# Investigating students' acceptance of E-learning system in Higher Educational Environments in the UAE: Applying the Extended Technology Acceptance Model (TAM)

# دراسة حول قبول الطلبة لنظام التعلم الإلكتروني ضمن بيئات التعليم العالي في الامارات العربية المتحدة: تطبيق النموذج الموسع لتقبل التكنولوجيا


**by**

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## Abstract

Recently, with the proliferation of internet technology, e-learning has become one of the important educational technologies in higher educational institutions. Nevertheless, the success of e-learning systems highly depends on the students' acceptance of such systems. The purpose of this study is threefold. First, to analyze the most widely used external factors of the Technology Acceptance Model (TAM) concerning the e-learning adoption and acceptance studies. In that, a quantitative research approach comprising of 120 significant published studies from the last twelve years was conducted in order to carry out a systematic review. As a result, the most extensively used external factors of TAM were identified, namely: computer self-efficacy, subjective/social norm, perceived enjoyment, system quality, information quality, content quality, accessibility, and computer playfulness. Second, to develop a new model by extending the TAM with the most widely used factors. Third, to validate the new model using the partial least squares-structural equation modelling (PLS-SEM) approach, which fits well with the purpose of our study. Data were collected using a questionnaire survey from five different universities that have already implemented the e-learning system in the United Arab of Emirates (UAE). The total number of participants in the study is 435 students. Results indicated that system quality, computer self-efficacy, and computer playfulness have a significant impact on students' perceived ease of use of e-learning systems. In addition, information quality, perceived enjoyment, and accessibility have a positive influence on students' perceived ease of use and perceived usefulness of e-learning systems. Furthermore, perceived usefulness and perceived ease of use have led to an increase in the students'

intention to use e-learning systems. Implications, limitations, and future research are also discussed.

## ملخص

**في الآونة الأخيرة ، مع انتشار تكنولوجيا الإنترنت ، أصبح التعليم الإلكتروني أحد التقنيات التعليمية الهامة في مؤسسات التعليم العالي. ومع ذلك ، يعتمد نجاح أنظمة التعلم الإلكتروني إلى حد كبير على قبول الطلاب لهذه الأنظمة. الغرض من هذه الدراسة هو ثلاثة اهداف. أولاً ، تحليل العوامل الخارجية الأكثر استخداماً في نموذج قبول التكنولوجيا فيما يتعلق بدراسة اعتماد التعلم الإلكتروني وقبوله. في ذلك ، تم إجراء منهج بحث كمي يضم 120 دراسة منشورة هامة من السنوات الاثنتي عشرة الأخيرة الماضية من أجل إجراء دراسة استقصائية. ونتيجة لذلك ، تم تحديد العوامل الخارجية الأكثر استخدامًا وهي (الكفاءة الذاتية للحاسوب، التأثير الاجتماعي، التمتع، جودة النظام، جودة المعلومات، وجودة مع العوامل الأكثر المحتوى، وإمكانية الوصول، متعة استخدام الحاسوب). ثانيا ، لتطوير نموذج جديد من خلال توسيع استخداما. ثالثًا ، التحقق نموذج نموذج قبول التكنولوجيا باستخدام النمذجة بالمعادلة البنائية لدراسة فرضيات البحث، والذي يتوافق جيدًا مع الغرض من دراستنا. تم جمع البيانات باستخدام مسح استبيان من خمس جامعات مختلفة قامت بالفعل بتطبيق نظام التعلم الإلكتروني في دولة الإمارات العربية المتحدة. العدد الإجمالي للمشاركين في الدراسة هو أربعمائة وخمسة وثلاثون طالبًا. أشارت النتائج إلى أن كان هناك تأثير إيجابي على جودة النظام، والكفاءة الذاتية للحاسوب، ومتعة استخدام الحاسوب على سهولة إدراك الطلاب لاستخدام أنظمة التعلم الإلكتروني. وبالإضافة إلى ذلك، أثرت جودة المعلومات والتمتع بها وإمكانية الوصول تأثيرا إيجابيا على سهولة استخدام الطلاب لفائدة نظام التعلم الإلكتروني وفائدته المدركة. وعلاوة على ذلك، فإن الفائدة المتوقعة، وسهولة الاستخدام المتوقعة أدت إلى زيادة نية الطلاب في استخدام نظم التعلم الإلكتروني؛ ومع ذلك، فقد تبين أن سهولة الاستخدام هي أهم عامل يؤثر على نية الطلاب واستخدامهم الفعلي للنظم التعلم الإلكتروني.**

## Dedication

I would like to dedicate my work to my dear parents for their prayer, and my soul mate and sweetheart wife **Raghad Alfaisal,** and to my lovely sons: **Ayham and Aysar.**

## Acknowledgement

First of all, I am deeply grateful to Allah for making this dissertation possible. I'm deeply grateful to **Professor. Khaled Shaalan** for his infinite supports, valuable advice and guidance. Special thanks and appreciations for **Professor. Sherief Abdallah** who taught me different modules during my study and for his great efforts and for encouraging me from the first step. I would like to express my sincere gratitude to my best friend, personal tutor **Dr. Mustafa Al-Emran** for the continuous support of dissertation study and related research. I would also like to thank **Professor. Mohamed Ghars El-din** for their support. Without his guidance and persistent help, this dissertation would not have been possible. This study could not have succeeded without helpful of all people who gave me support, especially Mr. Osama Al Khasawneh, Dr. Chaker Mhamdi, Mohamad Jamal, Ahmad Dbouk, and Ali Aknan.

Finally, all my true feelings and deepest gratitude for my parents and my dear wife **Raghad Al-Faisal** for her unlimited support. Thanks for all.

**Keywords** United Arab Emirates; Technology Acceptance Model (TAM); E-learning system, Self-Efficacy, Enjoyment, Subjective/ Social norm, System Quality, Information Quality, Content Quality Accessibility, and Computer Playfulness; Structure equation modeling (PLS-SEM); Emirates universities.

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# Chapter One

# Introduction

A complete overview is presented in this chapter. The problem definition is discussed and research motivations are explained. The research aim is described clearly. A short explanation of the research questions is given, along with the methodology employed. Finally, dissertation outline and chapters description are given.

## 1.1 Overview

Because of the developments in Informational Technology, E-learning has become a widely recognized method of higher education learning all over the world. This study concentrates on the acceptance of E-learning by students as an effective tool. E-learning is effectively implemented when there is an understanding of end-user acceptance process. Hence, this study concentrated on studying the acceptance of E-learning approach among students in the UAE universities. The purpose of this research was to offer a group of factors, on the basis of prevailing theories, that should be taken into account when planning an E-learning activity and which should be put forward to E-learning studying in universities of the UAE. The basic framework of the study was the Technology Acceptance Model, which was appropriate for obtaining the research aims.

## 1.2 Problem Definition

The part played by E-learning in the higher educational institutions in different universities across the globe has been examined in several research studies. A critical factor that should

be considered before using E-learning is the attitudes of students. The literature did not sufficiently consider the attitudes of students from the UAE universities. This study will examine the attitudes of students with respect to the use of E-learning in the higher educational setting in five universtites in UAE. The study analyzes the most extensively used external factors of Technology Acceptance Model (TAM) in terms of E-learning adoption and acceptance. Eight external factors (*Computer self-efficacy, Subjective/ Social norm, Enjoyment, System Quality, Information Quality, Content Quality, Accessibility, and Computer Playfulness*) are evaluated in this study as these factors are considered to have an impact on students' perceived ease of use, perceived usefulness, attitudes, intention to use and actual use of the E-learning systems. The participants were chosen from those universities which have successfully implemented E-learning systems.

### 1.3 Motivations

Electronic learning (E-learning) is fast becoming an essential method that is widely used and implemented by educational institutes and universities across the globe (Mohammadi, 2015). It is argued by (Al-Rahmi et al., 2018) that e-learning provides students with a virtual atmosphere in which students take part in several activities. Hence, it is evident that there are extensive benefits of e-learning system for its users. E-learning system has been used efficiently and has offered extensive benefits in developed countries, where the physical presence and the geographical gap could be bridged. However, the e-learning system in developing countries has partially or entirely been unsuccessfully adopted, its utilization has not been completed, and is considered to be less than the satisfactory level. For instance, the United Arab of Emirates (UAE) universities have implemented the e-learning system for

several years. However, the factors that affect its acceptance still needs further investigation (Alshammari, Ali, & Rosli, 2016).

The purpose of this dissertation is to analyze the e-learning literature that is linked to various studies that employed the Technology Acceptance Model (TAM) in the past few years, and to empirically examine the impact of the external factors like computer self-efficacy, subjective/social norm, enjoyment, system quality, information quality, content quality, accessibility, and computer playfulness on the e-learning adoption. Various studies have been carried out on the adoption of e-learning systems in several developed countries (Alharbi & Drew, 2014; Alia, 2016; Baleghi-Zadeh, Ayub, Mahmud, & Daud, 2014; Boateng, Mbrokoh, Boateng, Senyo, & Ansong, 2016; Haryanto & Kultsum, 2016; Tarhini, Mohammed, & Maqableh, 2016). However, there is limited empirical research that concentrates solely on the UAE (Al-hawari & Mouakket, 2010; Alshammari et al., 2016). This has motivated us to carry out a study for the UAE that fills the gap in the literature, as this country has a significantly distinct culture and value system. Furthermore, the UAE is taking short-term plan for becoming a smart country, where E-learning is not an exception. This country particularly does not have updated statistics regarding the uptake of e-learning. Hence, any empirical research that concentrates on the UAE is critical due to these apparent reasons. Consequently, our proposed research on the UAE is going to highlight the important reasons for uptake; the reasons that can carefully be shared with other regional cultures, and more broadly in other cultures that share a few of the parameters used by the study to form its deductions. In addition, recognizing these shared factors is going to help in enhancing the capability of researchers and subsequently bring about an improvement in the e-learning

adoption rates in their countries by working on the pertinent cultural and social factors that facilitate or hamper the adoption process.

The role played by e-learning in higher educational institutions in different universities across the globe has been examined in several research studies. A critical factor that should be considered before using the e-learning is the attitudes of students (Ardies, De Maeyer, Gijbels, & van Keulen, 2014). The literature did not sufficiently consider the attitudes of students from the UAE universities. This study analyzes the most extensively used external factors of the Technology Acceptance Model (TAM) in terms of e-learning adoption and acceptance. Eight external factors (i.e., system quality, information quality, content quality, computer self-efficacy, enjoyment, subjective/social norm, accessibility, and computer playfulness) are evaluated in this study as those factors are considered to have an impact on the students' perceived ease of use, perceived usefulness, attitudes, intention to use, and actual use of the e-learning systems. The main reason that motivated us to focus on the UAE is that the universities in this country have successfully implemented the e-learning system. The results of this study can offer essential information to both researchers and educators regarding the research trends of e-learning.

### 1.4 Aim of Research

This study seeks to investigate various groups of the most extensively used external factors (*Computer self-efficacy, Subjective/ Social norm, Enjoyment, System Quality, Information Quality, Content Quality, Accessibility, and Computer Playfulness*) of Technology Acceptance Model (TAM) which may have a significant influence on the perceptions of

students regarding the acceptance of the E-learning system in the higher educational settings in the UAE. The purpose of this study is to fill that gap. The study has the following aims:

1. To assess students' perspectives toward the use of the E-learning systems that they have access to. Specific factors are obtained from the university environment, which may influence the student's attitude and these are recognized in the study.

2. To examine the most widely used external factors of the Technology Acceptance Model (TAM) regarding the adoption and acceptance of E-learning which influences the core beliefs that form the structure of TAM. These include perceived usefulness, perceived ease of use, attitudes, intention to use, and actual use the E-learning systems. The latest factor obtained from the university setting is Strategic Focus, which has not been studied extensively in information technology systems, particularly in E-learning studies. Hence, assessing this factor as an external variable brings about a novel perspective to the research model. University Strategic Focus is indicative of the organizational clarity of strategic goals and policies associated with E-learning that should be attained and fulfilled. Other factors that are considered in the theoretical model of the study which have been obtained from the literature include (*Computer self-efficacy, Subjective/ Social norm, Enjoyment, System Quality, Information Quality, Content Quality, Accessibility, and Computer Playfulness*).

3. The purpose of this study also is to examine the specific case of the use of E-learning by students, where students organized an E-learning system to play a critical role in the learning process. However, it was not successful because the system was not used properly and the students were not offered additional resources to fulfill their learning objectives. Analyzing such cases allows one to focus on recommendations so that similar initiatives in other Higher

Education Institutes can be successful. Therefore, the purpose of this study is to help top management and policy makers regarding enhancements that may be needed to improve the students' perspectives toward E-learning, and to enhance their utilization of the system while undergoing the learning process.

4. To study the factors that affect the E-learning system acceptance in the existing literature.

5. To develop a general extended technology acceptance model (ETAM) for E-learning system acceptance?

6. To validate the developed model through the structural equation model (SEM).

### 1.5 Research Questions

The study aim can be attained by obtaining answers to the research questions given below:

- What are the factors that affect the E-learning system acceptance?
- What to extent do the most widely used external factors of Technology Acceptance Model (TAM) affect the E-learning system acceptance?
- How are the most widely used external factors of Technology Acceptance Model (TAM) affect the E-learning system acceptance?

### 1.6 Methodology

Firstly, the research methodology involves assessing the state-of-the-art of E-learning with respect to the students' attitudes towards the use of E-learning so that the gaps can be recognized and covered. We focus on the attitudes in the students of UAE universities. The study is inclined to use a quantitative approach that involves two questionnaire surveys: self-administered survey distributed to students in The British University in Dubai and University of Fujairah and online surveys that are circulated between the students in Abu Dhabi School of Management , Skyline University College, and MENA College of Management (MCM). Five

universities are going to be approached. Out of these, (Abu Dhabi School of Management , Skyline University College, University of Fujairah, The British University in Dubai, and MENA College of Management (MCM) are considered as they are the most popular universities in UAE. Google forms survey was used to obtain the research data, and the survey was emailed to 500 recipients. On the whole, 435 responses were obtained from the survey and these were used to test the hypotheses. The hypotheses were developed on the basis of prevailing theories, and were also in line with the E-learning context. The measurement model was evaluated using structural equation modeling (SEM) (*SmartPLS version 3.2.7*), which led to the final path model. The constructs of reliability, validity and model were then analyzed (*IBM SPSS Statistics Version 23*). The given thresholds and good fit values were used to test the final model. The findings show that validity and reliability fulfill the recommended satisfactory rate.

### 1.7 Dissertation Outline

The dissertation is structured into the following chapters.

**Chapter 1:** Introduces the study by presenting an overview of the study. The problem definition and research motivations are presented. The research objective and research questions are stated clearly. The methodology employed is then explained.

**Chapter 2:** The state-of-the-art E-learning system was assessed in terms of the students' attitudes towards the use of E-learning system. The study discussed the definition of E-learning as well as the E-learning in educational Institutions. Stress was laid on the inclusion and execution of E-learning along with other technological resources. Furthermore, the factors that had an impact on the students' attitudes towards using E-learning system were explained. The latest developments and opportunities that emerged while performing this survey were also discussed. Finally, the chapter concluded with an extensive review of the Technology Acceptance Model (TAM), as well as its history. The chapter also reviews the linking Technology Acceptance Model (TAM) to full E-learning systems.

**Chapter 3:** This chapter puts forward the methodology employed for evaluated the most widely applied external factors of Technology Acceptance Model (TAM) in terms of E-learning implementation. The chapter discusses the development of the research model and hypotheses that has served as the theoretical foundation for performing this study. It extensively discusses the research hypotheses that are going to be evaluated in this study. Finally, it presents a short discussion on the theoretical model elements and research hypothesis.

**Chapter 4:** In this chapter, the methodology employed in the study is presented. The chapter provides details of the research questions that the study is going to evaluate. The location from where the data has been collected is given. The study participants are presented. In addition, the students' surveys structures are extensively explained.

**Chapter 5:** In this chapter, the study findings are given. The chapter extensively explains the way students' surveys are going to be analyzed. The different analysis techniques that are going to fit the study theoretical model to the collected data are presented and the final study model is created, and the research hypotheses are validated.

**Chapter 6:** In this chapter, the conclusion, limitations and the recommendations of the study are given, in addition to the future work that may be carried out for future research.

# Chapter Two

# Literature Review

## 2.1 Overview

The methodology used to assess the most widely used external factors of Technology Acceptance Model (TAM) with respect to E-learning adoption has been presented in this chapter. A total of 120 published studies from the last twelve years were considered for carrying out a systematic review and analysis. According to the findings, the most extensively employed external factors of TAM are *Self-Efficacy, Enjoyment, Subjective Norm/Social influence, System Quality, Information Quality, Content Quality, Accessibility, and Computer Playfulness*. The way these external factors influence the five main constructs of TAM, i.e. Perceived Ease of Use (PEOU) and Perceived Usefulness (PU), Attitude (ATT), Behavioral intention to use (BI), and Actual use (AU) has been examined for different E-learning technology types and E-learning user types. Keeping in view these external factors and the way they affect PU, PEOU, ATT, BI and AU, an Extended Technology Acceptance Model (ETAM) was put forward in this study for E-learning system. A statistical meta-analysis of the technology acceptance model (TAM) used in different fields was carried out using 120 published studies, which offered ample data to be authentic. According to the findings, TAM is found to be a valid and robust model that is used extensively; however, it is applicable to an even wider context. To assess those conditions under which different outcomes may be exhibited by TAM, a moderator analysis of user types and usage types was carried out. It was deduced in the study that students may be used as substitutes for professionals in certain TAM studies, and possibly even in a general context. The worth of

meta-analysis as a rigorous substitute for qualitative and narrative literature review techniques was also shown.

## 2.2 Introduction

Modern education is affected to a large extent by the Internet and the Information and communication technologies. (Sangrà, Vlachopoulos, & Cabrera, 2012) defined E-learning as "E-learning is an approach to teaching and learning, representing all or part of the educational model applied, that is based on the use of electronic media and devices as tools for improving access to training, communication and interaction and that facilitates the adoption of new ways of understanding and developing learning." (Krishnan & Hussin, 2017). According to (Bates, 1997), when a learning environment is facilitated with technologies, an improvement is seen in the quality of learning, availability of training and education and cost-effectiveness of education, while the cost of education decreases. Because of these advantages, the field of E-learning has gained a lot of importance. However, even though the benefits of E-learning have been acknowledged to a large extent, there is still a high rate of rejection towards use of E-learning applications. Various technology adoption models were created and tested to predict the causes of this high rejection rate. These were: Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), Technology Acceptance Model (TAM), Social Cognitive Theory (SCT), Diffusion of Innovation Theory (DOI), and Uniform Theory of Acceptance and Use of Technology (UTAUT) (Tarhini, Elyas, Akour, & Al-Salti, 2016). The theoretical model, TAM, is used most extensively in the field of Information Systems (IS) to recognize user acceptance of IS applications (Y. Lee, Kozar, & Larsen, 2003). Various studies have been carried out to determine end users' E-learning adoption and acceptance (Al-Busaidi, 2013; Alkis, Coskunçay, & Yildirim, 2014;

Almaiah, Jalil, & Man, 2016; Damnjanovic, Jednak, & Mijatovic, 2015; Pribeanu, Balog, & Iordache, 2017) Nonetheless, there is no study that uses a systematic approach to sum up these researches. In contrast, there are various studies in the literature that assess general technology adoption, without focusing on any particular field or that assess the acceptance and adoption in a particular field, such as E-health (Holden & Rada, 2011). This is why a systematic review is needed to recognize, evaluate and comprehend the various research resources in the context of E-learning (Alkis et al., 2014). To conclude, the study systematically reviews and integrates the relevant literature using a meta-analysis (Abdullah & Ward, 2016; Wu et al., 2012) to present a more comprehensive analysis of the past studies. The key research question of the study was: what are the most widely employed external factors of Technology Acceptance Models (TAM) with respect to how E-learning influences the intentions of students to employ E-learning system?

The state-of-the-art of E-learning research is examined in this study, in addition to the attitudes of students and teachers in the universities that have adopted E-learning. It also seeks to recognize the different difficulties and opportunities of E-learning. The attitudes of students' and teachers with respect to the use of E-learning in the higher education contexts are also examined in this study.

### 2.3 Definition of E-learning

E-learning has become a significant trend in the educational applications of latest technologies. E-learning is defined as "a method of teaching and learning that fully or partially signifies the educational model used, based on the use of electronic media and devices as tools for enhancing availability of training, communication, and interaction, and that helps in accepting novel ways of comprehending and establishing learning" (Sangrà,

Vlachopoulos, & Cabrera, 2012). According to (Krishnan & Hussin, 2017), e-learning takes place using various forms of technologies and media. An important element of e-learning is the use of electronic media, and in present times, e-learning is explained as learning through different computational devices, such as computers, mobile phones, tablets, and virtual environments (Bates, 1997)**.** Therefore, the learners of e-learning became involved in educational activities, employing technology as an intermediate tool for learning. They use different devices for this purpose to access data and to communicate with others.

### 2.4 E-learning Systems in educational Institutions

It has been suggested in several UAE universities that e-learning should be used for different reasons, and the number of these kinds of tertiary learning opportunities has seen a consistent increase. Nonetheless, there has been little research to examine the factors that influence university students' adoption and use of e-learning. Since the mid-1990s, the education sector has broadly used the term e-learning. Nevertheless, researchers are yet to agree on the definition of e-learning. According to some researchers (Tarhini, Elyas, Akour, & Al-Salti, 2016), the delivery of teaching materials through electronic media is referred to as the e-learning, for instance: intranets, extranets, internet, broadcast, and satellite (Y. Lee, Kozar, & Larsen, 2003). According to (Al-Busaidi, 2013; Alkis, Coskunçay, & Yildirim, 2014; Almaiah, Jalil, & Man, 2016; Damnjanovic, Jednak, & Mijatovic, 2015; Pribeanu, Balog, & Iordache, 2017), e-learning is viewed as a web-based learning that employs collaboration, web-based communication, training and knowledge transfer so that the values could be added to individuals as well as organizations.

### 2.5 The Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) presented by (Holden & Rada, 2011) has been employed in various research studies, and therefore, it has become quite significant in the literature pertaining to technology acceptance (Alkis et al., 2014). According to the theory, two personal beliefs; i.e., perceived usefulness and perceived ease of use are affected by external and system-specific factors and predict the attitude towards using a technology. The attitude towards using then affects the behavioral intention to use a technology, which eventually predicts the actual system use. The traditional definitions of TAM's constructs are presented in Figure 1.

