to determine the effectiveness of a program (Cresswell, 2013). Therefore, using a survey research design in the present study is possible, since it evaluates the program by collecting data on a large scale.

In order to collect information about the opinions of the research participants, a questionnaire is the most suitable tool (Cresswell, 2013). In this study, the researcher attempts to determine whether students accept and intend to use LMSs continuously in higher education. Although interviews can be used as an instrument of data collection,

only questionnaires have been used in the present study. Questionnaires can be used to collect a large number of participants' responses and are more reliable. Interviews, on the other hand, are a more cooperative tool in data collection (Majid 2011). The source of potential errors differs between questionnaires and interviews. The instrument can be seen as the only source of error in the quantitative method; while interviewers, instruments, sampling and coding are all sources of error in the qualitative method.

Researchers using the quantitative method can use ratings, frequencies, and test scores; while researchers using the qualitative method tend to use non-numerical data such as pictures, words, and objects (Gredler 1996). Furthermore, the quantitative method of data collection allows for summarizing the data, and for evaluating the relationships between variables.

The present study uses a quantitative approach by using questionnaires as the main tools to collect data. This was done for the following reasons: First, questionnaires allow a larger sample of the research population to be reached. This is necessary because the minimum sample size for this study is relatively large (i.e. 242 participants). Secondly, questionnaires allow for data to be collected from participants anonymously and without interference, as was requested by the universities participating in the study.

3.3 THE RESEARCH POPULATION

A "research population" is defined as "the entire group of persons or events or things of interest which the researcher has the ability to find out" (Sekaran, 2003). The population of this study consists of Iraqi undergraduate students who are studying in the north of Iraq and are familiar with the LMS Moodle.

Hair (2010) has pointed out that for SEM (i.e. multiple regression analysis and CFA), the minimum sample size required is a ratio of 20:1 (i.e. 20 responses for each independent variable). The model developed for this research consists of six independent variables: information quality, system quality, service quality, instructor quality, technical support, and PEOU. Thus, the ratio of 20:1 requires a minimum sample size of 120 persons. A sufficient total number of completed responses can be obtained by conducting a statistical analysis of 242 responses. Moreover, the statistical research analysis will be taken into account all 242 responses without exception. All 242 participants' responses can be used in the CFA. In order to obtain the developed

model through unidimensionality, a goodness-of-fit (GOF) measures and constructs' validity ad according to Janssens et al. (2008) and Hair et al. (2010), testing the research hypotheses and determining the variance for the developed model can be achieved by using the 242 responses in a multiple regression analysis. Moreover, a multiple regression analysis is conducted in order to be able to accept or reject the study's hypotheses.

Both the expectation value (i.e. significant level) and standardized coefficient value (i.e. prediction value) for each hypothesis are calculated by means of a multiple regression analysis. The hypothesis is always accepted if the probability is less than $P < 0.05$; otherwise, the hypothesis is rejected. The standardized coefficient for all the research hypotheses will be provided by the analysis. Regardless of probability values, the standardized coefficient needs to be reported for both accepted and rejected hypotheses. The explained variance for the dependent variables such as PU, BI, student satisfaction, and actual use will be provided by the multiple regression analysis.

3.4 THE SAMPLING METHOD

Sampling is "the process of selecting a sufficient number of elements from the population" (Sekaran, 2003). The sampling is very useful, since it helps in measuring the responses of participants in different areas when it is not easy to use the whole population in the study because of geographical boundaries, survey expenses, or time limits (Al-Aulamie 2013). The quality of the sample should be taken into consideration, and a suitable sampling method should be used. A valid sample has to be used to show the participants' responses. Earlier, the population has to be familiarized with process of obtaining data. However, the researcher usually gives enough information to fill in the survey. There are two kinds of sampling methods in educational research: the probability sampling method, and the non-probability sampling method.

In the probability sampling method, all individuals are seen as the same, and the participants of the study are considered equal (Serkan, 2003). Determining the sampling frame is the most important value of the probability sampling method. The sampling frame is the list that includes all elements or individuals of the population that is to be studied (Sekaran, 2003).

The non-probability sampling method is used when the use of a sampling frame is difficult to achieve (Al-Aulamie 2013). Researchers can sample their research population without using a frame by using the non-probability sampling approach, which includes a range of sampling techniques. In order to choose the right sample, this study will use non-probability sampling; because the large population size makes it impractical to survey the whole research population. Self-selection based on the volunteer group was the most suitable sampling technique for this study among the non-probability techniques. According to Saunders et al. (2009), the self-selection technique allows an individual to participate in the study voluntarily without the researcher's interference. This is achieved by means of two steps. First, the researcher uses an appropriate media to make potential participants aware of the study. Second, the data is collected from the participating individuals.

The self-selection criteria for the data collection were as follows: First, an LMS (e.g. Moodle, Blackboard, and WebCT) had to be available in the university. The most commonly-used LMS in Iraqi universities is Moodle. Second, the university must promote and support the use of LMSs for teaching and learning. This means that learners will be more engaged and familiar with the system. Finally, the university should allow their learners to participate in the data collection process. There are many universities in the north of Iraq, but only one university (UKH) gave their consent.

3.5 DATA COLLECTION

An important part of research design is the method of data collection. A suitable approach for the data collection process must be chosen (Saunders et al., 2009). According to Saunders et al. (2009), the term "questionnaire" refers to all methods of data collection in which each person responds to the same set of questions which are asked in a predetermined order. Generally, according to Bryman and Bell (2007) and Saunders et al. (2009), the use of a questionnaire is cheap, fast, and allows for geographically dispersed-sampling, and it allows participants to answer questions without any obstacles. Quantitative data can be collected using many techniques, such as surveys, closed-ended observations, closed-ended interviews, or by using documents such as censuses or attendance records. Usually, data collection by means of a survey uses either pencil-and-paper questionnaires, phone interviews, face-to-face interviews,

or web-based and email forms (Muis, 2011). In this study, the survey is conducted using pencil-and-paper questionnaires. These are self-administered in the absence of the researcher.

According to Saunders et al. (2009), there are five considerations in choosing an appropriate approach. These are respondents' importance, distorting respondents, sample size, sample type, and the number of questions are in this study.

Because of the above-mentioned criteria and because the research population consists of students, a large sample size is required for this research. The questions use a Likert scale, and the number of questions is relatively high. For this reason, a self-completed questionnaire was selected for use. Moreover, the main method that has been used to collect data in the domain of technology acceptance is the self-completed questionnaire (e.g. Al-Aulamie 2013; Al-Harbi (2011); Park (2009); Alharbi & Drew (2014) ; Šumak, et al.2011).

3.5.1 Questionnaire Development

Designing a survey is an important part of the process of data collection. The design of the questionnaire may influence the response rate, and the data's internal validity and reliability. Foddy (1994) has stated that "the question must be comprehended by the respondent in the way that the researcher meant and the answer given by the respondent must be comprehended by the researcher in the way that respondent meant". In order to guarantee the validity and reliability of the questionnaire, the questionnaire development process involved several steps. Recognizing the items to measure the variables of the developed model was the first step that was taken. According to Hair (2010), for any confirmatory study, there should be two items for each variable in this research model. In order to measure the variables of the developed model, 47 measurement items were identified. The adapted measurement items were modified in order to make them appropriate for the current study. Subsequently, the second stage involved choosing suitable types of questions. Likert scale questionnaires are widely used to measure users' perceptions in technology acceptance research. In this kind of scale, "The researcher asks the respondent of how strongly he or she disagrees or agrees with a statement or series of statements, normally on a four, five, six or seven-point rating scale" (Saunders et al., 2009). A five-point Likert scale was used in this study.

This included five options; with ‘strongly agree’ as the highest rating, and ‘strongly disagree’ as the lowest rating.

The third step concerns the questionnaire’s layout. According to Dilman (2011), clear instructions, general appearance, and question order are important aspects of questionnaire design. If a questionnaire has an appropriate layout, this can decrease non-responses and error rates. Hence, the self-completed survey’s layout should make it simple for users to read and respond to questions. In addition, an attractive layout will assist users in completing the questionnaire easily. Dilman (2011) describes the relationship between a good cover page and response rate. The cover page of the questionnaire that was developed revealed and clarified the purpose of the study, indicated that participation was voluntary, and highlighted the confidentiality of the collected data. The fourth step involves pre-testing the developed questionnaire for validity, reliability, errors and mistakes (Saunders et al., 2009; Dilman 2011).

3.5.2 Pilot Study

A pilot study is defined as “A mini-version of a full-scale study or a trial run done in preparation of the complete study” (Van Teijlingen, Rennie et al. 2001). Thabane et al. (2010) have indicated that a pilot study has different responses in research, such as ensuring the validity of tools, examining research procedures, assessing the recruitment rate, and estimating parameters (e.g. the variance of the result variable) to calculate sample size. The acceptable sample size of a research questionnaire in a pilot study is between 100 and 200 (Dilman 2011). The pilot study was carried out at a Turkish university (Bahçeşehir University (BAU)), using undergraduate learners from the computer science department. A total of 120 responses were collected but, due to missing data in 10 responses, only 110 responses were used to test the survey’s reliability and validity.

Cronbach’s alpha was used to test the questionnaire’s reliability. The results of the pilot study showed that the Cronbach’s alpha of all questions is greater than 0.6. This is an acceptable result (see Table 3.1).

Table 3.1: Pilot study

Variable	Number of Items	Cronbach's alpha
Actual Use	3	0.772
Information Quality	6	0.926
Intention to Use	4	0.871
Perceived Usefulness	5	0.807
Satisfaction	6	0.816
Service Quality	5	0.836
System Quality	5	0.908
Technical System Support	6	0.950
Perceived Ease of Use	5	0.861
Instructor Quality	4	0.938

3.6 DATA ANALYSIS

In this study, the SEM technique was used to analyze the data that were collected. The SEM technique is an extension of many multivariate methods such as CFA, multiple regression, and multivariate analysis of variance that allow the researcher "to simultaneously investigate a series of interrelated dependence relationships among the measured variables and latent constructs as well as between several latent constructs" (Hair 2010). The foundation of SEM lies in two multivariate methods: factor analysis, and multiple regression analysis. However, SEM can be distinguished by the four steps which include (Hair 2010). First, multiple and interrelated dependence relationships are estimated. Second, the unobserved variables are represented. Third, the measurement error is accounted for. Lastly, a model is defined to explain the set of relationships.

Moreover, SEM is useful when examining hypotheses that involve dependence relationships (e.g. B→E→C) (Byrne 2013). There are different statistical software packages that implement SEM: Analysis of Moment Structures (AMOS), and Linear Structural Relations (LISREL). In this study, AMOS is used to carry out the CFA and multiple regression analysis. The AMOS utilizes graphical shapes to define variables, and regression paths are illustrated between the independent and dependent variables.

This study uses two SEM techniques: multiple regression analysis, and CFA. Firstly, CFA is used to measure "how good the representation of the measured variables towards their variables" is (Byrne 2013). Furthermore, the analysis presents a variety of measures to evaluate the model's GOF, according to which the model can be accepted or rejected (Byrne 2013). Secondly, the multiple regression analysis will explain the variance in learners' acceptance through PU, learner satisfaction, and BI, based on the structure of the developed model. In addition, the analysis will examine the research hypotheses to test the external variables' influence on students' acceptance of and continual usage intention in relation to the LMS. Furthermore, the Statistical Package for the Social Sciences (SPSS) was used for data screening before applying the SEM technique.

3.7 THE RESEARCH MODEL

Chapter two has discussed the extensive literature on the TAM and the IS success model of evaluating LMSs in higher education. A model based on the TAM and the IS success model has been developed. It consists of ten variables: system quality, information quality, service quality, instructor quality, technical system support, PEOU, PU, user satisfaction, BI to use the LMS, and actual use. Furthermore, the relationships between the independent variables and the dependent variables in this model have been conducted by the suggested hypotheses. In line with the proposed hypotheses, the research model relationships have been utilized the factors (variables) in the model (see Figure 3.1).