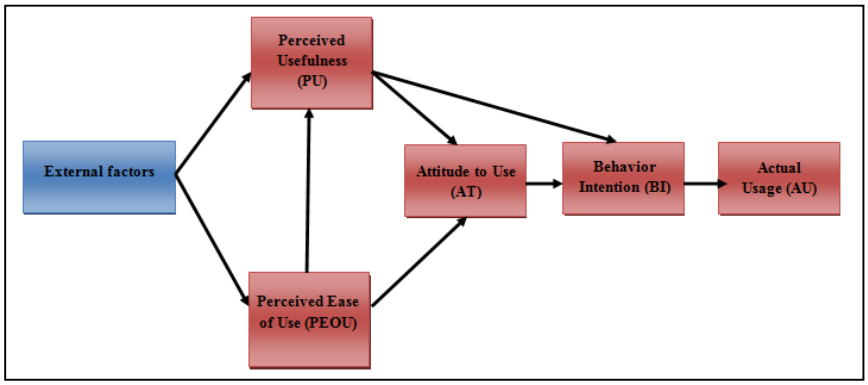


**Figure 1.** Original Technology Acceptance Model (TAM) by (Davis, 1989)

Davis put forward the Technology Acceptance Model (TAM), which was an extension of the Theory of Reasoned Action (TRA) (Sangrà et al., 2012). The model sought to determine the user acceptance for information systems. It describes the factors that determine the acceptance of the use of computers and pertinent technologies in various technologies and user groups. The purpose of TAM is to discover how external factors influence the beliefs, attitudes, and intentions by recognizing the limited variables put forward in earlier studies with respect to the cognitive and emotional factors of accepting the technology and employing TRA as the theoretical foundation for developing the theoretical associations among these variables (Krishnan & Hussin, 2017; Rhema, 2013).

## 2.6 Linking Technology Acceptance Model (TAM) to full E-learning systems

In the previous studies pertaining to Information Technology (IT) acceptance, various research themes have been presented which assess the way and the reasons for which people accept new technology. The TAM model is a robust predictive model that is appropriate for different groups of technologies (Rissa, 2014). Although TAM was established in the USA, it has been used and evaluated in different contexts and empirical studies like (B.-C. Lee, Yoon, & Lee, 2009).

According to (Krishnan & Hussin, 2017; B.-C. Lee et al., 2009; Rissa, 2014; Sangrà et al., 2012), a quantitative research approach comprising of 152 external factors were identified and assessed using 107 published articles in the duration of ten years was considered for carrying out a systematic review and analysis. The results of their study revealed that self-efficacy, subjective norm, enjoyment, computer anxiety, and experience were considered the most extensively used external factors that extend the TAM in more than 10 of the analyzed studies in their study. It has been noticed that the effect of the most widely used external factors was limited only to the core beliefs (perceived usefulness and perceived ease of use) of TAM. Although (Alavi & Leidner, 2001; Chu & Chen, 2016) achieved significant contribution to the existing of body literature, their study does not cover all the related studies in the context of the e-learning adoption. As a result, this study aims to analyze the studies that were already examined by (Deshpande, Bhattacharya, & Yammiyavar, 2012; Y.-C. Lee, 2006; Rym, Olfa, & Mélika, 2013; Wang, 2011) as well as other relevant studies that were collected based on the inclusion and exclusion criteria of this study. In that, this study is more comprehensive and considers more external factors. It aims to develop a new model by extending the TAM with the most extensively external factors that achieved significant

results in the previous literature. Nevertheless, this new model examines the e-learning acceptance and validates the proposed model using the partial least squares-structural equation modeling (PLS-SEM).

### 2.7 Data sources and correlation analysis

In order to achieve the aim of this study, a systematic review has been conducted. This review was carried out to assess the resources pertaining to the subject area (i.e., the acceptance of e-learning). That is, the e-learning acceptance studies pertaining to the extension of TAM with the external factors were analyzed. The studies were identified using different keywords that were related to TAM (as demonstrated in Table 1) and by using various journals databases (Emerald, IEEE Xplore, ProQuest, ScienceDirect, Springer, Wiley & Taylor) and search engines (Google Scholar). By following the search results, 408 studies were obtained based on the search terms that are described in Table 2. While performing data analysis, low-quality studies were removed from the synthesis, and 54 duplicate results were eliminated. Additionally, qualitative studies that did not offer extensive information, like e-learning outcomes, or those which seemed to depend more on the experience of the researcher instead of the field observations were removed.

Table 4 shows a total of 120 studies fulfilled the inclusion criteria and were included in the analyses. These are the same procedures followed by other similar studies (Davis, 1989) in conducting a systematic review.

| Keyword search |
|---|
| "TAM" AND "E-learning" |
| "Technology Acceptance Model" AND "E-Learning" |
| "Perceived Ease of Use" AND "E-Learning" |
| "Perceived Usefulness" AND "E-Learning" |
| "TAM" AND "web-based learning" |

| "TAM" AND "online learning" |
|---|

**Table 1:** Keyword search.

| Journal Databases | Frequency |
|---|---|
| Emerald | **39** |
| Google Scholar | **109** |
| IEEE | **41** |
| ProQuest | **38** |
| ScienceDirect | **74** |
| Springer | **54** |
| Wiley | **23** |
| Taylor | **27** |
| ASM | **3** |
| Total | **408** |

**Table 2:** Initial search results across the databases.

The criteria given below are used when choosing the valid papers to make sure that there is consistency in the studies for data analysis:

- The papers must be published in the last 12 years.
- The papers should have extended TAM in an empirical study.
- The papers should have examined adoption or acceptance of e-learning systems.
- The proper description should be given of the study methodology.
- The study results should be completed and given.
- All the constructs presented in the study were joined together to define the external factors frequently used once the valid papers were identified. To be confident of the power of the association between the external factors and TAM, external factors where the connection with TAM was verified and confirmed in four or more analysis were taken into account and assessed by the authors.

Overall, 239 external factors were identified and assessed in the 120 studies. However, it was determined that only eight external factors (computer self-efficacy, subjective/social norm, enjoyment, system quality, information quality, content quality, accessibility, and computer playfulness) had a relationship with TAM in four or more of the relevant studies as described in Table 3. This table shows the distribution of the most external factors across the databases.

| **External factors** | **Databases** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Emerald** | **Google Scholar** | **IEEE** | **ProQuest** | **ScienceDirect** | **Springer** | **Wiley** | **Taylor & Francis** | **ACM** | **Total** |
| Computer self-efficacy | 3 | 16 | 5 | 4 | 10 | 0 | 3 | 10 | 1 | 52 |
| Subjective/social norm | 1 | 6 | 3 | 2 | 9 | 1 | 4 | 8 | 0 | 34 |
| Perceived enjoyment | 2 | 5 | 2 | 5 | 3 | 0 | 1 | 1 | 0 | 19 |
| System quality | 0 | 2 | 1 | 0 | 5 | 1 | 1 | 1 | 0 | 11 |
| Information quality | 0 | 2 | 2 | 0 | 5 | 0 | 0 | 1 | 0 | 10 |
| Content quality | 1 | 1 | 0 | 3 | 1 | 1 | 2 | 1 | 0 | 10 |
| Accessibility | 0 | 4 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 8 |
| Perceived playfulness | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 1 | 0 | 4 |

**Table 3:** The most commonly used external factors across databases.

| Author (s) | E-learning technology type | Sample size | Country | User type | TAM constructs | | | | | External factors | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | PEOU | PU | AT | I | U | | | | | | | | | | | | | |
| (Abbad, Morris, Al-Ayyoub, & Abbad, 2009) | Web-based learning system | 470 | Jordan | Students | √ | √ | | √ | √ | Subjective Norms | Internet Experience | System Interactivity | Self-Efficacy | Technical Support | | | | | | | | |
| (T. Abbas & Abbas, 2016) | E-Learning system | 468 | Egypt | Students | √ | √ | | √ | | Interpersonal influence | External influence | Instructor influence | | | | | | | | | | |
| (T. M. Abbas, 2017) | E-Learning system | 442 | Egypt | Students | √ | √ | | √ | | Student engagement | Student self-efficacy | | | | | | | | | | | |
| (T. M. Abbas, Jones, & Hussien, 2016) | Web-based learning system | 428 | Egypt | Students | √ | √ | √ | √ | √ | E-learning resources | E-learning support | Platform functionality | E-learning platform | Platform interactivity | Platform response | | | | | | | |
| (Adewole-Odeshi, 2014) | E-Learning system | 387 | Nigerian | Students | √ | √ | √ | √ | | Age and students intention | Computer experience | | | | | | | | | | | |
| (Akman & Turhan, 2017) | E-Learning system | 142 | Turkey | Students | √ | √ | √ | √ | √ | Security awareness | Ethical awareness | | | | | | | | | | | |
| (Al-Ammary, Al-Sherooqi, & Al-Sherooqi, 2014) | Web-based learning system (Social Networking) | 109 | Bahrain | Students | √ | √ | √ | √ | | System design and features | Social influence | Perceived enjoyment | Computer self-efficacy | Perceived mobility value | Interactivity | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (Al-Aulamie, 2013) | E-Learning system | 766 | Saudi Arabia | Students | √ | √ | | √ | | Information Quality | Functionality | Accessibility | User Interface Design | Computer Playfulness | Enjoyment | Learning Goal Orientation | | | | | | |
| (Al-Busaidi, 2013)) | E-Learning system | 512 | Oman | Learners | √ | √ | | √ | | Self-efficacy | Users' satisfaction | Technology experience | Personal innovativeness | | | | | | | | | |
| (Alenezi, Abdul Karim, & Veloo, 2011) | E-Learning system | 408 | Saudi Arabia | Students | √ | √ | | √ | √ | Facilitating Conditions | Training | Institutional Technical Support | | | | | | | | | | |
| (Al-Gahtani, 2016) | E-Learning system | 286 | Saudi Arabia | Students | √ | √ | | √ | √ | Subjective norm | Image | Job relevance | Output quality | Result demonstability | Computer self-efficacy | Perception of external control | Computer anxiety | Computer playfulness | Perceived enjoyment | Objective usability | | |
| (Alharbi & Drew, 2014) | Learning management systems | 59 | Saudi Arabia | Faculty members | √ | √ | √ | √ | | LMS usage experience | Job relevance | Lack of LMS availability | | | | | | | | | | |
| (Al-hawari & Mouaket, 2010) | E-Learning system (blackboard) | 340 | Bahrain | Students | √ | √ | | | | E-satisfaction | Blackboard DF (BDF) | Students' e-retention | Enjoyment | | | | | | | | | |
| (Alia, 2016) | E-Learning system | 268 | Kuwait | Instructors | √ | √ | √ | √ | | Computer Self-efficacy | University Strategic Focus | Technical Support | | | | | | | | | | |
| (Alkharang, 2014) | E-Learning system | 214 | Kuwait | Students | | | | √ | √ | Performance Expectancy | Effort Expectancy | Facilitating Conditions | Management Awareness | Language Barriers | | | | | | | | |
| (Almaiah et al., 2016) | E-Learning system | 392 | Jordan | Students | √ | √ | | √ | | Learning content quality | Content design quality | Interactivity | Functionality | User-interface design | Accessibility | Availability | Personalization | Responsiveness | | | | |
| (Al-Mushasha, 2013) | E-Learning system | 224 | Saudi Arabia | Students | √ | √ | √ | √ | | University support | Computer self-efficacy | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (Alsabawy, Cater-Steel, & Soar, 2016) | E-Learning system | 720 | Australia | Students | | √ | | | | IT infrastructure services | System quality | Information quality | Efficiency | Availability | Fulfilment | Privacy | Responsiveness | Contact | | | | |
| (Alshammari et al., 2016) | Learning management system | 340 | UAE | Students | √ | √ | √ | √ | √ | Technical support | Computer self efficacy | Instructional design | | | | | | | | | | |
| (Arteaga Sánchez, Duarte Hueros, & García Ordaz, 2013) | E-Learning system | 226 | Spain | Students | √ | √ | √ | | √ | Technical support | Computer self-efficacy | | | | | | | | | | | |
| (Attis, 2014) | E-learning systems | 112 | USA | Teachers | √ | √ | | | | Demographics and experience | Computer anxiety | Computer self-efficacy | Technological complexity | Perceived convenience | | | | | | | | |
| (Ayodele, Oga, Bundot, & Ogbari, 2016) | E-Learning system | 869 | Nigeria | Employees | √ | √ | | √ | | Technical resources | Power supply | | | | | | | | | | | |
| (Bachtiar, Rachmadi, & Pradana, 2014) | E-Learning system | 423 | Indonesia | Students | √ | √ | | | √ | Use for Distance Learning | Use of Supplementary | System Functionality | System Interactivity | Usability | Self-Efficacy | Internet & Computer | Socio Environment | | | | | |
| (Baleghi-Zadeh et al., 2014) | Web-based learning system | 316 | Malaysia | Students | √ | √ | | √ | | Task-technology fit | | | | | | | | | | | | |
| (Boateng et al., 2016) | Web-based learning system | 337 | Ghana | Students | √ | √ | √ | √ | | Computer Self Efficacy | | | | | | | | | | | | |
| (Calisir, Altin Gumussoy, Bayraktaroglu, & Karaali, 2014) | Web based | 546 | Turkey | Employees | √ | √ | √ | √ | | Image | Perceived content quality | Perceived system quality | Anxiety | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (Capece & Campisi, 2013) | E-Learning system | 5395 | Italy | Employees | √ | √ | | | | Satisfaction | | | | | | | | | | | | |
| (C.-C. Chang, Tseng, Liang, & Yan, 2013) | Web-based learning system | 125 | Taiwan | Students | √ | √ | | √ | | Perceived convenience | Curiosity | | | | | | | | | | | |
| (C.-T. Chang et al., 2017) | Web-based learning system | 714 | Azerbaijan | Students | √ | √ | | √ | | Subjective norm | Experience | Perceived enjoyment | Computer anxiety | Self-efficacy | TI moderates | | | | | | | |
| (Y.-M. Cheng, 2014) | E-Learning system | 252 | Taiwan | Students and faculty | √ | √ | √ | √ | √ | Controllability | Responsiveness | Two-way Communication | Personalization | Enjoyment | Usage experience | | | | | | | |
| (Y. Cheng, 2011) | E-Learning system | 328 | Taiwan | Students | √ | √ | √ | √ | √ | Computer self-efficacy | Internet self-efficacy | Cognitive absorption | Learning goal orientation | System functionality | System interactivity | System response | Content quality | Interpersonal influence | External influence | Network externality | Perceived enjoyment | Perceived performance |
| (Y.-M. Cheng, 2012) | E-Learning system | 522 | Taiwan | Students | √ | √ | | √ | | Course content quality | Course design quality | Support service quality | System functionality | System interactivity | System response | User-interface design | Instructor attitude towards e-learners | Perceived enjoyment | | | | |
| (B. Cheng, Wang, Moormann, Olaniran, & Chen, 2012) | E-Learning system | 222 | China | Students | | √ | | √ | | Perceived managerial support | Perceived job support | Perceived organizational | | | | | | | | | | |
| (Cheung & Vogel, 2013) | E-Learning system | 136 | Australia | Students | √ | √ | √ | √ | √ | Compatibility | Perceived resource | Peer groups | External media | The lecturer | Self-efficacy | Sharing | Subjective norms | | | | | |
| (Chiang, Boakye, & Tang, 2017) | E-Learning system | 314 | USA | Students | √ | √ | | √ | | Content competence | Technical competence | Customization capability | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (Chinyamurindi & Shava, 2015) | E-Learning system | 113 | South African | Students | √ | √ | √ | √ | | computer self-efficacy | Gender | | | | | | | | | | | |
| (Chow, Herold, Choo, & Chan, 2012) | Web-based learning system | 206 | China | Students | √ | √ | | √ | | Computer self-efficacy | | | | | | | | | | | | |
| (Chu & Chen, 2016) | E-Learning system | 47 | Taiwan | Students | | | √ | √ | √ | Subjective norms | Social identity | Social bonds | | | | | | | | | | |
| (Damnjanovic et al., 2015) | Web-based learning system | 255 | Serbia | Students | √ | | | √ | | Format | Communicativeness | System quality | Satisfaction | Information quality | Performance outcome | | | | | | | |
| (Deshpande et al., 2012) | Web-based learning system | 40 | India | Students | √ | √ | √ | √ | √ | Computer-friendliness | Facilitating condition | | | | | | | | | | | |
| (Elkaseh, Wong, & Fung, 2015) | Web-based learning system | 318 | Libya | Students | √ | √ | √ | √ | | Social Influence | Perceived Enjoyment | | | | | | | | | | | |
| (Elkaseh, Wong, & Fung, 2016) | Web-based learning system | 300 | Libya | Students | √ | √ | √ | √ | | Social networking media | | | | | | | | | | | | |
| (Escobar-Rodriguez & Monge-Lozano, 2012) | E-Learning system (Moodle platforms) | 162 | Spain | Students | √ | √ | | √ | | Perceived usefulness for professors | Perceived compatibility with student tasks | Training | | | | | | | | | | |
| (Farahat, 2012) | E-Learning system | 153 | Egypt | Students | √ | √ | √ | √ | | Social influence | | | | | | | | | | | | |
| (Fathema, Shannon, & Ross, 2015) | E-Learning system | 560 | USA | Faculty members | √ | √ | √ | √ | √ | System Quality | Self-efficacy | Facilitating Conditions | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (Ghosh, 2016) | End-user learning | 139 | USA | Students | √ | √ | | | √ | TML System Features | Individual Characteristics | Facilitating conditions | Learning Outcomes | | | | | | | | | |
| (Govender & Rootman-le Grange, 2015) | Learning management system (LMS) | 89 | South Africa | Students | √ | √ | √ | | √ | Computer self-efficacy | The quality of the LMS | The quality of the content | Technical Support | | | | | | | | | |
| (Haryanto & Kultsum, 2016) | E-Learning system (e-book) | 243 | Indonesia | Teachers | √ | √ | √ | √ | | Computer Self Efficacy | | | | | | | | | | | | |
| (Holden & Rada, 2011)) | E-Learning system | 99 | USA | Teachers | √ | √ | √ | | √ | Computer Self Efficacy | Technology Self-Efficacy | | | | | | | | | | | |
| (Alrawashdeh, Firstauthor, & Secondcoauthor, n.d.) | E-Learning system | 233 | Taiwan | Employees | √ | √ | | √ | | Computer self-efficacy | Perceived flexibility | | | | | | | | | | | |
| (Hsia, Chang, & Tseng, 2014) | Web-based learning system | 223 | Taiwan | Employees | √ | √ | | √ | | Internal locus of control | Computer self-efficacy | | | | | | | | | | | |
| (R. Hussein, Aditiawarman, & Mohamed, 2007) | Web-based learning system | 147 | Indonesia | Online students | √ | √ | | √ | | Computer self-efficacy | Instructional design | Technological factors | Instructor's characteristics | | | | | | | | | |
| (Ismail, Razak, Zakariah, Alias, & Aziz, 2012)) | Web-based learning system | 215 | Malaysia | Students | √ | √ | | √ | | Percieved cognitive absorption | Perceived internet self-efficacy | Perceived computer self-efficacy | Interpersonal influence | External influence | Information quality | Service quality | System quality | Confirmation | Satisfaction | | | |
| (Jaber, 2016) | E-learning systems | 198 | Jordan | Students and faculty | √ | √ | | √ | | Cultural dimensions | Information quality | System an quality | User experience | Subjective norms | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (Jashapara & Tai, 2011) | E-Learning system | 403 | Taiwan | Students | √ | | | | | System self-efficacy | Computer anxiety | Computer playfulness | Personal innovativeness | Computer experience | | | | | | | | |
| (Jeong & Kim, 2017) | E-Learning system | 160 | South Korea | kindergarten teachers | √ | √ | | √ | | Computer self-efficacy | Subjective norm | Personal innovativeness | | | | | | | | | | |
| (Kanwal & Rehman, 2017) | E-Learning system | 354 | Pakistan | Students | √ | √ | √ | √ | | Computer Self-Efficacy | Internet Experience | Enjoyment | Computer Anxiety | Organizational Accessibility | System Characteristics | Subjective Norm | | | | | | |
| (Khor, 2014) | E-Learning system | 78 | Malaysia | Students | √ | √ | √ | √ | | Content quality | Cognitive absorption | Intrinsic motivation | | | | | | | | | | |
| (Krishnan & Hussin, 2017) | E-Learning system | 384 | Malaysia | Students | √ | √ | √ | √ | √ | Learner Readiness | Cultural Readiness | Technical Readiness | Financial Readiness | Environmental | | | | | | | | |
| (Ku, 2009) | E-learning systems | 115 | USA | Students | √ | √ | √ | √ | √ | Perceived resources | | | | | | | | | | | | |
| (Y.-C. Lee, 2006) | E-Learning system | 1,085 | Taiwan | Students | √ | √ | √ | √ | √ | Content quality | network externality | Computer self-efficacy | Course attributes | Subjective norm | Voluntariness | | | | | | | |
| (M.-C. Lee, 2010) | E-Learning system | 363 | Taiwan | Students | √ | √ | √ | √ | | Satisfaction | Confirmation | Subjective norm | enjoyment | Concentration | | | | | | | | |
| (B.-C. Lee et al., 2009) | Web-based learning system | 214 | South Korea | Students | √ | √ | | √ | | Instructor characteristics | Teaching materials | Design of learning contents | playfulness | | | | | | | | | |
| (Y.-H. Lee, Hsieh, & Hsu, 2011) | Web-based learning system | 552 | Taiwan | Employees | √ | √ | | √ | | Compatibility | Complexity | Relative advantages | Observability | Trialability | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (Y.-H. Lee et al., 2011) | E-Learning system | 357 | Taiwan | Employees | √ | √ | | √ | | Subjective norm | Organizational support | Management support | Individuals experience with computers | Computer self-efficacy | Task characteristics | Task equivocality | Task interdependence | | | | | |
| (Y.-H. Lee, Hsieh, & Chen, 2013) | Web-based learning system | 332 | Taiwan | Students | √ | √ | √ | √ | | Organisational support | Prior experience | Computer self-efficacy | Task equivocality | | | | | | | | | |
| (J. Lee, Choi, & Lee, 2015) | Web-based learning system | 120 | South Korea | Employees | √ | √ | | √ | | Mobility | Interactivity | Organizational innovativeness | Perceived risk | | | | | | | | | |
| (K.-M. Lin, 2011) | E-Learning system | 256 | Taiwan | Users | √ | √ | √ | √ | | Frequency of negative critical incidents | Quality attributes cumulative satisfaction | | | | | | | | | | | |
| (C.-C. Lin, 2013) | E-Learning system | 448 | Taiwan | Students | √ | √ | √ | √ | | User experience | Effectiveness | Efficiency | Learnability | Memorability | | | | | | | | |
| (Y.-C. Lin, Chen, & Yeh, 2010)) | Multimedia e-learning system | 214 | Taiwan | Students and faculty | √ | √ | | √ | | Perceived usefulness | Perceived enjoyment | System characteristics | Courseware features | Self-efficacy | | | | | | | | |
| (S.-C. Lin, Persada, & Nadlifatin, 2014) | Web-based learning system (Blackboard) | 302 | Taiwan | Students | √ | √ | √ | √ | | Perceived Interactivity | | | | | | | | | | | | |
| (S.-H. Liu, Liao, & Peng, 2005) | Web-based learning system | 102 | Taiwan | Students | √ | √ | √ | √ | | E-learning materials presentation types | Concentration | | | | | | | | | | | |
| (Mahmodi, 2017) | E-Learning system | 184 | Iran | Students | √ | √ | √ | √ | √ | Social impact | Facility conditions | Self-efficacy | Quality of the system | | | | | | | | | |
| (Martínez-Torres et al., 2008) | Web-based learning system | 220 | Spain | Students | √ | √ | | √ | √ | Interactivity and control | Feedback | Communicativeness | Enjoyment | User tools | Diffusion | Methodology | Format | Reliability | Accessibility | User adaptation | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (Mohammadi, 2015) | E-Learning system | 390 | Iran | Students | √ | √ | | √ | √ | Educational quality | Service quality | Technical system quality | Content and information quality | Satisfaction positively | | | | | | | | | |
| (Moreno, Cavazotte, & Alves, 2017) | E-Learning system | 251 | Brazil | Students | √ | √ | √ | √ | | Cognitive | computer self-efficacy | Prior experience | System interactivity | Output quality | Social influence | Facilitating conditions | | | | | | | |
| (Motaghian et al., 2013) | E-Learning system | 115 | Iran | Students | √ | √ | | √ | √ | Information quality | System quality | Service quality | Subjective norm | Self-efficacy | | | | | | | | | |
| (Mou, Shin, & Cohen, 2017) | E-Learning system | 436 | South Africa | Students | | √ | | √ | √ | Trust | Subjective norm | Confirmation of expectation | Satisfaction | Consumer trust | Degree of actual use | | | | | | | | |
| (Tran, 2016) | Blended e-learning | 396 | Vietnam | Students | √ | √ | √ | | | System Functionality | Content Feature | Language Capability | Interaction | Learning Climate | Computer Self-efficacy | Extraversion | Openness to experience | Conscientiousness | Agreeableness | Neuroticism | | | |
| (Ong & Lai, 2006) | E-Learning system | 156 | Taiwan | Students | √ | √ | | √ | | Computer self-efficacy | Gender | | | | | | | | | | | | |
| (Park, 2009) | E-Learning system | 628 | South Korea | Students | √ | √ | √ | √ | | e-learning self-efficacy | Subjective norm | System accessibility | | | | | | | | | | | |
| (Park, Nam, & Cha, 2012) | Mobile learning | 288 | South Korea | Students | √ | √ | √ | √ | | Self-efficacy | Major relevance | System accessibility | Subjective norm | | | | | | | | | | |
| (Patil, Razdan, & Chancellor, 2015) | E-Learning system | 100 | India | Teachers | | | | √ | √ | Performance Expectancy | Efforts Expectancy | Social Influence | Facilitating Condition | Gender | Age | Experience | Voluntariness | | | | | | |
| (Premchaiswadi, Porouhan, & Premchaiswadi, 2012) | E-Learning system | 86 | Thailand | Students | √ | √ | | √ | | System Interactivity | Internet Experience | Subjective Nonns | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (Pribeanu et al., 2017) | E-Learning system | 186 | Romania | Students | √ | √ | | | | Ergonomic quality | Perceived learnability | Learning quality | Perceived efficiency | Hedonic quality | Perceived cognitive absorption | Perceived enjoyment | | | | | | |
| (Rabaa'i, 1975) | E-Learning system (Moodel) | 515 | Kuwait | Students | √ | √ | √ | √ | | Percei ved Credibility | Self-Efficacy | Subjective Norm | Satisfaction | | | | | | | | | |
| (Raza, Umer, Qazi, & Makhdoom, 2017) | M-Learning system | 300 | Pakistan | Students | √ | √ | √ | √ | | Student Readiness | Subjective norm | Perceived Self-efficacy | Learning autonomy | Instructor's readiness | | | | | | | | |
| (Ramírez-Correa, Arenas-Gaitán, & Rondán-Cataluña, 2015) | E-Learning system | 389 | Chile & Spain | Students | √ | √ | | √ | √ | Result demonstrability | Perception of external control | Perceived enjoyment | | | | | | | | | | |
| (Rendados Santos & Okazaki, 2016) | E-Learning system | 446 | Brazil | Students | √ | √ | √ | √ | √ | Compatibility | Relative advantage | External influence | Subjective norms | Student-instructor interaction | Level of interactivity | Behavioural control | Resource facilitating | The professional categories | | | | |
| (Revythi & Tselios, 2017) | Learning Management Systems (LMS) | 345 | Greece | Students | √ | √ | √ | √ | | Self-efficacy | System access | Social norm | | | | | | | | | | |
| (Rezaei, Mohammadi, Asadi, & Kalantary, 2008) | Web-based learning system | 252 | Iran | Students | √ | √ | √ | √ | √ | Internet Experience | Computer Anxiety | Age | Computer Self-efficacy | Affect | | | | | | | | |
| (Rissa, 2014) | E-Learning system | 115 | Finnish | Employees | √ | √ | √ | √ | √ | Voluntariness | User experience | Self-efficacy | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (Roca & Gagné, 2008) | E-Learning system | 166 | Spain | Employees | √ | √ | | √ | | Perceived autonomy support | Perceived competence | Perceived relatedness | Perceived playfulness | | | | | | | | | |
| (Roca, Chiu, & Martínez, 2006) | E-Learning system | 172 | Spain | Individuals | √ | √ | | √ | | Confirmation | Cognitive absorption | Computer self-efficacy | Internet self-efficacy | Users' satisfaction | Information quality | Service quality | System quality | Interpersonal | External influence | | | |
| (Rodríguez-Ardura & Meseguer-Artola, 2016) | E-Learning system | 2530 | Spain | Students | √ | √ | √ | √ | | Didactic resources quality | Instructor attitude | Flow | Presence | | | | | | | | | |
| (Rym et al., 2013) | E-Learning system | 200 | Tunis | Employees | √ | √ | √ | √ | | Interpersonal influence | External influence | voluntariness | Content Quality | NTIC Self-efficacy | | | | | | | | |
| (Sánchez & Hueros, 2010) | E-Learning system | 226 | Spain | Students | √ | √ | √ | | √ | Technical support | Computer self-efficacy | | | | | | | | | | | |
| (Sandjojo & Wahyuningrum, 2015) | E-Learning, Blended Learning | 387 | Indonesia | Students | √ | √ | √ | √ | √ | System Quality | Information Quality | Service Quality | User Satisfaction | | | | | | | | | |
| (S. A. M. Shah, Iqbal, Janjua, & Amjad, 2013) | E-learning based course | 172 | Pakistan | Employees | √ | √ | | √ | | Learning Objectives | Demographic factors | | | | | | | | | | | |
| (G. U. D. Shah, Bhatti, Iftikhar, Qureshi, & Zaman, 2013) | E-Learning system | 400 | Pakistan | Students | √ | √ | | √ | | Information quality | Service quality | System quality | | | | | | | | | | |
| (Smith & Sivo, 2012) | E-Learning system | 517 | USA | Students | √ | √ | | √ | | Social Presence | Continuance Intention | Sociability | Gains (TREKA score) | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (Tagoe , 2012) | E-Learning system | 534 | Ghana | Students | √ | √ | √ | √ | | Access to computers | Distribution of computer usage | Students' frequency of use of the internet | | | | | | | | | | |
| (Tan et al., 2012) | E-Learning system | 401 | Malaysia | Students | √ | √ | √ | | | Gender | Subjective Norm | Past experience | Age | | | | | | | | | |
| (Tarhini et al., 2013a) | E-Learning system | 569 | Lebanon | Students | √ | √ | | √ | √ | Subjective Norm | Perceived Quality of work life | | | | | | | | | | | |
| (Tarhini et al., 2013b) | E-Learning system | 569 | Lebanon | Students | √ | √ | | √ | √ | Social norms | Quality of work life QWL | | | | | | | | | | | |
| (Tarhini, Hone, & Liu, 2014) | E-Learning system | 569 | Lebanon | Students | √ | √ | √ | √ | √ | Social norms impact | Quality of Work Life | Experience | Age | Educational level | Gender | | | | | | | |
| (Tarhini, Hone, Liu, & Tarhini, 2017) | E-Learning system | 569 | Qatar | Students | √ | √ | | √ | | Subjective Norm | Quality of work life | Power distance | Masculinity/femininity | Uncertainty avoidance | Individualism/collectivism | | | | | | | |
| (T. Teo & Zhou, 2017) | E-Learning system | 592 | China | Teachers | √ | √ | √ | √ | √ | Teachers' conceptions | Age | Gender | Teaching experience | Technology experience | Subjective norm | Facilitating conditions | Traditional conception | Constructivist conception | | | | |
| (T. Teo, 2010) | E-Learning system | 314 | Singapore | Students | √ | √ | √ | √ | | Subjective norm | Facilitating conditions | | | | | | | | | | | |
| (Theng et al., 2008) | E-Learning system (blackboard) | 451 | Singapore | Students | √ | √ | | √ | | Students' awareness | Learning by interaction | Making sense of learning | Computer self-efficacy | Students' prior experience | Easy navigation | Efficient user interface | Design patterns | | | | | |
| (Tseng & Hsia, 2008) | E-Learning system | 204 | Taiwan | Employees | √ | √ | | √ | | Computer self-efficacy | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (van Schaik * et al., 2005) | E-Learning system | 110 | Lebanon | Students | √ | √ | | √ | | Disorientation | | | | | | | | | | | | |
| (Vidanagama, 2016) | E-Learning system | 209 | Sri Lanka | Students | √ | √ | √ | √ | | Task-Technology Fit | Computer Self-efficacy | Support | IT Infrastructure | Presence of Enjoyment | Experience | | | | | | | |
| (Weibel, Stricker, & Wissmath, 2012) | E-Learning system | 72 | Switzerland | Students | √ | √ | √ | | | Flow | Satisfaction with VLC | Learning subject (bipolar scale) | | | | | | | | | | |
| (K.-T. Wong, Teo, & Goh, 2015) | E-Learning system | 156 | Australia | Students & teachers | | | | √ | | Social influence | Self - Efficacy | Performance Expectancy | Effort Expectancy | Facilitating conditions | | | | | | | | |
| (Wongvilaisakul & Lekcharoen, 2015) | E-Learning system | 420 | Thailand | Students | √ | √ | | √ | | Information quality | Functionality | Accessibility | | | | | | | | | | |
| (Yi-Cheng, Chun-Yu, Yi-Chen, & Ron-Chen, 2007) | E-Learning system | 214 | Taiwan | Students | √ | √ | | √ | √ | Perceived Enjoyment | System features | Characteristics of teaching materials | Self-Efficacy | Internet Experience | Computer Anxiety | Age | Affect | | | | | |
| (Yuen & Ma, 2008) | E-Learning system | 152 | China | Teachers | √ | √ | | | | Intension | Subjective norm | Computer self-efficacy | | | | | | | | | | |
| (Zanjani, Vali, & Ramazani, 2012) | E-Learning system | 103 | Iran | Students & teachers | √ | √ | | | √ | Computer Self-efficacy | | | | | | | | | | | | |
| (Zhao & Tan, 2010) | E-Learning system | 161 | China & Canada | Students | √ | √ | | √ | | Enjoyment | | | | | | | | | | | | |