Figure 3.1: Research model

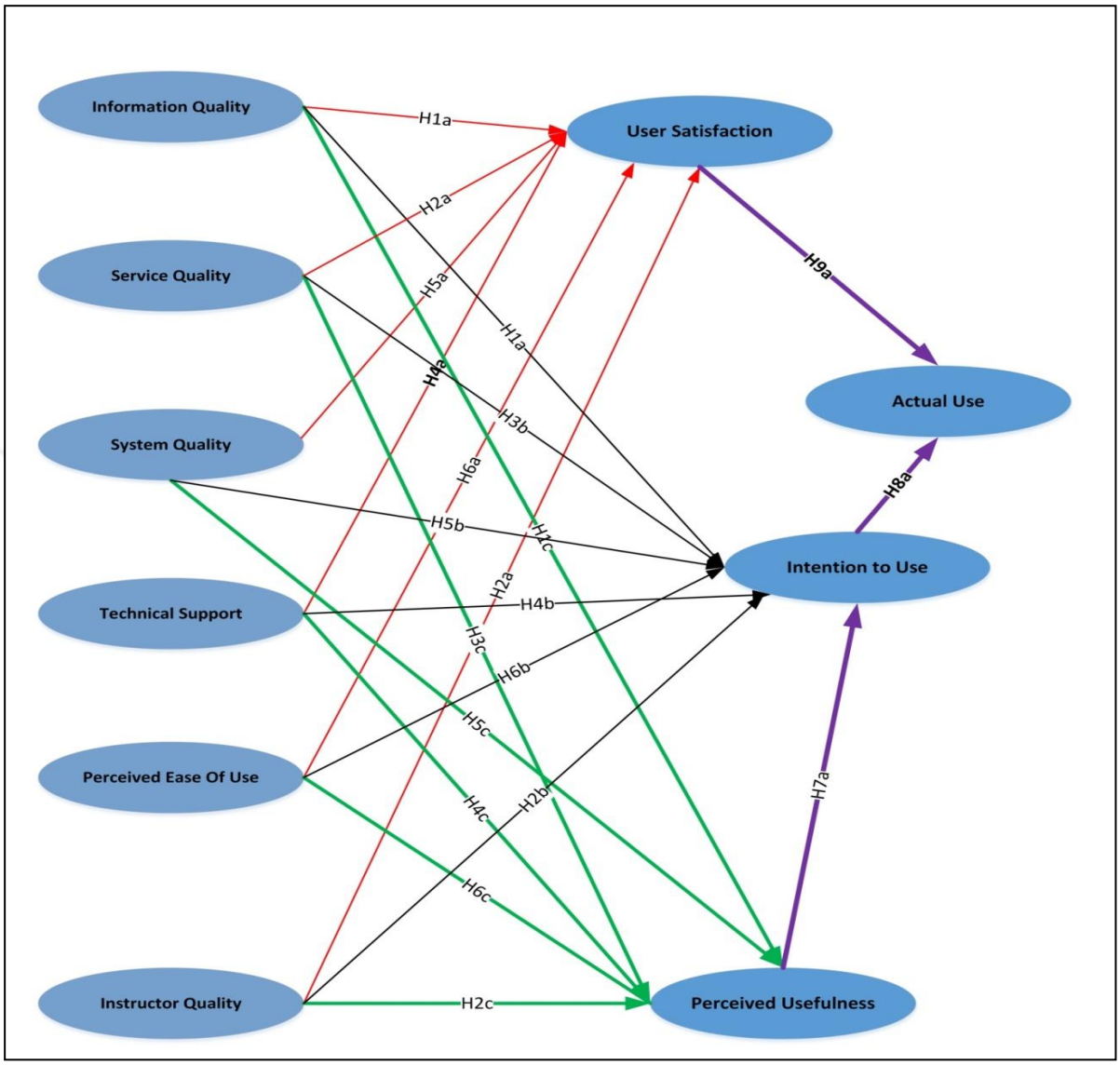


Table 3.2: Overview of research questions and corresponding procedure

Research Question	Data Collection Instrument	Data Analysis
What are the students' perceptions regarding the use of the LMS (Moodle) in higher education?	Likert Scale attitude questionnaire and self-completed questionnaire	Descriptive statistics (Data number, percentage) Content analysis
What are the relationships between PEOU, PU, user satisfaction, and BI to use the LMS?	CFA	Unidimensionality, estimation method and GOF measures (GFI, AGFI, RMSEA, CFI, NFI, and TLI)
What are the factors that affect student stratification, PU and BI to using LMSs in universities?	SEM	Research hypotheses, GOF measures (GFI, AGFI, RMSEA, CFI, NFI, and TLI) and multiple regression analysis (p-value and standardized coefficient (β)).

4. DATA ANALYSIS

4.1 INTRODUCTION

The data analysis section in this research consists of two parts. The first part consists of five methods, including data screening, cleaning, and checking for missing data and outliers; and checking the normality of the data's distribution. Preliminary data analysis was done using SPSS version 19. The second part of the data analysis involved the execution of SEM. This is "a technique of a statistical analysing that has developed to analyze the inter-relationships among multiple variables in a model" (Ghazali and Hasnida 2015).

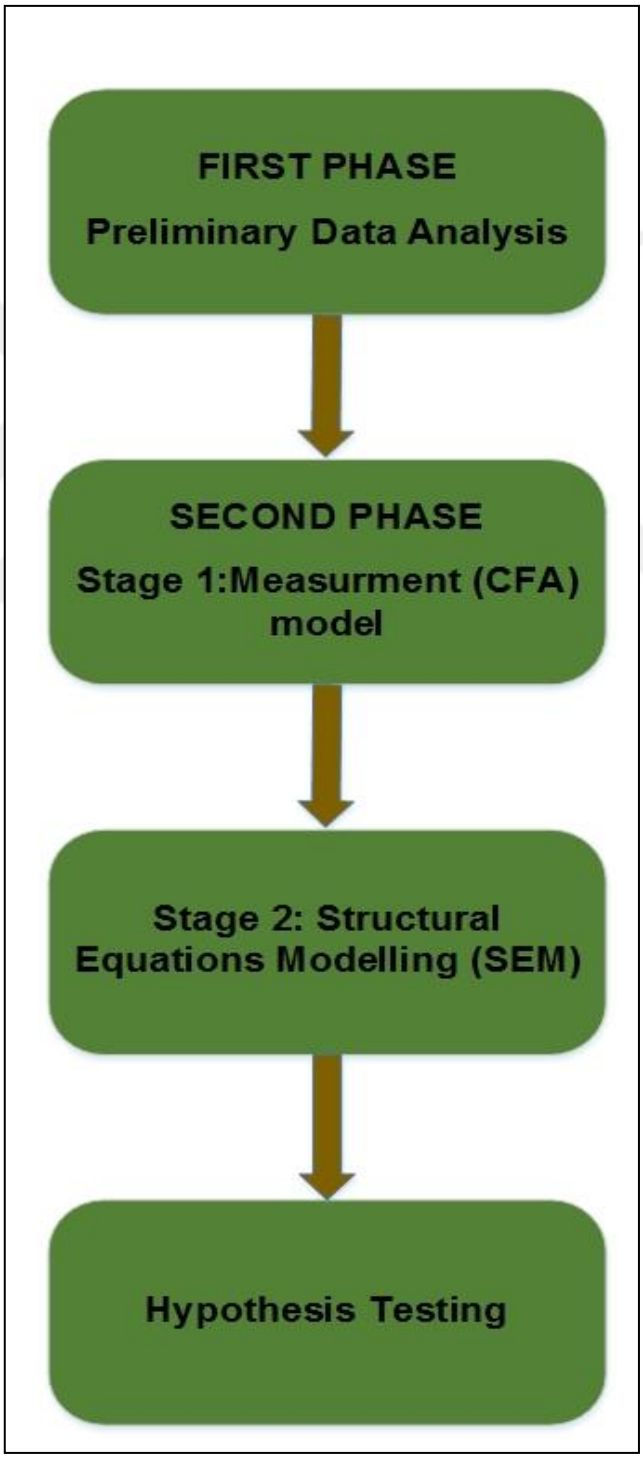
According to Hair (2010), SEM is a statistical methodology that combines multiple regression and CFA to investigate a series of dependence relationships between the observed measurement and unobserved (latent) variables, or between all unobserved variables. Unobserved variables are the theoretical constructs in a study that cannot be measured directly. They are also referred to as "latent" variables or factors (Hair 2010). In this study, system quality, service quality, technical support, instruction quality, and PEOU are latent variables.

On the other hand, manifesting variables are "variables that can be measured directly using developed tools or tests". These variables are also known as "observed variables" and "latent indicators" in statistical research. Observed variables are used to define or indicate unobserved variables. The SEM method applies a conservatory rather than an exploratory method to examine certain phenomena as shown by (Ghazali and Hasnida 2015). Compared to the ordinary least squares (OLS) method, the SEM method is able to obtain a more accurate and efficient outcome; because it analyzes the structure of covariance, variance, and the mean concurrently. Furthermore, the SEM is more efficient in making an evaluation for multiple variables (Hair 2010). The OLS technique analyses the variation of a mean value, and is suitable for performing an estimation of a single item.

Moreover, SEM is able to correct the measurement error by estimating the error variance parameters. The drawbacks of SEM are that the process might be more tiresome in order to obtain a model with a good fit. Some elements will be deleted as a

result of the unidimensionality problem, and the researcher's prediction is also a significant factor. The SEM method is also limited when it is used to deal with multilevel issues and nonlinear relations (Saunders et al., 2012). Figure 4.1 presents the two stages and sub-stages of the data analysis process used in this study.

Figure 4.1: Data analysis structure



4.2 PRELIMINARY DATA ANALYSIS

The screening and cleaning process must be performed before analyzing the data in order to ensure that all errors that are made during data entry are eliminated. Outliers, or "out-of-range values", are values in a dataset that are well under or well above other scores. According to Pallant (2013), screening methods include checking errors for all variables and fixing those errors in the dataset. Frequency analyses are conducted for each variable in order to screen for outliers during error checking. Outliers are either eliminated from the data or they are converted to a high score that is not too different from the rest of the values in the dataset. The appropriate changes have been made to the data in the dataset of the present study; e.g., a score of 44 has been converted to 4, or a score of 22 has been converted to 2.

4.2.1 Missing Data

According to Hair (2010), missing data result from respondents failing to respond to one or more survey questions. In the present study, there were 8 incomplete responses in the 250 responses that were collected. According to Hair (2010): "if one response fails to answer fifty percent of the survey questions, then the response should be deleted". In this study, eight participants failed to respond to half of the questionnaire questions. Therefore, the eight incomplete answers were discarded, in order to avoid creating any artificial relationships among the variables of the model. In total, there were 242 completed responses after discarding the missing data. All 242 responses were utilized for the statistical analysis.

4.2.2 Descriptive Statistics

As mentioned earlier, the research participants were students of Iraqi universities who used an LMS. Two models were combined and assessed. Three-tier technology was utilized to model expectation disconfirmation theory. Since the merged model consists of 10 factors, betwee 150-225 valid questionnaires are required. The data was collected between June 2015 and December 2015 at UKH in the north of Iraq. Out of about 300 distributed questionnaires, 250 were completed, of which 242 were valid. Thus, the response rate was eighty-three point three percent (Table 4.1).

Table 4.1: Response rate

	Data Collection Method	Population	Valid Sample	Frequency	Percent
UKH	Face-to-face	250	242	242	96.8%
Total		300	250	250	100%

Table 4.1 shows the participants' location, the number of participants in the study, and the respondents' results in terms of frequency and percentage.

Before beginning the analysis of the responses and investigating the validity of the hypotheses, some descriptive statistics about the respondents' demographics, their computer usage, and their characteristics are provided.

Table 4.2: Respondents' gender

Gender	Frequency	Percent
MALE	146	60.3
FEMALE	96	39.7
Total	242	100.0

Table 4.2 shows the participants' gender in terms of frequency and percentage.

Table 4.3: Respondents' nationality

Nationality	Frequency	Percent
Kurdish	218	90.1
Arabic	21	8.7
Other Nationality	3	1.2
Total	242	100.0

Table 4.3 shows the participants' nationalities according to frequency and percentage.

Table 4.4: Respondents' age

Age	Frequency	Percent
18-20	84	34.7
21-30	152	62.8
Over 31	6	2.5
Total	242	100.0

Table 4.4 indicates the respondents' age according to frequency and percentage.

Table 4.5: Respondents' experience in computer usage

Computer Usage	Frequency	Percent
Less than one year	10	4.1
1-3 years	15	6.2
Over 3 years	217	89.7
Total	242	100.0

Table 4.5 shows the respondents' experience in using computers according to frequency and percentage.

Table 4.6: Respondents' use of LMSs

LMS Usage	Frequency	Percent
Less than one year	24	9.9
1-3 years	171	70.7
Over 3 years	47	19.4
Total	242	100.0

Table 4.6 indicates the respondents' use of LMSs in education. The results are shown in terms of frequency and percentage.

Table 4.7: The number of courses that students have accessed in the LMS

Courses	Frequency	Percent
One course	4	1.7
2-3 courses	110	45.5
More than 4 courses	128	52.9
Total	242	100.0

Table 4.7 shows the number of courses that participants have accessed in the LMS. Results are shown according to frequency and percentage.

Table 4.8: Average number of hours that student spend using computers and internet

Average Time	Frequency	Percent
Less than 1 hour	14	5.8
1-3 hours	61	25.2
More than 3 hours	167	69.0
Total	242	100.0

Table 4.8 identifies the hours that participants spend using the internet and the computer for recreational purposes. Results are shown according to frequency and percentage.

Table 4.9: Average hours spent on education on the internet and computer

Average Time	Frequency	Percent
Less than 1 hour	75	31.0
1-3 hours	132	54.5
More than 3 hours	35	14.5
Total	242	100.0

Table 4.9 shows the participants' spend time on the internet and the computer for educational purposes per hours. Results are shown according to frequency and percentage.

Table 4.10: Average time spent using the LMS

Average time	Frequency	Percent
Less than 1 hour	159	65.7
1-3 hours	68	28.1
More than 3 hours	15	6.2
Total	242	100.0

Table 4.10 shows the hours that participants' spend on using the LMS platform for educational purposes. Results are shown according to frequency and percentage.

As represented in the above figures and tables, the demographic results indicate that the number of males in UKH is greater than the number of females. The majority of respondents was between 18 and 30 years old, and was undergraduates. Interestingly, it can be seen that ninety percent of the learners have significant experience in using the internet and computers. On the other hand, the students have a problem in using the LMS. Almost all the respondents use the LMS for less than one hour, as shown in Table 4.10. This research combined two models in order to investigate the factors that impact students' acceptance of and continual usage intention in relation to LMSs in higher education.

4.2.3 Outliers

Outliers represent cases in which a data point is substantially different from all the others in a particular set of data (Byrne, 2010). Outliers identified during the data cleaning phases have been attributed to mistakes in coding data or errors in entering data. According to Pallant (2013), there are many ways to check for outliers in a dataset; such as boxplots, histograms, or the five percent trimmed mean. According to Hair (2010), there are two types to identify outliers in research data: univariate and multivariate outliers.

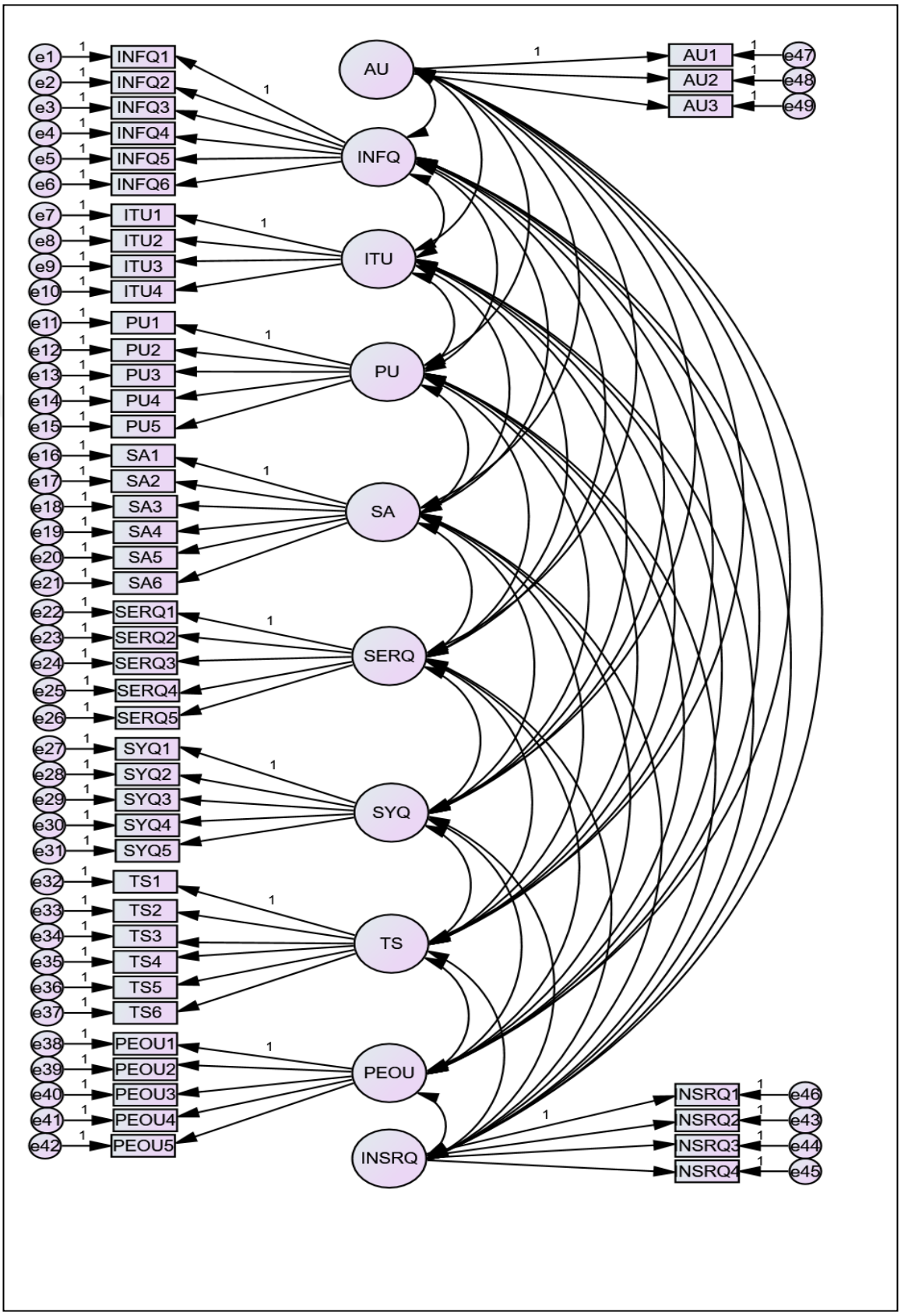
In this study, SPSS was used to identify the univariate outliers in the data by determining the frequency distributions of the z-score. This is suggested by Kline (2010). There are no specific rules in analyzing data to identify extreme values in research. If the study involves a large sample (more than 80), a value higher than approximately 3.29 can be accepted. According to Kline (2010), if one row in the dataset has more than two univariate outliers, it must be deleted from the data file. Accordingly, four rows (6, 66, 90, and 184) were deleted from the dataset. Table 3 in Appendix C shows the univariate outliers.

The second type of outlier that has been used in this study is multivariate outliers. This method involves the observation and analysis of more than one variable for determining outliers in the database. In this study, Mahalanobis' D2 technique has been used to define the multivariate outliers (Hair, 2010; Kline, 2010). Hair (2010) has defined the Mahalanobis D2 method as "a method that measures the distance of a particular case from the centroid of the remaining cases". The Mahalanobis D2 method was measured in this study using AMOS version 22.0, and it was applied to all records in the dataset. According to Tabachnick and Fidell (2007), if the p-value of any record is less than 0.05, it can be considered an influential outlier and the correlation between the variables for these responses are abnormal or significantly different compared to the rest of the dataset. In the dataset of the present study, 14 multivariate outliers are detected in the output of AMOS 22. However, the outliers were retained in the dataset: because of their limited number, they were not thought to be problematic, and they were therefore thought to be suitable to be included in further analysis (Hair et al., 2010). The results of the multivariate outliers are presented in Appendix C.

4.3 CONFIRMATORY FACTOR ANALYSIS (CFA)

Confirmatory factor analysis is “a method of examining how well the measured variables represent a smaller number of constructs” (Hair, 2010). The CFA evaluates the validity of the developed model by analyzing the model’s 49 measurement variables. The CFA measures how accurately the selected measured variables measure the model’s variables. Furthermore, the CFA deals with the measurement version of the developed model, which is known as the “measurement model”. In the measurement model, the structural relationships between the model variables, as suggested by the research, are replaced with correlational relationships (i.e. covariance). Figure 2.2 presents the representation of the measurement model in IBM AMOS. The developed model’s variables are connected. These are system quality (SYQ), information quality (IQ), service quality (SERQ), instructor quality (INSQ), technical support (TS), PU, PEOU, user satisfaction (SA), intention to use (ITTU), and actual use (AU). The CFA validates the developed model according to three measures: unidimensionality, the GOF measures, and construct validity. IBM AMOS version 22 was used for the CFA.

Figure 4.2: The Measurement model in AMOS



4.3.1 Unidimensionality

Unidimensionality allows the measured variables to have one underlying dimension (i.e. model variables) (Hair, 2010). Figure 4.2 presents the 49 measured variables and the 10 model variables. Each of the ten variables indicates the number of measured variables. For instance, the "information quality" variable has six measured variables (i.e. six questions): INFQ1, INFQ2, INFQ3, INFQ4, INFQ5, and INFQ6. Additionally, there are two conditions to ensure each measured variable has a unidimensional relationship with its main variable. First, the measured variable's factor loading (FL) must be higher than 0.5. Second, the FL must be significant (t-value > 1.96) (Al-Aulamie 2013). The FL result is based on the CFA, which confirms the unidimensionality of the most measured variable without two variables (INFQ6, SERQ4). According to Hair (2010), if the FL value of the measured variable is lower than 0.5, it must be deleted. The two measured variables did not reach the minimum recommended FL value. These measured variables become candidates for deletion to improve the model's validity (see Table 4.11).

Table 4.11: Unidimensionality

Variable	Measured Variable	Observed Variable Loading	T-value
Actual Use	AU1	0.778	***
	AU2	0.839	10.932
	AU3	0.667	10.613
Information Quality	INFQ1	0.623	***
	INFQ2	0.799	12.662
	INFQ3	0.728	11.688
	INFQ4	0.733	11.599
	INFQ5	0.706	11.375
	INFQ6	0.445	9.123
Intention to Use	ITU1	0.892	***
	ITU2	0.922	28.874
	ITU3	0.893	26.81
	ITU4	0.895	26.901

Perceived Usefulness	PU1	0.634	***
	PU2	0.762	12.008
	PU3	0.683	11.299
	PU4	0.713	11.497
	PU5	0.730	11.69
User Satisfaction	SA1	0.843	***
	SA2	0.774	18.617
	SA3	0.825	20.059
	SA4	0.755	17.742
	SA5	0.823	19.886
	SA6	0.644	14.032
Service Quality	SERQ1	0.592	***
	SERQ2	0.901	7.411
	SERQ3	0.565	8.465
	SERQ4	0.424	5.454
	SERQ5	0.864	12.432
System Quality	SYQ1	0.766	***
	SYQ2	0.783	15.301
	SYQ3	0.715	14.12
	SYQ4	0.784	15.513
	SYQ5	0.705	13.756
Technical System Support	TS1	0.746	***
	TS2	0.781	15.211
	TS3	0.767	15.211
	TS4	0.780	15.284
	TS5	0.591	11.261
	TS6	0.615	11.866
Perceived Ease of Use	PEOU1	0.839	***
	PEOU2	0.783	18.893
	PEOU3	0.836	20.604
	PEOU4	0.895	23.004

	PEOU5	0.84	20.668
Instructor Quality	INSRQ1	0.849	***
	INSRQ2	0.701	11.79
	INSRQ3	0.581	10.403
	INSRQ4	0.643	11.543

***** = t-value > 1.96 (i.e. the FL is significant > 1.96)**

4.3.2 Estimation Method

The Maximum Likelihood (ML) algorithm is an estimation method that was used in this study to create parameter estimates of SEM. Kline (2005) defines ML as "an estimation technique which acts simultaneously where estimates of model parameters for all variables are computed all at once". The ML is a repetition procedure which attempts to decrease discrepancies between the sample covariance and model. This algorithm predicts that the data of all variables have no missing values, and that the status distribution for all variables is multivariate normal. Moreover, with the ML, the estimation from a given sample is supposed to be "random but known", whereas the true values of model parameters are supposed to be "fixed but unknown" (Al-Aulamie 2013). Another point about this algorithm is its ability to deal with complex models, and its robustness to abnormal data (Brown 2006).

4.3.3 Goodness of Fit Measures (GOF)

Goodness-of-fit measures indicate "how well the specified model reproduces the observed covariance matrix among the indicator items" (Brown 2006). In the present study, three groups were used to assess the developed model's validity: the Practically Fit Index, Absolute Indices of Fit, and the Incremental Fit Index. There are various indexes developed in the CFA, but only a few are used in this study (Al-Aulamie 2013; Ghazali and Hasnida 2015). The six measures that have been selected are the most recognized measures, and are those ordinarily used in IS research (Hair 2010).

4.3.3.1 Practically Fit Measures

The first measure in the practical fit measure group is the chi-square statistic (X^2). It is also known as "CMIN" in IBM AMOS (minimum discrepancy). According to Byrne (2010), the chi-square statistic is a value indicating the discrepancy between the sample and fitted covariance matrices. The CMIN has limitations; e.g., it is sensitive to large and small sample sizes (Brown 2006). For instance, Hair (2010) has indicated that a model with a sample size over 200 has a significant chi-square value, even if there are very small discrepancies between obtained and implied covariance matrices. On the contrary, when the sample is small, it seems too likely to accept poor model fit. According to (Suhr 2006), " chi-square value close to zero indicates little difference between the expected and observed covariance matrices". Furthermore, the p-value must be greater than 0.05 when the chi-square value is close to zero.

The next measure is normed chi-square (NC). This index represents a value of ΔX^2 divided by degrees of freedom (df), resulting in a lower value (Kline, 2005). There is no consensus regarding an acceptable value for this statistic; recommendations range from as high as 5.0 to as low as 2.0 (Tabachnick and Fidell, 2007).

4.3.3.2 Absolute Indices of Fit

The absolute indices of fit compare the hypothesized model with other model (Hair 2010). This index assesses the ratio of variability in the population covariance matrix, which is described by predicting the covariance matrix in the research model (Kline 2005). The measures involved in this index are Goodness of Fit (GFI), Root Mean Square Error of Approximation (RMSEA), and Adjusted Goodness-of-Fit Index (AGFI).

The GFI statistic was developed by Jöreskog and Sorbom as an alternative to the chi-square statistic, and estimates the ratio of variance that is accounted for by the calculated population covariance (Tabachnick and Fidell, 2007). According to Kline (2005), the GFI index is a statistical method that measures the amount of covariance matrix among the factors in the research model. Most researchers suggest that the GFI should be 0.95 instead of 0.9 in a sample size with a few FLs (Hooper, Coughlan et al. 2008).

The AGFI differs from the GFI according to the number of degrees of freedom in the specified model. Nowadays, the AGFI has become less familiar, as it is not administrated by many computer simulation studies. The RMSEA was introduced by Steiger and Lind in 1980, and is a popular informative criterion in covariance structure modelling. This index measures the discrepancy between the measured and approximated covariance matrices per degree of freedom (df) in the model. The RMSEA is not sensitive to sample size, as the contradiction measured is in terms of the population and not the sample size. According to Hooper (2008), the RMSEA is sensitive to the number of measured parameters in the model. In addition, the RMSEA supports models that have a minimum number of parameters. In statistical research, acceptable values of the RMSEA are between five percent and eight percent (Kline, 2005).

4.3.3.3 Incremental Fit Measures

Incremental fit indices are also known as "comparative" or "relative fit" indices (Miles and Shevlin 2007). Incremental fit indices consist of a group of indices that do not utilize the chi-square in its raw form; rather, they compare the chi-square value to a baseline model. The incremental fit consists of three measures: the comparative fit index (CFI), the normed fit index (NFI), and the Tucker-Lewis index (TLI). The NFI estimates the model by comparing the $\chi 2$ value of the model to the $\chi 2$ of the independent model. The measured variables in the independent model are uncorrelated. Values for above index range between 0 and 1. Previous studies (e.g. Bentler and Bonett 1980) have suggested that values of the NFI that are greater than 0.90 indicate a good fit. More recent recommendations state that the cut-off criteria should be NFI $\geq$ .95 (Hair 2006). A major disadvantage of the NFI is that it is more sensitive to sample size: it tends to under-estimate fit for samples smaller than 200 (Bentler and Bonett 1980).
The TLI is also known as the Non-Normed Fit Index (NNFI). The TLI is an index that prefers simpler models. However, in situations where small samples are utilized, the value of the NNFI can identify a poor fit, in spite of other statistics pointing towards a good fit (Kline, 2005; Tabachnick and Fidell, 2007). The main problem with the NNFI is that due to its non-normed nature, values can rise above 1.0, and can thus be difficult

to explain (Byrne, 1998). Bentler and Hu (1999) have suggested that NNFI ≥ 0.95 is a good model fit.

The CFI was proposed by Bentler in 1990. This index, like the NFI, assumes that all latent variables are uncorrelated. The CFI is a developed form of the NFI that derived from the sample size (Byrne, 1998), then performs well even when the sample size is small (Kline 2005). As with the NFI, values for this index range between 0 and 1, with values closer to 1 designating a good fit. In past studies, it was proposed that an acceptable result was CFI ≥ 0.90, but current research argues that a value greater than 0.90 is required in order to ensure that misspecified models are not accepted. Thus, a value of CFI ≥ 0.95 is presently recognized as indicative of good fit (Hair 2006). Nowadays, this index is involved in all SEM programs, and is one of the most commonly-reported fit indices, due to being one of the measures least influenced by sample size (Fan, Thompson et al. 1999) (see Table 4.12).