**Table 4:** A total of 120 studies have been carried out using the extended TAM to describe the E-learning system (Abdullah & Ward, 2016).

## 2.8 Summary

This chapter has the following objectives: 1) systematically review the latest E-learning adoption or acceptance systems findings which have employed extended TAM. 2) identify the widely employed external factors from the given findings. 3) identify the strengths of the relationship amongst the widely utilized external factors and the TAM's variables of E-learning systems. 4) put forward extended TAM for E-learning. From the past 12 years, 120 research papers were analyzed in this study, which engaged extended TAM for E-learning adoption or acceptance systems. A total of 239 external factors of TAM were included in the mentioned studies. We decided to select those external factors that were confirmed in as minimum 4 studies to identify the widely employed external factors of TAM and to be self-assured regarding the association between the external factors and TAM constructs. Therefore, the most extensively used external factors were (*Computer self-efficacy, Subjective/ Social norm, Enjoyment, System Quality, Information Quality, Content Quality, Accessibility, and Computer Playfulness*).

# Chapter Three

# Research model and hypothesis

## 3.1 Overview

According to the findings, TAM is found to be a valid and robust model that is used extensively; however, it is applicable to an even wider context. To assess those conditions under which different outcomes may be exhibited by TAM, a moderator analysis of user types and usage types was carried out. It was deduced in the study that students may be used as substitutes for professionals in certain TAM studies, and possibly even in a general context. The worth of meta-analysis as a rigorous substitute for qualitative and narrative literature review techniques was also shown. These results may offer information to researchers and educators regarding the research trends of E-learning. The result revealed that (*Computer self-efficacy, Subjective/ Social norm, Enjoyment, System Quality, Information Quality, Content Quality, Accessibility, and Computer Playfulness*) were considered to be the most extensively used external factors. The purpose of this chapter is to develop the hypotheses, research model, and the relationship between the most extensively used external factors and TAM's variables (PEOU, PU, ATT, BI, and AU).

## 3.2 Research framework and hypothesis

### 3.2.1 System characteristics

The category, system characteristics, includes the components of content quality (CQ), information quality (IQ), and system quality (SQ) (C.-T. Chang, Hajiyev, & Su, 2017; Motaghian, Hassanzadeh, & Moghadam, 2013).

#### 3.2.1.1 System quality (SQ)

The system quality (SQ) determines the way that the system characteristics like usability, reliability, availability, and adaptability influence the outlooks of the users with respect to the use of e-learning system (Davis, 1989). Research indicated that SQ characteristics have a crucial role in adopting and using an e-learning system (Bhuasiri, Xaymoungkhoun, Zo, Rho, & Ciganek, 2012). Previous studies found that SQ has a positive impact on perceived ease of use of e-learning (Rym et al., 2013). Besides, it was also found that SQ has a positive effect on perceived usefulness of e-learning (Al-Busaidi, 2013). Therefore, the following hypotheses were formulated:

**H1a1:** System quality (SQ) has a positive effect on the perceived usefulness (PU) of e-learning system.

**H1a2:** System quality (SQ) has a positive effect on the perceived ease of use (PEOU) of e-learning system.

#### 3.2.1.2 Content quality (CQ)

It has been asserted by (Al-Busaidi, 2013; Al-hawari & Mouakket, 2010; Alshammari et al., 2016; Baleghi-Zadeh et al., 2014; Krishnan & Hussin, 2017; Tan, Ooi, Sim, & Phusavat, 2012; Tarhini, Hone, & Liu, 2013a, 2013b; van Schaik*, Barker, & Moukadem, 2005) that the content quality (CQ) aspect in e-learning signifies the depth and frequent updates of the content. CQ is a significant factor that describes e-learning acceptance or adoption (Abdullah & Ward, 2016). It has been determined in previous research that there is a significant impact of content quality on perceived usefulness (Abdullah & Ward, 2016). In addition, previous studies also found that there is a positive relation between CQ and the perceived ease of use

of an e-learning system (Abdullah & Ward, 2016). Therefore, the following hypotheses were formulated:

**H1b1:** Content quality (CQ) has a positive effect on the perceived usefulness (PU) of e-learning system.

**H1b2:** Content quality (CQ) has a positive effect on the perceived ease of use (PEOU) of e-learning system.

#### 3.2.1.3 Information quality (IQ)

Information quality (IQ) refers to "using e-learning for seeking information that may be important for learning and which is updated, so as to make it easier for the learner to comprehend it" (Wu et al., 2012). Information quality also refers to the "users' belief regarding the quality of information given on a Website" (Abbad, Morris, Al-Ayyoub, & Abbad, 2009) or "the degree to which the customer receives complete, precise and well-timed information over the electronic service interface" (T. Abbas & Abbas, 2016). It was found in previous e-learning research that there was a significant effect of information quality on the perceived ease of use (T. M. Abbas, 2017). Moreover, previous research also found that there is a positive relation between IQ and the perceived usefulness of an e-learning system (T. M. Abbas, Jones, & Hussien, 2016). Therefore, the following hypotheses were developed:

**H1c1:** Information quality (IQ) has a positive effect on the perceived usefulness (PU) of e-learning system.

**H1c2:** Information quality (IQ) has a positive effect on the perceived ease of use (PEOU) of e-learning system.

### 3.2.2 External factors

#### 3.2.2.1 Computer self-efficacy (CSE)

According to (Adewole-Odeshi, 2014), self-efficacy is "the individuals' confidence in their own capacity to take steps needed to deal with future situations". In this study, self-efficacy is related to computer systems (i.e., the confidence exhibited by the users in their own ability to use the e-learning system). According to (Akman & Turhan, 2017), a significant part is performed by computer self-efficacy (CSE) in determining the feelings and behavior of an individual. In that, it is stated that high efficacy expectations have higher chances of leading to success in a particular task. By analyzing the e-learning literature (as shown in Table 3), computer self-efficacy was found as the most widely employed external factor of TAM. It was revealed in various empirical studies that computer self-efficacy had a significant impact on the perceived usefulness, perceived ease of use of the e-learning system (Al-Ammary, Al-Sherooqi, & Al-Sherooqi, 2014). Hence, we hypothesize the following:

**H2a1:** Computer self-efficacy (CSE) has a positive effect on the perceived usefulness (PU) of the e-learning system.

**H2a2:** Computer self-efficacy (CSE) has a positive effect on the perceived ease of use (PEOU) of the e-learning system.

#### 3.2.2.2 Subjective norm (SN)

Subjective norm (SN) is considered a part of the social influence variables and signifies the perceived social pressure to carry out or avoid carrying out a behavior (Al-Aulamie, 2013). The subjective norm refers to "the person's perception that most people who are important to him or her think he or she should or should not perform the behavior in question" (Al-Busaidi, 2013). In certain situations, it is likely that people may employ a system to conform to the requirements of other people, instead of focusing on their personal emotions and beliefs (Alenezi, Abdul Karim, & Veloo, 2011). There have been extensive studies on the way subjective norm affects the learners' e-learning adoption or acceptance. In a study carried out by (Al-Gahtani, 2016), it was indicated that there was a significant impact of subjective norm on the perceived usefulness, perceived ease of use of e-learning system. Therefore, this leads to the following hypotheses:

**H3a1:** Subjective norm (SN) has a positive effect on the perceived usefulness (PU) of e-learning system.

**H3a2:** Subjective norm (SN) has a positive effect on the perceived ease of use (PEOU) of e-learning system.

#### 3.2.2.3 Perceived enjoyment (PE)

Perceived enjoyment (PE) is explained by (Alharbi & Drew, 2014) as "the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use". Several researchers have been intrigued by

enjoyment in the studies of technology acceptance as there may be a positive influence of the intrinsic variables on the perception of users (Al-hawari & Mouakket, 2010). The feeling of enjoyment when working on a new system can lead to a decrease in the perception of effort being put in by the user (Alia, 2016). Hence, perceived enjoyment is a significant factor that explains e-learning adoption or acceptance. It was demonstrated in previous research that perceived enjoyment has a significant effect on perceived ease of use (Alkharang, 2014) and perceived usefulness (Almaiah et al., 2016) of e-learning. When the student is aware that working on an e-learning system is enjoyable, there is a greater chance that s/he will have a positive impact on the usefulness and ease of use of such system (Al-Mushasha, 2013). Hence, the following hypotheses were developed:

**H4a1:** Perceived enjoyment (PE) has a positive effect on the perceived ease of use (PEOU) of e-learning system.

**H4a2:** Perceived enjoyment (PE) has a positive effect on the perceived usefulness (PU) of e-learning system.

#### 3.2.2.4 Perceived accessibility (PA)

Perceived accessibility (PA) refers to "the degree of ease of how a user can access and use the information and extracted from the system" (Alsabawy, Cater-Steel, & Soar, 2016). It was stated by (Alshammari et al., 2016) that system accessibility signifies the degree of ease which allows students to access and adopt the e-learning system. It was suggested that the higher the accessibility of the e-learning system, the greater the students perceive the system as easy to use (Arteaga Sánchez, Duarte Hueros, & García Ordaz, 2013). According to (Attis, 2014), system accessibility provides a direct indication of the perceived ease of use of a website. It was shown by (Ayodele, Oga, Bundot, & Ogbari, 2016) that there is a significant

impact of accessibility on perceived ease of use of e-learning system. The results of previous research demonstrated that there was a significant effect of perceived accessibility on perceived ease of use (Bachtiar, Rachmadi, & Pradana, 2014) as well as on perceived usefulness (Baleghi-Zadeh et al., 2014) of e-learning system. When the student considers the e-learning system to be accessible, there is a greater chance that s/he will have a positive impact on the usefulness and ease of use of such system (Boateng et al., 2016). Therefore, we hypothesize the following:

**H5a1:** Perceived accessibility (PA) has a positive effect on the perceived ease of use (PEOU) of e-learning system.

**H5a2:** Perceived accessibility (PA) has a positive effect on the perceived usefulness (PU) of e-learning system.

#### 3.2.2.5 Perceived playfulness (PP)

Perceived playfulness (PP) refers to "the degree of cognitive spontaneity in microcomputer interaction" (Calisir, Altin Gumussoy, Bayraktaroglu, & Karaali, 2014). Concepts like examination, discovery, curiosity, and difficulty are considered as a part of the term playfulness (Capece & Campisi, 2013). The term signifies the intrinsic motivation factor which is related to the use of a new system (C.-C. Chang, Tseng, Liang, & Yan, 2013). (C.-T. Chang et al., 2017) stated that the individual's playfulness is essential when the system acceptance is in the initial phases. According to a previous study conducted by (Y.-M. Cheng, 2014), perceived playfulness has a strong relation with perceived ease of use and perceived usefulness. Therefore, the following hypotheses were developed:

**H6a1:** Perceived playfulness (PP) has a positive effect on the perceived usefulness (PU) of e-learning system.

**H6a2:** Perceived playfulness (PP) has a positive effect on the perceived ease of use (PEOU) of e-learning system.

### 3.2.3 The technology acceptance model (TAM) constructs

On the basis of the extended TAM (as shown in Figure 2), the correlation between the users' beliefs are explained in detail as follows.