Table 4.12: Goodness-of-Fit Measures (GOF)

Goodness of Fit Index	Acceptable Value	Comment	References
Chi-square (X2)	Insignificant		Hair (2010)
Normed chi-square (X2/df)	=< 2		(Im and Grover 2003)
Goodness-of-Fit Index (GFI)	[0.00, 1.00]	GFI = 1.00: Perfect fit GFI > 0.9: Good fit	Hair (2006)
Adjusted GFI (AGFI)	[0.00, 1.00]	Values close to 1.00: Good fit GFI > 0.8: Good fit	Byrne (2010)
Root Mean Square Error of Approximation (RMSEA)	RMSEA ≤ 0.08	RMSEA < 0.05: Good fit RMSEA 0.05 - 0.08: Adequate fit Values up to 0.10: Poor fit	Hair (2010)
Normed Fit Index (NFI)	NFI ≥ 0.90	NFI = 1.00: Perfect fit Values close to 0.00: Poor fit	Hair (2006)
Comparative Fit Index (CFI)	CFI ≥ 0.90	0.00 > CFI > 1.00 for acceptance	Hooper, Coughlan and Mullen (2008)
Tucker-Lewis Index (TLI)	TLI > 0.90	0.0 > TLI > 1.00 for acceptance	Hair (2010)

The CFA calculated the six GOF measures for the 242 completed questionnaires. The results confirm the validity of the developed model over six measures: GFI, AGFI, RMSEA, CFI, NFI, and TLI (see Table 4.13). According to the results of these measurements, the RMSEA value of the model is only 0.05, where the recommended

value should be less than 0.08. Additionally, there are two techniques to obtain efficient result for the developed model over the RMSEA measure.

1. Standardized Regression Weights (FLs): Hair et al. (2010) state that "the factor loadings for the measured variables have to be at least 0.5 or the variable becomes a candidate for deleting". The factor loadings for the measured variables were calculated via CFA (see Table 4.11). The results present two measured variables that have low factor loading values. These are information quality (INFQ6≤ 0.5) and service quality (SERQ5≤ 0.5).

2. The Squared Multiple Correlations (SMC): The validity of the developed model can be improved by deleting any measured variable with a low SMC value. According to Hair et al. (2010), if the measured variable's value is lower than 0.5, the variable become a candidate for deletion. The analysis results identified three measured variables with an SMC value lower than the recommended value. These three measured variables are service quality (SERQ4 and SERQ5) and instructor quality (INSRQ4) (see Table 4.14).

According to Standardized Regression Weights and SMC outcomes, the four measured variables that have been identified will be deleted to improve the developed model's validity in relation to the RMSEA measure. The GFI measure for the developed model was calculated again after the four measured variables had been deleted. The research model gave better results over all of the GFI measures once the four measured variables had been deleted (see Table 4.15).

Table 4.13: The research model fit summary

Goodness-of-fit	X^2	df	GFI	AGFI	RMSEA	CFI	TLI	NFI
The developed model	1827	857	0.834	0.809	0.052	0.852	0.913	0.9120

Table 4.14: Squared Multiple Correlations (SMCs)

Item	Communality value
SERQ4	0.270
SERQ5	0.353
INSRQ4	0.446

Table 4.15: Refined model fit summary comparison

Goodness-of-fit	X^2	df	GFI	AGFI	RMSEA	CFI	TLI	NFI
Before deleting the four measured variables	1827	857	0.834	0.809	0.052	0.852	0.913	0.9120
After deleting the four measured variables	913.6	553	0.913	0.875	0.39	0.963	0.958	0.922

4.3.4 Validity and Reliability of Research Model

Cramer and Howitt (2004) have defined construct validity as "the extent to which a measure assesses the construct that it is intended or supposed to measure". To estimate construct validity, a CFA should be utilized. The construct validity of the measurement model will be evaluated by the following step.

The convergent validity is defined as "the extent to which a measure is related to other measures which have been designed to assess the same construct" (Cramer and Howitt, 2004). Hair (2010) suggests two ways to estimate convergent validity: Standardized Regression Weights or FL; and Average Variance Extracted (AVE). In assessing convergent validity, the value of FL should be 0.6 or higher (Chin 1998). The standard for accepting AVE is 0.5 or higher (Chin, 1998; Hair 2010). Secondly, "discriminant

validity" refers to the extent to which an item is distinct from other items (Hair 2010). According to Hair (2010), the value of AVE must be above 0.5 to ensure convergent validity, and the AVE has to be higher than maximum square variance to ensure discriminant validity. Table 4.17 reports the convergent validity and discriminant validity for each item in the developed model.

Table 4.16: Requirement for the validity of the measurement model

Type of validity	Requirement
Convergent Validity	Average Variance Extracted (AVE) ≥ 0.5 AVE = ∑ K2 / n (K=FL of every item; n=number of items in a model)
Discriminant Validity	Free from redundant items Correlation coefficient between each pair of latent constructs ≤ 0.8

(Golafshani 2003) defines reliability as "extent to which results are consistent over time and an accurate representation of the total population under study… if the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable." When a model is reliable, it is not guaranteed that it is valid. However, reliability would be an indicator of convergent validity (Hair 2006). This study used three kinds of reliability measurements; construct reliability (CR), internal reliability, and AVE. Construct reliability is designed to define the consistency of the objects representing latent variables (Ghazali and Hasnida 2015). According to Hair (2006), CR is the value of the square of total standardized loading divided by the sum of a square of total standardized loading and measurement error. The value of CR should be 0.6 or higher to indicate internal consistency. Internal reliability refers to "the degree to which all the items are measuring the same underlying construct" (Pallant, 2013). Internal reliability is estimated by Cronbach's alpha (CA) coefficient, and it is sensitive to the number of items measured. Average Variance Extracted refers to "the average

percentage of variation explained by the items in a construct" (Hair 2010). The value of AVE should be 0.5 or higher (see Table 4.18).

Table 4.17: Requirements for the reliability of the measurement model

Type of reliability	Requirement
Internal reliability	Cronbach's alpha ≥ 0.7
Construct reliability (CR)	CR ≥ 0.6 CR = (∑K)2/ [(∑K)2 + (∑1-K2)] (K=FL of every item)
Average Variance Extracted (AVE)	≥ 0.5

Table 4.18: Constructs' validity and reliability

Variable	Cronbach's alpha (α)	Construct reliability (CR)	Average variance extracted (AVE)
AU	0.788	0.865	0.684
INFQ	0.859	0.895	0.59
INSRQ	0.759	0.886	0.796
ITTU	0.911	0.937	0.788
PEOU	0.855	0.901	0.693
PU	0.818	0.872	0.578
SA	0.895	0.922	0.704
SERQ	0.867	0.902	0.694
SYQ	0.834	0.887	0.663
TS	0.859	0.898	0.638

4.4 STRUCTURAL EQUATION MODELING (SEM)

Structural equation modelling is a "multivariate technique combining aspects of factor analysis and multiple regressions that enables the researcher to simultaneously examine a series of interrelated dependence relationships among the measured variables and the latent constructs" (Hair 2010). The SEM uses multiple regression analysis (γ) to measure the developed model and research hypotheses. Structural equation modelling was implemented using IBM AMOS version 22, which makes it possible to examine the developed model's fit, explained variance, and the research hypotheses. Figure 4-3 illustrates the developed model, and Figure 4-4 illustrates the research model's representation in AMOS. Furthermore, in Figure 4-4, the large oval shapes show the model's ten variables, the square shapes represent the measured variables, and the small oval shapes represent the error terms for each measurement variable.

Figure 4.3: The Research model

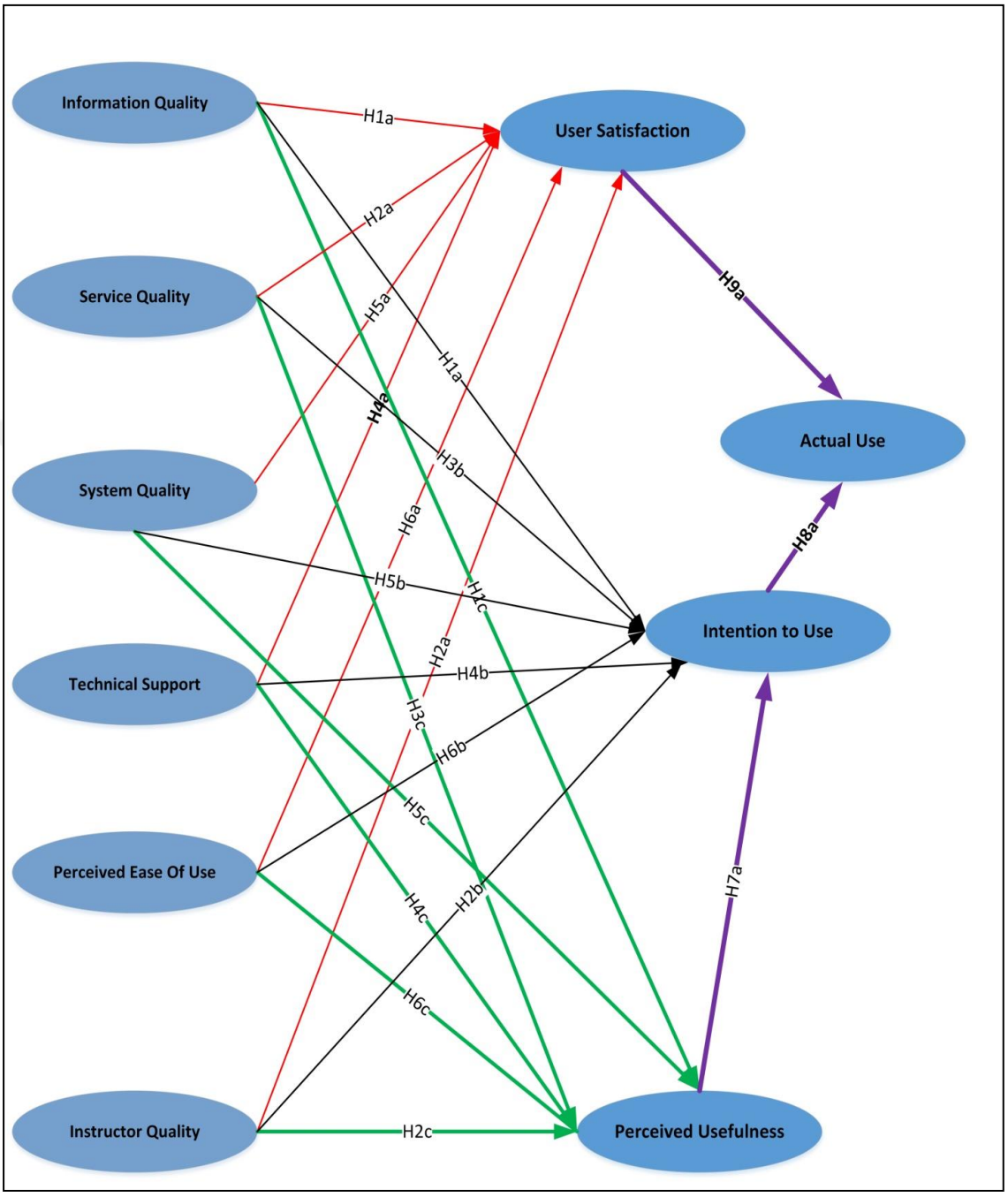
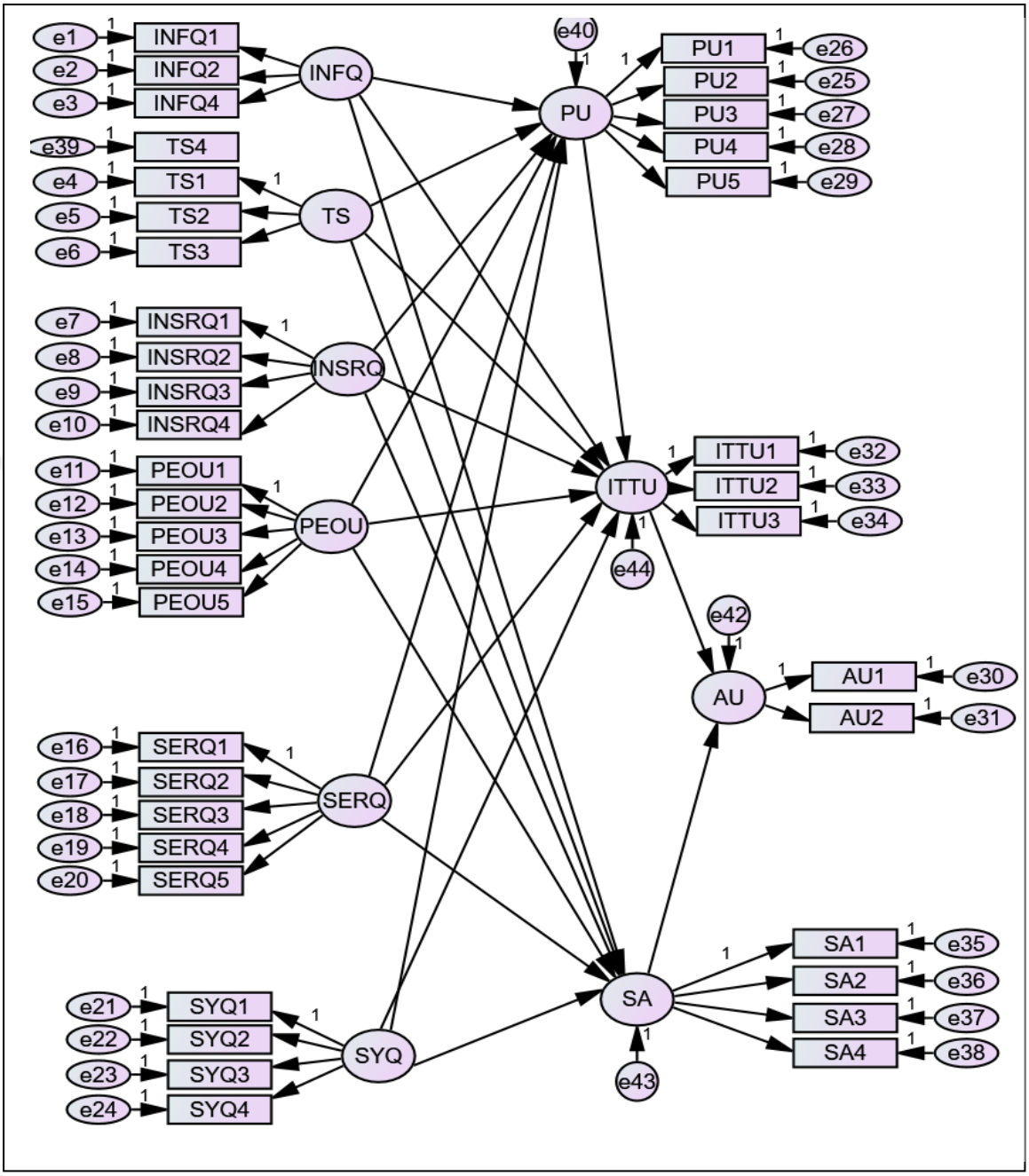