#### 3.2.3.1 Perceived ease of use (PEOU)

The perceived ease of use (PEOU) of a system refers the degree to which an individual perceives that the use of a specific technology would not be complicated (Y. Cheng, 2011). It has been shown in several studies carried out in the past that the PEOU has a positive relationship with the Behavioral Intention to Use (BI), directly as well as indirectly (Y.-M. Cheng, 2012). With respect to e-learning, PEOU is referred to the extent to which a student is of the view that using e-learning system will not require a lot of efforts and will be easy to use. The interaction between students and e-learning is clear and comprehensible (B. Cheng, Wang, Moormann, Olaniran, & Chen, 2012). Similarly, PEOU will influence the student's intention to directly or indirectly accept the e-learning system through the Perceived usefulness (PU). In that, there is a significant positive association between PEOU and BI. Thus, this leads to the following hypothesis:

**H10:** Perceived ease of use (PEOU) has a positive effect on the behavioral intention (BI) to use the e-learning system.

Also, it was demonstrated in the earlier research that there was a significant effect of PEOU on perceived usefulness (PU) (Cheung & Vogel, 2013). Based on that, we hypothesize the following:

**H7:** Perceived ease of use (PEOU) has a positive effect on the Perceived usefulness (PU) of the e-learning system.

In addition, previous research indicated that there is positive relation between PEOU and the attitudes toward the use of e-learning system (Chiang, Boakye, & Tang, 2017). Hence, the following hypothesis is put forward:

**H8:** Perceived ease of use (PEOU) has a positive effect on attitude towards the use (ATT) of e-learning system.

#### 3.2.3.2 Perceived usefulness (PU)

Perceived usefulness (PU) refers to the degree to which individuals expect the use of a new technology can improve their job performance (Chinyamurindi & Shava, 2015). Various empirical studies have indicated that PU is the primary determinant of the use of a specific technology (Chow, Herold, Choo, & Chan, 2012). The e-learning system can be considered as a tool of information technology, and the system will only be accepted by the students when they perceive that its use is going to improve their learning performance. Hence, with respect to the e-learning, PU signifies the degree to which students are of the view that the use of the e-learning system is going to enhance their learning performance. Therefore, PU is going to have an impact on their intention to directly or indirectly (through PEOU) accept and adopt the e-learning system. Previous e-learning studies indicated that there was a significant positive correlation between perceived usefulness (PU) and the intention to use

the e-learning system (BI) (Chu & Chen, 2016). Hence, the following hypothesis is developed:

**H11:** Perceived usefulness (PU) has a positive effect on the behavioral intention (BI) to use the e-learning system.

Additionally, the degree to which an individual perceives the system to meet the task requirements is determined by PU. It was suggested by (Damnjanovic et al., 2015) that PU influences the attitude towards the use of an innovation as the usefulness of an innovation affects an individual's interest and the actual use of that innovation (Deshpande et al., 2012). Therefore, it was stated by (Elkaseh, Wong, & Fung, 2015) that a high degree of PU would lead to a more positive attitude. There is strong empirical support for the correlation between PU and the attitude towards the use in the previous studies (Elkaseh, Wong, & Fung, 2016)**.** Hence, the following hypothesis is developed:

**H9:** Perceived usefulness (PU) has a positive effect on the attitude towards the use (ATT) of the e-learning system.

#### 3.2.3.3 Attitude towards use (ATT)

Attitude refers to "the degree to which a person has a positive or negative feeling towards e-learning systems" (Escobar-Rodriguez & Monge-Lozano, 2012). It has been shown by various studies (Farahat, 2012) that attitude has a direct impact on behavioral intention. Hence, to determine the way the attitude of students affects their acceptance and use of e-learning system, the following hypothesis is developed:

**H12:** Attitude towards use (ATT) has a positive effect on the behavioral intention (BI) to use the e-learning system.

### 3.2.3.4 Behavioral intention to use (BI)

It was stated by (Fathema, Shannon, & Ross, 2015) that Behavioral intention (BI) refers to the intent of the learners to employ e-learning systems, and involves persistent use from the present to the future. It has been shown by various studies (Ghosh, 2016) that behavioral intention to use directly and significantly influences the actual system use (AU) of e-learning. Hence, the hypothesis given below is put forward:

**H13:** The behavioral intention to use (BI) has a positive effect on the actual use (AU) of e-learning system.

From the above hypotheses based on the extended TAM model for E-learning acceptance among student, we construct the following research model (**Figure 2**).

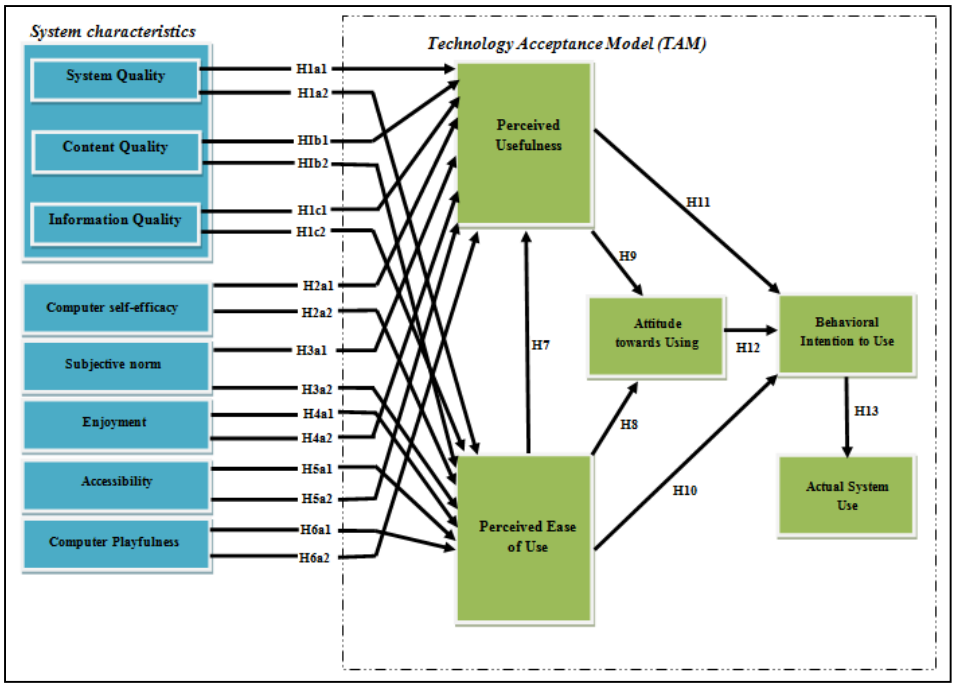

**Figure 2.** Research Model

# Chapter Four

# Research Methodology

## 4.1 Abstract

In this chapter, the methodology used to analyze the students' attitudes and acceptance of electronic learning (E-learning) systems in the higher educational segment of the UAE Universities has been explained. A theoretical framework was put forward in this study, which consists of the core constructs in TAM, i.e. perceived usefulness, perceived ease of use, attitude towards usage, intention to use, and actual use of the E-learning systems. The study also considered additional external factors, which comprised of (*Computer self-efficacy, Subjective/ Social norm, Enjoyment, System Quality, Information Quality, Content Quality, Accessibility, and Computer Playfulness*). The participants were chosen from five universities which have successfully implemented E-learning systems. The total number of questionnaires collected was four hundred and thirty-five. Structure equation modeling (SEM) was used to examine the research hypotheses. In this study, the location used for collecting data has also been discussed. The study participants are presented and the students' surveys structures are explained in detail.

## 4.2 Research Methodology

This study seeks to examine the attitudes of students towards the use of E-learning in the higher educational setting in the universities of the UAE region. When students' attitudes are comprehended, the strengths and weaknesses can be determined and the infrastructure needed can be suitably developed. Attitudes help in determining if the students are willing to

employ E-learning systems in the learning/education process. In this study, a quantitative approach is put forward that uses two questionnaire surveys: self-administered survey questionnaire distributed among the students in The British University in Dubai and University of Fujairah and online questionnaire was also employed in this study and was distributed among the students in Abu Dhabi School of Management , Skyline University College, and MENA College of Management (MCM).

### 4.3 Target population

The target population of this study is the students enrolled at five different universities in the UAE (i.e., Abu Dhabi School of Management, Skyline University College, University of Fujairah, The British University in Dubai, and MENA College of Management (MCM)). The sample was chosen based on the availability of students. According to the statistics obtained from the five universities, there were 5000 enrolled students at the time of data collection. With reference to (Govender & Rootman-le Grange, 2015), the minimum sample size for a population of 5000 is 357. Based on that, the questionnaire surveys were distributed among the students in the five mentioned universities.

### 4.4 Data Collection

Data collection took place from 07.9.2017 to 30.11.2017 while the fall semester 2017/2018 was in progress among the students in The British University in Dubai and University of Fujairah and with the help of self-administered survey questionnaire. On the whole, 300 questionnaires were circulated randomly, out of which 221 questionnaires were returned, giving a response rate of 73.6 percent. Out of these, 79 questionnaires were not considered because they included a large number of missing values. Subsequently, 221 usable questionnaires were evaluated, providing a usable response rate of 73.6 percent. An online

questionnaire was also employed in this study and was distributed among the students in Abu Dhabi School of Management , Skyline University College, and MENA College of Management (MCM). Google forms survey was used for gathering the research data, and the survey was distributed through email to all the target recipients. The analysis included 214 complete questionnaires that were used for evaluating the conceptual model.

On the whole, 435 responses were obtained that had all valid responses. This is considered to be an acceptable sample size as stated by (Krejcie & Morgan, 1970) that an approximate sampling size for a population of 5000 in 357 respondents. In this case, the sample size is 435, which is greater than the least requirements; hence, this sample size is acceptable and analysis can be carried out using structural equation modeling (Chuan & Penyelidikan, 2006) to test the hypotheses developed. The hypotheses were developed on the basis of prevailing theories and were pertinent to the E-learning context. The measurement model, validity, reliability, and model fit were evaluated using structural equation modeling (SEM) (Smart PLS Version 3.2.7), which was preceded by the final path model. The extensive details of the data collected are shown in Table 5.

| University | No. of students |
|---|---|
| The British University in Dubai | 135 |
| University of Fujairah | 86 |
| Skyline University College | 77 |
| Abu Dhabi School of Management (ADSM) | 83 |
| MENA College of Management (MCM) | 54 |
| **Total** | **435** |

**Table 5.** Participants details

## 4.5 Questionnaire Pilot Study

Prior to conduct the final survey, a pilot study was carried out to measure the reliability of the questionnaire items. For this study, 50 students were randomly selected from the target population. The Cronbach's alpha was used to measure the internal reliability of the constructs' items. According to (Alrawashdeh, Firstauthor, & Secondcoauthor, n.d.), a reliability coefficient of 0.70 or above is deemed to be acceptable. In this study, the Cronbach's alpha values for all the constructs were above 0.7 as shown in Table 6. Therefore, all the constructs were reliable, and hence, they can be used in the final study.

| Construct | Cronbach's alpha |
|---|---|
| System Quality | **0.921** |
| Content Quality | **0.974** |
| Information Quality | **0.868** |
| Computer self-efficacy | **0.844** |
| Subjective norm | **0.838** |
| Enjoyment | **0.899** |
| Accessibility | **0.892** |
| Computer Playfulness | **0.891** |
| Perceived Usefulness | **0.828** |
| Perceived Ease of Use | **0.897** |

| | |
|---|---|
| Attitude towards | **0.873** |
| Behavioral Intention to Use | **0.866** |
| Actual Use | **0.925** |

**Table 6:** Questionnairerely on survey measurement scale Cronbach's alpha

The table given above shows that the thirteen measurement scales of the questionnaire are reliable, and hence, they may be used in the study.

### 4.6 Study Instrument

To test the hypothesis presented in the research, a survey instrument was developed. The survey involved 30 items to measure the thirteen constructs in the questionnaire. Table 7 presents the sources of these constructs. The questions from the earlier studies were modified to make them consistent with the requirements of the current study.

| Constructs | Number of items | Source |
|---|---|---|
| Accessibility | 3 | (Martínez-Torres et al., 2008; Park, 2009) |
| Actual Use | 3 | (Cheung & Vogel, 2013; Martínez-Torres et al., 2008; Mohammadi, 2015) |
| Attitude towards | 3 | (Alia, 2016; Fathema et al., 2015; Rym et al., 2013; Sánchez & Hueros, 2010) |
| Behavioral Intention to Use | 3 | (Fathema et al., 2015; Rym et al., 2013) |
| Computer Playfulness | 3 | (B.-C. Lee et al., 2009; Venkatesh & Bala, 2008) |
| Computer self-efficacy | 3 | (Y.-C. Lin et al., 2010; Park, 2009; Rym et al., 2013) |
| Content Quality | 3 | (Almaiah et al., 2016; Y.-M. Cheng, 2012; Y.-C. Lee, 2006; Rym |

| | | |
|---|---|---|
| | | et al., 2013) |
| Enjoyment | 3 | (C.-T. Chang et al., 2017; Y. Cheng, 2011; Y.-C. Lin et al., 2010; Martínez-Torres et al., 2008) |
| Information Quality | 3 | (Alsabawy et al., 2016; Mohammadi, 2015; Roca et al., 2006) |
| Perceived Ease of Use | 3 | (Fathema et al., 2015; Martínez-Torres et al., 2008; Ong & Lai, 2006; Park, 2009) |
| Perceived Usefulness | 3 | (C.-T. Chang et al., 2017; Fathema et al., 2015; Martínez-Torres et al., 2008; Ong & Lai, 2006; Roca et al., 2006) |
| Subjective norm | 4 | (Alkharang, 2014; C.-T. Chang et al., 2017; Tarhini et al., 2013a) |
| System Quality | 3 | (Aixia & Wang, 2011; Fathema et al., 2015; Sandjojo & Wahyuningrum, 2015) |

**Table 7: Constructs and their sources**

### 4.7 Survey Structure

A questionnaire survey was developed and disseminated among the students. There were eight sections in the survey. The first section consists of the personal data of the participants. There are nine items in the second section which signify t general questions pertaining to the E-learning system. There are eight items in the third section which signify the E-learning system quality. In the fourth section, there are three items which indicate self-efficacy though the E-learning system. There are four items in the fifth section that signify subjective norm or social influences. Lastly, the final section includes two items that signify computer playfulness. To measure the 30 items, a five-point Likert scale has been used, that includes the measures strongly agree (5), agree (4), neutral (3), disagree (2), and strongly disagree (1)

.

## 4.8 Summary

This chapter deals with the research questions pertaining to attitudes and acceptance of students with respect to electronic learning (E-learning) systems in the higher educational sector in UAE universities. The study adopts a quantitative methodology as it uses questionnaire survey. Five universities from the UAE have been selected for obtaining the data. The study participants include 435 students. The survey structures of the students are explained in detail as follows.

# Chapter Five

# Discussion of the Results

## 5.1 Overview

In this chapter, the extended technology acceptance model (TAM) was examined by analysing the data that has been gathered. There has been successful use of structural equation modelling (SEM) (*SmartPLS Version 3.2.7*) with IBM SPSS Statistics software (*ver. 23*) to obtain the demographic data. Initially, structural model (Inner model) and measurement model (Outer model) is going to be put forward with constructs and indicators. Furthermore, the measurement model will be succeeded by the structural model assessment and final model presentation. According to the findings, TAM was a good theoretical method for comprehending users' acceptance of E-learning.

### 5.1.1 Students' personal information / Demographic Data

The personal/demographic data has been summarized in Table 8. The percentage of the female students was 54% while only 46% was males. 55% of the students age ranges between 18 and 29 while this percentage is very from those who are above 29 (45%). 36% of the students were from IT major while students in Business Management, engineering, science, law, education and humanities were 27%, 9%, 3%, 3%, 16% and 0.5% respectively. Most of the respondents of the study have a sound education background and are university graduates. 38% individuals had a bachelor degree, 35% had a master degree, and 16% had a doctoral degree, while the remaining had obtained some kind of diploma and diploma/advanced education. In the Figure 7 presented below, the distribution of

respondents' education is illustrated graphically: 60% of the respondents utilized Blackboard system, while 40% of the respondents used Moodel system.

According to (Al-Emran & Salloum, 2017), the "purposive sampling approach" was employed when the participants were easily accessible and were ready to be involved in the research. Students from various colleges, studying at different levels and having different ages were part of the study sample. IBM SPSS Statistics ver. 23 was used to assess the demographic data. Table 8 presents the complete demographic data of the respondents.

| Variables | Answers | Frequency | Percentage % |
|---|---|---|---|
| Gender | Female | 237 | 54.5 % |
| | Male | 198 | 45.5 % |
| Age | 18 to 29 | 239 | 54.9 % |
| | 30 to 39 | 153 | 35.2 % |
| | 40 to 49 | 37 | 08.5 % |
| | 50 to 59 | 6 | 01.4 % |
| | Above 60 | 0 | 0 % |
| College | College of Business and Economics | 118 | 27.1 % |
| | College of Humanities and Social Sciences | 22 | 05.1 % |
| | College of Information Technology | 158 | 36.3 % |
| | College of Engineering | 41 | 09.4 % |
| | College of Education | 70 | 16.1 % |
| | College of Law | 13 | 03.0 % |
| | College of Science | 13 | 03.0 % |
| Level of education | Diploma | 26 | 6.0 % |
| | Advanced Diploma | 22 | 5.0 % |
| | Bachelor | 166 | 38.2 % |
| | Master | 154 | 35.4 % |
| | Doctorate | 67 | 15.4% |
| Type of e-learning system | Blackboard | 260 | 60 % |
| | Moodle | 175 | 40 % |

**Table 8: Students' demographic data**

Of the 435 respondents, 237 (54 %) were females and 198 (46 %) were males. The gender distribution is shown in figure 3.

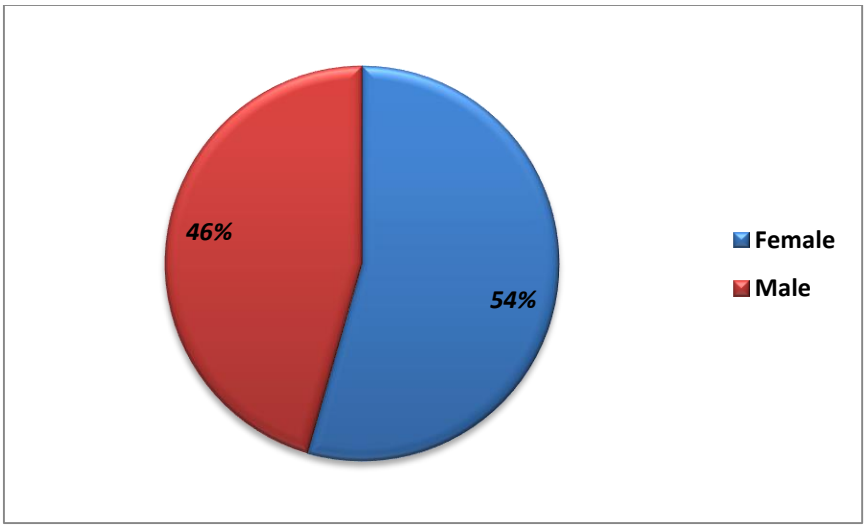


**Figure 3: Gender Age distribution**

The respondent ages fell in the category of 18 years to 59 years and above. 55% of the respondents were the ages of 18 and 29; 35 % were between ages of 30 and 39; 9% of the respondents were aged between 40 to 49; 1% were between ages of 50-59. It is evident from the age assessment that most of the respondents in sample are younger. A graphical representation of the age distribution of the respondents is demonstrated in figure 4.

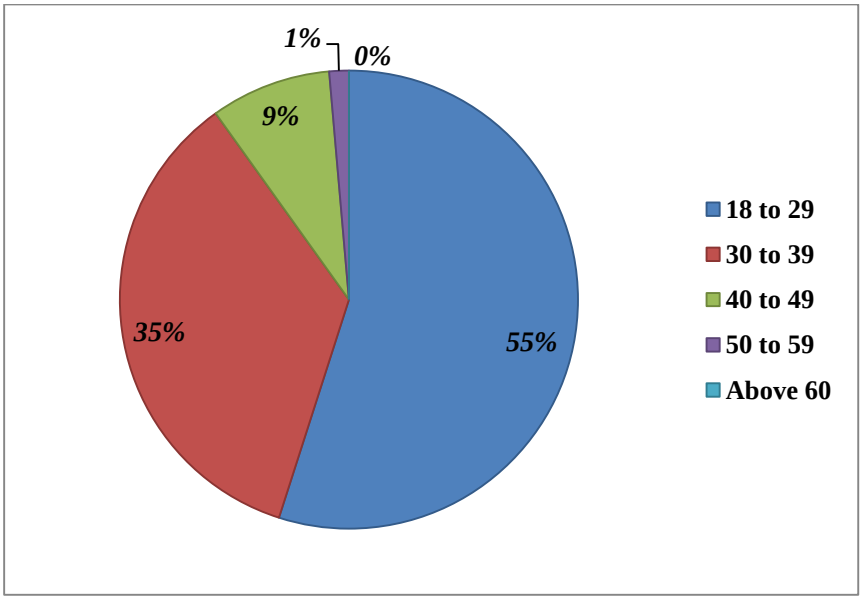


**Figure 4: Age Group distribution**

The analysis of the respondent colleges specifies that 36% of the respondents from the college of Information Technology and 27% from the college of business and economics. 16% of the total respondents belonged to the college of engineering, college of science and college of law while 5% for college of humanities and social sciences. A graphical representation of the distribution of respondents in college grouping is demonstrated in (Figure 5) .

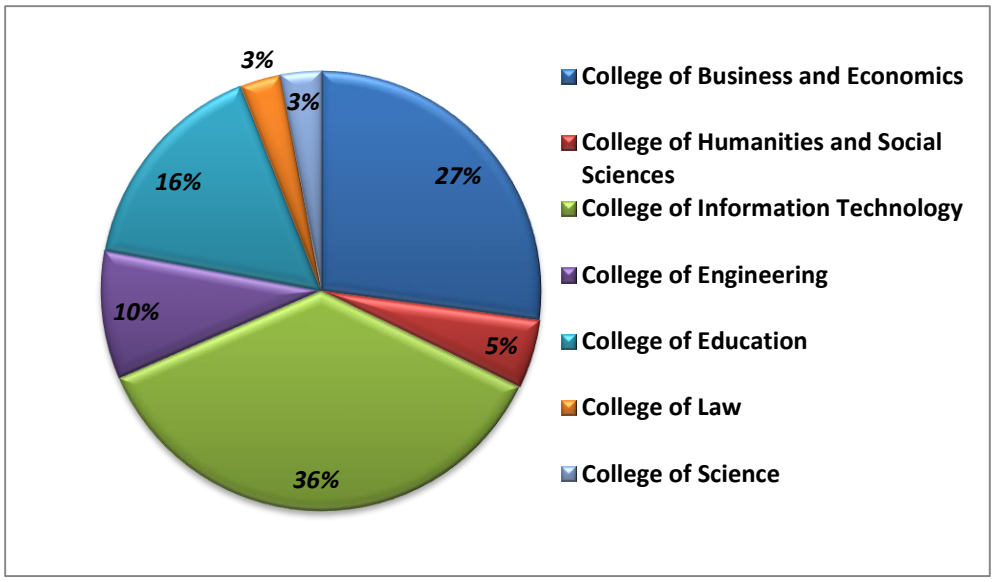


**Figure 5: Students' college distribution**

The majority of the respondents had educated background with most of them having university degrees. 38% individuals had a bachelor degree while 35% held a master degree, 16% of the respondents had a doctoral degree while remaining respondents had diploma/advanced education. Figure 6 presented below offers a graphical illustration of the classification of the respondents with respect to education.

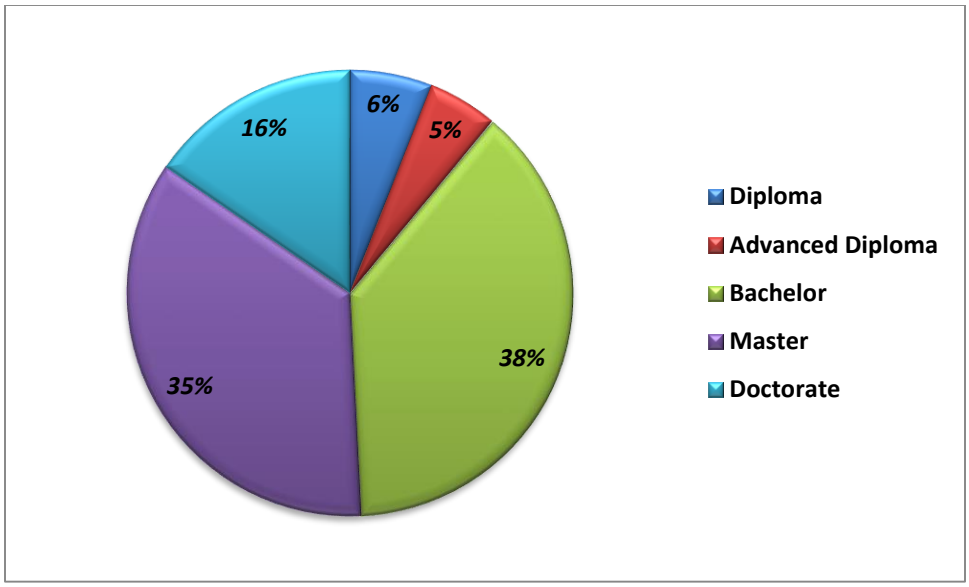


**Figure 6: Education category distribution**

60% of the respondents used Blackboard E-learnng system, while 40% reported using Moodel E-learning system,

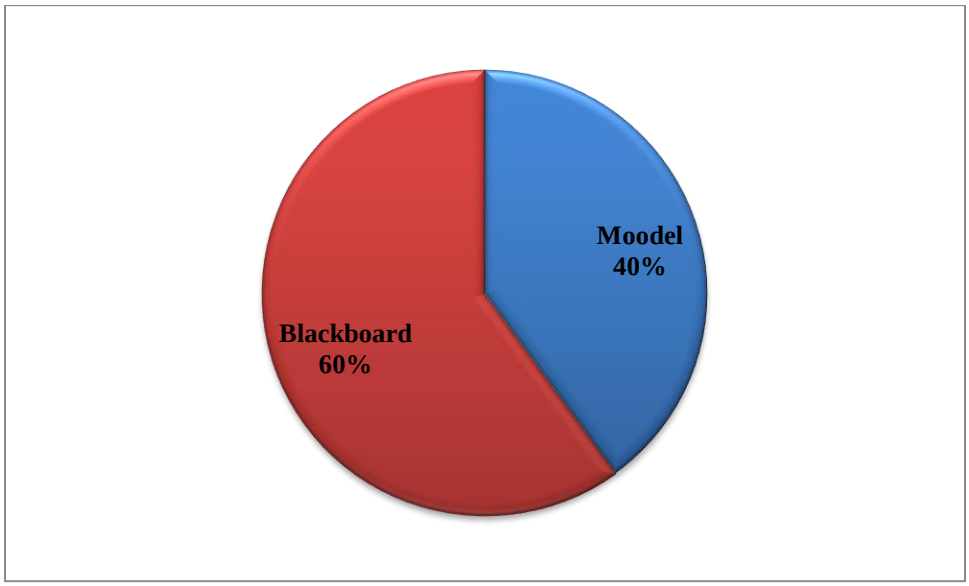


**Figure 7: E-learning system category**

E-learning will play an important part in formulating teaching and learning techniques for higher education. However, it is possible to effectively apply E-learning to higher education only in the presence of user acceptance for the technology. Hence, the purpose of this study is to evaluate those factors which have an impact on the intention of university students to accept E-learning. This study presents a model to determine the factors that have an impact on the acceptance of E-learning in higher education and to determine if eight external factors (*Computer self-efficacy, Subjective/ Social norm, Enjoyment, System Quality, Information Quality, Content Quality, Accessibility, and Computer Playfulness*) influence E-learning acceptance in any way or not. A structural equation model was used to evaluate the data collected from 435 participants.

## 5.2 Partial least square analysis methodology

### 5.2.1 Assessment of the measurement model (Outer model)

The use of Smart PLS for Partial Least Squares Structural Equation Modeling (PLS-SEM), a software developed by (Ringle, Wende, & Will, 2005) , is quite prevalent. Due to it being freely available to academics and researchers and having a friendly user-interface and advanced reporting features, its prevalence has increased since it was launched in 2005 (K. K.-K. Wong, 2013). The association between the indicators and latent construct that is being measured is described by the measurement model. There are two kinds of validities that are needed for evaluating the measurement model; which are the convergent validity and discriminate validity (Chin, 1998). The degree to which theoretically similar constructs are related to each other is given by convergent validity, while the degree to which there are

differences between two constructs is given by discriminate validity. These two validities together offer some proof of the goodness of fit of the measurement model.

#### 5.2.1.1 Convergent validity

Two methods were taken in to account to evaluate convergent validity. The loadings of the individual measures were analyzed first with respect to their corresponding constructs, followed by determining the composite reliabilities. To find out convergent validity, Partial Least Squares (Smart PLS ver. 3.2.6) was used. Two different kinds of analyses were performed, where the initial PLS operation that employed boot strapping method with 300 resamples created loadings, average variance extracted (AVE), weights, t-values and composite reliabilities for every measurement item corresponding to its hypothesized construct. For each measurement item, the loadings were evaluated, the findings of which demonstrated that a higher value was obtained for loadings of every item instead of the suggested value of 0.70 (Chin, 1998; Hair Jr, Hult, Ringle, & Sarstedt, 2016).

It was exhibited that the loadings for the measurement items were very high in contrast to the recommended value of 0.70. Item loadings of 0.70 or higher indicates that the measurement item and its hypothesized construct share more than 50% of the variance. Table 9 shows the subsequent number of items for every construct, average variance extracted and composite reliabilities. The internal consistency is satisfactory since the composite reliability values are greater than 0.80. It is demonstrated in Table 9 that the values of composite reliabilities are between **0.822** and **0.984**, which are more than the recommended value of **0.80**, while majority of them are over **0.80**. As all the variables have their values of Cronbach's alpha above .55, all of them meet the first measure of being reliable as demonstrated in Table 9.

| Constructs | Items | Factor Loading | Cronbach's Alpha | CR | AVE |
|---|---|---|---|---|---|
| System quality | SQ_1 | 0.961 | 0.842 | 0.923 | 0.856 |
| | SQ_2 | 0.888 | | | |
| Content quality | CQ_1 | 0.973 | 0.976 | 0.984 | 0.954 |
| | CQ_2 | 0.979 | | | |
| | CQ_3 | 0.979 | | | |
| Information quality | IQ_1 | 0.886 | 0.742 | 0.862 | 0.758 |
| | IQ_2 | 0.855 | | | |
| Computer self-efficacy | CSE1 | 0.897 | 0.721 | 0.846 | 0.733 |
| | CSE2 | 0.813 | | | |
| Subjective norm | SN1 | 0.709 | 0.724 | 0.828 | 0.547 |
| | SN2 | 0.704 | | | |
| | SN3 | 0.771 | | | |
| | SN4 | 0.770 | | | |
| Perceived enjoyment | PE1 | 0.908 | 0.772 | 0.898 | 0.814 |
| | PE2 | 0.908 | | | |
| Accessibility | AC1 | 0.744 | 0.759 | 0.828 | 0.709 |
| | AC2 | 0.930 | | | |
| Computer playfulness | CP1 | 0.912 | 0.749 | 0.888 | 0.798 |
| | CP2 | 0.875 | | | |
| Perceived usefulness | PU_1 | 0.890 | 0.677 | 0.822 | 0.698 |
| | PU_2 | 0.778 | | | |
| Perceived ease of use | PEOU_1 | 0.973 | 0.928 | 0.965 | 0.932 |
| | PEOU_2 | 0.958 | | | |
| Attitude towards use | ATT_1 | 0.894 | 0.749 | 0.889 | 0.800 |
| | ATT_2 | 0.895 | | | |
| Behavioral intention to use | BI_1 | 0.934 | 0.831 | 0.897 | 0.745 |
| | BI_2 | 0.860 | | | |
| | BI_3 | 0.791 | | | |
| Actual use | AU_1 | 0.945 | 0.842 | 0.926 | 0.862 |
| | AU_2 | 0.912 | | | |

**Table 9:** Convergent validity results which assures acceptable values (Factor loading, Cronbach's Alpha, composite reliability ≥ 0.70 & AVE > 0.5).

#### 5.2.1.2 Discriminate validity

The degree to which one construct differs from all other constructs in the research model is determined by means of discriminate validity (Chin, 1998). Discriminate validity was examined using two processes. The correlations of the latent variable measurements with the measurement items were analyzed. To determine discriminate validity, the constructing measures could be differentiated from each other. Powerful loading should be depicted by

these measures with respect to their hypothesized construct instead of other constructs in the research model, indicating that the loadings should be higher compared to the cross loadings.

To guarantee that there is a greater variance of every construct with its measures when compared to the other latent constructs in the research model, the average variance extracted (AVE) is evaluated. Usually, square root of the AVE for a specific construct should normally behigher when compared to the variance that is common between the construct and other constructs in the model**,** and it should be greater than the suggested value of 0.5 (Fornell & Larcker, 1981). It is recommended that the construct founds a minimum of 50% of the measurement variance when the AVE value is more than 0.5. Partial Least Squares (*SmartPLS ver. 3.2.6*) was used to evaluate the discriminate value. Table 11 includes the loadings and cross-loadings. It is demonstrated by an in depth analysis of the loadings and cross-loadings that the each of the measurement items load broadly on their individual latent constructs instead of loading on other constructs (W. T. Cheng & Chen, 2015).

The AVE analysis can be seen in Table 10. The square root of the AVE scores are shown in the bold diagonal constituents of the table, while the correlations between the constructs are shown by the off load diagonal constituents. The table shows that the square root of the AVE values remains higher as compared to the suggested value of 0.5 by being in the range of 0.71 and 0.95. The AVE is provocatively higher compared to any correlations with the construct (Hair Jr et al., 2016)**,** which clearly denotes a greater variance of all constructs with their individual measures, rather than with other constructs in the model, leading to discriminate validity.

#### 5.2.1.3 Heterotrait-Monotrait Ratio of Correlations (HTMT)

The Heterotrait-monotrait ratio of the correlations (HTMT) technique has been put forward recently to examine discriminate validity (Henseler, Ringle, & Sarstedt, 2015). The HTMT refers to the mean of the heterotrait-heteromethod correlations corresponding to the average of the monotrait-heteromethod correlations (Henseler et al., 2015). The heterotrait-monotrait ratio of correlations (HTMT) is the latest technique put forward to evaluate discriminate validity in partial least squares structural equation modelling, which is a significant foundation for model examination. When discriminate validity is not determined, researchers remain doubtful regarding whether the results suggesting hypothesized structural paths are correct, or if they are simply because of statistical discrepancies. The HTMT method is evidently better than the traditional approaches to discriminate validity assessment, like Fornell-Larcker criterion (Fornell & Larcker, 1981) and (partial) cross-loadings, which are mostly incapable of determining an absence of discriminate validity (Campbell & Fiske, 1959). When HTMT values are less than 1, the true correlation between the two constructs should be shown to be distinct. When the HTMT value is greater than this threshold, then discriminate validity is not present. A threshold of 0.85 has been implied by a few researchers (Kline, 2011), while others have suggested a value of 0.90 (T. S. H. Teo et al., 2008). Table 12 shows the Heterotrait-monotrait ratio of the correlations (HTMT) technique.This suggests that all constructs have higher variance with the own measures, rather than with other constructs in the model, which leads to discriminate validity.

| | Accessibility | AU | ATT | BI | CP | CSE | CQ | PE | IQ | PEOU | PU | SN | SQ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Accessibility** | **0.842** | | | | | | | | | | | | |
| **AU** | 0.171 | **0.92** | | | | | | | | | | | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **9** | | | | | | | | | | | |
| **ATT** | 0.299 | 0.220 | **0.894** | | | | | | | | | | |
| **BI** | 0.388 | 0.194 | 0.487 | **0.863** | | | | | | | | | |
| **CP** | 0.435 | 0.254 | 0.272 | 0.363 | **0.894** | | | | | | | | |
| **CSE** | 0.469 | 0.277 | 0.416 | 0.445 | 0.441 | **0.856** | | | | | | | |
| **CQ** | 0.113 | 0.117 | 0.153 | 0.235 | 0.119 | 0.272 | **0.977** | | | | | | |
| **PE** | 0.470 | 0.275 | 0.421 | 0.411 | 0.566 | 0.618 | 0.203 | **0.902** | | | | | |
| **IQ** | 0.422 | 0.262 | 0.405 | 0.438 | 0.409 | 0.589 | 0.372 | 0.599 | **0.871** | | | | |
| **PEOU** | 0.285 | 0.154 | 0.369 | 0.294 | 0.275 | 0.304 | 0.062 | 0.181 | 0.273 | **0.965** | | | |
| **PU** | 0.385 | 0.142 | 0.585 | 0.429 | 0.287 | 0.383 | 0.146 | 0.373 | 0.399 | 0.416 | **0.836** | | |
| **SN** | 0.546 | 0.204 | 0.403 | 0.450 | 0.531 | 0.582 | 0.294 | 0.597 | 0.564 | 0.260 | 0.355 | **0.739** | |
| **SQ** | 0.151 | 0.054 | 0.087 | 0.022 | 0.154 | 0.038 | 0.110 | 0.109 | 0.079 | 0.139 | 0.087 | 0.128 | **0.925** |

**Table 10:** Fornell-Larcker Scale.

| | **Accessibility** | **ATT** | **AU** | **BI** | **CP** | **CQ** | **CSE** | **PE** | **IQ** | **PEOU** | **PU** | **SN** | **SQ** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **AC1** | **0.744** | 0.149 | 0.159 | 0.266 | 0.340 | 0.126 | 0.367 | 0.393 | 0.349 | 0.186 | 0.201 | 0.464 | 0.162 |
| **AC2** | **0.930** | 0.318 | 0.141 | 0.374 | 0.395 | 0.082 | 0.426 | 0.413 | 0.373 | 0.280 | 0.406 | 0.475 | 0.113 |
| **ATT_1** | 0.246 | **0.894** | 0.216 | 0.431 | 0.241 | 0.147 | 0.360 | 0.392 | 0.420 | 0.339 | 0.523 | 0.345 | 0.085 |
| **ATT_2** | 0.288 | **0.895** | 0.178 | 0.440 | 0.245 | 0.127 | 0.384 | 0.361 | 0.305 | 0.321 | 0.523 | 0.376 | 0.070 |
| **AU_1** | 0.164 | 0.243 | **0.945** | 0.198 | 0.261 | 0.099 | 0.270 | 0.248 | 0.241 | 0.181 | 0.146 | 0.197 | 0.082 |
| **AU_2** | 0.152 | 0.157 | **0.912** | 0.158 | 0.206 | 0.121 | 0.243 | 0.265 | 0.246 | 0.095 | 0.114 | 0.180 | 0.010 |
| **BI_1** | 0.374 | 0.532 | 0.223 | **0.934** | 0.347 | 0.241 | 0.468 | 0.445 | 0.438 | 0.289 | 0.444 | 0.441 | 0.066 |
| **BI_2** | 0.354 | 0.368 | 0.164 | **0.860** | 0.320 | 0.183 | 0.373 | 0.335 | 0.382 | 0.261 | 0.355 | 0.414 | -0.010 |
| **BI_3** | 0.261 | 0.316 | 0.084 | **0.791** | 0.264 | 0.173 | 0.275 | 0.243 | 0.292 | 0.198 | 0.284 | 0.286 | -0.022 |
| **CP1** | 0.426 | 0.256 | 0.224 | 0.340 | **0.912** | 0.078 | 0.427 | 0.502 | 0.379 | 0.254 | 0.287 | 0.493 | 0.143 |
| **CP2** | 0.345 | 0.228 | 0.232 | 0.308 | **0.875** | 0.140 | 0.358 | 0.513 | 0.351 | 0.237 | 0.222 | 0.455 | 0.133 |
| **CQ_1** | 0.114 | 0.139 | 0.117 | 0.211 | 0.127 | **0.973** | 0.269 | 0.210 | 0.372 | 0.057 | 0.127 | 0.291 | 0.113 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CQ_2** | 0.107 | 0.152 | 0.105 | 0.235 | 0.104 | **0.979** | 0.255 | 0.185 | 0.365 | 0.063 | 0.142 | 0.289 | 0.119 |
| **CQ_3** | 0.112 | 0.156 | 0.121 | 0.240 | 0.118 | **0.979** | 0.272 | 0.202 | 0.354 | 0.061 | 0.158 | 0.283 | 0.093 |
| **CSE1** | 0.451 | 0.395 | 0.287 | 0.413 | 0.444 | 0.244 | **0.897** | 0.583 | 0.589 | 0.270 | 0.386 | 0.543 | 0.032 |
| **CSE2** | 0.341 | 0.309 | 0.175 | 0.344 | 0.296 | 0.220 | **0.813** | 0.464 | 0.400 | 0.252 | 0.256 | 0.446 | 0.034 |
| **PE1** | 0.443 | 0.381 | 0.227 | 0.360 | 0.476 | 0.197 | 0.588 | **0.908** | 0.539 | 0.164 | 0.347 | 0.538 | 0.089 |
| **PE2** | 0.405 | 0.379 | 0.270 | 0.383 | 0.548 | 0.169 | 0.525 | **0.897** | 0.542 | 0.163 | 0.325 | 0.539 | 0.107 |
| **IQ_1** | 0.374 | 0.352 | 0.266 | 0.332 | 0.364 | 0.258 | 0.523 | 0.526 | **0.886** | 0.249 | 0.367 | 0.453 | 0.083 |
| **IQ_2** | 0.361 | 0.354 | 0.186 | 0.438 | 0.349 | 0.399 | 0.503 | 0.518 | **0.855** | 0.225 | 0.326 | 0.535 | 0.053 |
| **PEOU_1** | 0.307 | 0.404 | 0.153 | 0.306 | 0.288 | 0.082 | 0.329 | 0.195 | 0.295 | **0.973** | 0.433 | 0.292 | 0.137 |
| **PEOU_2** | 0.236 | 0.298 | 0.143 | 0.258 | 0.237 | 0.032 | 0.251 | 0.150 | 0.224 | **0.958** | 0.363 | 0.200 | 0.130 |
| **PU_1** | 0.360 | 0.561 | 0.102 | 0.413 | 0.251 | 0.153 | 0.384 | 0.320 | 0.362 | 0.404 | **0.890** | 0.360 | 0.056 |
| **PU_2** | 0.276 | 0.399 | 0.143 | 0.292 | 0.230 | 0.082 | 0.239 | 0.306 | 0.301 | 0.277 | **0.778** | 0.216 | 0.096 |
| **SN1** | 0.452 | 0.321 | 0.232 | 0.401 | 0.360 | 0.247 | 0.490 | 0.475 | 0.456 | 0.174 | 0.227 | **0.709** | 0.037 |
| **SN2** | 0.366 | 0.201 | 0.046 | 0.252 | 0.353 | 0.190 | 0.347 | 0.370 | 0.254 | 0.139 | 0.262 | **0.704** | 0.145 |
| **SN3** | 0.379 | 0.323 | 0.097 | 0.314 | 0.416 | 0.230 | 0.390 | 0.418 | 0.418 | 0.169 | 0.311 | **0.771** | 0.129 |
| **SN4** | 0.424 | 0.339 | 0.225 | 0.367 | 0.433 | 0.207 | 0.496 | 0.501 | 0.522 | 0.274 | 0.246 | **0.770** | 0.069 |
| **SQ_1** | 0.158 | 0.124 | 0.079 | 0.040 | 0.130 | 0.131 | 0.070 | 0.136 | 0.120 | 0.141 | 0.113 | 0.135 | **0.961** |
| **SQ_2** | 0.113 | 0.011 | 0.003 | -0.011 | 0.168 | 0.056 | -0.022 | 0.044 | -0.002 | 0.110 | 0.027 | 0.095 | **0.888** |

**Table 11:** Cross-loading results.

| | **Accessibility** | **AU** | **ATT** | **BI** | **CP** | **CSE** | **CQ** | **PE** | **IQ** | **PEOU** | **PU** | **SN** | **SQ** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Accessibility** | | | | | | | | | | | | | |
| **AU** | 0.245 | | | | | | | | | | | | |
| **ATT** | 0.404 | 0.271 | | | | | | | | | | | |
| **BI** | 0.517 | 0.214 | 0.595 | | | | | | | | | | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CP** | 0.631 | 0.317 | 0.361 | 0.454 | | | | | | | | | |
| **CSE** | 0.730 | 0.364 | 0.591 | 0.584 | 0.618 | | | | | | | | |
| **CQ** | 0.156 | 0.129 | 0.184 | 0.266 | 0.136 | 0.339 | | | | | | | |
| **PE** | 0.581 | 0.252 | 0.546 | 0.466 | 0.688 | 0.827 | 0.208 | | | | | | |
| **IQ** | 0.488 | 0.261 | 0.494 | 0.522 | 0.455 | 0.796 | 0.492 | 0.804 | | | | | |
| **PEOU** | 0.356 | 0.167 | 0.436 | 0.326 | 0.325 | 0.388 | 0.063 | 0.176 | 0.208 | | | | |
| **PU** | 0.569 | 0.187 | 0.816 | 0.558 | 0.452 | 0.613 | 0.195 | 0.553 | 0.562 | 0.583 | | | |
| **SN** | 0.758 | 0.293 | 0.494 | 0.522 | 0.651 | 0.745 | 0.301 | 0.796 | 0.697 | 0.231 | 0.519 | | |
| **SQ** | 0.217 | 0.080 | 0.091 | 0.047 | 0.201 | 0.070 | 0.108 | 0.088 | 0.106 | 0.153 | 0.111 | 0.191 | |

**Table 12:** Heterotrait-Monotrait Ratio (HTMT).

### 5.2.2 Assessment of structural model (Inner model)

The structural model was examined after the measurement model's (Harun, Liew, Kassim, & Sulong, 2015) relevance had been determined, after which hypothesis testing took place. According to the structural model, there is a causal association between the latent constructs of the research model. The structural model was initially analysed by identifying the model's predictive capacity. The hypothesized associations between the latent constructs presented in the research model where then analysed (Hair Jr et al., 2016). The predictive power of the research model is obtained by the R-square value of the dependent variables, while path coefficients are used to examine the capability of the hypothesized relationships. PLS-Graph (*SmartPLS ver. 3.2.6*) was utilized to perform validation of the structural model. As per the directions presented in the PLS-Graph Users Guide, the model was included in PLS. The outcomes of the PLS-Graph output are given in Figure 8.