Figure 4.4: The Research model represented in IBM AMOS 22



4.4.1 Research Hypotheses:

Hypothesis (H1a): Information Quality has a significant effect on student satisfaction

Hypothesis (H1b): Information Quality has a significant effect on students' BI to use the LMS

Hypothesis (H1c): Information Quality has a significant effect on PU

Hypothesis (H2a): The Quality of Instruction has a significant effect on student satisfaction

Hypothesis (H2b): Instructor Quality has a significant effect on students' BI to use the LMS

Hypothesis (H2c): The Quality of Instruction has a significant effect on PU

Hypothesis (H3a): Service Quality has a significant effect on student satisfaction

Hypothesis (H3b): Service Quality has a significant effect on students' BI to use the LMS

Hypothesis (H3c): Service Quality has a significant effect on PU

Hypothesis (H4a): Technical Support has a significant effect on student satisfaction

Hypothesis (H4b): Technical System Quality has a positive effect on students' BI to use the LMS

Hypothesis (H4c): Technical Support has a significant effect on PU

Hypothesis (H5a): System Quality has a significant effect on student satisfaction

Hypothesis (H5b): System Quality has a significant effect on students' BI to use the LMS

Hypothesis (H5c): System Quality has a significant effect on PU

Hypothesis (H6a): PEOU has a significant effect on student satisfaction

Hypothesis (H6b): PEOU has a significant effect on students' BI to use the LMS

Hypothesis (H6c): PEOU has a significant effect on PU

Hypothesis (H7a): PEOU has a significant positive effect on students' BI to use the LMS

Hypothesis (H8a): Students' intention to use the LMS has a positive effect on the actual use of the LMS

Hypothesis (H9a): Student satisfaction has a significant effect on the actual use of the LMS

4.4.2 The Fit of the Research Model

The research model's GOF has been measured using seven measures: normed chi-square (X^2/df), GFI, AGFI, CFI, RMSEA, TLI, and Standardized Root Mean Residual (SRMR). All of these measures have been explained in the previous section. The results have confirmed the research model's GOF over the seven measures:

Table 4.19: The Research model's GOF results

Goodness-of-fit	X^2	df	GFI	AGFI	RMSEA	SRMR	CFI	TLI	NFI
Measured Variables	1164	434	0.901	0.873	0.057	0.64	0.939	0.914	0.922

4.4.3 The Research Model's Results

The multiple regression analysis tested the research model in term of the explored variance and the study's hypotheses. The outcome has verified the significance of the research model. The model performed better than the existing models in explaining students' acceptance of LMSs acording to BI, PU and satisfaction. Furthermore, the outcome has confirmed that six identified variables are crucial in predicting students' acceptance of LMSs in universities. These variables are system quality, information quality, service quality, technical support, instruction quality, and ease of use. These six variables were good predictors of learners' perception of the usefulness of the LMS, satisfaction, and BI. Moreover, the six variables explained a high percentage of the variance between the dependent variables. Figure 4-5 presents the six variables with their standardized coefficients (i.e. prediction values) and significance levels. These are clarified using straight and dotted lines. The explained variance value is designed inside user satisfaction, PU, and BI.

Furthermore, the multiple regression analysis examined the study's hypotheses using the p-value and standardised coefficient (β*)*. First, the p-value (i.e. significance level) is defined as "the probability that a statistic would occur by sampling error if the null hypothesis is true" (Vogt and Johnson 2011). According to Hair et al. (2010), the

acceptable p-value for the study hypothesis to be accepted is where p-value ≤ 0.05. A p-value where p-value > 0.05 will result in the hypothesis being rejected. Second, the standardized coefficient (i.e. prediction value) is "[a] statistic that provides a way to compare the relative importance of different variables in a multiple regression analysis" (Vogt and Johnson 2011). The standardized coefficient will indicate the prediction value for the independent variable towards the dependent variable.

According to the statistical analyses, of the 21 proposed hypotheses, 19 were accepted and 2 were rejected. Figure 4.5 shows the 19 accepted hypotheses marked with a straight line and the rejected hypotheses with a dotted line. Furthermore, the values of the lines describe the standardized coefficient for the accepted and rejected hypotheses. Additionally, Table 4.21 gives detailed information about the findigs of the hypothesis tests.

Figures 4.3 and Figure 4.5 show the same research model (research model). Figure 4.3 represents the research model before the statistical analysis, where the relationships between the model's variables show the hypotheses. Figure 4-5 presents the research model after the statistical analysis. The p-value and standardised coefficient (β) for each hypothesis are conducted. Furthermore, Figure 4-4 presents the research model's structural illustration in IBM AMOS. However, IBM AMOS does not show the significance level of a hypothesis in the figure. For more clear results Figure 4-5 was redrawn with MS Visio (2016) to make the outcome visible and readable. The hypotheses' p-values (i.e. significance levels) in Figure 4-5 are shown with a line. The accepted hypotheses are shown with a straight line, while the rejected hypotheses are shown with a dotted line.

The research model's outcomes displayed in Figure 4-5 can be described as follows. First, PU (H7a) has a strong and significant influence on BI (β = 0.475, p-value ≤ 0.01). Second, PEOU has a positive influence on PU (H6c), BI (H6b), and user satisfaction (H6a) with (β = 0.146, p-value ≤ 0.01), (β =0.393, p-value ≤ 0.01), and (β =0.22, p-value ≤ 0.01), respectively. The results show that PEOU was the third strongest determinant of BI, after PU and user satisfaction. TAM constructs were functional and meaningful in predicting students' BI. Third, System quality was hypothesized to have a positive influence on student satisfaction (H3a), students' perception of the usefulness of the LMS (H3c), and BI (H3b). The first and second hypotheses were accepted with

standardized coefficients of ($\beta = 0.144$), ($\beta = 0.209$) and p-values of (p-value < 0.001) and (p-value < 0.001), respectively. The significance of (H3c) is consistent with previous research (e.g. Yanjun et al.,2010; Cheng, 2011). On the other hand, the third hypothesis (H3b) regarding the influence of system quality on BI was rejected, because the p-value was higher than 0.05.

Fourth, information quality was hypothesized to have a positive effect on students' satisfaction (H1a), BI (H2b), and PU (H2c). The first hypothesis (H2a) was accepted with ($\beta = 0.56$, p-value ≤ 0.01): the effect of information quality on PU was stronger than system quality.

The second and third hypotheses (H2b) were accepted with ($\beta = 1{,}19$, p-value ≤ 0.01) and ($\beta = 0.61$, p-value ≤ 0.01) .

Fifth, technical support was hypothesized to positively affect three variables: student satisfaction (H3a), BI (H3b), and PU (H3c). All three hypotheses were accepted. However, technical support's strongest impact was on BI, with a standardized coefficient and a p-value of ($\beta = 0.468$, p-value ≤ 0.01). The standardized coefficient and probability value of its relationship with PU and user satisfaction were ($\beta = 0.27$, p-value ≤ 0.01) and ($\beta = 0.25$, p-value ≤ 0.05), respectively.

Sixth, instruction quality was proposed to have a positive impact on PU (H2c), user satisfaction (H2a), and BI (H2b). Based on the results, instruction quality (H2a) was the second-strongest determinant of user satisfaction (after service quality), with ($\beta = 0.260$, p-value ≤ 0.01). However, instruction quality did not affect students' perception of the system's usefulness, as is indicated by the insignificant relationship between instruction quality and PU (p-value = 0.344 > 0.05). However, the relationship between instruction quality and BI is significant, with (p-value ≤ 0.05 , $\beta = 0.164$).

Figure 4.5: The Research model result

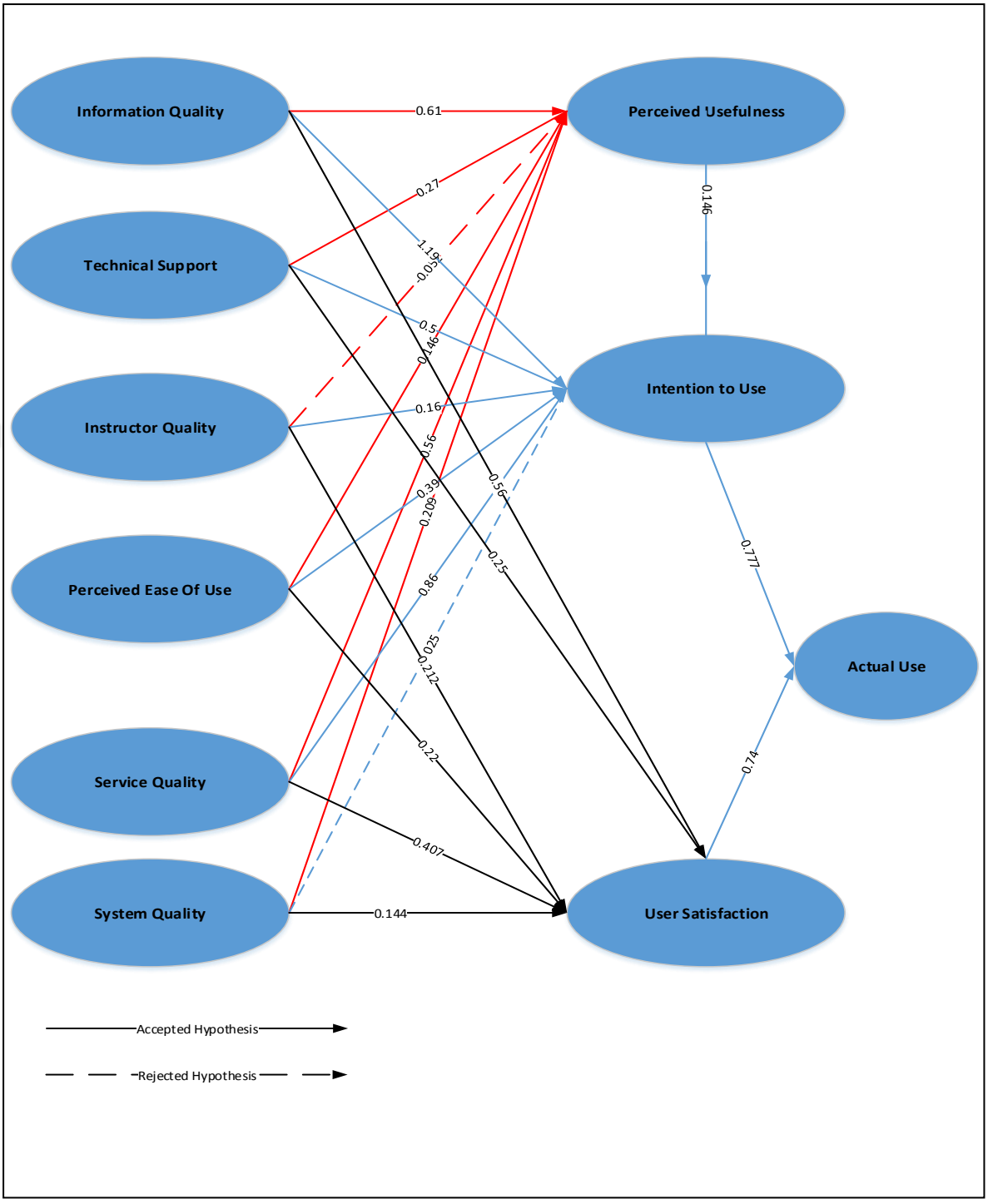


Table 4.20: Hypothesis testing results

Hypothesis	Paths			Standardized coefficient (β)	Probability value (p-value ≤ 0.05)	Hypothesis result based on the probability value
H1a	INFQ	----->	SA	0.56	***	Accepted
H1c	INFQ	----->	PU	0.61	***	Accepted
H1b	INFQ	----->	ITU	1.19	***	Accepted
H2a	INSQ	----->	SA	0.212	***	Accepted
H2c	INSQ	----->	PU	0.052	0.334	Rejected
H2b	INSQ	----->	ITU	0.164	0.017	Accepted
H3a	SERQ	----->	SA	0.407	***	Accepted
H3c	SERQ	----->	PU	0.564	***	Accepted
H3b	SERQ	----->	ITU	0.864	***	Accepted
H4a	TS	----->	SA	0.25	***	Accepted
H4c	TS	----->	PU	0.27	***	Accepted
H4b	TS	----->	ITU	0.468	***	Accepted
H5a	SYQ	----->	SA	0.144	0.005	Accepted
H5c	SYQ	----->	PU	0.209	***	Accepted
H5b	SYQ	----->	ITU	0.025	0.19	Rejected
H6a	PEOU	----->	SA	0.22	***	Accepted
H6c	PEOU	----->	PU	0.146	0.005	Accepted
H6b	PEOU	----->	ITU	0.393	***	Accepted
H7a	PU	----->	ITU	0.475	***	Accepted
H8a	ITU	----->	AU	0.777	***	Accepted
H9a	SA	----->	AU	0.74	***	Accepted

4.4.4 The Moderating Effect of Gender

The current study's model will be analzed from two proposed model, the measurement and structural. The first section of the research model is the measurement model, that investigated differences between genders for the terms of the measured variables. However, the research model in the structural model will be tested for differences between genders in term of the hypotheses. Following Byrne (2010), the data will be classified by multi-group analysis in AMOS based on the grouping value (e.g. gender). Moreover, the analysis of the data of each group will be administrated simultaneously.