#### 5.2.2.1 Coefficient of determination -$R^2$

The most common measure used to analyze the structural model is the coefficient of determination, so-called $R^2$ (Dreheeb, Basir, & Fabil, 2016). The predictive accuracy of the model is determined using this measure which is computed as the squared correlation between a particular endogenous construct's actual and predicted values (Hair Jr et al., 2016; Senapathi & Srinivasan, 2014). In addition, it also signifies the degree of variance in the endogenous constructs validated by every exogenous construct related to it. According to the recommendations provided by (Chin, 1998), when the $R^2$ value is more than 0.67, it is perceived as high, whereas the values between 0.33 and 0.67 are considered as moderate, and the values between 0.19 and 0.33 are considered as weak.

According to Table 13, the $R^2$ values for the behavioral intention to use, perceived ease of use, and perceived usefulness were found to be between 0.19 and 0.33; and hence, the predictive power of these constructs is considered as weak. Besides, the $R^2$ value of the attitude towards use is found to explain 36.1% of the variance, and, therefore; the predictive power of this construct is considered as moderate. In addition, the $R^2$ value of the actual use is found to explain 37% of the variance, and, thus; the predictive power of this construct is regarded as moderate.

| Constructs | $R^2$ | Results |
|---|---|---|
| **Actual use** | 0.370 | Moderate |
| **Attitude towards use** | 0.361 | Moderate |
| **Behavioral intention** | 0.275 | Weak |
| **Perceived ease of use** | 0.165 | Weak |
| **Perceived usefulness** | 0.308 | Weak |

**Table 13:** $R^2$ of the endogenous latent variables.

#### 5.2.2.2 Predictive relevance

The $R^2$ values are not only used to determine predictiveaccuracy, but are also used by researchers to assess the Stone-Geisser's $Q^2$ value (Geisser, 1974; Stone, 1974) which is representative of the predictive relevance of the model. In particular, this means that when predictive relevance is depicted by PLS-SEM, then the data points of indicators in reflective measurement models of endogenous constructs as well as endogenous single-item constructs are evidently predicted. When the $Q^2$ values in the structural model are more than zero for a particular reflective endogenous latent variable, the predictive relevance of the path model is obtained for this specific construct. To use PLS for prediction, a measure of predictive power is needed (Hair Jr et al., 2016). The Blind folding process has been recommended for assessing predictive relevance. It was found that the following latent variables were significant:

Behavioural Intention to Use, Actual Use, Attitude towards, Perceived Ease of Use and Perceived Usefulness. In the study, a $Q^2$ value of **0.029**, **0.274**, **0.186,** **0.124** and **0.185**, respectively was recorded when there was an omission distance of 7 which depicts the highly predictive model (see table 14).

It is evident from the aforementioned example that if prediction of observables or possible observables is compared to unreal constructs parameters, the relevance of observables is comparatively higher (Akter, D'Ambra, & Ray, 2011; Geisser, 1975).

| Variable | SSO | SSE | $Q^2$ (=1-SSE/SSO) |
|---|---|---|---|
| **Accessibility** | *870.000* | *870.000* | |
| **Actual Use** | *870.000* | *845.010* | ***0.029*** |
| **Attitude towards** | *870.000* | *631.857* | ***0.274*** |
| **Behavioral Intention to Use** | *1,305.000* | *1,062.784* | ***0.186*** |
| **Computer Playfulness** | *870.000* | *870.000* | |
| **Computer self-efficacy** | *870.000* | *870.000* | |
| **Content Quality** | *1,305.000* | *1,305.000* | |
| **Enjoyment** | *870.000* | *870.000* | |
| **Information Quality** | *870.000* | *870.000* | |
| **Perceived Ease of Use** | *870.000* | *762.080* | ***0.124*** |
| **Perceived Usefulness** | *870.000* | *709.054* | ***0.185*** |
| **Subjective norm** | *1,740.000* | *1,740.000* | |
| **System Quality** | *870.000* | *870.000* | |

**Table 14: Construct Cross validated Redundancy**

### 5.2.2.3 Goodness of fit the model

According to (Tenenhaus, Vinzi, Chatelin, & Lauro, 2005), Gof referred to the Global fit measure, which indicates the geometric mean of average variance extracted (AVE) and the $R^2$ average of the endogenous factors (Hair Jr et al., 2016). The study model is essentially evaluated on two levels using the Gof, the measurement and structural model, while ensuring the efficiency of the model on the whole Gof can be calculated in the following way:

$$GoF = \sqrt{\overline{(R^2} \times \overline{AVE)}}$$

The criteria of Gof has been put forward by (Wetzels, Odekerken-Schröder, & Van Oppen, 2009) to determine whether Gof, small, medium or large, can be considered as global valid PLS model. Table 15 given below shows these criteria.

| GoF | Result |
|---|---|
| **Greater than 0.36** | Large |
| **Between 0.25 to 0.36** | Medium |
| **Less than 0.1 to 0.25** | Small |
| **Less than 0.1** | No fit |

**Table 15: The criteria of Gof**

| Constructs | AVE |
|---|---|
| **System Quality** | *0.856* |
| **Content Quality** | *0.954* |
| **Information Quality** | *0.758* |
| **Computer self-efficacy** | *0.733* |
| **Subjective norm** | *0.547* |
| **Enjoyment** | *0.814* |
| **Accessibility** | *0.709* |
| **Computer Playfulness** | *0.798* |
| **Average** | ***0.771*** |
| **Constructs** | $R^2$ |
| **Perceived Usefulness** | *0.308* |
| **Perceived Ease of Use** | *0.165* |
| **Attitude towards** | *0.361* |
| **Behavioral Intention to Use** | *0.275* |
| **Actual Use** | *0.037* |
| **Average** | ***0.230*** |
| **Goodness of fit GoF and Predictive** | ***0.421*** |

**Table 16: Goodness of Fit of the model (Gof)**

It is demonstrated in Table 16 above that the value of Gof is 0.421. This means that the Gof model in the study is quite large and depicts sufficient global PLS model validity.

#### 5.2.2.4 Test of the hypotheses - Path coefficient

To analyze the various hypothesized associations, the structural equation modeling was used (see Table 17**).** (Milošević, Živković, Manasijević, & Nikolić, 2015) stated that the values of fit indices that were computed showed that there was suitable fit of the structural model to the data for the given research model. As per the opinion of (Milošević et al., 2015) this study recommends the intended values of fit indices, there is fitting structural model fit to the data for the research model (Tarhini et al., 2017) (see Fig. 8). It can be seen in the Table that all the values were in the given range. In addition to it, few direct hypotheses also showed support (Ma & Yuen, 2011). The resulting path coefficients of the suggested research model are shown in Figure 8. Generally, the data supported sixteen out of twenty-three hypotheses. Five endogenous variables were verified in the model (PU, PEOU, ATT, BI, and AU). Based on the data analysis hypotheses H1a2, H1c1, H1c2, H2a2, H4a1, H4a2, H5a1, H5a2, H6a1, H7, H8, H9, H10, H11,H12, and H13 were supported by the empirical data, while H1a1, H1b1, H1b2, H2a1, H3a1, H3a2, H6a2, and H10 were rejected. The results showed that PU significantly influenced ATT ($\beta$= 0.521, P<0.001) and BI ($\beta$= 0.193, P<0.01) supporting hypothesis H9 and H11 respectively. PEOU was determined to be significant in affecting PU ($\beta$= 0.296, P<0.001), supporting hypotheses H7. Furthermore, PU was significantly influenced by three exogenous factors: IQ ($\beta$= 0.138, P < P<0.05), PE ($\beta$= 0.132, P < P<0.05), and PA ($\beta$= 0.158, P<0.05) which support hypotheses H1c1, H4a2, and H5a2.

PEU was found to be significantly influenced by six exogenous factors: SQ ($\beta$= -0.101, P<0.01), IQ ($\beta$=0.154, P<0.05), CSE ($\beta$= 0.207, P<0.01), PN ($\beta$=-0.201, P<0.01), PA ($\beta$=0.128, P<0.05), and PP ($\beta$= 0.157, P <0.01), supporting hypotheses H1a2, H1c2, H2a2, H4a1, H5a1, and H6a1 respectively. PU significantly influenced ATT ($\beta$= 0.152, P<0.01) and BI ($\beta$= 0.193,

P<0.01) supporting hypothesis H9 and H11 respectively. The results also revealed that ATT significantly influenced BI (β= 0.342, P<0.001) supporting hypothesis H12. BI was found to be significant in influencing AU (β= 0.194, P<0.01), supporting hypotheses H13.

The relationship between PU and SQ (β= -0.005, P=0.911), CQ (β= 0.017, P=0.750) CSE (β= 0.057, P=0.379), SN (β= 0.012, P=0.860), and PP (β= -0.026, P=0.657) are statistically not significant, and Hypotheses H1a1, H1b1, H2a1, H3a1, and H6a2 are generally not supported. Content Quality (CQ), Subjective norm (SN) has statistically not significant effects on PEOU (β= -0.062; p=0.251), and (β= 0.024; p=0.736) respectively. Hence, H1b2 and H3a2 are not supported. Next, the effects of PEOU on intention to use (BI) (β= 0.088; p=0.062) is not significant, hence, H10 is not supported. A summary of the hypotheses testing results is shown in Table 17.

| H | Relationship | Path | *t*-value | *p*-value | Direction | Decision |
|---|---|---|---|---|---|---|
| H1a1 | System Quality → Perceived Usefulness | -0.005 | 0.112 | 0.911 | Negative | Not supported |
| H1a2 | System Quality → Perceived Ease of Use | 0.101 | 2.499 | 0.013 | Positive | Supported* |
| H1b1 | Content Quality → Perceived Usefulness | 0.017 | 0.319 | 0.750 | Positive | Not supported |
| H1b2 | Content Quality → Perceived Ease of Use | -0.062 | 1.148 | 0.251 | Negative | Not supported |
| H1c1 | Information Quality → Perceived Usefulness | 0.138 | 2.345 | 0.019 | Positive | Supported* |
| H1c2 | Information Quality → Perceived Ease of Use | 0.154 | 2.244 | 0.025 | Positive | Supported* |
| H2a1 | Computer self-efficacy → Perceived Usefulness | 0.057 | 0.881 | 0.379 | Positive | Not supported |
| H2a2 | Computer self-efficacy → Perceived Ease of Use | 0.207 | 3.060 | 0.002 | Positive | Supported** |
| H3a1 | Subjective norm → Perceived Usefulness | 0.012 | 0.176 | 0.860 | Positive | Not supported |
| H3a2 | Subjective norm → Perceived Ease of Use | 0.024 | 0.338 | 0.736 | Positive | Not supported |
| H4a1 | Enjoyment → Perceived Ease of Use | -0.201 | 2.675 | 0.008 | Negative | Supported** |
| H4a2 | Enjoyment → Perceived Usefulness | 0.132 | 2.110 | 0.035 | Positive | Supported* |
| H5a1 | Accessibility → Perceived Ease of Use | 0.128 | 2.256 | 0.025 | Positive | Supported* |
| H5a2 | Accessibility → Perceived Usefulness | 0.158 | 2.833 | 0.005 | Positive | Supported** |
| H6a1 | Computer Playfulness → Perceived Ease of Use | 0.157 | 2.808 | 0.005 | Positive | Supported** |

| | | | | | | |
|---|---|---|---|---|---|---|
| H6a2 | Computer Playfulness → Perceived Usefulness | -0.026 | 0.444 | 0.657 | Negative | Not supported |
| H7 | Perceived Ease of Use → Perceived Usefulness | 0.296 | 5.164 | 0.000 | Positive | Supported** |
| H8 | Perceived Ease of Use → Attitude towards | 0.152 | 3.125 | 0.002 | Positive | Supported** |
| H9 | Perceived Usefulness → Attitude towards | 0.521 | 9.699 | 0.000 | Positive | Supported** |
| H10 | Perceived Ease of Use → Behavioral Intention to Use | 0.088 | 1.869 | 0.042 | Positive | Supported* |
| H11 | Perceived Usefulness → Behavioral Intention to Use | 0.193 | 2.834 | 0.005 | Positive | Supported** |
| H12 | Attitude towards → Behavioral Intention to Use | 0.342 | 5.133 | 0.000 | Positive | Supported** |
| H13 | Behavioral Intention to Use → Actual Use | 0.194 | 3.489 | 0.001 | Positive | Supported** |

**Table 17:** Results of structural model (significant at p** < = 0.01, p* < 0.05).

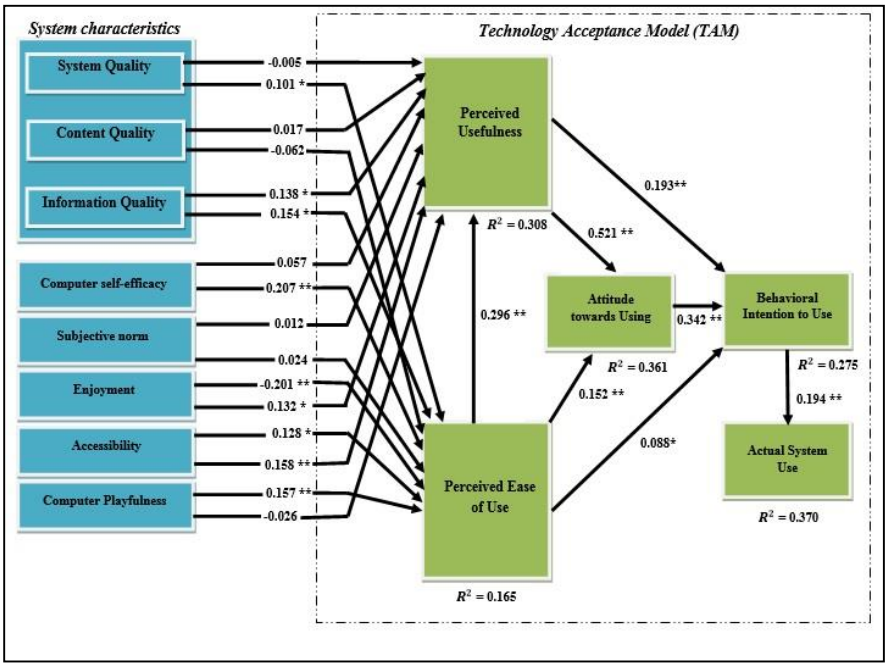


**Figure 8.** Path coefficient results (significant at p** < = 0.01, p* < 0.05).

## 5.3 Discussion

Although (Abdullah & Ward, 2016) achieved significant results by determining the most frequently factors (Self-efficacy, Subjective Norm, Enjoyment, Computer Anxiety, and Experience), it was found that (Computer self-efficacy, Enjoyment, Subjective Norm, Social influence, quality of the system and information quality) were considered the most extensively used external factors in the existing study . the main objective of this paper is to analyze the study that was already analysis by (Abdullah & Ward, 2016) with other relevant studies that were collected based on inclusion and exclusion criteria of this study. Structure equation modeling (PLS-SEM) was used to examine the research hypotheses The structural model given in Figure 2 was analysed by assessing structural paths, t-statistics and variance explained (R-squared value). The model was made to run through a bootstrap re-sampling routine to obtain path significances (Efron & Tibshirani, 1993). Bootstrapping refers to a nonparametric technique to examine the significance level of partial least square estimates (Chin, 1998). It produces a specific number of subsamples by randomly selecting a case from the original data set. The number of cases employed for bootstrapping in the study is identical to the sample size, which involves 435 cases. The study used a total of 1000 re-samples. Table 17 illustrates the findings of data analysis. The PLS technique was used to test the sixteen hypotheses given above. The path significance of every hypothesized relationship that is part of the research model and the variance explained ($R^2$) by every path were evaluated. A one-tailed t-test was employed in this study as all the hypotheses in this study are directional. The one-tailed t-test (df = 435) showed that the 0.05 significance level, or $p < 0.05$, requires a t-value >1.657, and the 0.01 significance level, or $p < 0.01$, requires a t-value >2.354. The 0.001 significance level, or $p < 0.001$, requires the corresponding t-value >3.152. The path coefficients and their

significance are demonstrated in Table 15. Out of the proposed hypotheses, sixteen were supported. The hypotheses that were obtained from TAM H7, H8, H9, H10, H11, H12, and H13 were supported.

It was found in the study that system quality, information quality, computer self-efficacy, enjoyment, accessibility, and, computer playfulness all led to an increase in the students' perceived ease of use of E-learning systems. It was shown that system quality had a positive influence on perceived ease of use, which supported H1a2. There was a positive influence of information quality on perceived ease of use and perceived usefulness, supporting both H1c1 and H1c2. However, computer self-efficacy had a more profound impact compared to the other five factors. This result stresses on the significance of students' competency and high degree of confidence in using E-learning systems. The positive impact of computer self-efficacy on perceived ease of use was also found in some past studies (e.g., (T. M. Abbas, 2017; Al-Gahtani, 2016; C.-T. Chang et al., 2017; Y. Cheng, 2011; Chow et al., 2012; Fathema et al., 2015; Hsia et al., 2014; Y.-H. Lee et al., 2013; Sánchez & Hueros, 2010), supporting H2a2. There was a positive influence of enjoyment on perceived ease of use and perceived usefulness, supporting both H4a1 and H4a2. Furthermore, there was a positive influence of accessibility on perceived ease of use and perceived usefulness, supporting H5a1 and H5a2. There was also a positive influence of computer playfulness on perceived ease of use, supporting H6a1. Nonetheless, it was not found in our experimental results that content quality and subjective norms significantly influenced perceived ease of use and perceived usefulness, which is why H1b1, H1b2, H3a1 and H3a2 were rejected. There was no direct influence of system quality on perceived usefulness. In contrast to the prior researcher, it was shown in the study by (Govender & Rootman-le Grange, 2015) that the direct effect of system quality on

perceived usefulness was rejected, whereas the findings of (Alsabawy et al., 2016; Damnjanovic et al., 2015; Fathema et al., 2015; Jaber, 2016; Mahmodi, 2017) supported it. The result that computer self-efficacy also did not have any direct impact on perceived usefulness was consistent with the findings of (Alia, 2016; Arteaga Sánchez et al., 2013; Fathema et al., 2015; Govender & Rootman-le Grange, 2015; Jeong & Kim, 2017; Park et al., 2012; Revythi & Tselios, 2017) however, it was not consistent with the study outcomes of (Al-Mushasha, 2013; C.-T. Chang et al., 2017; Chow et al., 2012; Fathema et al., 2015; Haryanto & Kultsum, 2016; Hsia et al., 2014). Finally, system quality did not have direct impact on perceived usefulness. The direct effect of system quality on perceived usefulness was also rejected in the study, whereas the findings of the study by (Roca & Gagné, 2008) supported it. System quality, information quality, content quality, computer self-efficacy, subjective norm, enjoyment, accessibility, and computer playfulness predicted perceived ease of use, and together, these variables explained 16.5% ($R^2$ = 0.165) of the variance in perceived ease of use, which suggested a weak R-squared value on the whole. System quality, information quality, content quality, computer self-efficacy, subjective norm, enjoyment, accessibility, and, computer playfulness predicted perceived usefulness, and in combination, these variables explained 31% ($R^2$ = 0.308) of the variance in Perceived usefulness, which suggested a weak overall R-squared value. Perceived Ease of Use and Perceived usefulness predicted attitude, and these variables explained 36% of the variance in attitude ($R^2$ = 0.361) of the variance in attitude, suggesting a moderate overall R-squared value. Behavioral intention was predicted by perceived ease of use and perceived usefulness, and attitude, where the variables explained 27.5% ($R^2$ = 0.275) of the variance in behavioural intention. In return, system usage was predicted by behavioural intention, with the variable explaining 0.3% ($R^2$ = 0.037) of the

variance in system usage. The key outcomes of the present study are: there is a positive impact of system quality on students' perceived ease of use of E-learning systems; there is a positive impact of information quality on students' perceived ease of use and perceived usefulness of E-learning systems; computer self-efficacy positive influences students' perceived ease of use of E-learning systems; enjoyment positively influences students' perceived ease of use and perceived usefulness of E-learning systems; there is positive impact of accessibility on students' perceived ease of use and perceived usefulness of E-learning systems; and students' perceived ease of use of E-learning systems is positive affected by computer playfulness. Consequently, lawmakers and managers of e-learning systems in education institutions (especially in UAE universities) need to focus on those factors that play an influential role in enhancing teaching performance and in improving students efficiency in design and implementation process of an effective E-learning system that should be followed by lecturers in universities.

# Chapter Six

# Conclusion and Future work

## 6.1 Overview

In this paper, systematic review was carried out on the literatures, and it was shown that the trend was shifting towards assessing those factors that might have an impact on the acceptance and usage of E-learning system by using TAM. The factors investigated mostly are eight external factors (*Computer self-efficacy, Subjective/ Social norm, Enjoyment, System Quality, Information Quality, Content Quality, Accessibility, and Computer Playfulness*), whereas other factors have hardly been analyzed by employing TAM. It was shown in the study that E-learning system has several advantages for its users, both students as well as instructors. Nonetheless, it is not possible to get these advantages without having maximum utilization and involvement of the E-learning system, which basically requires comprehending and analyzing the factors that may have an impact on the acceptance and usage of E-learning system for the users. In addition, this review also offered a lot of new information to the researchers regarding the factors that have not been examined, and also for those factors that have been analyzed with the help of TAM. It is important to perform subsequent studies on the factors that may affect the E-learning system usage using TAM as there are insufficient literatures in contrast to other technologies.

## 6.2 Conclusion and future work

The objective of this study is threefold. First, to analyze the most widely used external factors of the TAM concerning the e-learning adoption and acceptance studies. In that, a quantitative research approach comprising of 120 significant published studies from the last twelve years

was conducted in order to conduct a systematic review. As a result, the most extensively used external factors of TAM were identified, namely: computer self-efficacy, subjective/social norm, perceived enjoyment, system quality, information quality, content quality, accessibility, and computer playfulness. Second, a new model has been developed through the extension of TAM with the most widely used factors. Third, the new model has been validated using the PLS-SEM approach, which fits well with the purpose of our study. Data were collected using a questionnaire survey from five different universities that have already implemented the e-learning system in the UAE. The total number of participants in the study is 435 students.

Out of the 23 hypothesized associations in the research model, 16 supported hypotheses presented relationships between variables of the model which in turn had an impact on students' acceptance of e-learning systems. According to the study findings, there was a positive impact of system quality, computer self-efficacy, and computer playfulness on students' perceived ease of use of e-learning systems. In addition, information quality, enjoyment, and accessibility have positively influenced the students' perceived ease of use and perceived usefulness of e-learning systems. Furthermore, perceived usefulness and perceived ease of use have led to an increase in students' intention to use e-learning systems; however, perceived ease of use was found to be the most significant factor that affected the students' intention and their actual use of such systems.

Furthermore, perceived ease of use and perceived usefulness were found to be the most powerful predictors of usage intention. Therefore, it is the responsibility of the developers to create a system that is useful and easy to use. Developers and designers should consider the systems' interactivity, functionality, and response. The content quality of the e-learning system does not adequately involve the learners. There should be an audio and visual aid, animated

simulation, and videos of experiments in the e-learning system contents so that the learners are fully engaged in the learning contents. The system and its interface should be designed by the designers and developers in such a way that it is easy to use, which may improve the intent to accept and adopt e-learning. There should be a rapid and consistent response of the system so that the learners are encouraged towards technology usage. When the system responds rapidly, the users become more interested in the learning process. It is also shown in the results that the system features should fulfill the requirements of the users to leverage the system's adoption, and consequently, enhances the behavioral intention towards using e-learning.

### 6.3 Implications for Practice

An extended TAM model is developed aiming to understand the students' acceptance of e-learning systems. The study outcomes offer a deeper understanding of the external factors and give useful suggestions for policymakers, professionals, developers, and designers in effectively adopting the e-learning systems. First, university administration needs to establish the appropriate infrastructure of e-learning systems and evaluate the readability of students for e-learning systems. Second, the decision-makers and managers of e-learning systems in the higher educational institutions (especially in UAE) need to focus on those factors that play an influential role in enhancing the students' acceptance of such systems which in turn affects the teaching performance and students' efficiency. Third, the research findings show how external factors pertaining to students' acceptance of e-learning systems are significant. Hence, the culture of e-learning systems should be instilled within the students. As such, students' readability to e-learning systems should be examined and developed, and computer labs that are installed with suitable facilities for e-learning systems should be developed and made accessible to all the students in the university. Fourth, training courses should be set up to

encourage students' perception of ease and usefulness of e-learning systems as that would improve the positive attitudes of students and subsequently, their behavioral intention to use the e-learning systems.

### 6.4 Limitations and future research

Although the results of the study were quite interesting and played an essential role in describing the students' acceptance of e-learning systems, it also has some limitations. First, the study was solely directed towards students, and if instructors' responses were considered, it would become possible to obtain comparisons between the analyses of instructors and students. Further research should consider this point. Second, the model is cross-sectional and determines users' perceptions and intentions for a single point in time. Therefore, it is suggested that more studies should be carried out using the longitudinal survey as it is possible that the perceptions and preferences of individuals would change when they acquire more experience with the passage of time. Third, the present study has focused on private universities in the UAE, and hence, the outcomes can only be generalized to the private universities and not the public ones. Fourth, the sample is obtained from a limited number of universities, and it is important to consider larger populations, having distinct income, education, demographical, and psychological attitudes. When the sample is highly representative, there is an increase in the generalizability of the research findings.

## References


Abbad, M., Morris, D., Al-Ayyoub, A. E., & Abbad, J. (2009). Students' Decisions to Use an eLearning System: A Structural Equation Modelling Analysis. *iJET*, *4*(4), 4–13.

Abbas, T., & Abbas, T. (2016). Social factors affecting students' acceptance of e-learning environments in developing and developed countries: A structural equation modeling approach. *Journal of Hospitality and Tourism Technology*, *7*(2), 200–212.

Abbas, T. M. (2017). Human factors affecting university hospitality and tourism students' intention to use e-learning: A comparative study between Egypt and the UK. *Journal of Human Resources in Hospitality & Tourism*, *16*(4), 349–366.

Abbas, T. M., Jones, E., & Hussien, F. M. (2016). Technological Factors Influencing University Tourism and Hospitality Students' Intention to Use E-Learning: A Comparative Analysis of Egypt and the United Kingdom. *Journal of Hospitality & Tourism Education*, *28*(4), 189–201.

Abdullah, F., & Ward, R. (2016). Developing a General Extended Technology Acceptance Model for E-Learning (GETAMEL) by analysing commonly used external factors. *Computers in Human Behavior*, *56*, 238–256.

Adewole-Odeshi, E. (2014). Attitude of Students Towards E-learning in South-West Nigerian Universities: An Application of Technology Acceptance Model. *Library Philosophy and Practice*, 0_1.

Aixia, D., & Wang, D. (2011). Factors influencing learner attitudes toward e-learning and development of e-learning environment based on the integrated e-learning platform. *International Journal of E-Education, E-Business, E-Management and E-Learning*, *1*(3), 264.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211.

Akman, I., & Turhan, C. (2017). User acceptance of social learning systems in higher education: an application of the extended Technology Acceptance Model. *Innovations in Education and Teaching International*, *54*(3), 229–237.

Akter, S., D'Ambra, J., & Ray, P. (2011). An evaluation of PLS based complex models: the roles of power analysis, predictive relevance and GoF index.

Al-Adwan, A., Al-Adwan, A., & Smedley, J. (2013). Exploring students acceptance of e-learning using Technology Acceptance Model in Jordanian universities. *International Journal of Education and Development Using Information and Communication Technology*, *9*(2), 4.

Al-Ammary, J. H., Al-Sherooqi, A. K., & Al-Sherooqi, H. K. (2014). The acceptance of social networking as a learning tools at University of Bahrain. *International Journal of Information and Education Technology*, *4*(2), 208.

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

Al-Busaidi, K. A. (2013). An empirical investigation linking learners' adoption of blended learning to their intention of full e-learning. *Behaviour & Information Technology*, *32*(11), 1168–1176.

Al-Debei, M. M. (2014). The quality and acceptance of websites: an empirical investigation in the context of higher education. *International Journal of Business Information Systems*, *15*(2), 170–188.

Al-Emran, M., & Salloum, S. A. (2017). Students' Attitudes Towards the Use of Mobile Technologies in e-Evaluation. *International Journal of Interactive Mobile Technologies (iJIM)*, *11*(5), 195–202.

Al-Gahtani, S. S. (2016). Empirical investigation of e-learning acceptance and assimilation: A structural equation model. *Applied Computing and Informatics*, *12*(1), 27–50.

Al-hawari, M. A., & Mouakket, S. (2010). The influence of technology acceptance model (tam) factors on students'e-satisfaction and e-retention within the context of uae e-learning. *Education, Business and Society: Contemporary Middle Eastern Issues*, *3*(4), 299–314.

Al-Mushasha, N. F. A. (2013). Determinants of e-learning acceptance in higher education environment based on extended technology acceptance model. In *e-Learning" Best Practices in Management, Design and Development of e-Courses: Standards of Excellence and Creativity", 2013 Fourth International Conference on* (pp. 261–266). IEEE.

Al-Rahmi, W., Alias, N., Othman, M. S., Alzahrani, A. I., Alfarraj, O., Saged, A. A., & Rahman, N. S. A. (2018). Use of E-Learning by University Students in Malaysian Higher Educational Institutions: A Case in Universiti Teknologi Malaysia. *IEEE Access*. https://doi.org/10.1109/ACCESS.2018.2802325

Alavi, M., & Leidner, D. E. (2001). Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS Quarterly*, 107–136.

Alenezi, A. R., Abdul Karim, A. M., & Veloo, A. (2011). Institutional support and e-learning acceptance: An extension of the technology acceptance model. *International Journal of Instructional Technology and Distance Learning*, *8*(2), 3–16.

Alharbi, S., & Drew, S. (2014). Using the technology acceptance model in understanding academics' behavioural intention to use learning management systems. *International Journal of Advanced Computer Science and Applications*, *5*(1), 143–155.

Alia, A. (2016). An investigation of the application of the Technology Acceptance Model (TAM) to evaluate instructors' perspectives on E-Learning at Kuwait University. Dublin City University.

Alkharang, M. M. (2014). Factors that influence the adoption of e-learning: an empirical study in Kuwait. Brunel University London.

Alkis, N., Coskunçay, D. F., & Yildirim, S. Ö. (2014). A Systematic Review of Technology Acceptance Model in e-Learning Context. In *Proceedings of the XV International Conference on Human Computer Interaction* (p. 55). ACM.

Almaiah, M. A., Jalil, M. A., & Man, M. (2016). Extending the TAM to examine the effects of quality features on mobile learning acceptance. *Journal of Computers in Education*, *3*(4), 453–485.

Alrawashdeh, T. A., Firstauthor, A. B., & Secondcoauthor, D. E. (n.d.). Extended UTAUT to examine the acceptance of web based training system by public sector's employees.

Alsabawy, A. Y., Cater-Steel, A., & Soar, J. (2016). Determinants of perceived usefulness of e-learning systems. *Computers in Human Behavior*, *64*, 843–858.

Alshammari, S. H., Ali, M. B., & Rosli, M. S. (2016). The Influences of Technical Support, Self Efficacy and Instructional Design on the Usage and Acceptance of LMS: A Comprehensive Review. *Turkish Online Journal of Educational Technology-TOJET*, *15*(2), 116–125.

Ardies, J., De Maeyer, S., Gijbels, D., & van Keulen, H. (2014). Students attitudes towards

technology. *International Journal of Technology and Design Education*, *25*(1), 43–65. https://doi.org/10.1007/s10798-014-9268-x

Arteaga Sánchez, R., Duarte Hueros, A., & García Ordaz, M. (2013). E-learning and the University of Huelva: a study of WebCT and the technological acceptance model. *Campus-Wide Information Systems*, *30*(2), 135–160.

Attis, J. (2014). *An investigation of the variables that predict teacher e-learning acceptance*. Liberty University.

Ayodele, S. O., Oga, O. E., Bundot, Y. G., & Ogbari, M. E. (2016). Role of power supply towards e-learning acceptance: VBSEM-AMOS. In *Information Communication and Management (ICICM), International Conference on* (pp. 151–155). IEEE.

Bachtiar, F. A., Rachmadi, A., & Pradana, F. (2014). Acceptance in the deployment of blended learning as a learning resource in information technology and computer science program, Brawijaya university. In *Computer Aided System Engineering (APCASE), 2014 Asia-Pacific Conference on* (pp. 131–135). IEEE.

Baleghi-Zadeh, S., Ayub, A. F. M., Mahmud, R., & Daud, S. M. (2014). Behaviour Intention to Use the Learning Management: Integrating Technology Acceptance Model with Task-Technology Fit. *Middle-East Journal of Scientific Research*, *19*(1), 76–84.

Bates, T. (1997). *Restructuring the university for technological change*. Murdoch University.

Bazelais, P., Doleck, T., & Lemay, D. J. (2017). Investigating the predictive power of TAM: A case study of CEGEP students' intentions to use online learning technologies. *Education and Information Technologies*, 1–19.

Bhuasiri, W., Xaymoungkhoun, O., Zo, H., Rho, J. J., & Ciganek, A. P. (2012). Critical success factors for e-learning in developing countries: A comparative analysis between ICT experts and faculty. *Computers & Education*, *58*(2), 843–855.

Boateng, R., Mbrokoh, A. S., Boateng, L., Senyo, P. K., & Ansong, E. (2016). Determinants of e-learning adoption among students of developing countries. *The International Journal of Information and Learning Technology*, *33*(4), 248–262.

Calisir, F., Altin Gumussoy, C., Bayraktaroglu, A. E., & Karaali, D. (2014). Predicting the intention to use a web-based learning system: Perceived content quality, anxiety, perceived system quality, image, and the technology acceptance model. *Human Factors and Ergonomics in Manufacturing & Service Industries*, *24*(5), 515–531.

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin*, *56*(2), 81.

Capece, G., & Campisi, D. (2013). User satisfaction affecting the acceptance of an e-learning platform as a mean for the development of the human capital. *Behaviour & Information Technology*, *32*(4), 335–343.

Chang, C.-C., Tseng, K.-H., Liang, C., & Yan, C.-F. (2013). The influence of perceived convenience and curiosity on continuance intention in mobile English learning for high school students using PDAs. *Technology, Pedagogy and Education*, *22*(3), 373–386.

Chang, C.-T., Hajiyev, J., & Su, C.-R. (2017). Examining the students' behavioral intention to use e-learning in Azerbaijan? The General Extended Technology Acceptance Model for E-learning approach. *Computers & Education*, *111*, 128–143.

Cheng, B., Wang, M., Moormann, J., Olaniran, B. A., & Chen, N.-S. (2012). The effects of organizational learning environment factors on e-learning acceptance. *Computers & Education*, *58*(3), 885–899.

Cheng, W. T., & Chen, C. (2015). The Impact of e-Learning on Workplace On-the-job

Training. *International Journal of E-Education, E-Business, E-Management and E-Learning*, *5*(4), 212.
Cheng, Y. (2011). Antecedents and consequences of e-learning acceptance. *Information Systems Journal*, *21*(3), 269–299.
Cheng, Y.-M. (2012). Effects of quality antecedents on e-learning acceptance. *Internet Research*, *22*(3), 361–390.
Cheng, Y.-M. (2014). Roles of interactivity and usage experience in e-learning acceptance: a longitudinal study. *International Journal of Web Information Systems*, *10*(1), 2–23.
Cheung, R., & Vogel, D. (2013). Predicting user acceptance of collaborative technologies: An extension of the technology acceptance model for e-learning. *Computers & Education*, *63*, 160–175.
Chiang, C.-Y., Boakye, K., & Tang, X. (2017). The Investigation of E-Learning System Design Quality on Usage Intention. *Journal of Computer Information Systems*, 1–10.
Chin, W. W. (1998). The partial least squares approach to structural equation modeling. *Modern Methods for Business Research*, *295*(2), 295–336.
Chinyamurindi, W., & Shava, H. (2015). An investigation into e-learning acceptance and gender amongst final year students. *South African Journal of Information Management*, *17*(1), 1–9.
Cho, V., Cheng, T. C. E., & Lai, W. M. J. (2009). The role of perceived user-interface design in continued usage intention of self-paced e-learning tools. *Computers & Education*, *53*(2), 216–227.
Chow, M., Herold, D. K., Choo, T.-M., & Chan, K. (2012). Extending the technology acceptance model to explore the intention to use Second Life for enhancing healthcare education. *Computers & Education*, *59*(4), 1136–1144.
Chu, T.-H., & Chen, Y.-Y. (2016). With Good We Become Good: Understanding e-learning adoption by theory of planned behavior and group influences. *Computers & Education*, *92*, 37–52.
Chuan, C. L., & Penyelidikan, J. (2006). Sample size estimation using Krejcie and Morgan and Cohen statistical power analysis: A comparison. *Jurnal Penyelidikan IPBL*, *7*, 78–86.
Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly*, 189–211.
Damnjanovic, V., Jednak, S., & Mijatovic, I. (2015). Factors affecting the effectiveness and use of Moodle: students' perception. *Interactive Learning Environments*, *23*(4), 496–514.
Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 319–340.
DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research*, *3*(1), 60–95.
Deshpande, Y., Bhattacharya, S., & Yammiyavar, P. (2012). A behavioral approach to modeling Indian children's ability of adopting to e-learning environment. In *Intelligent human computer interaction (IHCI), 2012 4th international conference on* (pp. 1–7). IEEE.
Dreheeb, A. E., Basir, N., & Fabil, N. (2016). Impact of System Quality on Users' Satisfaction in Continuation of the Use of e-Learning System. *International Journal of E-Education, E-Business, E-Management and E-Learning*, *6*(1), 13.
Efron, B., & Tibshirani, R. J. (1993). The jackknife. In *An introduction to the bootstrap* (pp. 141–152). Springer.

Elkaseh, A. M., Wong, K. W., & Fung, C. C. (2015). The Acceptance of e-learning as a tool for teaching and learning in Libyan higher education. *IPASJ International Journal of Information Technology (IIJIT)*, *3*(4), 1–11.

Elkaseh, A. M., Wong, K. W., & Fung, C. C. (2016). Perceived ease of use and perceived usefulness of social media for e-learning in Libyan higher education: A structural equation modeling analysis. *International Journal of Information and Education Technology*, *6*(3), 192.

Escobar-Rodriguez, T., & Monge-Lozano, P. (2012). The acceptance of Moodle technology by business administration students. *Computers & Education*, *58*(4), 1085–1093.

Farahat, T. (2012). Applying the technology acceptance model to online learning in the Egyptian universities. *Procedia-Social and Behavioral Sciences*, *64*, 95–104.

Fathema, N., Shannon, D., & Ross, M. (2015). Expanding The Technology Acceptance Model (TAM) to Examine Faculty Use of Learning Management Systems (LMSs) In Higher Education Institutions. *Journal of Online Learning & Teaching*, *11*(2).

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 39–50.

Geisser, S. (1974). A predictive approach to the random effect model. *Biometrika*, *61*(1), 101–107.

Geisser, S. (1975). The predictive sample reuse method with applications. *Journal of the American Statistical Association*, *70*(350), 320–328.

Ghosh, B. (2016). Exploratory Study of Effects of eLearning System Acceptance on Learning Outcomes. *Journal of Information Systems Applied Research*, *9*(2), 13.

Govender, I., & Rootman-le Grange, I. (2015). Evaluating the Early Adoption of Moodle at a Higher Education Institution. In *European Conference on e-Learning* (p. 230). Academic Conferences International Limited.

Grinnell, R. M. (2001). Social Work Research and Evaluation: Quantitative and Qualitative.

Hair Jr, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2016). *A primer on partial least squares structural equation modeling (PLS-SEM)*. Sage Publications.

Harun, A., Liew, T. S., Kassim, A. W. M., & Sulong, R. S. (2015). Smartphone dependency and its impact on purchase behavior. *Asian Social Science*, *11*(26), 196.

Haryanto, H., & Kultsum, H. U. (2016). E-Learning Program Adoption: Technology Acceptance Model Approach. In *Proceeding of the International Conference on Teacher Training and Education* (Vol. 2, pp. 616–622).

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, *43*(1), 115–135.

Ho, C. K. Y., Ke, W., & Liu, H. (2015). Choice decision of e-learning system: Implications from construal level theory. *Information & Management*, *52*(2), 160–169.

Holden, H., & Rada, R. (2011). Understanding the influence of perceived usability and technology self-efficacy on teachers' technology acceptance. *Journal of Research on Technology in Education*, *43*(4), 343–367.

Hsia, J.-W., Chang, C.-C., & Tseng, A.-H. (2014). Effects of individuals' locus of control and computer self-efficacy on their e-learning acceptance in high-tech companies. *Behaviour & Information Technology*, *33*(1), 51–64.

Hussein, R., Aditiawarman, U., & Mohamed, N. (2007). E-learning acceptance in a developing country: a case of the Indonesian Open University. In *German e-Science conference*.

Hussein, Z. (2017). Leading to Intention: The Role of Attitude in Relation to Technology Acceptance Model in E-Learning. *Procedia Computer Science*, *105*, 159–164.
Ismail, N. Z., Razak, M. R., Zakariah, Z., Alias, N., & Aziz, M. N. A. (2012). E-learning continuance intention among higher learning institution students' in Malaysia. *Procedia-Social and Behavioral Sciences*, *67*, 409–415.
Jaber, O. A. (2016). An Examination of Variables Influencing the Acceptance and Usage of E-Learning Systems in Jordanian Higher Education Institutions. Cardiff Metropolitan University.
Jashapara, A., & Tai, W.-C. (2011). Knowledge mobilization through e-learning systems: Understanding the mediating roles of self-efficacy and anxiety on perceptions of ease of use. *Information Systems Management*, *28*(1), 71–83.
Jeong, H. I., & Kim, Y. (2017). The acceptance of computer technology by teachers in early childhood education. *Interactive Learning Environments*, *25*(4), 496–512.
Jung, M.-L. L., Loria, K., & Saha, R. M. P. (2008). E-Learning: Investigating University Student s Acceptance of Technology. *European Journal of Open, Distance and E-Learning*, *11*(2).
Kanwal, F., & Rehman, M. (2017). Factors Affecting E-Learning Adoption in Developing Countries–Empirical Evidence from Pakistan's Higher Education Sector. *IEEE Access*.
Khor, E. T. (2014). An analysis of ODL student perception and adoption behavior using the technology acceptance model. *The International Review of Research in Open and Distributed Learning*, *15*(6).
Kline, R. B. (2011). *Convergence of structural equation modeling and multilevel modeling*. na.
Krejcie, R. V, & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, *30*(3), 607–610.
Krishnan, K. S. T., & Hussin, H. (2017). E-Learning Readiness on Bumiputera SME's Intention for Adoption of Online Entrepreneurship Training in Malaysia. *Management*, *7*(1), 35–39.
Ku, C.-H. (2009). *Extending the technology acceptance model using perceived user resources in higher education web-based online learning courses*. University of Central Florida.
Lee, B.-C., Yoon, J.-O., & Lee, I. (2009). Learners' acceptance of e-learning in South Korea: Theories and results. *Computers & Education*, *53*(4), 1320–1329.
Lee, J., Choi, M., & Lee, H. (2015). Factors affecting smart learning adoption in workplaces: comparing large enterprises and SMEs. *Information Technology and Management*, *16*(4), 291–302.
Lee, M.-C. (2010). Explaining and predicting users' continuance intention toward e-learning: An extension of the expectation–confirmation model. *Computers & Education*, *54*(2), 506–516.
Lee, Y.-C. (2006). An empirical investigation into factors influencing the adoption of an e-learning system. *Online Information Review*, *30*(5), 517–541.
Lee, Y.-H., Hsieh, Y.-C., & Chen, Y.-H. (2013). An investigation of employees' use of e-learning systems: applying the technology acceptance model. *Behaviour & Information Technology*, *32*(2), 173–189.
Lee, Y.-H., Hsieh, Y.-C., & Hsu, C.-N. (2011). Adding innovation diffusion theory to the technology acceptance model: Supporting employees' intentions to use e-learning systems. *Journal of Educational Technology & Society*, *14*(4), 124.
Lee, Y., Kozar, K. A., & Larsen, K. R. T. (2003). The technology acceptance model: Past,

present, and future. *Communications of the Association for Information Systems*, *12*(1), 50.
Liao, H.-L., & Lu, H.-P. (2008). The role of experience and innovation characteristics in the adoption and continued use of e-learning websites. *Computers & Education*, *51*(4), 1405–1416.
Lin, C.-C. (2013). Exploring the relationship between technology acceptance model and usability test. *Information Technology and Management*, *14*(3), 243–255.
Lin, J. C.-C., & Lu, H. (2000). Towards an understanding of the behavioural intention to use a web site. *International Journal of Information Management*, *20*(3), 197–208.
Lin, K.-M. (2011). e-Learning continuance intention: Moderating effects of user e-learning experience. *Computers & Education*, *56*(2), 515–526.
Lin, S.-C., Persada, S. F., & Nadlifatin, R. (2014). A study of student behavior in accepting the Blackboard Learning System: A Technology Acceptance Model (TAM) approach. In *Computer Supported Cooperative Work in Design (CSCWD), Proceedings of the 2014 IEEE 18th International Conference on* (pp. 457–462). IEEE.
Lin, Y.-C., Chen, Y.-C., & Yeh, R. C. (2010). Understanding college students' continuing intentions to use multimedia e-learning systems. *World Transactions on Engineering and Technology Education*, *8*(4), 488–493.
Liu, I.-F., Chen, M. C., Sun, Y. S., Wible, D., & Kuo, C.-H. (2010). Extending the TAM model to explore the factors that affect Intention to Use an Online Learning Community. *Computers & Education*, *54*(2), 600–610.
Liu, S.-H., Liao, H.-L., & Peng, C.-J. (2005). Applying the technology acceptance model and flow theory to online e-learning users' acceptance behavior. *E-Learning*, *4*(H6), H8.
Ma, W. W. K., & Yuen, A. H. K. (2011). Understanding online knowledge sharing: An interpersonal relationship perspective. *Computers & Education*, *56*(1), 210–219.
Mahmodi, M. (2017). The Analysis of the Factors Affecting the Acceptance of E-learning in Higher Education. *Interdisciplinary Journal of Virtual Learning in Medical Sciences*, *8*(1).
Martínez-Torres, M. R., Toral Marín, S. L., Garcia, F. B., Vazquez, S. G., Oliva, M. A., & Torres, T. (2008). A technological acceptance of e-learning tools used in practical and laboratory teaching, according to the European higher education area. *Behaviour & Information Technology*, *27*(6), 495–505.
Masrom, M. (2007). Technology acceptance model and e-learning. *Technology*, *21*(24), 81.
McKinney, V., Yoon, K., & Zahedi, F. "Mariam." (2002). The measurement of web-customer satisfaction: An expectation and disconfirmation approach. *Information Systems Research*, *13*(3), 296–315.
Milošević, I., Živković, D., Manasijević, D., & Nikolić, D. (2015). The effects of the intended behavior of students in the use of M-learning. *Computers in Human Behavior*, *51*, 207–215.
Mohammadi, H. (2015). Investigating users' perspectives on e-learning: An integration of TAM and IS success model. *Computers in Human Behavior*, *45*, 359–374.
Moreno, V., Cavazotte, F., & Alves, I. (2017). Explaining university students' effective use of e-learning platforms. *British Journal of Educational Technology*, *48*(4), 995–1009.
Motaghian, H., Hassanzadeh, A., & Moghadam, D. K. (2013). Factors affecting university instructors' adoption of web-based learning systems: Case study of Iran. *Computers & Education*, *61*, 158–167.