Furthermore, the chi-square method has been used to test for differences between genders in the model. The different chi-square values of each gender were compared on the measurement and structural model levels.A CFA has been used to calculate the chi-square in the measurement model, and SEM has been used to find the chi-square in the structural model. There are two ways to compute the difference in chi-square in the research model: first, the chi-square can be calculated without weight constraints; and second, it can be calculated with weight constraints (Byrne, 2010). If the chi-square value is significantly different, then the model is not equivalent across genders.

Firstly, the chi-square has been calculated in the measurement model before and after implementing the weight constraints on the measured variables. The chi-square results of the unconstrained and fully constrained models revealed no significant different between males' and females' opinions regarding the measured variables (see Table 4.21).

Table 4.21: The difference in chi-square for the measurement model (CFA Model)

Measurement Model Test	X^2	Degrees of freedom (df)
Unconstrained model	1913.531	1264
Fully constrained model	1880.452	1236
Difference in chi-square	33.079	28

Lastly, testing the structural model in this research required calculating the chi-square before and after implementing the measurement constraints on the study's hypotheses. According to the chi-square result, there is a significant difference between the participats'responses to the research hypotheses of females and males (see Table 4.22).
The result of analyzing the differences between genders shows that there are six hypotheses that differ significantly between genders. Firstly, amongst all the variables that were hypothesized to influence student satisfaction in using the LMS, PEOU (H6a) is the only variable regarding which females and males had different opinions. Hypothesis H6a (PEOU) was rejected for males and accepted for females. Furthermore, the hypotheses regarding the influence of technical support quality (H4c), system quality (H5c), and instructor quality (H2c) on PU were significantly different between genders. Lastly, there were differences between each gender's BI to use the LMS in relation to two variables, namely information quality (H1b) and service quality (H3b). Moreover, the structural model analysis revealed that the illustrated variance towards the dependent variables (i.e. user satisfaction, BI and PU) are different between females and males (see Table 4.23).

Table 4.22: The differences in chi-square ΔX2 for the structural model

Measurement Model Test	X^2	Degrees of freedom (df)
Unconstrained model	1798.388	1157
Fully constrained model	1722.465	1110
Difference in chi-square	33.079	28

Table 4.23: The Significantly different hypotheses between genders

Hypotheses	Path	Male		Female	
		Standardized coefficient (β)	Probabiliy value (p-value≤ 0.05)	Standardized coefficient (β)	Probability value (p-value ≤ 0.05)
H4c	TS----->PU	-0.026	0.693	-0.22	0.01
H2c	INSRQ---->PU	0.038	0.571	0.291	0.002
H5c	SYQ----->PU	0.161	0.009	0.053	0.459
H1b	INFQ----->ITU	-0.068	0.275	-0.225	0.017
H3b	SERQ---->ITU	0.234	0.032	0.071	0.386
H6a	PEOU---→SA	-0.039	0.569	-0.221	0.014

Table 4.24: The Explained variance for the dependent variables between genders

Gender	User Satisfaction	Behavioral Intention	Perceived Usefulness
Female	49%	46%	52%
Male	60%	56%	47%

5. DISCUSSION AND CONCLUSION

5.1 DISCUSSION

The goal of this research was to identify the factors that affect student attitudes toward using an LMS (Moodle) at an Iraqi university; and to determine the underlying causal relationships between all factors by integrating two familiar models, the TAM model and the DL&ML IS success model. The research model consists of ten variables classified into three groups. The first group focuses on system design (information quality, system quality, instructor quality, technical system support, service quality, PU, and PEOU). The second group focuses on system usage (user satisfaction and BI to use the LMS). The third group is system findings (i.e. actual use of the LMS). The identified variables have been shown in determining students' acceptance of and continual usage intention in relation to LMSs in higher education.

First, system quality had a significant positive influence on the PU of LMSs. This means that undergraduate students place emphasis on the quality aspects (i.e., navigation speed, functions, communication capability, and collaborative learning) of the LMS (Moodle). Also, the results showed that system quality had a significant positive influence on student satisfaction. In addition, system quality had an insignificant effect on students' BI to use the LMS.

Second, information quality had a positive influence on PU and students' satisfaction, since the LMS provided accurate, up-to-date and relevant information. Information quality has been found to be important for learners' perception of the system's usefulness. Petter (2008) indicated that "there is an insufficient stuy addressed the inconsistency between information quality and behavioural intention". This is because many studies have shown that information quality has an insignificant effect on behavioral intention (e.g. ALMARASHDEH 2010). On the other hand, several studies (e.g. Mohammadi 2014; Mohammadi 2015; Joel S. Mtebe 2014 and Chang 2012) have shown that information quality has a positive influence on users' BI. In this study, a significant relationship between information quality and BI was found.

Third, service quality has been shown to be a crucial determiner of Iraqi learners' acceptance of the LMS. Service quality positively influenced all constructs of the research model: students' satisfaction, PU, and BI. Park et al. (2009) indicated that the significance of service quality (i.e. internet service) in universities in developing countries due to the difficulties that students face in accessing information. As a result, service quality has a direct influence on all constructs of the research model. Furthermore, service quality strongly effects the students' satisfaction because of design aspects that can enable information access (Park, 2009; Park et al., 2009).

Fourth, instructor quality was found to significantly influence students' satisfaction and BI to use an LMS. While the relationship between instructor quality and satisfaction or BI has not been tested empirically in the IS literature, this study has shown that instructor quality is important in shaping students' satisfaction and BI to use an LMS. On the other hand, instructor quality has an insignificant effect on PU.

Fifth, technical system support had a positive influence on PU and BI. The impact of technical support on BI was significant (p-value ≤ 0.001); however, the standardized coefficient was very high ($\beta = 0.468$). This indicates that having technical support is sufficient for an LMS to be accepted. Moreover, the effect of technical system support on PU was significant, with p-value ≤ 0.001 and standardized coefficient $\beta = 0.27$. This indicates that learners with access to good technical support will perceive the system as a useful system, because the students believe that using the LMS will assist them to improve their current skills and to learn new skills. Furthermore, technical support had a significant effect on students' satisfaction.

Sixth, in line with previous research (Chau and Hu 2001; Davis, 2003), PEOU was found to have a significant influence on BI to use the LMS. An explanation might be that when students perceive the LMS as easy to use and nearly free of effort, they may have a positive attitude towards the usefulness of the LMS. These findings support a current study that proposes that users' positive feeling towards the ease of use of technology is related to continued use of the technology (Yildirim 2000). The results of this study also revealed that PEOU had a significant effect on PU. An explanation for this might be that learners are ready to adopt the LMS, and this may suggest that learners tend to concentrate on the usefulness of the technology itself. Moreover, PEOU had a positive effect on student satisfaction.

Seventh, PU significantly affected learners' BI to use the LMS. This is because learners had a tendency to use the LMS to achieve their learning goals, where these goals can be achieved by using teaching schedules, discussion forums or online chatting; or by downloading lecture materials (Raaij and Schepers, 2008). Achieving these goals will permit learners to perceive the system as useful, thus driving them to accept the system and to continue to use it. Furthermore, the results revealed that system quality, information quality, service quality, and technical system support have a strong effect on PU. Hence, learners' perception of usefulness can be further enhanced by concentrating on these five aspects of system design. In addition, prior research has indicated the importance of PU to increase LMS acceptance (Mohammadi 2014; Mohammadi 2015; Joel S. Mtebe 2014; Chang 2012 and Liu et al., 2010). The Iraqi learners' PEOU was important in determining their BI and their perceptions of the system's usefulness.

Finally, PEOU had a positive effect on student satisfaction.

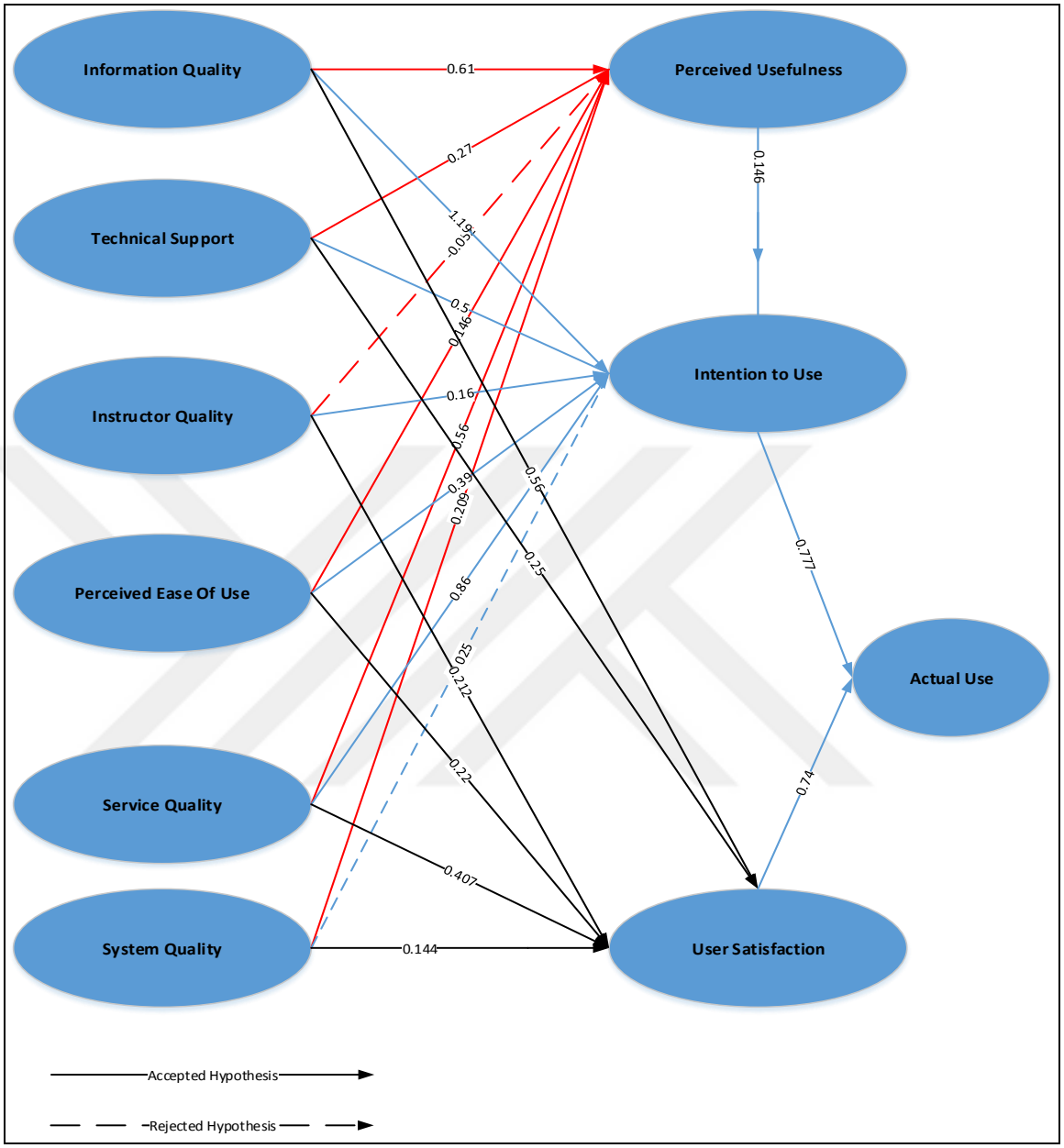
These results verify the underlying associations between the TAM constructs: PEOU, PU, and BI. Finally, in this study, student satisfaction and BI to use the LMS were found to have a positive effect on actual use of the LMS in Iraqi higher education.

5.1.1 The Research model's performance

A number of studies have investigated learners' acceptance of and intention to continue to use LMSs. Several of these studies found the combination of variables of the TAM and IS success model together in one model. This study identified four variables of the IS success model (system quality, information quality, service quality, and user satisfaction), four variables of TAM (PEOU, PU, BI to use, and actual system use) and external variables (instructor quality and technical system support) to investigate students' acceptance of and intention to continue to use LMSs in Iraq. The associations between the identified variables and the TAM constructs were conducted by the study hypotheses. The research model's representation can be evaluated by explanation of variance in the dependent variables: user satisfaction, BI, and PU. The explained variance (root square, R^2) can be defined as "variance in the independent variable that can be accounted for by (statically associated with) variance in the independent variable(s)" (Vogt and Johnson, 2011).

The model used in this study is to demonstrate the large variance in the dependent variables; i.e. PU, user satisfaction, and BI to use the LMS. The total explained variances – the R in PU, user satisfaction, and BI – are sixty-five percent, fifty-six percent, and sixty-nine percent, respectively. The research model's explained R outcomes are considered as one of the study's main contributions, as they have exceeded existing models that investigate learners' acceptance of and intention to continue to use LMSs (see Figure 5-1). Furthermore, the dependent variables in this study have less variation of explained variance; unlike the existing models, where a high R^2 in one dependent variable is faced with a significantly lower R^2 in another dependent variable.

Figure 5.1: The Research model's results



*The numbers represent the standardized coefficient (beta)

5.1.2 The Moderating Effect of Gender

The results of the data analysis have revealed that of the 21 research hypotheses, 15 hypotheses did not differ between genders, and 6 hypotheses were significantly different between females and males (see Table 5.1). These hypotheses are H4c, H2c, H5c, H1b, H3b, and H6a. Most of the differences are related to the variables of technical support, instructor quality, information quality, system quality, service quality, and PEOU. For instance, females perceived information quality as the strongest determinant of BI, while the same relationship was insignificant for males. On the other hand, service quality's influence on BI was only significant for males. Sánchez-Franco (2006) has indicated that there is inconsistency between male and female perceptions of external variables. This inconsistency can cause a user gender or culture variations (Saadé et al., 2008; Saadé et al., 2009; Sánchez-Franco et al., 2009; Terzis and Economides 2011; Padilla-Meléndez et al., 2013).

The moderating influence of gender has attracted significant interest in the technology acceptance field, but most prior studies investigating gender and technology acceptance have obtained contradictory findings (Padilla-Meléndez et al., 2013). Sun and Zhang (2006) have stated that it is noteworthy that the major function of moderating factors is explaining the inconsistencies by identifying the situational differences. The conclusions of the present study have revealed that gender can moderate some features of the research model. Furthermore, some studies have investigated Iraqi learners' acceptance of and intention to continue to use LMSs in terms of gender differences. Hence, more investigation is required to confirm gender differences between Iraq learners.

Table 5.1: List of the significant and insignificant paths between genders

Hypotheses	Path	Male		Female	
		Standardized coefficient (β)	Probability value (p-value ≤ 0.05)	Standardized coefficient (β)	Probability value (p-value ≤ 0.05)
H4c	TS-------->PU	-0.026	0.693	-0.22	0.01
H2c	INSRQ---->PU	0.038	0.571	0.291	0.002
H5c	SYQ----->PU	0.161	0.009	0.053	0.459
H1b	INFQ---->ITU	-0.068	0.275	-0.225	0.017
H3b	SERQ---->ITU	0.234	0.032	0.071	0.386
H6a	PEOU---→SA	-0.039	0.569	-0.221	0.014
H1c	INFQ→PU	0.347	***	0.430	***
H6c	PEOU--→ PU	-0.13	0.829	-0.086	0.315
H3c	SERQ---→PU	0.483	***	0.220	***
H6b	PEOU-→ITTU	0.234	***	0.484	0.002
H4b	TS→ITTU	-0.05	0.888	0.053	0.515
H2b	INSRQ→ITTU	0.010	0.229	0.061	0.562
H7b	PU---→ ITTU	0.920	***	0.225	***
H5a	SYQ-→SA	0.097	0.174	-0.023	0.753
H2a	INSRQ→SA	0.374	*	0.271	*
H3a	SERQ→SA	0.199	**	0.411	***
H4a	TS→SA	0.068	0.194	0.050	0.309
H1a	INFQ→SA	0.286	***	0.221	***
H5b	SYQ→ITTU	0.017	0.79	0.079	0.31
H9a	SA→AU	0.098	0.068	0.63	0.341
H8a	ITTU→AU	0.799	***	0.871	***

5.2 CONCLUSION

The LMS (Moodle) investigated in this study is used as an e-learning management tool in learners' educational activities. This study examined perceptions of the LMS Moodle in learners' educational activities in terms of its impact on students' satisfaction and BI to use LMSs in educational activities.

The research model uses the factors of two well-known models (the TAM and the IS success model), and combines the independent and dependent variables of these models to explore the factors affecting student perceptions of LMSs in educational activities.

Based on the research results, several outcomes can be drawn.

First, students have positive perceptions of the factors in this model (information quality, service quality, system quality, instructor quality, technical system support, PEOU, and PU).

Second, information quality has a more significant impact on succeeded system information. Thus, higher information quality in term of comprehensibility, availability, security, and the accuracy of information leads to increase student satisfaction and their intention to use LMSs such as Moodle.

Third, other aspects of system quality (e.g. system security, system privacy, and system availability) have influenced the participants' responses because the system quality of each platform has a significant influence on user satisfaction and accessing the IS.

Fourth, our results also indicated that service quality has a positive effect on LMS success; furthermore, it can improve usage behavior.

Finally, based on the research results, through the enhancing LMSs (e.g. Moodle), the three positive results on improving PEOU, instructor quality, and technical system support will foster student involvement, BI to use the LMS, and student satisfaction.

5.3 RECOMMENDATIONS

To get a better overview of the students' opinions and use of LMSs, a larger survey should be performed. Students from different faculties, departments, and universities could be used as participants, and could complete a more comprehensive questionnaire. This would more accurately measure students' satisfaction, BI to use LMSs, and opinions about LMSs. A general user acceptance questionnaire could be used, or a more specific questionnaire could be created. Furthemore, additional interviews with students from other departments and faculties could also be conducted ahead of the survey, contributing to an even better basis for the questionnaire. An interesting project would also be to study the LMS Moodle, and to learn how it can be used to customize the already-existing features of the LMS, or to develop new features which will improve the LMS at UKH.

Last but not least, a TAM and DL&ML IS success model can be utilized to assess a prototype of the new feature(s) before the prototype is developed, and also to assess the developed feature(s). Alternatively, a usability test could be performed with a selection of users.

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APPENDICES

APPENDICES A: RESEARCH QUESTİONNAİRE

Dear Student

Learning management system (LMS) is increasingly popular in the world and becoming a typical instruction on pair with traditional classroom instruction. The questionnaire in this research is designed to investigate student perception, satisfaction with, and behavioural intention to use Learning management system (Moodle) in your university . The collected information and knowledge can be used to further enhance the quality of online learning programs.

PART 1: Demographic Information

1. **University .....**
2. **Nationality .....**
3. **Gender** ☐ **Male** ☐ **Female**
4. **Ages** ☐ **18- 20 years** ☐ **21 - 30 years** ☐ **Over 30**
5. **Computer Usage** ☐ **Less than 1 year** ☐ **1 - 3 years** ☐ **Over 3 years**
6. **LMS (MOODEL) Usage** ☐ **Less than 1 year** ☐ **1 - 3 years** ☐ **Over 3 years**
7. **How many courses have you accessed in LMS (MOODLE)?**

   ☐ **One course** ☐ **More than one course**

8. **Average time I spend on using a computer/Internet per day.**

   ☐ **Less than 1 hour** ☐ **1-3 hour** ☐ **Over 3 hour**

9. **Average time I spend on using a computer/Internet for educational purposes per day.**

   ☐ **Less than one hour** ☐ **1-3 hour** ☐ **Over 3 hour**

10. Average time I spend on using MOODLE per day is.

☐ **Less than 1 hour** ☐ **1-3 hour** ☐ **More than 3 hour**

PART 2

Please indicate how much you agree or disagree with each of the following statements listed below.

(Likert's scale 1 , strongly disagree; 5, strongly agree)

Information Quality

10- The course content in the LMS is accurate

11- The course content in the LMS is up to-date

12- The courses in the LMS have sufficient content required for me to complete learning process.

13- The content in the LMS is presented in ways appropriate to the learners' knowledge, skills and abilities.

14- I find it easy to understand and follow the content in lecture notes.

15- Lecture notes are supported by multimedia tools (Flash animation, simulations, video, etc...).

System Quality

16- LMS (MOODLE) system provides collaborative learning.

17- LMS (MOODLE) system provides required facilities such as chat and forum.

18- LMS (MOODLE) system provides opportunity of communicating with other learners.

19- LMS (MOODLE) system provides possibility of learning evaluation.

20- LMS (MOODLE) system is appropriate with my learning style.

Service Quality

21- **The service that was supported by the university is good enough.**
22- **I can contact with the teacher via e-mail, phone or social network.**
23- **I do not encounter any problems during communicating with university administration and help desk.**
24- **I do not experience any problems during registrations.**
25- **Overall, the service supported by university is good enough.**

Technical System Quality

26- **LMS(MOODLE) system optimizes response time**
27- **LMS (MOODLE) system is user friendly.**
28- **LMS (MOODLE) system is reliable.**
29- **LMS (MOODLE) system is secure.**
30- **LMS (MOODLE) system has flexible features.**
31- **LMS (MOODLE) system has attractive features.**

Perceived Ease of Use

32- **The process of using LMS is clear.**
33- **The process of employing LMS is understandable.**
34- **It is easy to become skilful at using the LMS.**
35- **It is easy to get materials from LMS.**
36- **Overall, I believe that LMS is easy to use.**

Instructor Quality

37- **Instructor's attitudes are good to students.**
38- **Teacher's attitudes are friendly to learners.**
39- **The teacher is knowledgeable enough about content.**
40- **Instructor updates lecture notes and fixes all the errors and mistakes in the documents**

Perceived Usefulness

41- **Using LMS improves my academic achievement.**
42- **LMS makes it easier for me to learn at university.**
43- **LMS system makes my learning more effective.**
44- **LMS has a positive effect on my learning.**
45- **Overall, LMS is beneficial for my learning.**

User Satisfaction

46- **LMS (MOODLE) system is enjoyable.**
47- **I am pleased enough with LMS (MOODLE) system.**
48- **LMS (MOODLE) system satisfies my educational needs.**
49- **I am very satisfied with the course content I access from LMS.**
50- **I am satisfied with performance of the LMS system**
51- **Overall, my interaction with LMS is very satisfying**

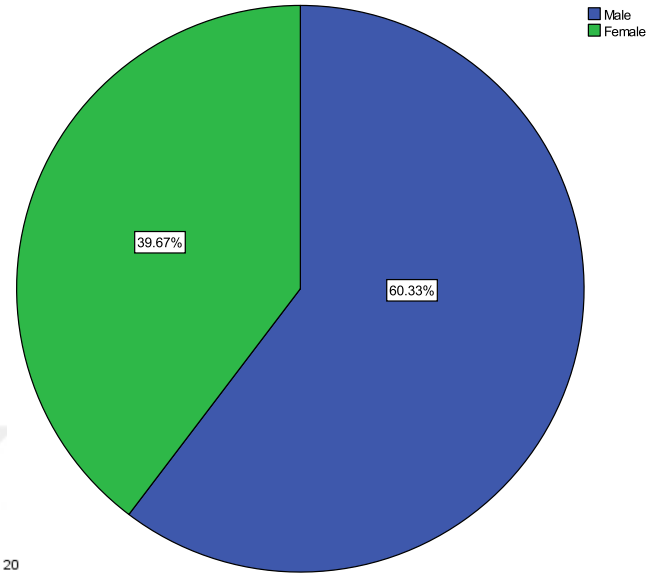
Behavioural Intention to use LMS

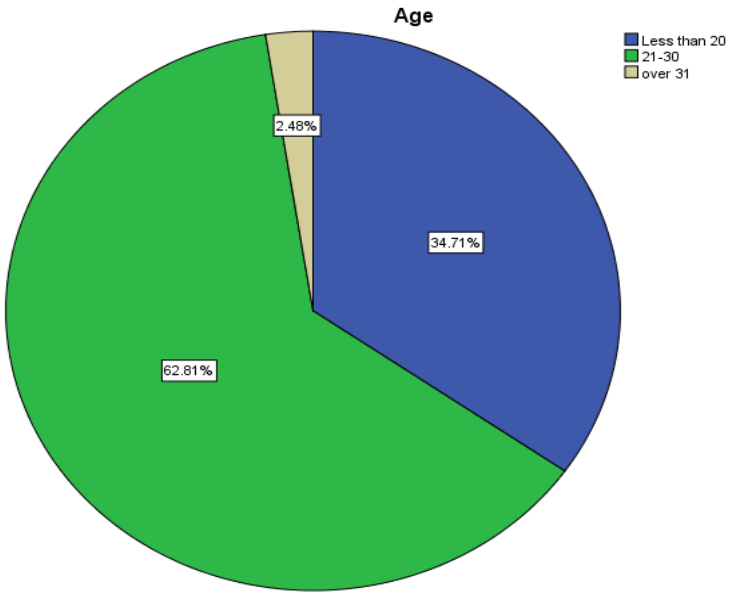
52- **I intend to use the system as a learning tool.**
53- **I intend to use the system for knowledge management.**
54- **I intend to use the system for knowledge gathering.**
55- **I intend to use the system for knowledge sharing.**

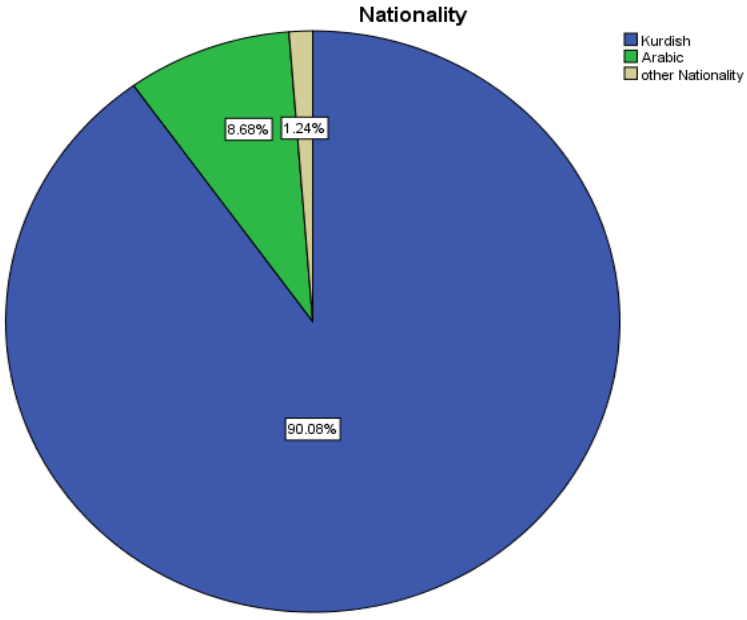
Actual Use

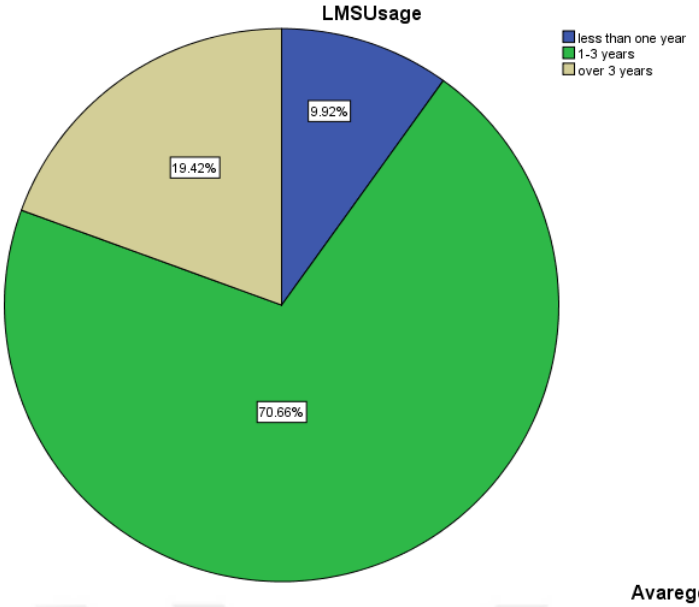
56- **I use LMS (MOODLE) system on daily basis.**
57- **I use LMS (MOODLE) system frequently.**
58- **I visit LMS (MOODLE) system often.**