Mou, J., Shin, D.-H., & Cohen, J. (2017). Understanding trust and perceived usefulness in the consumer acceptance of an e-service: A longitudinal investigation. *Behaviour & Information Technology*, *36*(2), 125–139.

Nunnally, J. C., & Bernstein, I. H. (1978). Psychometric theory.

Ong, C.-S., & Lai, J.-Y. (2006). Gender differences in perceptions and relationships among dominants of e-learning acceptance. *Computers in Human Behavior*, *22*(5), 816–829.

Park, S. Y. (2009). An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-learning. *Journal of Educational Technology & Society*, *12*(3), 150.

Park, S. Y., Nam, M., & Cha, S. (2012). University students' behavioral intention to use mobile learning: Evaluating the technology acceptance model. *British Journal of Educational Technology*, *43*(4), 592–605.

Patil, S., Razdan, P. N., & Chancellor, V. (2015). Creating awareness acceptance and application of e-learning in higher education institutions: using technology acceptance model (TAM). *International Journal of Multidisciplinary Consortium*, *2*(4).

Premchaiswadi, W., Porouhan, P., & Premchaiswadi, N. (2012). An empirical study of the key success factors to adopt e-learning in Thailand. In *Information Society (i-Society), 2012 International Conference on* (pp. 333–338). IEEE.

Pribeanu, C., Balog, A., & Iordache, D. D. (2017). Measuring the perceived quality of an AR-based learning application: a multidimensional model. *Interactive Learning Environments*, *25*(4), 482–495.

Rabaa'i, A. A. (1975). Extending the Technology Acceptance Model (TAM) to assess Students' Behavioural Intentions to adopt an e-Learning System: The Case of Moodle as a Learning Tool. *Journal of Emerging Trends in Engineering and Applied Sciences (JETEAS)*, *7*(1), 13–30.

Ramírez-Correa, P. E., Arenas-Gaitán, J., & Rondán-Cataluña, F. J. (2015). Gender and acceptance of E-learning: a multi-group analysis based on a structural equation model among college students in Chile and Spain. *PloS One*, *10*(10), e0140460.

Raza, S. A., Umer, A., Qazi, W., & Makhdoom, M. (2017). The Effects of Attitudinal, Normative, and Control Beliefs on M-Learning Adoption Among the Students of Higher Education in Pakistan. *Journal of Educational Computing Research*, 735633117715941.

Renda dos Santos, L. M., & Okazaki, S. (2016). Planned e-learning adoption and occupational socialisation in Brazilian higher education. *Studies in Higher Education*, *41*(11), 1974–1994.

Revythi, A., & Tselios, N. (2017). Extension of Technology Acceptance Model by using System Usability Scale to assess behavioral intention to use e-learning. *arXiv Preprint arXiv:1704.06127*.

Rezaei, M., Mohammadi, H. M., Asadi, A., & Kalantary, K. (2008). Predicting e-learning application in agricultural higher education using technology acceptance model. *Turkish Online Journal of Distance Education*, *9*(1).

Rhema, A. (2013). An analysis of experiences and perceptions of technology-based learning in higher education institutions in Libya: informing the advancement of e-learning. Victoria University.

Ringle, C. M., Wende, S., & Will, A. (2005). SmartPLS 2.0 (Beta). Hamburg. *Available in Http://www. Smartpls. de*.

Rissa, J. (2014). An empirical study on the e-learning acceptance among the Finnish labor.

Roca, J. C., Chiu, C.-M., & Martínez, F. J. (2006). Understanding e-learning continuance intention: An extension of the Technology Acceptance Model. *International Journal of Human-Computer Studies*, *64*(8), 683–696.

Roca, J. C., & Gagné, M. (2008). Understanding e-learning continuance intention in the workplace: A self-determination theory perspective. *Computers in Human Behavior*, *24*(4), 1585–1604.

Rodríguez-Ardura, I., & Meseguer-Artola, A. (2016). What leads people to keep on e-learning? An empirical analysis of users' experiences and their effects on continuance intention. *Interactive Learning Environments*, *24*(6), 1030–1053.

Rym, B., Olfa, B., & Mélika, B. M. (2013). Determinants of e-learning acceptance: An empirical study in the Tunisian context. *American Journal of Industrial and Business Management*, *3*(3), 307.

Saadé, R. G., Tan, W., & Nebebe, F. (2008). Impact of Motivation on Intentions in Online Learning: Canada vs China. *Issues in Informing Science & Information Technology*, *5*.

Saaid, S. A., & Rashid, J. A. (2012). Interoperability of e-publishing: Knowledge and perception of iLearn system among students. In *International Conference on Education and e-Learning (EeL). Proceedings* (p. 184). Global Science and Technology Forum.

Sánchez, R. A., & Hueros, A. D. (2010). Motivational factors that influence the acceptance of Moodle using TAM. *Computers in Human Behavior*, *26*(6), 1632–1640.

Sandjojo, N., & Wahyuningrum, T. (2015). Measuring e-learning systems success: Implementing D & M is success model. In *Interactive Digital Media (ICIDM), 2015 4th International Conference on* (pp. 1–6). IEEE.

Sangrà, A., Vlachopoulos, D., & Cabrera, N. (2012). Building an inclusive definition of e-learning: An approach to the conceptual framework. *The International Review of Research in Open and Distributed Learning*, *13*(2), 145–159.

Senapathi, M., & Srinivasan, A. (2014). An empirical investigation of the factors affecting agile usage. In *Proceedings of the 18th international conference on evaluation and assessment in software engineering* (p. 10). ACM.

Shah, G. U. D., Bhatti, M. N., Iftikhar, M., Qureshi, M. I., & Zaman, K. (2013). Implementation of technology acceptance model in e-learning environment in rural and urban areas of Pakistan. *World Applied Sciences Journal*, *27*(11), 1495–1507.

Shah, S. A. M., Iqbal, N., Janjua, S. Y., & Amjad, S. (2013). Employee behavior towards adoption of e-learning courses: validating technology acceptance model. *Mediterranean Journal of Social Sciences*, *4*(14), 765.

Smith, J. A., & Sivo, S. A. (2012). Predicting continued use of online teacher professional development and the influence of social presence and sociability. *British Journal of Educational Technology*, *43*(6), 871–882.

Stone, M. (1974). Cross-validatory choice and assessment of statistical predictions. *Journal of the Royal Statistical Society. Series B (Methodological)*, 111–147.

Tagoe, M. (2012). Students' Perceptions on Incorporating E-Learning into Teaching and Learning at the University of Ghana. *International Journal of Education and Development Using Information and Communication Technology*, *8*(1), 91–103.

Tan, G. W.-H., Ooi, K.-B., Sim, J.-J., & Phusavat, K. (2012). Determinants of mobile learning adoption: An empirical analysis. *Journal of Computer Information Systems*, *52*(3), 82–91.

Tarhini, A., Elyas, T., Akour, M. A., & Al-Salti, Z. (2016). Technology, Demographic Characteristics and E-Learning Acceptance: A Conceptual Model Based on Extended

Technology Acceptance Model. *Higher Education Studies*, *6*(3), 72–89.
Tarhini, A., Hassouna, M., Abbasi, M. S., & Orozco, J. (2015). Towards the Acceptance of RSS to Support Learning: An empirical study to validate the Technology Acceptance Model in Lebanon. *Electronic Journal of E-Learning*, *13*(1), 30–41.
Tarhini, A., Hone, K., & Liu, X. (2013a). Extending the TAM model to empirically investigate the students' behavioural intention to use e-learning in developing countries. In *Science and Information Conference (SAI), 2013* (pp. 732–737). IEEE.
Tarhini, A., Hone, K., & Liu, X. (2013b). Factors affecting students' acceptance of e-learning environments in developing countries: a structural equation modeling approach. *International Journal of Information and Education Technology*, *3*(1), 54.
Tarhini, A., Hone, K., & Liu, X. (2014). The effects of individual differences on e-learning users' behaviour in developing countries: A structural equation model. *Computers in Human Behavior*, *41*, 153–163.
Tarhini, A., Hone, K., Liu, X., & Tarhini, T. (2017). Examining the moderating effect of individual-level cultural values on users' acceptance of E-learning in developing countries: a structural equation modeling of an extended technology acceptance model. *Interactive Learning Environments*, *25*(3), 306–328.
Tarhini, A., Mohammed, A. B., & Maqableh, M. (2016). Modeling Factors Affecting Student's Usage Behaviour of E-Learning Systems in Lebanon. *International Journal of Business and Management*, *11*(2), 299.
Tenenhaus, M., Vinzi, V. E., Chatelin, Y.-M., & Lauro, C. (2005). PLS path modeling. *Computational Statistics & Data Analysis*, *48*(1), 159–205.
Teo, T. (2010). Examining the influence of subjective norm and facilitating conditions on the intention to use technology among pre-service teachers: a structural equation modeling of an extended technology acceptance model. *Asia Pacific Education Review*, *11*(2), 253–262.
Teo, T. S. H., Srivastava, S. C., & Jiang, L. (2008). Trust and electronic government success: An empirical study. *Journal of Management Information Systems*, *25*(3), 99–132.
Teo, T., & Zhou, M. (2017). The influence of teachers' conceptions of teaching and learning on their technology acceptance. *Interactive Learning Environments*, *25*(4), 513–527.
Theng, Y.-L., Ei Tun, E., Zaw, M. M. H., Cho, S. Y. Y., Miao, C., Kan, M.-Y., & Tang, A. C. (2008). An empirical study of students' perceptions on e-learning systems. In *Proceedings of the 2nd International Convention on Rehabilitation Engineering & Assistive Technology* (pp. 245–249). Singapore Therapeutic, Assistive & Rehabilitative Technologies (START) Centre.
Tran, K. N. N. (2016). The Adoption of Blended E-learning Technology in Vietnam using a Revision of the Technology Acceptance Model. *Journal of Information Technology Education*, *15*.
Tseng, A.-H., & Hsia, J.-W. (2008). The impact of internal locus of control on perceived usefulness and perceived ease of use in e-learning: An extension of the technology acceptance model. In *Cyberworlds, 2008 International Conference on* (pp. 815–819). IEEE.
van Schaik*, P., Barker, P., & Moukadem, I. (2005). Using a digital campus to support electronic learning in Lebanon. *Innovations in Education and Teaching International*, *42*(2), 157–166.
Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic

motivation, and emotion into the technology acceptance model. *Information Systems Research*, *11*(4), 342–365.
Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, *39*(2), 273–315.
Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, *46*(2), 186–204.
Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 425–478.
Vidanagama, D. U. (2016). Acceptance of E-Learning among Undergraduates of Computing Degrees in Sri Lanka. *International Journal of Modern Education and Computer Science*, *8*(4), 25.
Wang, M. (2011). Integrating organizational, social, and individual perspectives in Web 2.0-based workplace e-learning. *Information Systems Frontiers*, *13*(2), 191–205.
Webster, J., & Martocchio, J. J. (1992). Microcomputer playfulness: Development of a measure with workplace implications. *MIS Quarterly*, 201–226.
Weibel, D., Stricker, D., & Wissmath, B. (2012). The use of a virtual learning centre in the context of a university lecture: factors influencing satisfaction and performance. *Interactive Learning Environments*, *20*(1), 77–87.
Wetzels, M., Odekerken-Schröder, G., & Van Oppen, C. (2009). Using PLS path modeling for assessing hierarchical construct models: Guidelines and empirical illustration. *MIS Quarterly*, 177–195.
Wong, K.-T., Teo, T., & Goh, P. S. C. (2015). Understanding the intention to use interactive whiteboards: model development and testing. *Interactive Learning Environments*, *23*(6), 731–747.
Wong, K. K.-K. (2013). Partial least squares structural equation modeling (PLS-SEM) techniques using SmartPLS. *Marketing Bulletin*, *24*(1), 1–32.
Wongvilaisakul, W., & Lekcharoen, S. (2015). The acceptance of e-Learning using SEM approach: A case of IT Literacy development for PIM students. In *Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology (ECTI-CON), 2015 12th International Conference on* (pp. 1–6). IEEE.
Wu, W.-H., Wu, Y.-C. J., Chen, C.-Y., Kao, H.-Y., Lin, C.-H., & Huang, S.-H. (2012). Review of trends from mobile learning studies: A meta-analysis. *Computers & Education*, *59*(2), 817–827.
Yi-Cheng, C., Chun-Yu, C., Yi-Chen, L., & Ron-Chen, Y. (2007). Predicting college student'use of e-learning systems: an attempt to extend technology acceptance model. *PACIS 2007 Proceedings*, 121.
Yuen, A. H. K., & Ma, W. W. K. (2008). Exploring teacher acceptance of e-learning technology. *Asia-Pacific Journal of Teacher Education*, *36*(3), 229–243.
Zanjani, M., Vali, F., & Ramazani, M. (2012). Investigation of e-learning acceptance in teaching English language based on TAM Model.
Zhao, J., & Tan, W. (2010). E-learning systems adoption across cultures: a comparison study. In *E-Product E-Service and E-Entertainment (ICEEE), 2010 International Conference on* (pp. 1–4). IEEE.

**Appendix A: Questionnaires / Surveys**

# Applying the Extended Technology Acceptance Model to E-learning systems in the UAE Universities Questionnaire

Dear Participant,

My name is **Said A. Salloum** and I am a master candidate from **The British University in Dubai**, **Faculty of Engineering and Information Technology**. By answering this questionnaire you will help me realizing my final dissertation. This survey aims at study is to investigate the factors affecting the E-learning acceptance in the Asian Universities. Thank you for your time and cooperation in this research study.

**Part one : Demographic information**

| |
|---|
| **1- Your age:**<br>❍ 18-29 (1)<br>❍ 30-39 (2)<br>❍ 40-49 (3)<br>❍ 50-59 (4)<br>❍ 60+ (5) |
| **2- Are you?**<br>❍ Female (1) ❍ Male (2) |
| **3- What is your level of education?**<br>❍ Diploma (1) ❍ Diploma / Advanced (2) ❍ Bachelor (3) ❍ Master (4)<br>❍ Doctorate (5) |
| **4- Your college:**<br>❍ College of Business and Economics (1)<br>❍ College of Humanities and Social Sciences (2) |

- College of Information Technology (3)
- College of Engineering (4)
- College of Education (5)
- College of Food and Agriculture (6)
- College of Science (7)
- Fine Arts & Design (8)
- College of Medicine and Health Sciences (9)
- Sharia and Islamic Studies (10)

- **Answer the following questions by circling the most appropriate answer. 5= *Strongly agree*, 4= *Agree*, 3= *Neutral*, 2= *Disagree*, and 1= *Strongly disagree.***

| **<u>Part two:</u> E- learning system acceptance** | | | | | |
|---|---|---|---|---|---|
| What type of learning management systems you are currently using? | Blackboard(1) Moodle(2) *KALAM*(3) *Classroom management system*(4) | | | | |
| The use of the E-learning tool will make learning easier | **5** | **4** | **3** | **2** | **1** |
| I find the E-learning system to be useful in my learning. | **5** | **4** | **3** | **2** | **1** |
| Using the E-learning system in my job increases my productivity. | **5** | **4** | **3** | **2** | **1** |
| My interaction with E-learning system is clear and understandable | **5** | **4** | **3** | **2** | **1** |
| I find it easy to get the E-learning system to do what I want it to do. | **5** | **4** | **3** | **2** | **1** |
| I find the E-learning system to be easy to use. | **5** | **4** | **3** | **2** | **1** |
| The E-learning system provides an attractive learning environment. | **5** | **4** | **3** | **2** | **1** |
| I have a generally favorable attitude toward using E-learning system. | **5** | **4** | **3** | **2** | **1** |
| Overall, I like using the E-learning system. | **5** | **4** | **3** | **2** | **1** |
| I will use the E-learning system on a regular basis in the future. | **5** | **4** | **3** | **2** | **1** |
| I intend to use the functions and content of E-learning system to assist my academic activities. | **5** | **4** | **3** | **2** | **1** |

| | | | | | |
|---|---|---|---|---|---|
| I will strongly recommend others to use the E-learning system. | **5** | **4** | **3** | **2** | **1** |
| I use E-learning system frequently. | **5** | **4** | **3** | **2** | **1** |
| I use E-learning on daily basis. | **5** | **4** | **3** | **2** | **1** |
| How many times a week do you use the E-learning tool? | **(1)** Every day<br>**(2)** A few times a week<br>**(3)** Occasionally<br>**(4)** Rarely/never | | | | |
| **<u>Part three:</u> Quality (Q)** | | | | | |
| The E-learning system responds quickly during the busiest hours of the day. | **5** | **4** | **3** | **2** | **1** |
| I am satisfied with E-learning system interaction | **5** | **4** | **3** | **2** | **1** |
| I am satisfied with the E-learning system functions | **5** | **4** | **3** | **2** | **1** |
| The E-learning system often provides the updated information. | **5** | **4** | **3** | **2** | **1** |
| The E-learning system can provide learning content that I need. | **5** | **4** | **3** | **2** | **1** |
| I think that the information I will get from E-learning is valuable | **5** | **4** | **3** | **2** | **1** |
| E-learning provides information that is relevant to my needs. | **5** | **4** | **3** | **2** | **1** |
| E-learning provides comprehensive information. | **5** | **4** | **3** | **2** | **1** |
| The information from the e-learning system is up-to-date enough for my purposes. | **5** | **4** | **3** | **2** | **1** |
| **<u>Part four:</u> E-learning self-efficacy (SE)** | | | | | |
| I feel confident using E-learning system even if there is no one around to help. | **5** | **4** | **3** | **2** | **1** |

| | | | | | |
|---|---|---|---|---|---|
| I have the necessary skills for using an E-learning system. | **5** | **4** | **3** | **2** | **1** |
| In my opinion, using the tools of E-learning is important. | **5** | **4** | **3** | **2** | **1** |
| **<u>Part five:</u> Subjective norm (SN)/ Social influence** | | | | | |
| My Instructors think that I should participate in the E-learning activities. | **5** | **4** | **3** | **2** | **1** |
| Other students think that I should participate in the E- learning activities. | **5** | **4** | **3** | **2** | **1** |
| People who influence my behaviour or who opinions I value think that I should use the E-learning system. | **5** | **4** | **3** | **2** | **1** |
| In general, I believe that the university would support the use of the E-learning system. | **5** | **4** | **3** | **2** | **1** |
| **<u>Part ssix:</u> Enjoyment** | | | | | |
| I find using the E-learning system to be enjoyable. | **5** | **4** | **3** | **2** | **1** |
| The use of the E-learning system stimulates my imagination. | **5** | **4** | **3** | **2** | **1** |
| The actual process of using the E-learning is pleasant. | **5** | **4** | **3** | **2** | **1** |
| **<u>Part seven:</u> Accessibility** | | | | | |
| I have no difficulty accessing and using an E-learning system in the university. | **5** | **4** | **3** | **2** | **1** |
| The chain of communication is suitable to get access to the E-learning system. | **5** | **4** | **3** | **2** | **1** |
| I can easily use the chain of communication that gives me access to the e-learning tool. | **5** | **4** | **3** | **2** | **1** |
| **<u>Part eight:</u> Computer Playfulness** | | | | | |
| I feel that E-learning will help me to improve my creativity. | **5** | **4** | **3** | **2** | **1** |
| I feel that E-learning will help me to improve my imagination by obtaining information. | **5** | **4** | **3** | **2** | **1** |
| I feel E-learning is fun regardless of usage purposes | **5** | **4** | **3** | **2** | **1** |

**Thanks for your information and time**