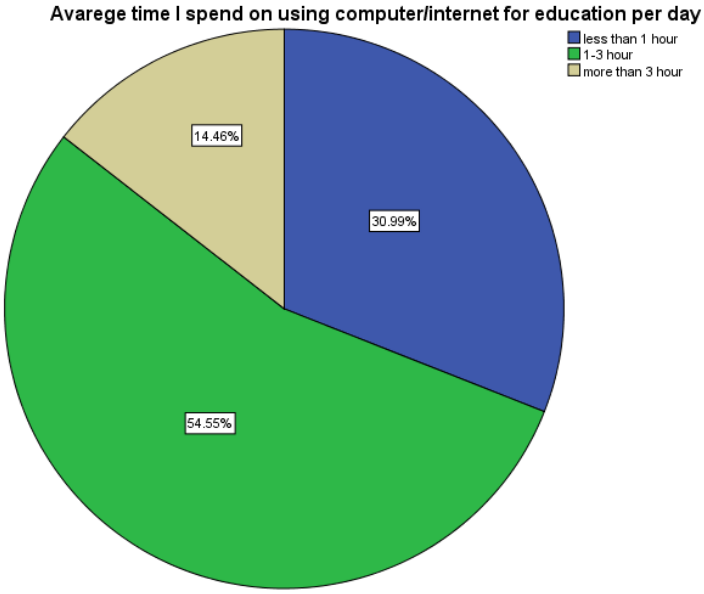
APPENDICES B: DESCRİPTİVE ANALYSİS FİGURES

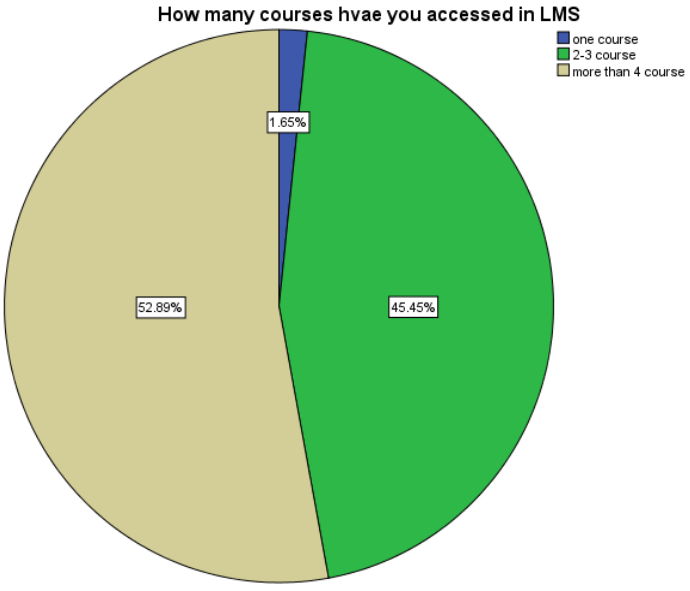


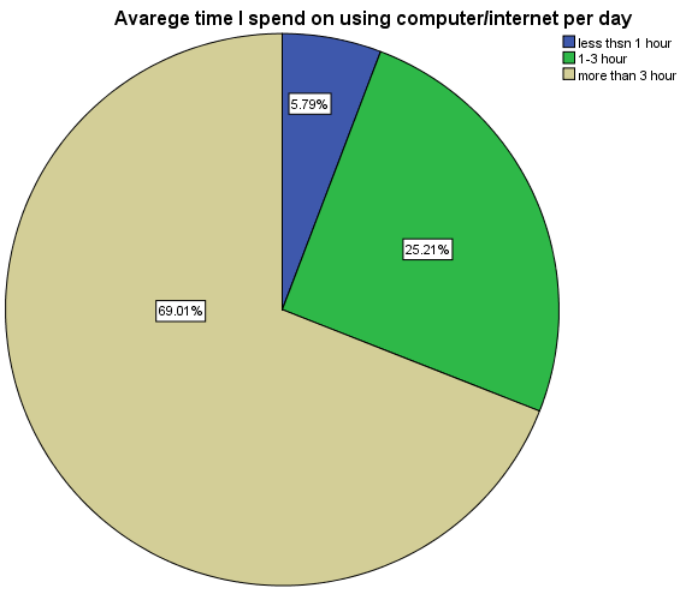


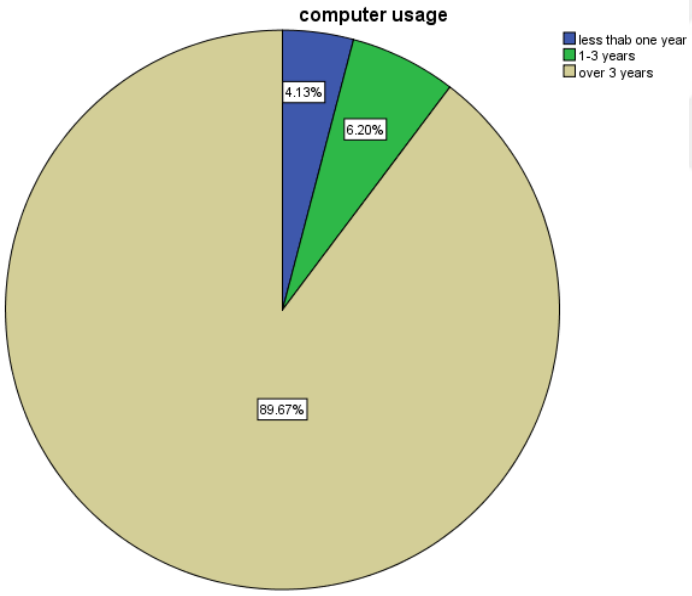


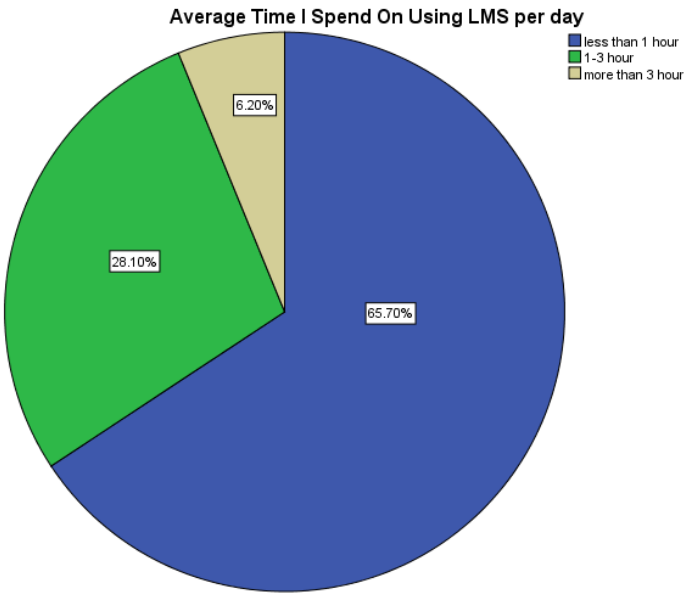

LMSUsage
less than one year
1-3 years
over 3 years
9.92%
19.42%
70.66%


Avarege time I spend on using computer/internet for education per day
less than 1 hour
1-3 hour
more than 3 hour
14.46%
30.99%
54.55%


How many courses hvae you accessed in LMS
one course
2-3 course
more than 4 course
1.65%
52.89%
45.45%


Avarege time I spend on using computer/internet per day
less thsn 1 hour
1-3 hour
more than 3 hour
5.79%
25.21%
69.01%


computer usage
less thab one year
1-3 years
over 3 years
4.13%
6.20%
89.67%


Average Time I Spend On Using LMS per day
less than 1 hour
1-3 hour
more than 3 hour
6.20%
28.10%
65.70%

APPENDICES C: OUTLİERS

Univariate outliers

Variable	Minimum	Maximum
AU1	-2.38556	1.54838
AU2	-2.16122	1.64946
AU3	-2.27006	1.47341
INFQ1	-2.13606	1.54313
INFQ2	-1.92624	1.57207
INFQ3	-2.31793	1.61159
INFQ4	-2.33215	1.58716
INFQ5	-2.22587	1.50188
INFQ6	-2.36874	1.49794
ITU1	-2.38416	1.63651
ITU2	-2.19065	1.50369
ITU3	-2.22002	1.51084
ITU4	-1.86418	1.51509
PU1	-2.05556	1.56882
PU2	-1.88507	1.63082
PU3	-2.01446	1.6304
PU4	-2.28146	1.30369
PU5	-2.57782	1.40833
SA1	-3.23808	1.71367
SA2	-2.11423	1.6571
SA3	-2.08925	1.70274
SA4	-2.04785	1.68767
SA5	-2.36409	1.55447
SA6	-3.06397	1.3496

SERQ1	-2.38717	1.35196
SERQ2	-2.67577	1.67011
SERQ3	-2.36441	1.62296
SERQ4	-2.44422	1.7434
SERQ5	-2.0659	1.83994
SYQ1	-2.3762	1.60332
SYQ2	-2.3329	1.37522
SYQ3	-2.29239	1.43082
SYQ4	-2.34578	1.50943
SYQ5	-2.60014	1.43341
TS1	-2.51423	1.05785
TS2	-2.80976	1.09807
TS3	-2.68021	1.14264
TS4	-2.6024	1.1463
TS5	-2.58839	1.20792
TS6	-2.13699	1.46267
PEOU1	-3.01858	1.51163
PEOU2	-3.08494	1.63263
PEOU3	-2.8105	1.51472
PEOU4	-2.88483	1.60474
PEOU5	-3.23559	1.67358
INSRQ2	-3.05349	1.59396
INSRQ3	-3.60858	1.40305

APPENDICES D: INTERNATIONAL STUDIES BASED ON THE TAM AND DL&ML IN E-LEARNING

1. TAM

Researcher	Theories used	Independent variable	Dependent variable	Key findings
Al-Harbi (2011)	TAM with external variables	PEOU; perceived institutional influence; social influence; individual characteristics; institutional influence; and system characteristics.	BI	PEOU; perceived institutional influence; social influence; individual characteristics; institutional influence; and system characteristics significantly and positively affect students' BI to use LMSs
Park (2009)	TAM with external variables	PEOU; PU; e-learning self-efficacy; subjective norm; and system accessibility.	BI and Attitude	Both e-learning self-efficacy and subjective norm play an important role in affecting attitudes towards e-learning and BI to use e-learning. System accessibility has a direct effect on attitudes towards e-

				learning.
Alharbi & Drew (2014)	TAM with external variables	Job relevance, LMS usage experience; and lack of LMS availability.	PEOU; PU, BI and attitude towards usage	Both experienced and inexperienced users confirm the original TAM findings. Inexperienced users indicated a higher degree of positivity towards LMS adoption.
Farahat (2012)	Update TAM in order to include and examine possible social influence	Social influence of students; PEOU; perception of the usefulness of online learning.	Attitude towards online learning and BI to learn online	Social influence of students, PEOU, and the perception of the usefulness of online learning have a significant effect on BI to learn online and attitudes towards online learning.
COŞKUNÇAY&ÖZKAN (2013)	TAM with external variables	Compatibility; application self-efficacy; technological complexity;	PEOU, PU, BI	Application self-efficacy, technological complexity and subjective norm have a positive effect on PEOU and PU. On the other hand, social factors have an

		Subjective norm.		indirect effect on BI of teachers in Turkish universities to use LMSs.
Babić (2012)	TAM with external variables	Computer literacy; self-efficacy; institutional factors; situational factors; acquiring knowledge and skills.	Intention to use and actual use	Computer literacy; self-efficacy; institutional factors; situational factors; and acquiring knowledge and skills significantly influenced BI and actual use of E-learning by teachers in university.
Asiri et al. (2012)	TAM with external variables	Attitudes towards using LMSs, beliefs towards e-learning; competency; Barriers; and demographic variables.	Utilization level of Jusur LMS	Four main constructs – attitudes towards using LMSs; attitude towards e-learning; competency; barriers; and demographic variables – have significantly influenced students' perceptions of using Jusur LMS in Malaysian universities.
Šumak, et.al., 2011	TAM with external variables	• PU; • PEOU; • BI; • Attitude toward	Actual use	The results of the analysis show that Moodle use depends on two main factors: BI and attitudes

		using		toward using Moodle.
Daneshgar et.al., 2010	TAM with external variables	• Computing attitude; • Internet self-efficacy; • Course flexibility; • Course quality; • Technology quality; • Diversity in assessment; • PU	Perceived e-learner satisfaction	The key finding is that internet self-efficacy and internet quality have a less impact on learners' satisfaction. Satisfaction is more dependent on usefulness and attitude, flexibility, and the quality of the system.

2. DL&ML models

Researcher	Theories used	Independent variable	Dependent variable	Key findings
Chen (2012)	DL&ML model	Service quality; information quality; instructor quality; and system quality.	BI	According to the results, each factor (information, service, system, and instructor quality) has a positive effect on employee perceptions and satisfaction.
Jeong and Kim (2012)	DL&ML model	System quality; information quality; and instructional quality.	Student satisfaction	The independent variables (system, information, and instructional quality) have a positive effect on student's satisfaction in an educational organization.
Fang, Chiu et al. (2011)	DL&ML model	Communication quality; quality of information; and quality of service.	User satisfaction; loyalty intention; and E-learning usage.	In this study, it was found that the independent factors (communication quality, quality of information, and quality of service) have a positive effect on students', instructors', and staff members' satisfaction and BI to use e-learning

				systems.
Raspopovic, Miroslava, et al. (2014)	DL&ML model	Information quality; system quality; and Service quality.	E-learning use; user satisfaction and Net benefit.	Evaluating the net benefit factor according to academic performance and achievements. The results showed that information quality, system quality, and service quality have a positive effect on e-learning use and learner satisfaction.
Saba (2013)	DL&ML model	System quality; information quality; and computer self-efficacy.	System use; user satisfaction; and self-managed learning behaviors.	System quality, information, and computer self-efficacy have a significant influence on learner satisfaction and self-managed learning behavior.
(Mtebe and Raisamo 2014)	DL&ML model	Course quality; System quality; and Service quality.	User satisfaction; LMS use.	In developing countries (e.g. Sub-Saharan countries), system quality, course quality, and service quality positively affect LMS usage. Course quality was found to have a positive effect on learners' satisfaction.